8. The resistivity of iron is 1×10^{-7} *ohm*$-m$. The resistance of a iron wire of particular length and thickness is 1 *ohm*. If the length and the diameter of wire both are doubled, then the resistivity in *ohm*$-m$ will be
[CPMT 1983; DPMT 1999]
(a) 1×10^{-7} (b) 2×10^{-7}
(c) 4×10^{-7} (d) 8×10^{-7}

9. The temperature coefficient of resistance for a wire is $0.00125/^{\circ}C$. At 300K its resistance is 1 *ohm*. The temperature at which the resistance becomes 2 *ohm* is
[IIT 1980; MP PET 2002; KCET 2003; MP PMT 2001; Orissa JEE 2002]
(a) 1154 K (b) 1100 K
(c) 1400 K (d) 1127 K

10. When the length and area of cross-section both are doubled, then its resistance
[MP PET 1989]
(a) Will become half (b) Will be doubled
(c) Will remain the same (d)Will become four times

11. The resistance of a wire is 20 *ohm*s. It is so stretched that the length becomes three times, then the new resistance of the wire will be
[MP PET 1989]
(a) 6.67 *ohm*s (b) 60.0 *ohm*s
(c) 120 *ohm*s (d) 180.0 *ohm*s

12. The resistivity of a wire [MP PMT 1984; DPMT 1982]
(a) Increases with the length of the wire
(b) Decreases with the area of cross-section
(c) Decreases with the length and increases with the cross-section of wire
(d) None of the above statement is correct

13. *Ohm*'s law is true
(a) For metallic conductors at low temperature
(b) For metallic conductors at high temperature
(c) For electrolytes when current passes through them
(d) For diode when current flows

14. The example for non-*ohm*ic resistance is [MP PMT 1978]
(a) Copper wire (b) Carbon resistance
(c) Diode (d) Tungston wire

15. Drift velocity v_d varies with the intensity of electric field as per the relation
[CPMT 1981; BVP 2003]
(a) $v_d \propto E$ (b) $v_d \propto \frac{1}{E}$
(c) v_d = constant (d) $v_d \propto E^2$

16. On increasing the temperature of a conductor, its resistance increases because
[CPMT 1982]
(a) Relaxation time decreases
(b) Mass of the electrons increases
(c) Electron density decreases
(d) None of the above

17. In a conductor 4 *coulombs* of charge flows for 2 *seconds*. The value of electric current will be
[CPMT 1984]
(a) 4 *volts* (b) 4 *amperes*
(c) 2 *amperes* (d) 2 *volts*

18. The specific resistance of a wire is ρ, its volume is 3 m^3 and its resistance is 3 *ohm*s, then its length will be
[CPMT 1984]
(a) $\sqrt{\frac{1}{\rho}}$ (b) $\frac{3}{\sqrt{\rho}}$
(c) $\frac{1}{\rho}\sqrt{3}$ (d) $\rho\sqrt{\frac{1}{3}}$

19. 62.5×10^{18} electrons per second are flowing through a wire of area of cross-section 0.1 m^2, the value of current flowing will be
[CPMT 1984]
(a) 1 A (b) 0.1 A
(c) 10 A (d) 0.11 A

20. A piece of wire of resistance 4 *ohm*s is bent through 180° at its mid point and the two halves are twisted together, then the resistance is
[CPMT 1971]
(a) 8 *ohm*s (b) 1 *ohm*
(c) 2 *ohm*s (d) 5 *ohm*s

21. When a piece of aluminium wire of finite length is drawn through a series of dies to reduce its diameter to half its original value, its resistance will become
[NCERT 1974; AIIMS 1997; MH CET 2000; UPSEAT 2001; CBSE PMT 2002]

(a) Two times (b) Four times
(c) Eight times (d) Sixteen times

22. A wire 100 cm long and 2.0 mm diameter has a resistance of 0.7 *ohm*, the electrical resistivity of the material is
(a) $4.4\times10^{-6}\ ohm\times m$ (b) $2.2\times10^{-6}\ ohm\times m$
(c) $1.1\times10^{-6}\ ohm\times m$ (d) $0.22\times10^{-6}\ ohm\times m$

23. A certain wire has a resistance R. The resistance of another wire identical with the first except having twice its diameter is **[CPMT 1999]**
(a) $2R$ (b) $0.25R$
(c) $4R$ (d) $0.5R$

24. In hydrogen atom, the electron makes 6.6×10^{15} revolutions per second around the nucleus in an orbit of radius $0.5\times10^{-10}\ m$. It is equivalent to a current nearly
(a) 1 A (b) 1 mA
(c) $1\ \mu A$ (d) $1.6\times10^{-19}\ A$

25. A wire of length 5 m and radius 1 mm has a resistance of 1 *ohm*. What length of the wire of the same material at the same temperature and of radius 2 mm will also have a resistance of 1 *ohm*
(a) 1.25 m (b) 2.5 m
(c) 10 m (d) 20 m

26. When there is an electric current through a conducting wire along its length, then an electric field must exist
(a) Outside the wire but normal to it
(b) Outside the wire but parallel to it
(c) Inside the wire but parallel to it
(d) Inside the wire but normal to it

27. Through a semiconductor, an electric current is due to drift of
(a) Free electrons
(b) Free electrons and holes
(c) Positive and negative ions
(d) Protons

28. In an electrolyte 3.2×10^{18} bivalent positive ions drift to the right per second while 3.6×10^{18} monovalent negative ions drift to the left per second. Then the current is
(a) 1.6 amp to the left (b) 1.6 amp to the right
(c) 0.45 amp to the right (d)0.45 amp to the left

29. A metallic block has no potential difference applied across it, then the mean velocity of free electrons is (T = absolute temperature of the block)
(a) Proportional to T
(b) Proportional to $\sqrt{T}$
(c) Zero
(d) Finite but independent of temperature

30. The specific resistance of all metals is most affected by
(a) Temperature (b) Pressure
(c) Degree of illumination (d)Applied magnetic field

31. The positive temperature coefficient of resistance is for
(a) Carbon (b) Germanium
(c) Copper (d) An electrolyte

32. The fact that the conductance of some metals rises to infinity at some temperature below a few Kelvin is called
(a) Thermal conductivity (b)Optical conductivity
(c) Magnetic conductivity (d) Superconductivity

33. Dimensions of a block are $1\ cm\times1\ cm\times100\ cm$. If specific resistance of its material is $3\times10^{-7}\ ohm-m$, then the resistance between the opposite rectangular faces is **[MP PET 1993]**
(a) $3\times10^{-9}\ ohm$ (b) $3\times10^{-7}\ ohm$
(c) $3\times10^{-5}\ ohm$ (d) $3\times10^{-3}\ ohm$

34. In the above question, the resistance between the square faces is **[MP PET 1993]**
(a) $3\times10^{-9}\ ohm$ (b) $3\times10^{-7}\ ohm$
(c) $3\times10^{-5}\ ohm$ (d) $3\times10^{-3}\ ohm$

35. There is a current of 20 amperes in a copper wire of 10^{-6} square metre area of cross-section. If the number of free electrons per cubic metre is 10^{29}, then the drift velocity is

(a) $125\times10^{-3}\ m/sec$ (b) $12.5\times10^{-3}\ m/sec$

(c) $1.25\times10^{-3}\ m/sec$ (d) $1.25\times10^{-4}\ m/sec$

36. The electric intensity E, current density j and specific resistance k are related to each other by the relation **[DPMT 2001]**

(a) $E=j/k$ (b) $E=jk$

(c) $E=k/j$ (d) $k=jE$

37. The resistance of a wire of uniform diameter d and length L is R. The resistance of another wire of the same material but diameter $2d$ and length $4L$ will be **[CPMT 1984; MP PET 2002]**

(a) $2R$ (b) R

(c) $R/2$ (d) $R/4$

38. There is a current of 1.344 *amp* in a copper wire whose area of cross-section normal to the length of the wire is $1\ mm^2$. If the number of free electrons per cm^3 is 8.4×10^{22}, then the drift velocity would be **[CPMT 1990]**

(a) 1.0 mm/sec (b) 1.0 m/sec

(c) 0.1 mm/sec (d) 0.01 mm/sec

39. It is easier to start a car engine on a hot day than on a cold day. This is because the internal resistance of the car battery

(a) Decreases with rise in temperature

(b) Increases with rise in temperature

(c) Decreases with a fall in temperature

(d) Does not change with a change in temperature

40. 5 *amperes* of current is passed through a metallic conductor. The charge flowing in one minute in coulombs will be **[MP PET 1984]**

(a) 5 (b) 12

(c) 1/12 (d) 300

41. Two wires of the same material are given. The first wire is twice as long as the second and has twice the diameter of the second. The resistance of the first will be **[MP PMT 1993]**

(a) Twice of the second (b) Half of the second

(c) Equal to the second (d) Four times of the second

42. An electric wire is connected across a cell of e.m.f. E. The current I is measured by an ammeter of resistance R. According to *ohm*'s law **[MP PMT 1993]**

(a) $E=I^2R$ (b) $E=IR$

(c) $E=R/I$ (d) $E=I/R$

43. The resistances of a wire at temperatures $t°C$ and $0°C$ are related by **[MP PMT 1993]**

(a) $R_t=R_0(1+\alpha t)$ (b) $R_t=R_0(1-\alpha t)$

(c) $R_t=R_0^2(1+\alpha t)$ (d) $R_t=R_0^2(1-\alpha t)$

44. An electric wire of length 'I' and area of cross-section a has a resistance R *ohm*s. Another wire of the same material having same length and area of cross-section $4a$ has a resistance of **[MP PMT 1993]**

(a) $4R$ (b) $R/4$

(c) $R/16$ (d) $16R$

45. For which of the following the resistance decreases on increasing the temperature **[MP PET 1993]**

(a) Copper (b) Tungsten

(c) Germanium (d) Aluminium

46. If n, e, τ and m respectively represent the density, charge relaxation time and mass of the electron, then the resistance of a wire of length l and area of cross-section A will be **[CPMT 1992]**

(a) $\frac{ml}{ne^2\tau A}$ (b) $\frac{m\tau^2 A}{ne^2 l}$

(c) $\frac{ne^2\tau A}{2ml}$ (d) $\frac{ne^2 A}{2m\tau l}$

47. The relaxation time in conductors **[DPMT 2003]**

(a) Increases with the increase of temperature

(b) Decreases with the increase of temperature

(c) It does not depend on temperature

(d) All of sudden changes at 400 K

48. Which of the following statement is correct

(a) Liquids obey fully the *ohm*'s law

(b) Liquids obey partially the *ohm*'s law

(c) There is no relation between current and p.d. for liquids

(d) None of the above

49. A certain piece of silver of given mass is to be made like a wire. Which of the following combination of length (L) and the area of cross-sectional (A) will lead to the smallest resistance **[MP PMT 1995; CBSE PMT 1997]**

(a) L and A

(b) $2L$ and $A/2$

(c) $L/2$ and $2A$

(d) Any of the above, because volume of silver remains same

50. The resistance of a wire is 10Ω. Its length is increased by 10% by stretching. The new resistance will now be **[CPMT 2000; Pb PET 2004]**

(a) 12Ω (b) 1.2Ω

(c) 13Ω (d) 11Ω

51. Resistance of tungsten wire at $150°C$ is 133Ω. Its resistance temperature coefficient is $0.0045/°C$. The resistance of this wire at $500°C$ will be **[DPMT 2004]**

(a) 180Ω (b) 225Ω

(c) 258Ω (d) 317Ω

52. A metal wire of specific resistance $64\times10^{-6}\ ohm-cm$ and length 198 cm has a resistance of 7 ohm, the radius of the wire will be **[MP PET 1994]**

(a) 2.4 cm (b) 0.24 cm

(c) 0.024 cm (d) 24 cm

53. A copper wire of length 1 m and radius 1 mm is joined in series with an iron wire of length 2 m and radius 3 mm and a current is passed through the wires. The ratio of the current density in the copper and iron wires is **[MP PMT 1994]**

(a) 18 : 1 (b) 9 : 1

(c) 6 : 1 (d) 2 : 3

54. For a metallic wire, the ratio V/i (V= the applied potential difference, i = current flowing) is **[MP PMT 1994; BVP 2003]**

(a) Independent of temperature

(b) Increases as the temperature rises

(c) Decreases as the temperature rises

(d) Increases or decreases as temperature rises, depending upon the metal

55. The resistance of a wire is R. If the length of the wire is doubled by stretching, then the new resistance will be **[Roorkee 1992; AFMC 1995; KCET 1993; AMU (Med.) 1999; CBSE PMT 1999; MP PET 2001; UPSEAT 2001]**

(a) $2R$ (b) $4R$

(c) R (d) $\frac{R}{4}$

56. Which of the following has a negative temperature coefficient **[AFMC 1995]**

(a) C (b) Fe

(c) Mn (d) Ag

57. The reciprocal of resistance is **[AFMC 1995]**

(a) Conductance (b) Resistivity

(c) Voltage (d) None of the above

58. A solenoid is at potential difference 60 V and current flows through it is 15 *ampere*, then the resistance of coil will be **[AFMC 1995]**

(a) 4Ω (b) 8Ω

(c) 0.25Ω (d) 2Ω

59. All of the following statements are true except **[Manipal MEE 1995]**

(a) Conductance is the reciprocal of resistance and is measured in *Siemens*

(b) *Ohm*'s law is not applicable at very low and very high temperatures

(c) *Ohm*'s law is applicable to semiconductors

(d) *Ohm*'s law is not applicable to electron tubes, discharge tubes and electrolytes

60. A potential difference of V is applied at the ends of a copper wire of length l and diameter d. On doubling only d, drift velocity **[MP PET 1995]**

(a) Becomes two times (b) Becomes half

(c) Does not change (d) Becomes one fourth

61. If the resistance of a conductor is 5 Ω at 50^oC and 7 Ω at 100^oC then the mean temperature

coefficient of resistance of the material is
[Pb PET 2000]

(a) $0.008/^oC$ (b) $0.006/^oC$

(c) $0.004/^oC$ (d) $0.001/^oC$

62. The resistance of a discharge tube is
[AFMC 1996; CBSE PMT 1999]

(a) *Ohm*ic (b) Non-*ohm*ic

(c) Both (a) and (b) (d) Zero

63. We are able to obtain fairly large currents in a conductor because [Haryana CEE 1996]

(a) The electron drift speed is usually very large

(b) The number density of free electrons is very high and this can compensate for the low values of the electron drift speed and the very small magnitude of the electron charge

(c) The number density of free electrons as well as the electron drift speeds are very large and these compensate for the very small magnitude of the electron charge

(d) The very small magnitude of the electron charge has to be divided by the still smaller product of the number density and drift speed to get the electric current

64. A platinum resistance thermometer has a resistance of 50Ω at $20°C$. When dipped in a liquid the resistance becomes 76.8Ω. The temperature coefficient of resistance for platinum is $\alpha = 3.92\times10^{-3}/°C$. The temperature of the liquid is

(a) $100°C$ (b) $137°C$

(c) $167°C$ (d) $200°C$

65. In a wire of circular cross-section with radius r, free electrons travel with a drift velocity V when a current I flows through the wire. What is the current in another wire of half the radius and of the same material when the drift velocity is $2V$
[MP PET 1997]

(a) $2I$ (b) I

(c) $I/2$ (d) $I/4$

66. The resistivity of a wire depends on its [MP PMT/PET 1998]

(a) Length (b) Area of cross-section

(c) Shape (d) Material

67. The conductivity of a superconductor is
[Similar to KCET 1993; MP PMT/PET 1998]

(a) Infinite (b) Very large

(c) Very small (d) Zero

68. In a neon discharge tube 2.9×10^{18} Ne^+ ions move to the right each *second* while 1.2×10^{18} electrons move to the left per *second*. Electron charge is $1.6\times10^{-19}C$. The current in the discharge tube [MP PET 1999]

(a) 1 A towards right (b) 0.66 A towards right

(c) 0.66 A towards left (d) Zero

69. A steady current flows in a metallic conductor of non-uniform cross-section. The quantity/ quantities constant along the length of the conductor is/are
[KCET 1994, IIT 1997 Cancelled; CBSE PMT 2001]

(a) Current, electric field and drift speed

(b) Drift speed only

(c) Current and drift speed

(d) Current only

70. The resistivity of alloys $= R_{alloy}$; the resistivity of constituent metals R_{metal}. Then, usually
[KCET 1994]

(a) $R_{alloy} = R_{metal}$

(b) $R_{alloy} < R_{metal}$

(c) There is no simple relation between R_{alloy} and R_{metal}

(d) $R_{alloy} > R_{metal}$

71. Two wires A and B of same material and same mass have radius $2r$and r. If resistance of wire A is 34Ω, then resistance of B will be
[RPET 1997]

(a) $544\,\Omega$ (b) $272\,\Omega$

(c) $68\,\Omega$ (d) $17\,\Omega$

72. Two rods of same material and length have their electric resistance in ratio $1:2$. When both rods are dipped in water, the correct statement will be **[RPMT 1997]**

(a) *A* has more loss of weight

(b) *B* has more loss of weight

(c) Both have same loss of weight

(d) Loss of weight will be in the ratio $1:2$

73. $20\,\mu A$ current flows for 30 *seconds* in a wire, transfer of charge will be **[RPMT 1997]**

(a) $2\times10^{-4}\,C$ (b) $4\times10^{-4}\,C$

(c) $6\times10^{-4}\,C$ (d) $8\times10^{-4}\,C$

74. σ_1 and σ_2 are the electrical conductivities of *Ge* and *Na* respectively. If these substances are heated, then

(a) Both σ_1 and σ_2 increase

(b) σ_1 increases and σ_2 decreases

(c) σ_1 decreases and σ_2 increases

(d) Both σ_1 and σ_2 decrease

75. 1.6 *mA* current is flowing in conducting wire then the number of electrons flowing per *second* is **[RPMT 1999]**

(a) 10^{11} (b) 10^{16}

(c) 10^{19} (d) 10^{15}

76. A current *I* is passing through a wire having two sections *P* and *Q* of uniform diameters *d* and *d*/2 respectively. If the mean drift velocity of electrons in sections *P* and *Q* is denoted by v_P and v_Q respectively, then **[Roorkee 1999]**

(a) $v_P = v_Q$ (b) $v_P = \frac{1}{2}v_Q$

(c) $v_P = \frac{1}{4}v_Q$ (d) $v_P = 2\,v_Q$

77. If an electric current is passed through a nerve of a man, then man **[UPSEAT 1999]**

(a) Begins to laugh

(b) Begins to weep

(c) Is excited

(d) Becomes insensitive to pain

78. The resistance of a coil is 4.2 Ω at 100^o *C* and the temperature coefficient of resistance of its material is $0.004/^o$ *C*. Its resistance at 0^o *C* is

(a) 6.5 Ω (b) 5 Ω

(c) 3 Ω (d) 4 Ω

79. Masses of three wires of copper are in the ratio of 1 : 3 : 5 and their lengths are in the ratio of $5:3:1$. The ratio of their electrical resistances are **[AFMC 2000]**

(a) 1 : 3 : 5 (b) 5 : 3 : 1

(c) 1 : 15 : 125 (d) 125 : 15 : 1

80. Conductivity increases in the order of **[AFMC 2000]**

(a) *Al, Ag, Cu* (b) *Al, Cu, Ag*

(c) *Cu, Al, Ag* (d) *Ag, Cu, Al*

81. A uniform wire of resistance *R* is uniformly compressed along its length, until its radius becomes *n* times the original radius. Now resistance of the wire becomes **[KCET 2000]**

(a) $\frac{R}{n^4}$ (b) $\frac{R}{n^2}$

(c) $\frac{R}{n}$ (d) nR

82. The resistance of a conductor is 5 *ohm* at 50^oC and 6 *ohm* at 100^oC. Its resistance at 0^oC is **[KCET 2000**

(a) 1 *ohm* (b) 2 *ohm*

(c) 3 *ohm* (d) 4 *ohm*

83. If an electron revolves in the path of a circle of radius of 0.5×10^{-10} *m* at frequency of 5×10^{15} *cycles/s* the electric current in the circle is (Charge of an electron = 1.6×10^{-19} *C*) **[EAMCET 2000]**

(a) 0.4 *mA* (b) 0.8 *mA*

(c) 1.2 *mA* (d) 1.6 *mA*

84. Equal potentials are applied on an iron and copper wire of same length. In order to have the same current flow in the two wires, the ratio *r* (iron)/*r* (copper) of their radii must be (Given that specific resistance of iron = 1.0×10^{-7} *ohm–m* and specific resistance of copper = 1.7×10^{-8} *ohm-m*) **[MP PMT 2000]**

(a) About 1.2 (b) About 2.4

(c) About 3.6 (d) About 4.8

85. An electron (charge = 1.6×10^{-19} *coulomb*) is moving in a circle of radius $5.1 \times 10^{-11} m$ at a frequency of 6.8×10^{15} *revolutions/sec*. The equivalent current is approximately **[MP PET 2000]**

(a) 5.1×10^{-3} *amp* (b) 6.8×10^{-3} *amp*

(c) 1.1×10^{-3} *amp* (d) 2.2×10^{-3} *amp*

86. A rod of a certain metal is 1.0 *m* long and 0.6 *cm* in diameter. Its resistance is 3.0×10^{-3} *ohm*. Another disc made of the same metal is 2.0 *cm* in diameter and 1.0 *mm* thick. What is the resistance between the round faces of the disc **[MP PET 2000]**

(a) 1.35×10^{-8} *ohm* (b) 2.70×10^{-7} *ohm*

(c) 4.05×10^{-6} *ohm* (d) 8.10×10^{-5} *ohm*

87. At what temperature will the resistance of a copper wire become three times its value at 0^oC (Temperature coefficient of resistance for copper = 4×10^{-3} *per* ^oC) **[MP PET 2000]**

(a) 400^oC (b) 450^oC

(c) 500^oC (d) 550^oC

88. An electron revolves 6×10^{15} *times/sec* in circular loop. The current in the loop is

(a) 0.96 *mA* (b) 0.96 μA

(c) 28.8 *A* (d) None of these

89. The charge of an electron is 1.6×10^{-19} *C*. How many electrons strike the screen of a cathode ray tube each *second* when the beam current is 16 *mA* **[AMU (Med.) 2000]**

(a) 10^{17} (b) 10^{19}

(c) 10^{-19} (d) 10^{-17}

90. If potential $V = 100 \pm 0.5$ *Volt* and current $I = 10 \pm 0.2$ *amp* are given to us. Then what will be the value of resistance

(a) 10 ± 0.7 *ohm* (b) 5 ± 2 *ohm*

(c) 0.1 ± 0.2 *ohm* (d) None of these

91. A nichrome wire 50 *cm* long and one square *millimetre* cross-section carries a current of 4*A* when connected to a 2*V* battery. The resistivity of nichrome wire in *ohm metre* is **[EAMCET 2001]**

(a) 1×10^{-6} (b) 4×10^{-7}

(c) 3×10^{-7} (d) 2×10^{-7}

92. If an observer is moving with respect to a stationary electron, then he observes

(a) Only magnetic field (b) Only electric field

(c) Both (a) and (b) (d) None of the above

93. Calculate the amount of charge flowing in 2 *minutes* in a wire of resistance 10 Ω when a potential difference of 20 *V* is applied between its ends **[Kerala (Engg.) 2001]**

(a) 120 *C* (b) 240 *C*

(c) 20 *C* (d) 4 *C*

94. If a wire of resistance *R* is melted and recasted to half of its length, then the new resistance of the wire will be **[KCET (Med.) 2001]**

(a) *R*/4 (b) *R*/2

(c) *R* (d) 2*R*

95. The drift velocity does not depend upon **[BHU 2001]**

(a) Cross-section of the wire (b)

(c) Number of free electrons (d)

96. There is a current of 40 *ampere* in a wire of $10^{-6} m^2$ area of cross-section. If the number of free electron per m^3 is 10^{29}, then the drift velocity will be **[MNR 1995; UPSEAT 2000]** **[Pb. PMT 2001]**

(a) 1.25×10^3 *m/s* (b) 2.50×10^{-3} *m/s*

(c) 25.0×10^{-3} *m/s* (d) 250×10^{-3} *m/s*

97. At room temperature, copper has free electron density of 8.4×10^{28} per m^3. The copper conductor has a cross-section of $10^{-6} m^2$ and carries a current of 5.4 *A*. The electron drift velocity in copper is **[UPSEAT 2002]**

(a) 400 *m/s* (b) 0.4 *m/s*

(c) 0.4 *mm/s* (d) 72 *m/s*

98. The resistance of a 5 *cm* long wire is 10 Ω. It is uniformly stretched so that its length becomes 20 *cm*. The resistance of the wire is **[RPET 2001]**

(a) 160 Ω (b) 80 Ω

(c) 40 Ω (d) 20 Ω

99. The resistance of an incandescent lamp is **[KCET 2002]**

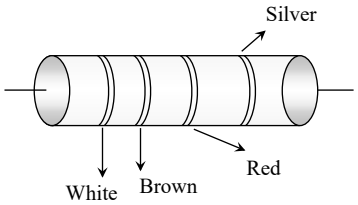
(a) Greater when switched off

(b) Smaller when switched on

(c) Greater when switched on

(d) The same whether it is switched off or switched on

100. In the figure a carbon resistor has bands of different colours on its body as mentioned in the figure. The value of the resistance is



(a) 2.2 $k\,\Omega$

(b) 3.3 $k\,\Omega$

(c) 5.6 $k\,\Omega$

(d) 9.1 $k\,\Omega$

101. By increasing the temperature, the specific resistance of a conductor and a semiconductor [AIEEE 2002]

(a) Increases for both

(b) Decreases for both

(c) Increases, decreases

(d) Decreases, increases

102. Which of the following is vector quantity [AFMC 2002]

(a) Current density (b) Current

(c) Wattless current (d) Power

103. Masses of 3 wires of same metal are in the ratio 1 : 2 : 3 and their lengths are in the ratio 3 : 2 : 1. The electrical resistances are in ratio

(a) 1 : 4 : 9 (b) 9 : 4 : 1

(c) 1 : 2 : 3 (d) 27 : 6 : 1

104. A current of 1 mA is flowing through a copper wire. How many electrons will pass a given point in one *second*

[$e = 1.6 \times 10^{-19}$ *Coulomb*] [RPMT 2000; MP PMT 2002]

(a) 6.25×10^{19} (b) 6.25×10^{15}

(c) 6.25×10^{31} (d) 6.25×10^{8}

105. The drift velocity of free electrons in a conductor is 'v' when a current 'i' is flowing in it. If both the radius and current are doubled, then drift velocity will be [BHU 2002]

(a) v (b) $\frac{v}{2}$

(c) $\frac{v}{4}$ (d) $\frac{v}{8}$

106. A wire of radius r has resistance R. If it is stretched to a radius of $\frac{3r}{4}$, its resistance becomes [BHU 2002]

(a) $\frac{9R}{16}$ (b) $\frac{16R}{9}$

(c) $\frac{81R}{256}$ (d) $\frac{256R}{81}$

107. The resistance of a conductor increases with [CBSE PMT 2002]

(a) Increase in length

(b) Increase in temperature [Kerala PET 2002]

(c) Decrease in cross–sectional area

(d) All of these

108. A copper wire has a square cross-section, 2.0 mm on a side. It carries a current of 8 A and the density of free electrons is $8 \times 10^{28}\ m^{-3}$. The drift speed of electrons is equal to [AMU (Med.) 2002]

(a) $0.156 \times 10^{-3}\ m.s^{-1}$ (b) $0.156 \times 10^{-2}\ m.s^{-1}$

(c) $3.12 \times 10^{-3}\ m.s^{-1}$ (d) $3.12 \times 10^{-2}\ m.s^{-1}$

109. Two wires of same material have length L and $2L$ and cross–sectional areas $4A$ and A respectively. The ratio of their specific resistance would be [MHCET 2002]

(a) 1 : 2 (b) 8 : 1

(c) 1 : 8 (d) 1 : 1

110. When a current flows through a conductor its temperature [CPMT 2002] [MHCET 2002]

(a) May increase or decrease

(b) Remains same

(c) Decreases

(d) Increases

111. What length of the wire of specific resistance $48 \times 10^{-8}\ \Omega\ m$ is needed to make a resistance of 4.2 Ω (diameter of wire = 0.4 mm) [CBSE PMT 2000; Pb. PMT 2002]

(a) 4.1 m (b) 3.1 m

(c) 2.1 m (d) 1.1 m

112. A strip of copper and another of germanium are cooled from room temperature to 80 K. The resistance of [AIEEE 2003]

(a) Each of these increases

(b) Each of these decreases

(c) Copper strip increases and that of germanium decreases

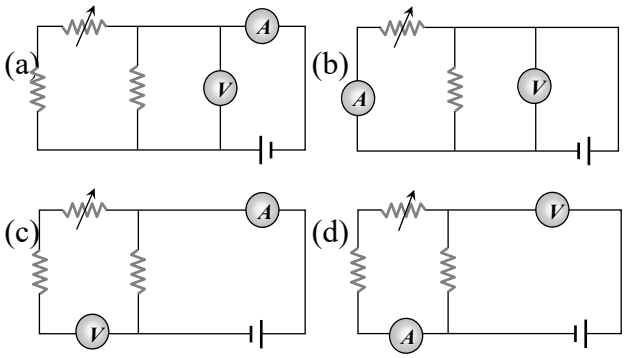
(d) Copper strip decreases and that of germanium increases

113. The length of a given cylindrical wire is increased by 100 %. Due to the consequent decrease in diameter the change in the resistance of the wire will be

(a) 300 % (b) 200 %

(c) 100 % (d) 50 %

114. Express which of the following setups can be used to verify Ohm's law



115. We have two wires A and B of same mass and same material. The diameter of the wire A is half of that B. If the resistance of wire A is 24 *ohm* then the resistance of wire B will be

(a) 12 *Ohm* (b) 3.0 *Ohm*

(c) 1.5 *Ohm* (d) None of the above

116. In a hydrogen discharge tube it is observed that through a given cross-section 3.13×10^{15} electrons are moving from right to left and 3.12×10^{15} protons are moving from left to right. What is the electric current in the discharge tube and what is its direction

(a) $1\,mA$ towards right (b) $1mA$ towards left

(c) $2mA$ towards left (d) $2\,mA$ towards right

117. A steady current i is flowing through a conductor of uniform cross-section. Any segment of the conductor has **[MP PET 1996]**

(a) Zero charge

(b) Only positive charge

(c) Only negative charge

(d) Charge proportional to current i

118. The length of the wire is doubled. Its conductance will be **[Kerala PMT 2004]**

(a) Unchanged (b) Halved

(c) Quadrupled (d) 1/4 of the original value

119. A source of e.m.f. E = 15 V and having negligible internal resistance is connected to a variable resistance so that the current in the circuit increases with time as $i = 1.2\ t + 3$. Then, the total charge that will flow in first five second will be **[AIEEE 2003] [IIT-JEE (Screening) 2003]**

(a) 10 C (b) 20 C

(c) 30 C (d) 40 C

120. The new resistance of wire of R Ω, whose radius is reduced half, is **[J & K CET 2004; Pb PMT 2004]**

(a) 16 R (b) 3 R

(c) 2R (d) R

121. A resistance R is stretched to four times its length. Its new resistance will be **[ISM Dhanbad 1994; UPSEA**

(a) 4 R (b) 64 R

(c) $R/4$ (d) 16 R

122. What is the resistance of a carbon resistance which has bands of colours brown, black and brown **[DCE 1999]**

(a) 100 Ω **[CPMT 2003]** (b) 1000 Ω

(c) 10 Ω (d) 1 Ω

123. The lead wires should have **[Pb. PMT 2000]**

(a) Larger diameter and low resistance

(b) Smaller diameter and high resistance

(c) Smaller diameter and low resistance

(d) Larger diameter and high resistance

124. The alloys constantan and manganin are used to make standard resistance due to they have **[MP PMT 1996] [MH CET 2000; NCERT 1990]**

(a) Low resistivity

(b) High resistivity

(c) Low temperature coefficient of resistance

(d) Both (b) and (c)

125. When a potential difference is applied across the ends of a linear metallic conductor **[MP PET 1997]**

(a) The free electrons are accelerated continuously from the lower potential end to the higher potential end of the conductor

(b) The free electrons are accelerated continuously from the higher potential end to the lower potential end of the conductor

(c) The free electrons acquire a constant drift

velocity from the lower potential end to the higher potential end of the conductor

(d) The free electrons are set in motion from their position of rest

126. The electric resistance of a certain wire of iron is R. If its length and radius are both doubled, then **[CBSE PMT 2004]**

(a) The resistance will be doubled and the specific resistance will be halved

(b) The resistance will be halved and the specific resistance will remain unchanged

(c) The resistance will be halved and the specific resistance will be doubled

(d) The resistance and the specific resistance, will both remain unchanged

127. A wire of diameter 0.02 *metre* contains 10^{28} free electrons per cubic metre. For an electrical current of 100 A, the drift velocity of the free electrons in the wire is nearly **[UPSEAT 2004]**

(a) 1×10^{-19} *m/s* (b) 5×10^{-10} *m/s*

(c) 2×10^{-4} *m/s* (d) 8×10^{3} *m/s*

128. The following four wires are made of the same material and are at the same temperature. Which one of them has highest electrical resistance **[UPSEAT 2004]**

(a) Length = 50 *cm*, diameter = 0.5 *mm*

(b) Length = 100 *cm*, diameter = 1 *mm*

(c) Length = 200 *cm*, diameter = 2 *mm*

(d) Length = 300 *cm*, diameter = 3 *mm*

129. The colour sequence in a carbon resistor is red, brown, orange and silver. The resistance of the resistor is **[DCE 2004]**

(a) $21 \times 10^{3} \pm 10\%$ (b) $23 \times 10^{1} \pm 10$

(c) $21 \times 10^{3} \pm 5\%$ (d) $12 \times 10^{3} \pm 5\%$

130. A thick wire is stretched so that its length become two times. Assuming that there is no change in its density, then what is the ratio of change in resistance of wire to the initial resistance of wire **[MH CET 2004]**

(a) 2 : 1 (b) 4 : 1

(c) 3 : 1 (d) 1 : 4

131. The length of the resistance wire is increased by 10%. What is the corresponding change in the resistance of wire **[MH CET 2004]**

(a) 10% (b) 25%

(c) 21% (d) 9%

132. The electric field E, current density J and conductivity σ of a conductor are related as **[Kerala PMT 2005]**

(a) $\sigma = E/j$ (b) $\sigma = j/E$

(c) $\sigma = jE$ (d) $\sigma = 1/jE$

133. Two wires that are made up of two different materials whose specific resistance are in the ratio 2 : 3, length 3 : 4 and area 4 : 5. The ratio of their resistances is **[Kerala PMT 2005]**

(a) 6 : 5 (b) 6 : 8

(c) 5 : 8 (d) 1 : 2

Grouping of Resistances

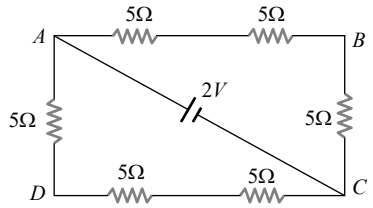
1. The potential difference between points A and B of adjoining figure is **[CPMT 1991]**

(a) $\frac{2}{3}V$

(b) $\frac{8}{9}V$

(c) $\frac{4}{3}V$

(d) $2V$



2. Two resistors of resistance R_1 and R_2 having $R_1 > R_2$ are connected in parallel. For equivalent resistance R, the correct statement is **[CPMT 1978; KCET (Med.) 2000]**

(a) $R > R_1 + R_2$ (b) $R_1 < R < R_2$

(c) $R_2 < R < (R_1 + R_2)$ (d) $R < R_1$

3. A wire of resistance R is divided in 10 equal parts. These parts are connected in parallel, the equivalent resistance of such connection will be **[CPMT 1973, 91]**

(a) 0.01 R (b) 0.1 R

(c) 10 R (d) 100 R

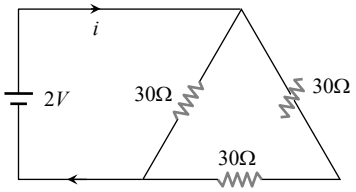
4. The current in the adjoining circuit will be **[IIT 1983; CPMT 1991, 92; MH CET 2002; Pb. PMT 2001; Kerala PMT 2004]**

(a) $\frac{1}{45}$ *ampere*

(b) $\frac{1}{15}$ *ampere*

(c) $\frac{1}{10}$ *ampere*

(d) $\frac{1}{5}$ *ampere*



5. There are 8 equal resistances R. Two are connected in parallel, such four groups are connected in series, the total resistance of the system will be **[MP PMT 1987]**

(a) $R/2$ (b) 2 R

(c) 4 R (d) 8 R

6. Three resistances of one *ohm* each are connected in parallel. Such connection is again connected with $2/3\Omega$ resistor in series. The resultant resistance will be **[MP PMT 1985]**

(a) $\frac{5}{3}\Omega$ (b) $\frac{3}{2}\Omega$

(c) 1Ω (d) $\frac{2}{3}\Omega$

7. The lowest resistance which can be obtained by connecting 10 resistors each of 1/10 *ohm* is **[MP PMT 1984; EAMCET 1994]**

(a) $1/250\Omega$ (b) $1/200\Omega$

(c) $1/100\Omega$ (d) $1/10\Omega$

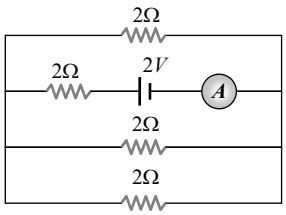
8. The reading of the ammeter as per figure shown is

(a) $\frac{1}{8}A$

(b) $\frac{3}{4}A$

(c) $\frac{1}{2}A$

(d) 2 A



9. Three resistors each of 2 *ohm* are connected together in a triangular shape. The resistance between any two vertices will be **[CPMT 1983; MP PET 1990; MP PMT 1993; DCE 2004]**

(a) 4/3 *ohm* (b) 3/4 *ohm*

(c) 3 *ohm* (d) 6 *ohm*

10. There are n similar conductors each of resistance R. The resultant resistance comes out to be x when connected in parallel. If they are connected in series, the resistance comes out to be **[DPMT 2004]**

(a) x/n^2 (b) $n^2 x$

(c) x/n (d) nx

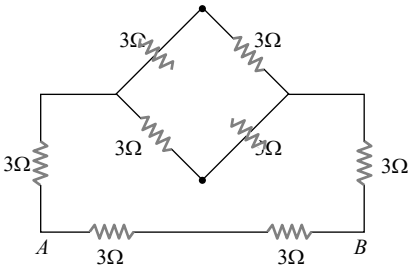
11. Equivalent resistance between A and B will be **[CPMT 1981]**

(a) 2 *ohm*

(b) 18 *ohm*

(c) 6 *ohm*

(d) 3.6 *ohm*



12. A wire has a resistance of 12 *ohm*. It is bent in the form of equilateral triangle. The effective resistance between any two corners of the triangle is

(a) 9 *ohm*s (b) 12 *ohm*s

(c) 6 *ohm*s (d) 8/3 *ohm*s

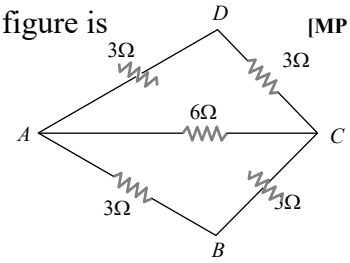
13. The effective resistance between the points A and B in the figure is **[MP PET 1994]**

(a) 5Ω

(b) 2Ω

(c) 3Ω

(d) 4Ω



14. Three resistances of magnitude 2, 3 and 5 *ohm* are connected in parallel to a battery of 10 volts and of negligible resistance. The potential difference across 3Ω resistance will be **[CPMT 1972]**

(a) 2 *volts* (b) 3 *volts*

(c) 5 *volts* (d) 10 *volts*

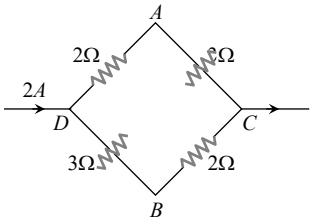
15. A current of 2 A flows in a system of conductors as shown. The potential difference $(V_A - V_B)$ will be **[CPMT 1975, 76]**

(a) $+2\ V$

(b) $+1\ V$

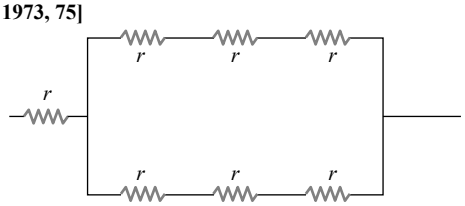
(c) $-1\ V$

(d) $-2\ V$



16. Referring to the figure below, the effective resistance of the network is

[NCERT 1973, 75]



(a) $2r$

(b) $4r$

(c) $10r$

(d) $5r/2$

17. Two resistances are joined in parallel whose resultant is $\frac{6}{8}$ *ohm*. One of the resistance wire is broken and the effective resistance becomes 2Ω. Then the resistance in *ohm* of the wire that got broken was

[CPMT 1976; DPMT 1982]

(a) 3/5 (b) 2

(c) 6/5 (d) 3

18. Given three equal resistors, how many different combination of all the three resistors can be made **[NCERT 1970]**

(a) Six (b) Five

(c) Four (d) Three

19. Lamps used for household lighting are connected in

(a) Series (b) Parallel

(c) Mixed circuit (d) None of the above

20. The equivalent resistance of resistors connected in series is always **[CPMT 1984; MP PMT 1999]**

(a) Equal to the mean of component resistors

(b) Less than the lowest of component resistors

(c) In between the lowest and the highest of component resistors

(d) Equal to sum of component resistors

21. A cell of negligible resistance and e.m.f. 2 volts is connected to series combination of 2, 3 and 5 *ohm*. The potential difference in volts between the terminals of 3 *ohm* resistance will be

[CPMT 1976]

(a) 0.6 (b) 2/3

(c) 3 (d) 6

22. Four wires of equal length and of resistances 10 *ohm*s each are connected in the form of a square. The equivalent resistance between two opposite corners of the square is

[NCERT 1977]

(a) 10 *ohm* (b) 40 *ohm*

(c) 20 *ohm* (d) 10/4 *ohm*

23. Two resistors are connected (a) in series (b) in parallel. The equivalent resistance in the two cases are 9 *ohm* and 2 *ohm* respectively. Then the resistances of the component resistors are

[CPMT 1984]

(a) 2 *ohm* and 7 *ohm* (b) 3 *ohm* and 6 *ohm*

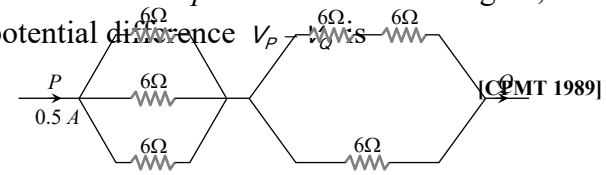
(c) 3 *ohm* and 9 *ohm* (d) 5 *ohm* and 4 *ohm*

24. Resistors of 1, 2, 3 *ohm* are connected in the form of a triangle. If a 1.5 volt cell of negligible internal resistance is connected across 3 *ohm* resistor, the current flowing through this resistance will be **[CPMT 1984]**

(a) 0.25 *amp* (b) 0.5 *amp*

(c) 1.0 *amp* (d) 1.5 *amp*

25. Resistances of 6 *ohm* each are connected in the manner shown in adjoining figure. With the current 0.5 *ampere* as shown in figure, the potential difference $V_P - V_Q$ is



[CPMT 1989]

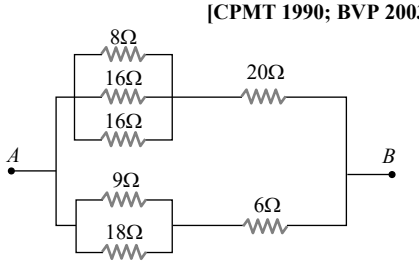
(a) 3.6 V (b) 6.0 V

(c) 3.0 V (d) 7.2 V

26. The equivalent resistance of the arrangement of resistances shown in adjoining figure between the points *A* and *B* is

[CPMT 1990; BVP 2003]

(a) 6 *ohm*

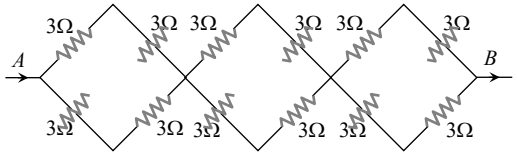


(b) 8 *ohm*

(c) 16 *ohm*

(d) 24 *ohm*

27. In the network of resistors shown in the adjoining figure, the equivalent resistance between *A* and *B* is



(a) 54 *ohm* (b) 18 *ohm*

(c) 36 *ohm* (d) 9 *ohm*

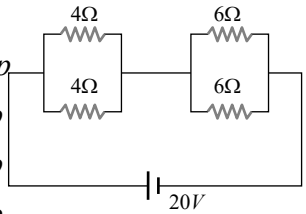
28. A wire is broken in four equal parts. A packet is formed by keeping the four wires together. The resistance of the packet in comparison to the resistance of the wire will be

[MP PET 1985; AFMC 2005]

(a) Equal (b) One fourth

(c) One eight (d) $\frac{1}{16}$ *th*

29. Four resistances are connected in a circuit in the given figure. The electric current flowing through 4 *ohm* and 6 *ohm* resistance is respectively **[MP PET 1993]**



(a) 2 *amp* and 4 *amp*

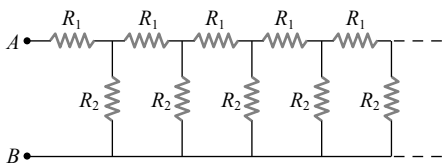
(b) 1 *amp* and 2 *amp*

(c) 1 *amp* and 1 *amp*

(d) 2 *amp* and 2 *amp*

30. An infinite sequence of resistance is shown in the figure. The resultant resistance between *A* and *B* will be, when $R_1 = 1\,ohm$ and $R_2 = 2\,ohm$

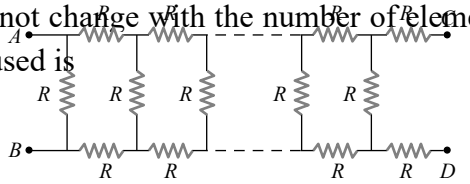
[MP PET 1993]



(a) Infinity (b) 1Ω

(c) 2Ω (d) 1.5Ω

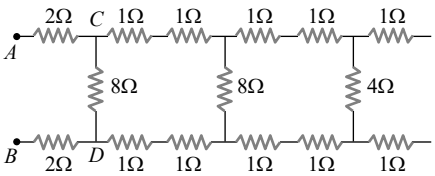
31. In the figure, the value of resistors to be connected between *C* and *D* so that the resistance of the entire circuit between *A* and *B* does not change with the number of elementary sets used is



(a) *R* (b) $R(\sqrt{3}-1)$

(c) 3 *R* (d) $R(\sqrt{3}+1)$

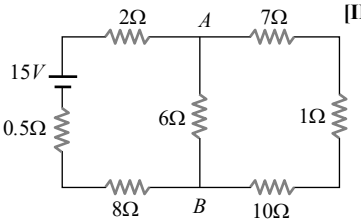
32. In the figure shown, the total resistance between *A* and *B* is



(a) 12Ω (b) 4Ω

(c) 6Ω (d) 8Ω

33. The current from the battery in circuit diagram shown is **[IIT 1989]**



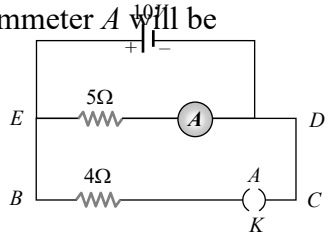
(a) 1 *A*

(b) 2 *A*

(c) 1.5 *A*

(d) 3 *A*

34. In the given figure, when key *K* is opened, the reading of the ammeter *A* will be



(a) 50 *A*

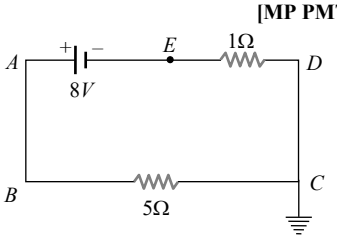
(b) 2 *A*

(c) 0.5 *A*

(d) $\frac{10}{9}$ *A*

35. In the given circuit, the potential of the point *E* is

[MP PMT 2003]



(a) Zero

(b) $-8\ V$

(c) $-4/3\ V$

(d) 4/3 V

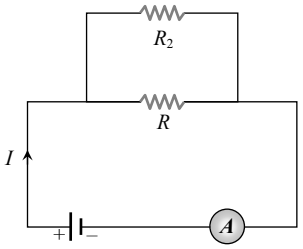
36. If a resistance R_2 is connected in parallel with the resistance R in the circuit shown, then possible value of current through R and the possible value of R_2 will be

(a) $\frac{I}{3}, R$

(b) $I, 2R$

(c) $\frac{I}{3}, 2R$

(d) $\frac{I}{2}, R$

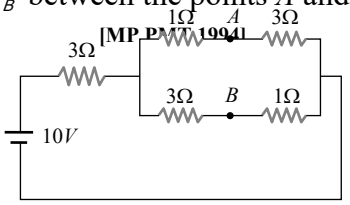


37. Four wires AB, BC, CD, DA of resistance 4 *ohm* each and a fifth wire BD of resistance 8 *ohm* are joined to form a rectangle $ABCD$ of which BD is a diagonal. The effective resistance between the points A and B is **[MP PMT 1994]**

(a) 24 *ohm* (b) 16 *ohm*

(c) $\frac{4}{3}$ *ohm* (d) $\frac{8}{3}$ *ohm*

38. A battery of e.m.f. 10 V is connected to resistance as shown in figure. The potential difference $V_A - V_B$ between the points A and B is **[MP PMT 1994]**



(a) $-2V$

(b) $2V$

(c) $5V$

(d) $\frac{20}{11}V$

39. Three resistances, each of 1 *ohm*, are joined in parallel. Three such combinations are put in series, then the resultant resistance will be **[MP PMT 1994]**

(a) 9 *ohm* (b) 3 *ohm*

(c) 1 *ohm* (d) $\frac{1}{3}$ *ohm*

40. A student has 10 resistors of resistance 'r'. The minimum resistance made by him from given resistors is **[AFMC 1995]**

(a) $10\ r$ (b) $\frac{r}{10}$

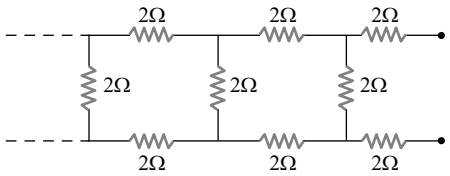
(c) $\frac{r}{100}$ (d) $\frac{r}{5}$

41. Two wires of same metal have the same length but their cross-sections are in the ratio $3:1$. They are joined in series. The resistance of the thicker wire is 10Ω. The total resistance of the combination will be **[CBSE PMT 1995]**

(a) 40Ω (b) $\frac{40}{3}\Omega$

(c) $\frac{5}{2}\Omega$ (d) 100Ω

42. The equivalent resistance of the following infinite network of resistances is **[AIIMS 1995]**



(a) Less than 4Ω

(b) 4Ω

(c) More than 4Ω but less than 12Ω

(d) 12Ω

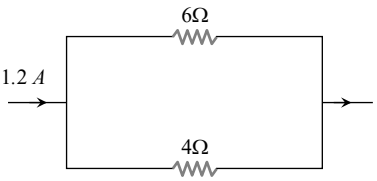
43. In the figure given below, the current passing through 6Ω resistor is **[Manipal MEE 1995]**

(a) 0.40 *ampere*

(b) 0.48 *ampere*

(c) 0.72 *ampere*

(d) 0.80 *ampere*



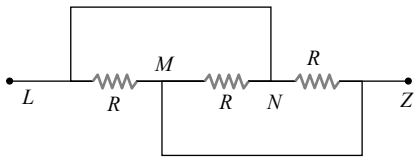
44. Three equal resistances each of value R are joined as shown in the figure. The equivalent resistance between M and N is **[MP PET 1995]**

(a) R

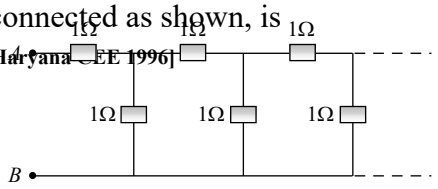
(b) $2R$

(c) $\frac{R}{2}$

(d) $\frac{R}{3}$



45. The equivalent resistance between points A and B of an infinite network of resistances each of 1Ω connected as shown, is [Haryana CEE 1996]



(a) Infinite (b) 2Ω

(c) $\frac{1+\sqrt{5}}{2}\Omega$ (d) Zero

46. A copper wire of resistance R is cut into ten parts of equal length. Two pieces each are joined in series and then five such combinations are joined in parallel. The new combination will have a resistance [MP PET 1996]

(a) R (b) $\frac{R}{4}$

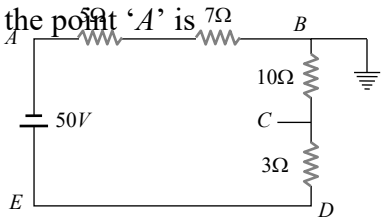
(c) $\frac{R}{5}$ (d) $\frac{R}{25}$

47. A wire has resistance 12Ω. It is bent in the form of a circle. The effective resistance between the two points on any diameter is equal to [JIPMER 1999]

(a) 12Ω (b) 6Ω

(c) 3Ω (d) 24Ω

48. In the circuit shown, the point 'B' is earthed. The potential at the point 'A' is



(a) 14 V

(b) 24 V

(c) 26 V

(d) 50 V

49. Three resistors each of 4Ω are connected together to form a network. The equivalent resistance of the network cannot be

(a) 1.33Ω (b) 3.0Ω

(c) 6.0Ω (d) 12.0Ω

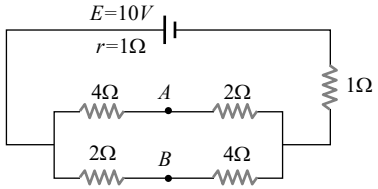
50. In the circuit shown below, the cell has an e.m.f. of 10 V and internal resistance of 1 *ohm*. The other resistances are shown in the figure. The potential difference $V_A - V_B$ is [MP PMT 1997]

(a) 6 V

(b) 4 V

(c) 2 V

(d) -2 V

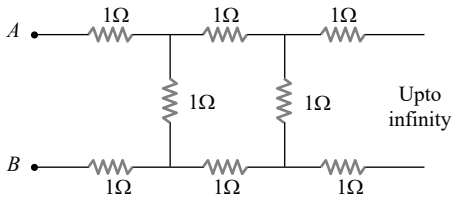


51. A wire of resistance R is cut into 'n' equal parts. These parts are then connected in parallel. The equivalent resistance of the combination will be [MP PMT/PET 1998; BHU 2005]

(a) nR (b) $\frac{R}{n}$

(c) $\frac{n}{R}$ (d) $\frac{R}{n^2}$

52. The resistance between the terminal points A and B of the given infinitely long circuit will be [MP PMT/PET 1998]



(a) $(\sqrt{3}-1)$ (b) $(1-\sqrt{3})$

(c) $(1+\sqrt{3})$ (d) $(2+\sqrt{3})$

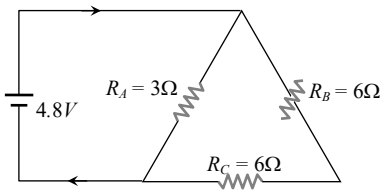
53. The current in the given circuit is [CBSE PMT 1999]

(a) 8.31 A

(b) 6.82 A

(c) 4.92 A

(d) 2 A

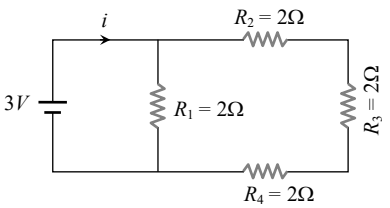


54. What is the current (i) in the circuit as shown in figure [AIIMS 1998]

(a) 2 A

(b) 1.2 A

(c) 1 A



(d) 0.5 A

55. n equal resistors are first connected in series and then connected in parallel. What is the ratio of the maximum to the minimum resistance **[KCET 1994]**

(a) n (b) $\frac{1}{n^2}$

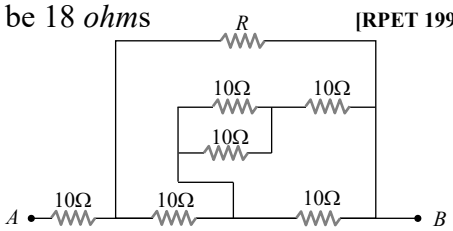
(c) n^2 (d) $\frac{1}{n}$

56. A uniform wire of 16Ω is made into the form of a square. Two opposite corners of the square are connected by a wire of resistance 16Ω. The effective resistance between the other two opposite corners is **[EAMCET (Med.) 1995]**

(a) 32Ω (b) 20Ω

(c) 8Ω (d) 4Ω

57. For what value of R the net resistance of the circuit will be 18 *ohms* **[RPET 1997]**



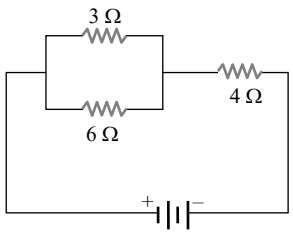
(a) 8Ω

(b) 10Ω

(c) 16Ω

(d) 24Ω

58. In the figure, current through the 3Ω resistor is 0.8 *ampere*, then potential drop through 4Ω resistor is **[CBSE PMT 1993; AFMC 1999; MP PMT 2004]**



(a) 9.6 V

(b) 2.6 V

(c) 4.8 V

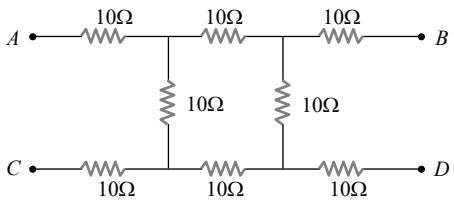
(d) 1.2 V

59. Three resistances 4Ω each of are connected in the form of an equilateral triangle. The effective resistance between two corners is **[CBSE PMT 1993]**

(a) 8Ω (b) 12Ω

(c) $\frac{3}{8}\Omega$ (d) $\frac{8}{3}\Omega$

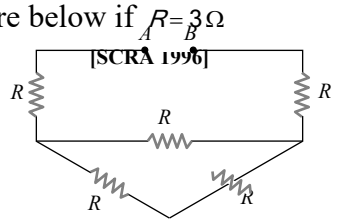
60. What will be the equivalent resistance between the two points A and D **[CBSE PMT 1996]**



(a) 10Ω (b) 20Ω

(c) 30Ω (d) 40Ω

61. What is the equivalent resistance between A and B in the figure below if $R=3\Omega$ **[SCRA 1996]**



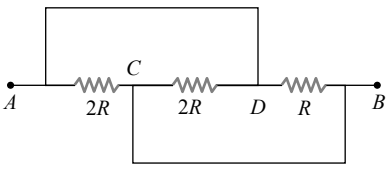
(a) 9Ω

(b) 12Ω

(c) 15Ω

(d) None of these

62. What is the equivalent resistance between A and B **[BHU 1997; MP PET 2001]**



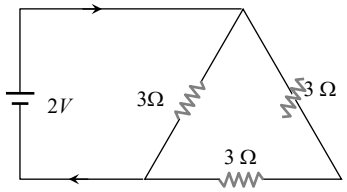
(a) $\frac{2}{3}R$

(b) $\frac{3}{2}R$

(c) $\frac{R}{2}$

(d) $2R$

63. The current in the following circuit is **[CBSE PMT 1997]**



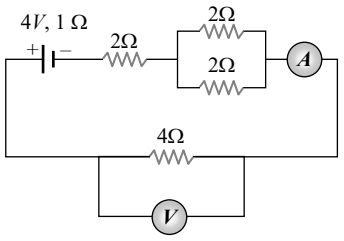
(a) $\frac{1}{8}A$

(b) $\frac{2}{9}A$

(c) $\frac{2}{3}A$

(d) $1A$

64. What is the equivalent resistance of the circuit **[KCET 1998]**



(a) 6Ω

(b) 7Ω

(c) 8Ω

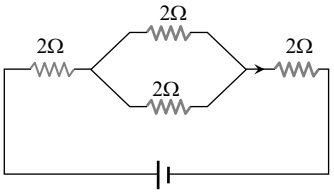
(d) 9Ω

65. 10 wires (same length, same area, same material) are connected in parallel and each has 1Ω resistance, then the equivalent resistance will be **[RPMT 1999]**

(a) 10 Ω (b) 1 Ω

(c) 0.1 Ω (d) 0.001 Ω

66. The equivalent resistance of the circuit shown in the figure is **[CPMT 1999]**



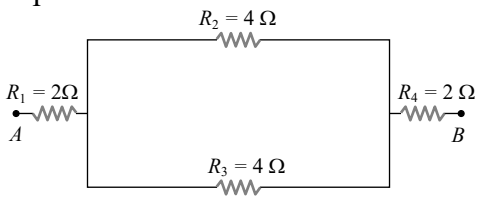
(a) 8 Ω

(b) 6 Ω

(c) 5 Ω

(d) 4 Ω

67. In the given figure, the equivalent resistance between the points A and B is



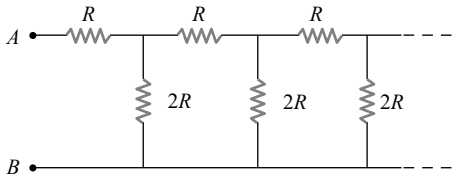
(a) 8 Ω

(b) 6 Ω

(c) 4 Ω

(d) 2 Ω

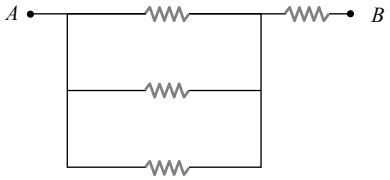
68. An infinite ladder network is arranged with resistances R and 2 R as shown. The effective resistance between terminals A and B is



(a) ∞ (b) R

(c) 2 R (d) 3 R

69. If all the resistors shown have the value 2 *ohm* each, the equivalent resistance over AB is



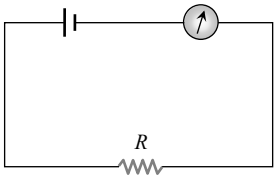
(a) 2 *ohm*

(b) 4 *ohm*

(c) $1\frac{2}{3}$ *ohm*

(d) $2\frac{2}{3}$ *ohm*

70. A battery of *emf* 10 V and internal resistance 3Ω is connected to a resistor as shown in the figure. If the current in the circuit is 0.5 A. then the resistance of the resistor will be



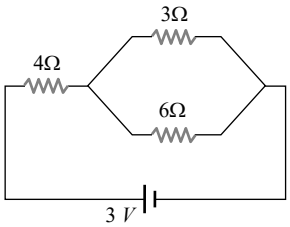
(a) 19 Ω

(b) 17 Ω

(c) 10 Ω

(d) 12 Ω

71. The potential drop across the 3Ω resistor is **[CPMT 2000]**



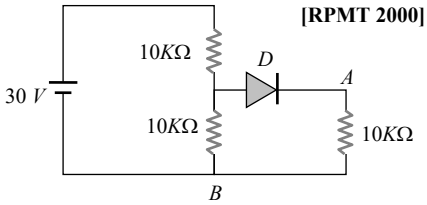
(a) 1 V

(b) 1.5 V

(c) 2 V

(d) 3 V

72. In the given figure, potential difference between A and B is **[AIIMS 1999]** **[RPMT 2000]**



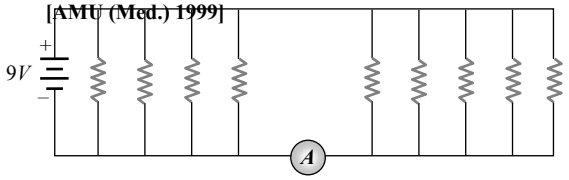
(a) 0

(b) 5 *volt*

(c) 10 *volt*

(d) 15 *volt*

73. If each resistance in the figure is of 9 Ω then reading of ammeter is **[RPMT 2000]** **[AMU (Med.) 1999]**



(a) 5 A (b) 8 A

(c) 2 A (d) 9 A

74. Four resistances 10 Ω, 5 Ω, 7 Ω and 3 Ω are connected so that they form the sides of a rectangle AB, BC, CD and DA respectively. Another resistance of 10 Ω is connected across the diagonal AC. The equivalent resistance between A and B is **[JIPMER 1999]**

(a) 2 Ω (b) 5 Ω

(c) 7 Ω (d) 10 Ω

75. Two wires of equal diameters, of resistivities ρ_1 and ρ_2 and lengths l_1 and l_2, respectively, are joined in series. The equivalent resistivity of the combination is

[EAMCET (Engg.) 2000]

(a) $\frac{\rho_1 l_1 + \rho_2 l_2}{l_1 + l_2}$ (b) $\frac{\rho_1 l_2 + \rho_2 l_1}{l_1 - l_2}$

(c) $\frac{\rho_1 l_2 + \rho_2 l_1}{l_1 + l_2}$ (d) $\frac{\rho_1 l_1 - \rho_2 l_2}{l_1 - l_2}$

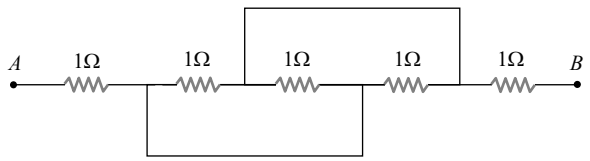
76. Four resistances of 100 Ω each are connected in the form of square. Then, the effective resistance along the diagonal points is

(a) 200 Ω (b) 400 Ω

(c) 100 Ω (d) 150 Ω

77. Equivalent resistance between the points A and B is (in Ω)

[AMU (Engg.) 2000]



(a) $\frac{1}{5}$ (b) $1\frac{1}{4}$

(c) $2\frac{1}{3}$ (d) $3\frac{1}{2}$

78. Two wires of the same material and equal length are joined in parallel combination. If one of them has half the thickness of the other and the thinner wire has a resistance of 8 *ohms*, the resistance of the combination is equal to

[AMU (Engg.) 2000]

(a) $\frac{5}{8}$ *ohms* (b) $\frac{8}{5}$ *ohms*

(c) $\frac{3}{8}$ *ohms* (d) $\frac{8}{3}$ *ohms*

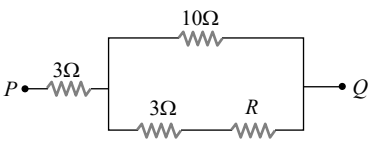
79. In the circuit shown here, what is the value of the unknown resistor R so that the total resistance of the circuit between points P and Q is also equal to R **[MP PET 2001]**

(a) 3 *ohms*

(b) $\sqrt{39}$ *ohms*

(c) $\sqrt{69}$ *ohms*

(d) 10 *ohms*



80. A uniform wire of resistance 9 Ω is cut into 3 equal parts. They are connected in the form of equilateral triangle ABC. A cell of e.m.f. 2 V and negligible internal resistance is connected across B and C. Potential difference across AB is

[Kerala (Engg.) 2001]

(a) 1 V (b) 2 V

(c) 3 V (d) 0.5 V

81. The resistors of resistances 2 Ω, 4 Ω and 8 Ω are connected in parallel, then the equivalent resistance of the combination will be **[MH CET 2000] [KCET 2001]**

(a) $\frac{8}{7}\Omega$ (b) $\frac{7}{8}\Omega$

(c) $\frac{7}{4}\Omega$ (d) $\frac{4}{9}\Omega$

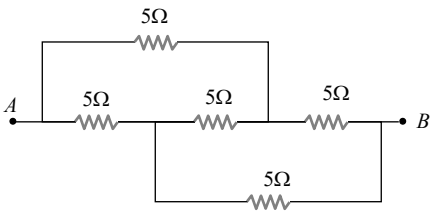
82. Effective resistance between A and B is **[UPSEAT 2001]**

(a) 15 Ω

(b) 5 Ω

(c) $\frac{5}{2}\Omega$

(d) 20 Ω



83. The effective resistance of two resistors in parallel is $\frac{12}{7}\Omega$. If one of the resistors is disconnected the resistance becomes 4 Ω. The resistance of the other resistor is **[MH CET 2002]**

(a) 4 Ω (b) 3 Ω

(c) $\frac{12}{7}\Omega$ (d) $\frac{7}{12}\Omega$

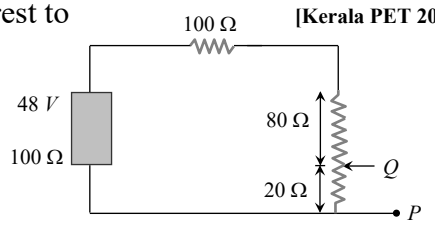
84. Two resistance wires on joining in parallel the resultant resistance is $\frac{6}{5}$ *ohms*. One of the wire breaks, the effective resistance is 2 *ohms*. The resistance of the broken wire is

[MP PET 2001, 2002]

(a) $\frac{3}{5}$ *ohm* (b) 2 *ohm*

(c) $\frac{6}{5}$ *ohm* (d) 3 *ohm*

85. In the circuit, the potential difference across PQ will be nearest to **[Kerala PET 2002]**



(a) 9.6 *V*

(b) 6.6 *V*

(c) 4.8 *V*

(d) 3.2 *V*

86. Three resistors are connected to form the sides of a triangle *ABC*, the resistance of the sides *AB, BC* and *CA* are 40 *ohms*, 60 *ohms* and 100 *ohms* respectively. The effective resistance between the points *A* and *B* in *ohms* will be **[JIPMER 2002]**

(a) 32 (b) 64

(c) 50 (d) 200

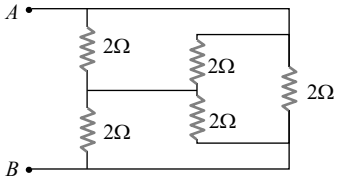
87. Find the equivalent resistance across *AB* **[Orissa JEE 2002]**

(a) 1 Ω

(b) 2 Ω

(c) 3 Ω

(d) 4 Ω



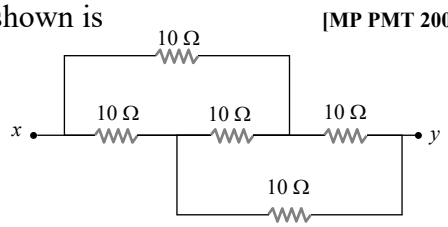
88. The equivalent resistance between *x* and *y* in the circuit shown is **[MP PMT 2002]**

(a) 10 Ω

(b) 40 Ω

(c) 20 Ω

(d) $\frac{5}{2}$ Ω



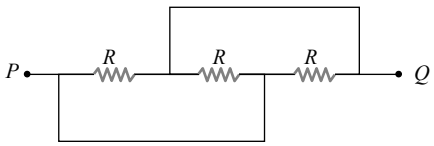
89. The equivalent resistance between the points *P* and *Q* of the circuit given is

(a) $\frac{R}{4}$

(b) $\frac{R}{3}$

(c) 4 *R*

(d) 2 *R*



90. Two wires of the same dimensions but resistivities ρ_1 and ρ_2 are connected in series. The equivalent resistivity of the combination is

(a) $\rho_1 + \rho_2$ (b) $\frac{\rho_1 + \rho_2}{2}$

(c) $\sqrt{\rho_1 \rho_2}$ (d) $2(\rho_1 + \rho_2)$

91. Three unequal resistors in parallel are equivalent to a resistance 1 *ohm*. If two of them are in the ratio 1 : 2 and if no resistance value is fractional, the largest of the three resistances in *ohms* is **[EAMCET 2003]**

(a) 4 (b) 6

(c) 8 (d) 12

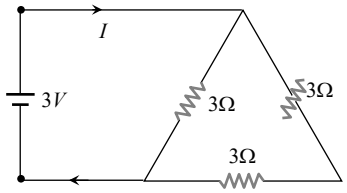
92. A 3*volt* battery with negligible internal resistance is connected in a circuit as shown in the figure. The current *I*, in the circuit will be

(a) 1/3 *A*

(b) 1 *A*

(c) 1.5 *A*

(d) 2 *A*



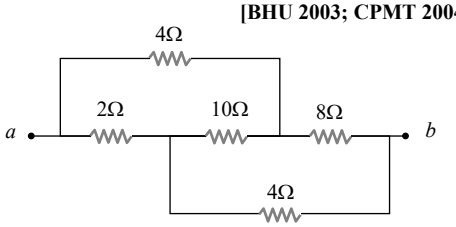
93. Find the equivalent resistance between the points *a* and *b* **[BHU 2003; CPMT 2004]**

(a) 2 Ω

(b) 4 Ω

(c) 8 Ω

(d) 16 Ω



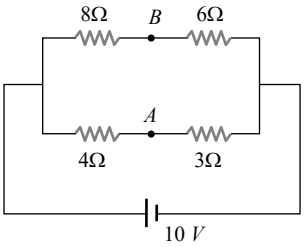
94. The potential difference between point *A* & *B* is **[BHU 2003; CPMT 2004; MP PMT 2005]**

(a) $\frac{20}{7}$ *V*

(b) $\frac{40}{7}$ *V*

(c) $\frac{10}{7}$ *V*

(d) 0 **[Pb. PMT 2002]**



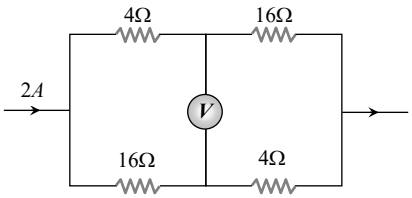
95. In the circuit shown below, The reading of the voltmeter *V* is

(a) 12 *V*

(b) 8 *V*

(c) 20 *V*

(d) 16 *V*



96. A wire has a resistance of 12 *ohm*. It is bent in the form of equilateral triangle. The effective resistance between any two corners of the triangle is **[KCET 2003]**

(a) 9 *ohm*s (b) 12 *ohm*s

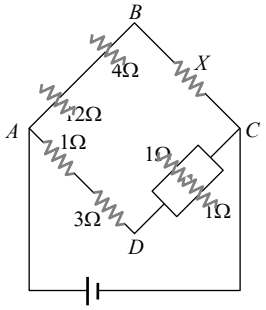
(c) 6 *ohm*s (d) 8/3 *ohm*s

97. A series combination of two resistors 1 Ω each is connected to a 12 V battery of internal resistance 0.4 Ω. The current flowing through it will be **[MH CET (Med.) 1999]**

(a) 3.5 A (b) 5 A

(c) 6 A (d) 10 A

98. In the circuit shown in the adjoining figure, the current between B and D is zero, the unknown resistance is of **[CPMT 1986]**



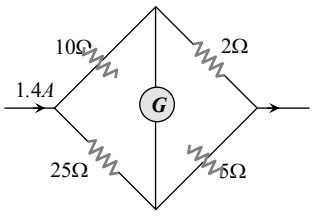
(a) 4 Ω

(b) 2Ω

(c) 3Ω

(d) *em.f.* of a cell is required to find the value of X

99. In the circuit shown in the figure, the current flowing in 2Ω resistance **[CPMT 1989; MP PMT 2004]**



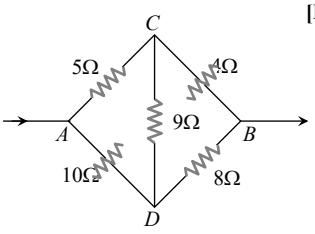
(a) 1.4 A

(b) 1.2 A

(c) 0.4 A

(d) 1.0 A

100. Five resistors are connected as shown in the diagram. The equivalent resistance between A and B is **[MP PMT 1996]**



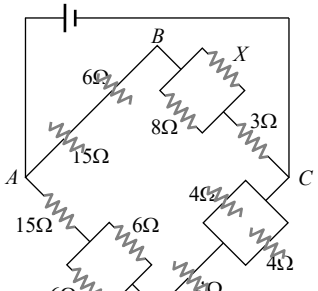
(a) 6 *ohm*

(b) 9 *ohm*

(c) 12 *ohm*

(d) 15 *ohm*

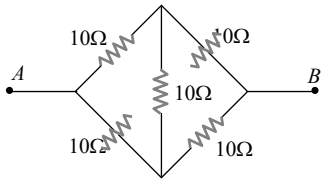
101. In the figure given the value of X resistance will be, when the p.d. between B and D is zero **[MP PET 1993]**



(a) 4 *ohm* (b) 6 *ohm*

(c) 8 *ohm* (d) 9 *ohm*

102. The effective resistance between points A and B is **[NCERT 1974; MP PMT 2000]**



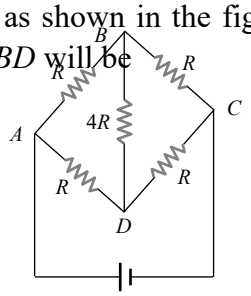
(a) 10 Ω

(b) 20 Ω

(c) 40 Ω

(d) None of the above three values

103. Five resistors of given values are connected together as shown in the figure. The current in the arm BD will be **[MP PMT 1995]**



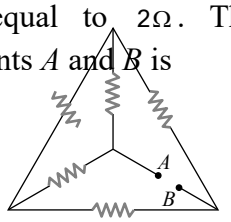
(a) Half the current in the arm ABC

(b) Zero

(c) Twice the current in the arm ABC

(d) Four times the current in the arm ABC

104. In the network shown in the figure, each of the resistance is equal to 2Ω. The resistance between the points A and B is **[CBSE PMT 1995]**



(a) 1Ω

(b) 4Ω

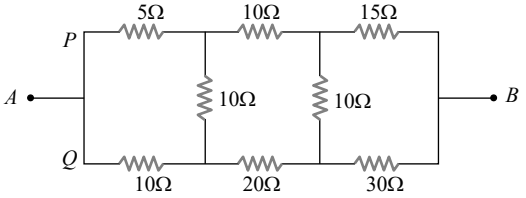
(c) 3Ω

(d) 2Ω

105. In the arrangement of resistances shown below,

the effective resistance between points A and B is

[MP PMT 1997; RPET 2001]



(a) $20\,\Omega$ (b) $30\,\Omega$

(c) $90\,\Omega$ (d) $110\,\Omega$

106. Five resistances are connected as shown in the figure. The effective resistance between the points A and B is

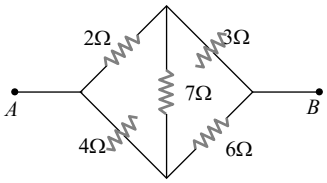
[MP PMT 1999; KCET 2001; BHU 2001, 05]

(a) $\frac{10}{3}\Omega$

(b) $\frac{20}{3}\Omega$

(c) $15\,\Omega$

(d) $6\,\Omega$



107. In the given figure, when galvanometer shows no deflection, the current (in ampere) flowing through $5\,\Omega$ resistance will be

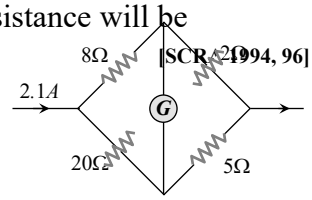
[SCRA 1994, 96]

(a) 0.5

(b) 0.6

(c) 0.9

(d) 1.5



108. In the Wheatstone's bridge shown, $P=2\,\Omega$, $Q=3\,\Omega$, $R=6\,\Omega$ and $S=8\,\Omega$. In order to obtain balance, shunt resistance across 'S' must be

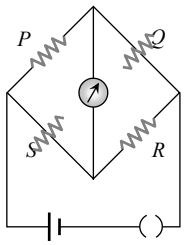
[SCRA 1998]

(a) $2\,\Omega$

(b) $3\,\Omega$

(c) $6\,\Omega$

(d) $8\,\Omega$



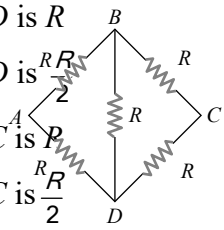
109. Five equal resistances each of value R are connected in a form shown alongside. The equivalent resistance of the network

(a) Between the points B and D is R

(b) Between the points B and D is $\frac{R}{2}$

(c) Between the points A and C is R

(d) Between the points A and C is $\frac{R}{2}$



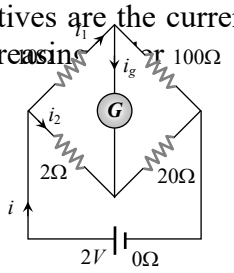
110. In the circuit shown below the resistance of the galvanometer is 20 Ω. In which case of the following alternatives are the currents arranged strictly in the decreasing order

(a) i, i_1, i_2, i_g

(b) i, i_2, i_1, i_g

(c) i, i_2, i_g, i_1

(d) i, i_1, i_g, i_2



111. Potential difference between the points P and Q in the electric circuit shown is

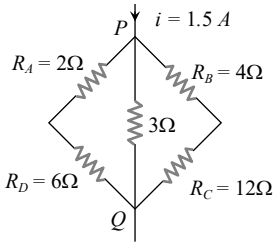
[KCET 1999]

(a) 4.5 V

(b) 1.2 V

(c) 2.4 V

(d) 2.88 V



112. The current between B and D in the given figure is

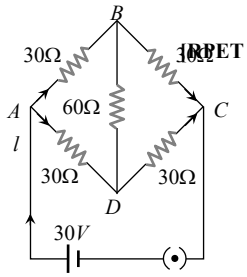
[RPET 2000; DCE 2001]

(a) 1 *amp*

(b) 2 *amp*

(c) Zero

(d) 0.5 *amp*

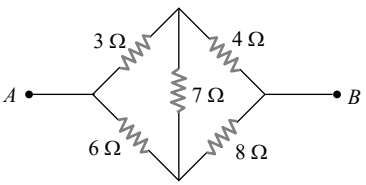


113. In the given figure, equivalent resistance between A and B will be

(a) $\frac{14}{3}\,\Omega$

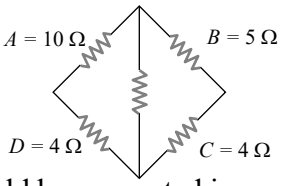
(b) $\frac{3}{14}\,\Omega$

(c) $\frac{9}{14}\,\Omega$



(d) $\frac{14}{9}\ \Omega$

114. In a typical Wheatstone network, the resistances in cyclic order are $A = 10\ \Omega$, $B = 5\ \Omega$, $C = 4\ \Omega$ and $D = 4\ \Omega$ for the bridge to be balanced **[KCET 2000]**



(a) 10 Ω should be connected in parallel with A

(b) 10 Ω should be connected in series with A

(c) 5 Ω should be connected in series with B

(d) 5 Ω should be connected in parallel with B

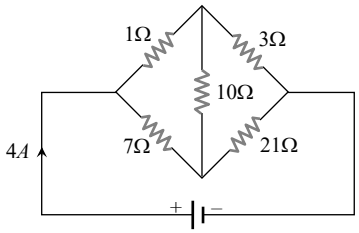
115. In the circuit shown in figure, the current drawn from the battery is $4A$. If 10 Ω resistor is replaced by 20 Ω resistor, then current drawn from the circuit will be **[KCET 2000; CBSE PMT 2001]**

(a) 1 A

(b) 2 A

(c) 3 A

(d) 0 A



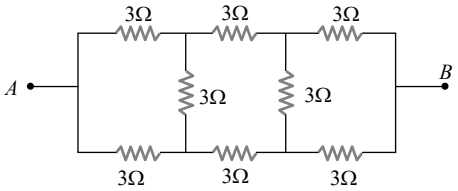
116. Calculate the equivalent resistance between A and B **[UPSEAT 2001]**

(a) $\frac{9}{2}\Omega$

(b) 3 Ω

(c) 6 Ω

(d) $\frac{5}{3}\Omega$



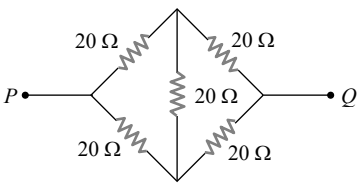
117. The equivalent resistance between P and Q in the given figure, is **[MH CET (Med.) 2001]**

(a) 50 Ω

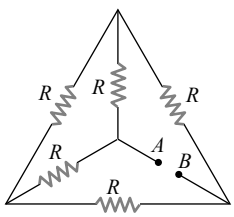
(b) 40 Ω

(c) 30 Ω

(d) 20 Ω



118. If each of the resistance of the network shown in the figure is R, the equivalent resistance between A and B is **[KCET 2002]**



(a) 5 R

(b) 3 R

(c) R

(d) $R/2$

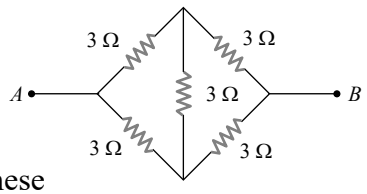
119. The equivalent resistance of the following diagram A and B is

(a) $\frac{2}{3}\Omega$

(b) 9 Ω

(c) 6 Ω

(d) None of these



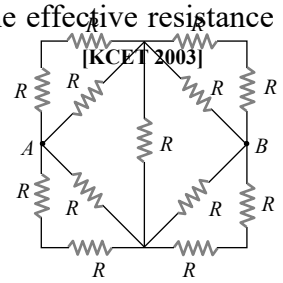
120. Thirteen resistances each of resistance R *ohm* are connected in the circuit as shown in the figure below. The effective resistance between A and B is **[KCET 2003]**

(a) $2R\ \Omega$

(b) $\frac{4R}{3}\Omega$

(c) $\frac{2R}{3}\Omega$

(d) $R\ \Omega$



121. In a Wheatstone's bridge all the four arms have equal resistance R. If the resistance of the galvanometer arm is also R, the equivalent resistance of the combination as seen by the battery is **[CBSE PMT 2003]**

(a) $\frac{R}{2}$ (b) R

(c) 2 R (d) $\frac{R}{4}$

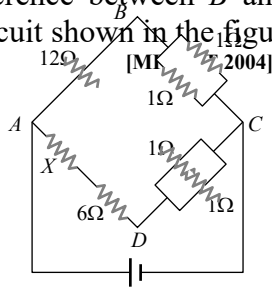
122. For what value of unknown resistance X, the potential difference between B and D will be zero in the circuit shown in the figure **[MP PMT 2004]**

(a) 4 Ω

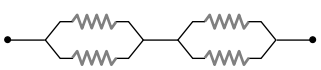
(b) 6 Ω

(c) 2 Ω

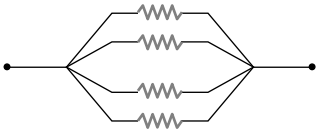
(d) 5 Ω

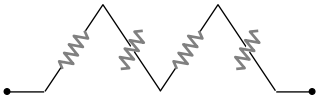


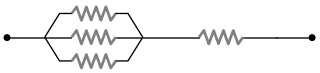
123. Which arrangement of four identical resistances should be used to draw maximum energy from a cell of voltage V **[MP PMT 2004]**



(a)

(b) 

(c) 

(d) 

124. An unknown resistance R_1 is connected in series with a resistance of 10 Ω. This combinations is connected to one gap of a metre bridge while a resistance R_2 is connected in the other gap. The balance point is at 50 *cm*. Now, when the 10 Ω resistance is removed the balance point shifts to 40 *cm*. The value of R_1 is (in *ohm*) **[KCET 2004]**

(a) 60 (b) 40

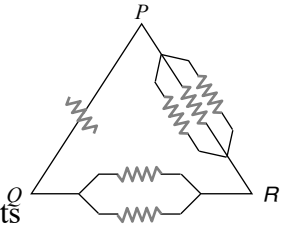
(c) 20 (d) 10

125. A wire has a resistance of 6 Ω. It is cut into two parts and both half values are connected in parallel. The new resistance is .... **[KCET 2004]**

(a) 12 Ω (b) 1.5 Ω

(c) 3 Ω (d) 6 Ω

126. Six equal resistances are connected between points *P, Q* and *R* as shown in the figure. Then the net resistance will be maximum between **[IIT-JEE (Screening) 2004]**



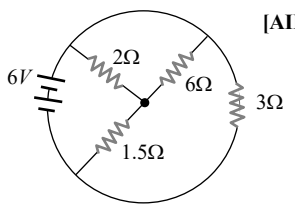
(a) *P* and *Q*

(b) *Q* and *R*

(c) *P* and *R*

(d) Any two points

127. The total current supplied to the circuit by the battery is **[AIEEE 2004]**



(a) 1 *A*

(b) 2 *A*

(c) 4 *A*

(d) 6 *A*

128. An electric current is passed through a circuit containing two wires of the same material, connected in parallel. If the lengths and radii of the wires are in the ratio of 4/3 and 2/3, then the ratio of the currents passing through the wire will be **[AIEEE 2004]**

(a) 3 (b) 1/3

(c) 8/9 (d) 2

129. If a rod has resistance 4 Ω and if rod is turned as half cycle then the resistance along diameter **[BCECE 2004]**

(a) 1.56 Ω (b) 2.44 Ω

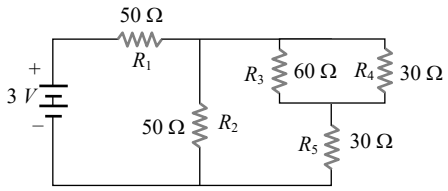
(c) 4 Ω (d) 2 Ω

130. If three resistors of resistance 2Ω, 4Ω and 5 Ω are connected in parallel then the total resistance of the combination will be **[Pb. PMT 2004]**

(a) $\frac{20}{19}\Omega$ (b) $\frac{19}{20}\Omega$

(c) $\frac{19}{10}\Omega$ (d) $\frac{10}{19}\Omega$

131. In circuit shown below, the resistances are given in ohms and the battery is assumed ideal with emf equal to 3 *volt*. The voltage across the resistance R_4 is **[UPSEAT 2004; Kerala PMT 2004]**



(a) 0.4 *V*

(b) 0.6 *V*

(c) 1.2 *V*

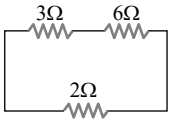
(d) 1.5 *V*

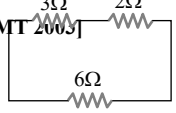
132. A parallel combination of two resistors, of 1 Ω each, is connected in series with a 1.5 Ω resistor. The total combination is connected across a 10 *V* battery. The current flowing in the circuit is **[DCE 2004]**

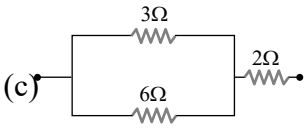
(a) 5 *A* (b) 20 *A*

(c) 0.2 *A* (d) 0.4 *A*

133. If you are provided three resistances 2 Ω, 3 Ω and 6 Ω. How will you connect them so as to obtain the equivalent resistance of 4 Ω **[DPMT 2005]**

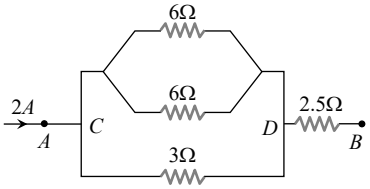
(a) 

(b) 



(c) (d) None of these

134. The equivalent resistance and potential difference between A and B for the circuit is respectively **[Pb. PMT 2003]**



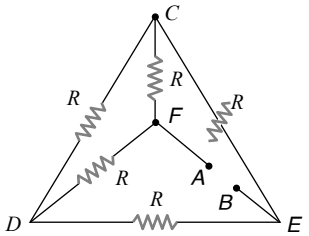
(a) 4 Ω, 8 V

(b) 8 Ω, 4 V

(c) 2 Ω, 2 V

(d) 16 Ω, 8 V

135. Five equal resistances each of resistance R are connected as shown in the figure. A battery of V volts is connected between A and B. The current flowing in $AFCEB$ will be **[CBSE PMT 2004]**



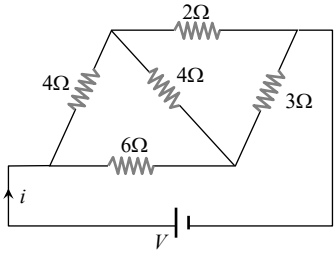
(a) $\frac{3V}{R}$

(b) $\frac{V}{R}$

(c) $\frac{V}{2R}$

(d) $\frac{2V}{R}$

136. For the network shown in the figure the value of the current i is **[Kerala PMT 2005]**



(a) $\frac{9V}{35}$

(b) $\frac{5V}{18}$

(c) $\frac{5V}{9}$

(d) $\frac{18V}{5}$

137. When a wire of uniform cross-section a, length l and resistance R is bent into a complete circle, resistance between any two of diametrically opposite points will be **[CBSE PMT 2005]**

(a) $\frac{R}{4}$ (b) $\frac{R}{8}$

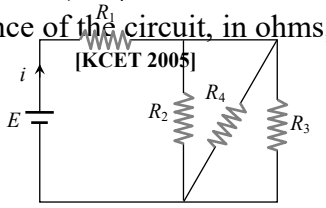
(c) $4R$ (d) $\frac{R}{2}$

138. The current in a simple series circuit is 5.0 *amp*. When an additional resistance of 2.0 *ohms* is inserted, the current drops to 4.0 *amp*. The original resistance of the circuit in ohms was **[KCET 2005]**

(a) 1.25 (b) 8

(c) 10 (d) 20

139. In the circuit given E = 6.0 V, R_1 = 100 *ohms*, R_2 = R_3 = 50 *ohms*, R_4 = 75 *ohms*. The equivalent resistance of the circuit, in ohms, is **[KCET 2005]**



(a) 11.875

(b) 26.31

(c) 118.75

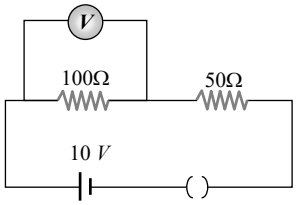
(d) None of these

140. By using only two resistance coils-singly, in series, or in parallel one should be able to obtain resistances of 3, 4, 12 and 16 *ohms*. The separate resistances of the coil are **[KCET 2005]**

(a) 3 and 4 (b) 4 and 12

(c) 12 and 16 (d) 16 and 3

141. In the given circuit, the voltmeter records 5 *volts*. The resistance of the voltmeter in *ohms* is **[KCET 2005]**



(a) 200

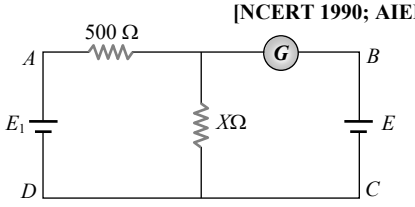
(b) 100

(c) 10

(d) 50

Kirchhoff's Law, Cells

1. In the adjoining circuit, the battery E_1 has an *e.m.f.* of 12 *volt* and zero internal resistance while the battery E has an *e.m.f.* of 2 *volt*. If the galvanometer G reads zero, then the value of the resistance X in *ohm* is **[NCERT 1990; AIEEE 2005]**



(a) 10

(b) 100

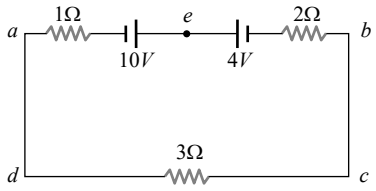
(c) 500

(d) 200

2. The magnitude and direction of the current in

the circuit shown will be

[CPMT 1986, 88]



(a) $\frac{7}{3}A$ from a to b through e

(b) $\frac{7}{3}A$ from b to a through e

(c) $1A$ from b to a through e

(d) $1A$ from a to b through e

3. A cell of *e.m.f.* $1.5\,V$ having a finite internal resistance is connected to a load resistance of 2Ω. For maximum power transfer the internal resistance of the cell should be **[BIT 1988]**

(a) 4 *ohm* (b) 0.5 *ohm*

(c) 2 *ohm* (d) None of these

4. By a cell a current of 0.9 A flows through 2 *ohm* resistor and 0.3 A through 7 *ohm* resistor. The internal resistance of the cell is **[KCET 2003]**

(a) 0.5Ω (b) 1.0Ω

(c) 1.2Ω (d) 2.0Ω

5. The e.m.f. of a cell is E volts and internal resistance is r *ohm*. The resistance in external circuit is also r *ohm*. The p.d. across the cell will be **[CPMT 1985; NCERT 1973]**

(a) $E/2$ (b) $2E$

(c) $4E$ (d) $E/4$

6. A cell of e.m.f. E is connected with an external resistance R, then p.d. across cell is V. The internal resistance of cell will be **[MNR 1987; Kerala PMT 2002; MP PMT 2002]**

(a) $\frac{(E-V)R}{E}$ (b) $\frac{(E-V)R}{V}$

(c) $\frac{(V-E)R}{V}$ (d) $\frac{(V-E)R}{E}$

7. Two cells, e.m.f. of each is E and internal resistance r are connected in parallel between the resistance R. The maximum energy given to the resistor will be, only when **[MNR 1988; MP PET 2000; UPSEAT 2001]**

(a) $R = r/2$ (b) $R = r$

(c) $R = 2r$ (d) $R = 0$

8. Kirchhoff's first law *i.e.* $\Sigma i = 0$ at a junction is based on the law of conservation of **[CBSE PMT 1997; AIIMS 2000; MP PMT 2002; RPMT 2001; DPMT 2005]**

(a) Charge (b) Energy

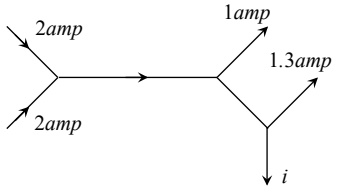
(c) Momentum (d) Angular momentum

9. Kirchhoff's second law is based on the law of conservation of **[RPET 2003; MH CET 2001]**

(a) Charge (b) Energy

(c) Momentum (d) Sum of mass and energy

10. The figure below shows currents in a part of electric circuit. The current i is **[CPMT 1981; RPET 1999]**



(a) 1.7 *amp*

(b) 3.7 *amp*

(c) 1.3 *amp*

(d) 1 *amp*

11. The terminal potential difference of a cell is greater than its e.m.f. when it is

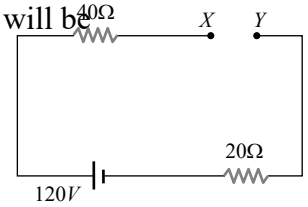
(a) Being discharged

(b) In open circuit

(c) Being charged

(d) Being either charged or discharged

12. In the circuit shown, potential difference between X and Y will be



(a) Zero

(b) 20 V

(c) 60 V

(d) 120 V

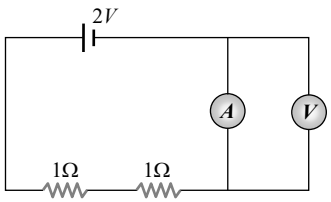
13. In the above question, potential difference across the 40Ω resistance will be

(a) Zero (b) 80 V

(c) 40 V (d) 120 V

14. In the circuit shown, A and V are ideal ammeter and voltmeter respectively. Reading of the voltmeter will be

(a) 2 V



(b) 1 V

(c) 0.5 V

(d) Zero

15. When a resistance of 2*ohm* is connected across the terminals of a cell, the current is 0.5 *amperes*. When the resistance is increased to 5 *ohm*, the current is 0.25 *amperes*. The internal resistance of the cell is **[MP PMT 1996]**

(a) 0.5 *ohm* (b) 1.0 *ohm*

(c) 1.5 *ohm* (d) 2.0 *ohm*

16. The terminal potential difference of a cell when short-circuited is (E = E.M.F. of the cell)

(a) E (b) $E/2$

(c) Zero (d) $E/3$

17. A primary cell has an e.m.f. of 1.5 volts, when short-circuited it gives a current of 3 amperes. The internal resistance of the cell is **[CPMT 1976, 83]**

(a) 4.5 *ohm* (b) 2 *ohm*

(c) 0.5 *ohm* (d) 1/4.5 *ohm*

18. A 50V battery is connected across a 10 *ohm* resistor. The current is 4.5 *amperes*. The internal resistance of the battery is **[CPMT 1985; BHU 1997; Pb. PMT 2001]**

(a) Zero (b) 0.5 *ohm*

(c) 1.1 *ohm* (d) 5.0 *ohm*

19. The potential difference in open circuit for a cell is 2.2 *volts*. When a 4 *ohm* resistor is connected between its two electrodes the potential difference becomes 2 *volts*. The internal resistance of the cell will be **[MP PMT 1984; SCRA 1994; CBSE PMT 2002]**

(a) 1 *ohm* (b) 0.2 *ohm*

(c) 2.5 *ohm* (d) 0.4 *ohm*

20. A new flashlight cell of e.m.f. 1.5 *volts* gives a current of 15 *amps*, when connected directly to an ammeter of resistance 0.04Ω. The internal resistance of cell is **[MP PET 1994]**

(a) 0.04Ω (b) 0.06Ω

(c) 0.10Ω (d) 10Ω

21. A cell whose e.m.f. is 2 V and internal resistance is 0.1Ω, is connected with a resistance of 3.9Ω. The voltage across the cell terminal will be **[CPMT 1990; MP PET 1993; CBSE PMT 1999; AFMC 1999; Pb. PMT 2000; AIIMS 2001]**

(a) 0.50 V (b) 1.90 V

(c) 1.95 V (d) 2.00 V

22. The reading of a high resistance voltmeter when a cell is connected across it is 2.2 V. When the terminals of the cell are also connected to a resistance of 5Ω the voltmeter reading drops to 1.8 V. Find the internal resistance of the cell **[KCET 2003; MP PMT 2003]**

(a) 1.2Ω (b) 1.3Ω

(c) 1.1Ω (d) 1.4Ω

23. When cells are connected in parallel, then **[MNR 1983]**

(a) The current decreases (b)The current increases

(c) The e.m.f. increases (d) The e.m.f. decreases

24. The internal resistance of a cell depends on

(a) The distance between the plates

(b) The area of the plates immersed

(c) The concentration of the electrolyte

(d) All the above

25. n identical cells each of e.m.f. E and internal resistance r are connected in series. An external resistance R is connected in series to this combination. The current through R is **[DPMT 2002]**

(a) $\frac{nE}{R+nr}$ (b) $\frac{nE}{nR+r}$

(c) $\frac{E}{R+nr}$ (d) $\frac{nE}{R+r}$

26. A cell of internal resistance r is connected to an external resistance R. The current will be maximum in R, if **[CPMT 1982]**

(a) $R=r$ (b) $R<r$

(c) $R>r$ (d) $R=r/2$

27. To get the maximum current from a parallel combination of n identical cells each of internal resistance r in an external resistance R, when **[DPMT 1999]**

(a) $R>>r$ (b) $R<<r$

(c) $R=r$ (d) None of these

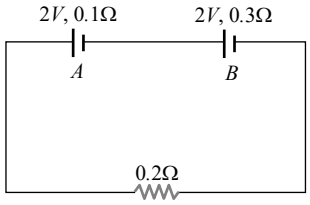
28. Two identical cells send the same current in 2Ω resistance, whether connected in series or in parallel. The internal resistance of the cell should be

[NCERT 1982; Kerala PMT 2002]

(a) 1Ω (b) 2Ω

(c) $\frac{1}{2}\Omega$ (d) 2.5Ω

29. The internal resistances of two cells shown are 0.1Ω and 0.3Ω. If $R = 0.2\Omega$, the potential difference across the cell



(a) B will be zero

(b) A will be zero

(c) A and B will be $2V$

(d) A will be $> 2V$ and B will be $< 2V$

30. A torch battery consisting of two cells of 1.45 *volts* and an internal resistance 0.15Ω, each cell sending currents through the filament of the lamps having resistance 1.5*ohm*s. The value of current will be **[MP PET 1994]**

(a) 16.11 *amp* (b) 1.611 *amp*

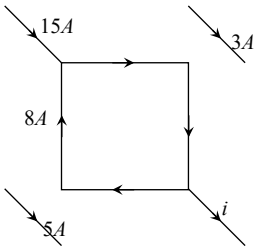
(c) 0.1611 *amp* (d) 2.6 *amp*

31. The electromotive force of a primary cell is 2 *volts*. When it is short-circuited it gives a current of 4 *amperes*. Its internal resistance in *ohm*s is **[MP PET 1995]**

(a) 0.5 (b) 5.0

(c) 2.0 (d) 8.0

32. The figure shows a network of currents. The magnitude of currents is shown here. The current i will be **[MP PMT 1995]**



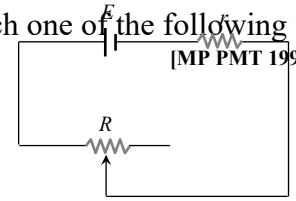
(a) 3 A

(b) 13 A

(c) 23 A

(d) – 3 A

33. A battery of e.m.f. E and internal resistance r is connected to a variable resistor R as shown here. Which one of the following is true **[MP PMT 1995]**



(a) Potential difference across the terminals of the battery is maximum when $R = r$

(b) Power delivered to the resistor is maximum when $R = r$

(c) Current in the circuit is maximum when $R = r$

(d) Current in the circuit is maximum when $R >> r$

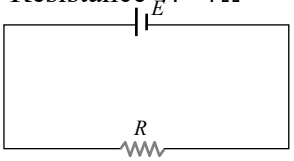
34. A dry cell has an e.m.f. of 1.5 V and an internal resistance of 0.05Ω. The maximum current obtainable from this cell for a very short time interval is **[Haryana CEE 1996]**

(a) 30 A (b) 300 A

(c) 3 A (d) 0.3 A

35. Consider the circuit given here with the following parameters

E.M.F. of the cell = 12 V. Internal resistance of the cell $= 2\Omega$. Resistance $R = 4\Omega$



Which one of the following statements in true

(a) Rate of energy loss in the source is = 8 W

(b) Rate of energy conversion in the source is 16 W

(c) Power output in is = 8 W

(d) Potential drop across R is = 16 V

36. A current of two amperes is flowing through a cell of e.m.f. 5 *volts* and internal resistance 0.5 *ohm* from negative to positive electrode. If the potential of negative electrode is $10V$, the potential of positive electrode will be **[MP PMT 1997]**

(a) 5 V (b) 14 V

(c) 15 V (d) 16 V

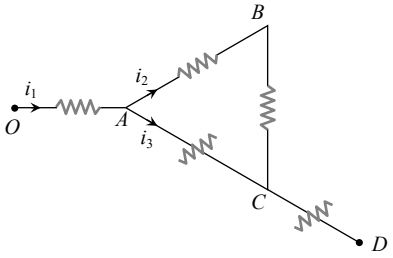
37. 100 cells each of e.m.f. 5 V and internal resistance 1 *ohm* are to be arranged so as to

produce maximum current in a 25 *ohm*s resistance. Each row is to contain equal number of cells. The number of rows should be [MP PMT 1997]

(a) 2 (b) 4

(c) 5 (d) 10

38. The current in the arm CD of the circuit will be [MP PMT/PET 1998; MP PMT 2000; DPMT 2000]



(a) $i_1 + i_2$

(b) $i_2 + i_3$

(c) $i_1 + i_3$

(d) $i_1 - i_2 + i_3$

39. When a resistance of 2 *ohm* is connected across the terminals of a cell, the current is 0.5 A. When the resistance is increased to 5 *ohm*, the current is 0.25 A. The e.m.f. of the cell is [MP PET 1999, 2000; Pb. PMT 2002; MP PMT 2000]

(a) 1.0 V (b) 1.5 V

(c) 2.0 V (d) 2.5 V

40. Two non-ideal identical batteries are connected in parallel. Consider the following statements [MP PMT 1999]

(i) The equivalent e.m.f. is smaller than either of the two e.m.f.s

(ii) The equivalent internal resistance is smaller than either of the two internal resistances

(a) Both (i) and (ii) are correct

(b) (i) is correct but (ii) is wrong

(c) (ii) is correct but (i) is wrong

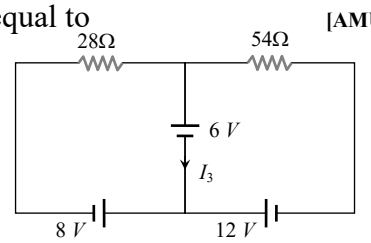
(d) Both (i) and (ii) are wrong

41. If six identical cells each having an e.m.f. of $6V$ are connected in parallel, the e.m.f. of the combination is [EAMCET (Med.) 1995; Pb. PMT 1999; CPMT 2000]

(a) 1 V (b) 36 V

(c) $\frac{1}{6}V$ (d) 6 V

42. Consider the circuit shown in the figure. The current I_3 is equal to [AMU 1995]



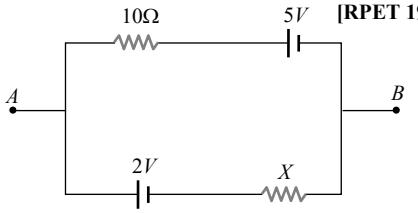
(a) 5 *amp*

(b) 3 *amp*

(c) -3 *amp*

(d) $-5/6$ *amp*

43. If $V_{AB} = 4\,V$ in the given figure, then resistance X will be [RPET 1997]



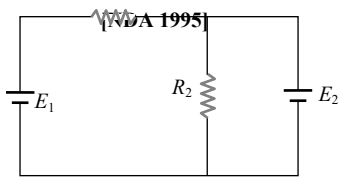
(a) 5Ω

(b) 10Ω

(c) 15Ω

(d) 20Ω

44. Two resistances R_1 and R_2 are joined as shown in the figure to two batteries of e.m.f. E_1 and E_2. If E_2 is short-circuited, the current through R_1 is [NDA 1995]



(a) E_1 / R_1

(b) E_2 / R_1

(c) E_2 / R_2

(d) $E_1 / (R_2 + R_1)$

45. A storage battery has e.m.f. 15 *volts* and internal resistance 0.05 *ohm*. Its terminal voltage when it is delivering 10 *ampere* is [JIPMER 1997]

(a) 30 *volts* (b) 1.00 *volts*

(c) 14.5 *volts* (d) 15.5 *volts*

46. The number of dry cells, each of e.m.f. 1.5 *volt* and internal resistance 0.5 *ohm* that must be joined in series with a resistance of 20 *ohm* so as to send a current of 0.6 *ampere* through the circuit is [SCRA 1998]

(a) 2 (b) 8

(c) 10 (d) 12

47. *Emf* is most closely related to

(a) Mechanical force (b) Potential difference

(c) Electric field (d) Magnetic field

48. For driving a current of 2 A for 6 *minutes* in a circuit, 1000 J of work is to be done. The e.m.f. of the source in the circuit is

(a) 1.38 V (b) 1.68 V

(c) 2.04 V (d) 3.10 V

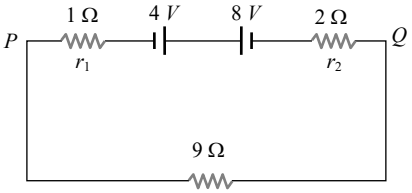
49. Two batteries of e.m.f. $4V$ and 8 V with internal resistances 1 Ω and 2 Ω are connected in a circuit with a resistance of 9 Ω as shown in figure. The current and potential difference between the points P and Q are

(a) $\frac{1}{3}A$ and $3V$

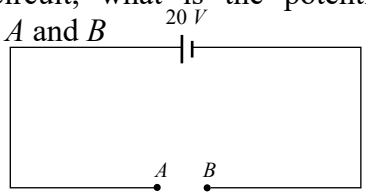
(b) $\frac{1}{6}A$ and $4V$

(c) $\frac{1}{9}A$ and $9V$

(d) $\frac{1}{2}A$ and $12V$



50. In the shown circuit, what is the potential difference across A and B



(a) 50 V

(b) 45 V

(c) 30 V

(d) 20 V

51. Four identical cells each having an electromotive force (e.m.f.) of $12V$, are connected in parallel. The resultant electromotive force (e.m.f.) of the combination is

[CPMT 1999]

(a) 48 V (b) 12 V

(c) 4 V (d) 3 V

52. Electromotive force is the force, which is able to maintain a constant **[Pb. PMT 1999]**

(a) Current (b) Resistance

(c) Power (d) Potential difference

53. A cell of *emf* 6 V and resistance 0.5 *ohm* is short circuited. The current in the cell is

(a) 3 *amp* (b) 12 *amp*

(c) 24 *amp* (d) 6 *amp*

54. A storage cell is charged by 5 *amp* D.C. for 18 *hours*. Its strength after charging will be

(a) 18 AH (b) 5 AH

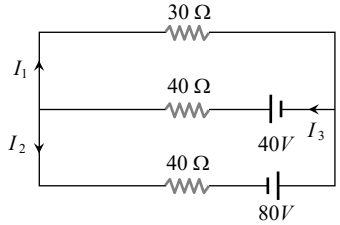
(c) 90 AH (d) 15 AH

55. A battery having e.m.f. $5\ V$ and internal resistance 0.5 Ω is connected with a resistance of 4.5 Ω then the voltage at the terminals of battery is **[RPMT 2000]**

(a) 4.5 V (b) 4 V

(c) 0 V (d) 2 V

56. In the given circuit the current I_1 is



(a) 0.4 A

(b) – 0.4 A

(c) 0.8 A

(d) – 0.8 A

57. The internal resistance of a cell of e.m.f. $12V$ is $5\times10^{-2}\ \Omega$. It is connected across an unknown resistance. Voltage across the cell, when a current of 60 A is drawn from it, is

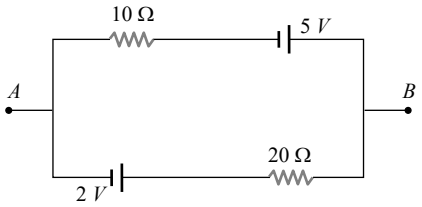
[CBSE PMT 2000]

(a) 15 V (b) 12 V

(c) 9 V (d) 6 V

58. [AIIMS 1999] The current in the given circuit is

[AIIMS 2000; MH CET 2003]



(a) 0.1 A

(b) 0.2 A

(c) 0.3 A

(d) 0.4 A

59. A current of 2.0 *ampere* passes through a cell of e.m.f. 1.5 *volts* having internal resistance of 0.15 *ohm.* The potential difference measured, in *volts*, across both the ends of the cell will be

(a) 1.35 (b) 1.50

(c) 1.00 (d) 1.20

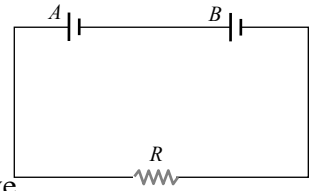
60. A battery has e.m.f. 4 V and internal resistance r. When this battery is connected to an external resistance of 2 *ohms*, a current of 1 *amp*. flows in the circuit. How much current will flow if the terminals of the battery are connected directly **[JIPMER 1999]**

[MP PET 2001]

(a) 1 *amp* (b) 2 *amp*

(c) 4 *amp* (d) Infinite

61. Two batteries A and B each of e.m.f. 2 V are connected in series to an external resistance R = 1 *ohm*. If the internal resistance of battery A is 1.9 *ohms* and that of B is 0.9 *ohm*, what is the potential difference between the terminals of battery A **[JIPMER 1999]** **[MP PET 2001]**



(a) 2 V

(b) 3.8 V

(c) Zero

(d) None of the above **[DCE 2000]**

62. When a resistor of 11 Ω is connected in series with an electric cell, the current flowing in it is 0.5 A. Instead, when a resistor of 5 Ω is connected to the same electric cell in series, the

current increases by 0.4 A. The internal resistance of the cell is **[EAMCET 2001]**

(a) 1.5 Ω (b) 2 Ω

(c) 2.5 Ω (d) 3.5 Ω

63. The internal resistance of a cell is the resistance of

[BHU 1999, 2000; AIIMS 2001]

(a) Electrodes of the cell

(b) Vessel of the cell

(c) Electrolyte used in the cell

(d) Material used in the cell

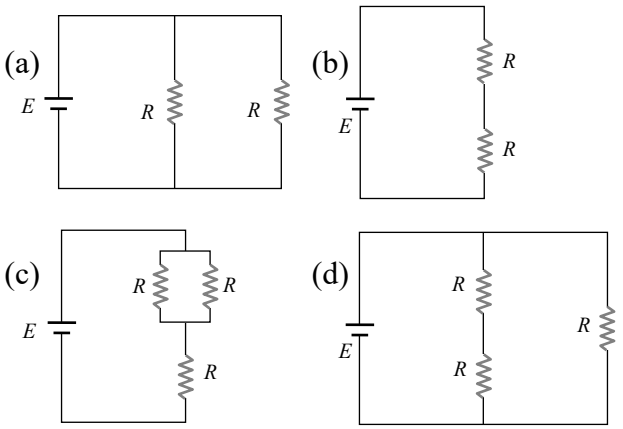
64. How much work is required to carry a 6 μC charge from the negative terminal to the positive terminal of a 9 V battery

[KCET (Med.) 2001]

(a) $54 \times 10^{-3} J$ (b) $54 \times 10^{-6} J$

(c) $54 \times 10^{-9} J$ (d) $54 \times 10^{-12} J$

65. Consider four circuits shown in the figure below. In which circuit power dissipated is greatest (Neglect the internal resistance of the power supply) **[Orissa JEE 2002]**



66. The *emf* of a battery is 2 V and its internal resistance is 0.5 Ω. The maximum power which it can deliver to any external circuit will be

(a) 8 *Watt* (b) 4 *Watt*

(c) 2 *Watt* (d) None of the above

67. Kirchoff's I law and II law of current, proves the

[CBSE PMT 1993; BHU 2002; AFMC 2003]

(a) Conservation of charge and energy

(b) Conservation of current and energy

(c) Conservation of mass and charge

(d) None of these

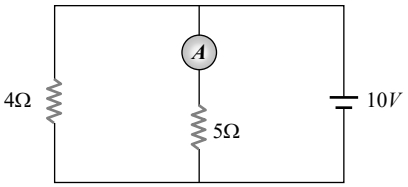
68. In the circuit, the reading of the ammeter is (assume internal resistance of the battery be zero)

(a) $\frac{40}{29} A$

(b) $\frac{10}{9} A$

(c) $\frac{5}{3} A$

(d) 2 A

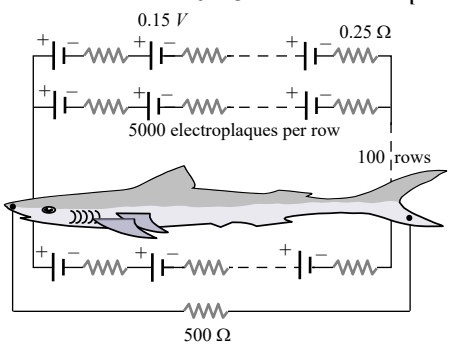


69. In the above question, if the internal resistance of the battery is 1 *ohm*, then what is the reading of ammeter

(a) 5/3 A (b) 40/29 A

(c) 10/9 A (d) 1 A

70. Eels are able to generate current with biological cells called electroplaques. The electroplaques in an eel are arranged in 100 rows, each row stretching horizontally along the body of the fish containing 5000 electroplaques. The arrangement is suggestively shown below. Each electroplaques has an emf of 0.15 V and internal resistance of 0.25 Ω **[AIIMS 2004]**



The water surrounding the eel completes a circuit between the head and its tail. If the water surrounding it has a resistance of 500 Ω, the current an eel can produce in water is about **[AMU (Med.) 2002]**

(a) 1.5 A (b) 3.0 A

(c) 15 A (d) 30 A

71. Current provided by a battery is maximum when

[AFMC 2004]

(a) Internal resistance equal to external resistance

(b) Internal resistance is greater than external resistance

(c) Internal resistance is less than external resistance

(d) None of these

72. A battery is charged at a potential of 15 V for 8 *hours* when the current flowing is 10 A. The battery on discharge supplies a current of 5 A for 15 *hours*. The mean terminal voltage during discharge is 14 V. The "*Watt-hour*" efficiency of the battery is **[CBSE PMT 2004]**

(a) 82.5% (b) 80 %

(c) 90% (d) 87.5%

73. In the given current distribution what is the value of I

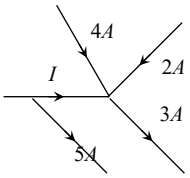
[Orissa PMT 2004]

(a) 3A

(b) 8 A

(c) 2A

(d) 5A



74. A capacitor is connected to a cell of emf E having some internal resistance r. The potential difference across the

[CPMT 2004; MP PMT 2005]

(a) Cell is $< E$ (b) Cell is E

(c) Capacitor is $> E$ (d) Capacitor is $< E$

75. When the resistance of 9 Ω is connected at the ends of a battery, its potential difference decreases from 40 *volt* to 30 *volt*. The internal resistance of the battery is **[DPMT 2003]**

(a) 6 Ω (b) 3 Ω

(c) 9 Ω (d) 15 Ω

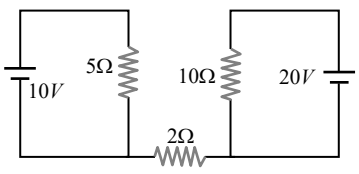
76. The maximum power drawn out of the cell from a source is given by (where r is internal resistance) **[DCE 2002]**

(a) $E^2/2r$ (b) $E^2/4r$

(c) E^2/r (d) $E^2/3r$

77. Find out the value of current through 2Ω resistance for the given circuit

(a) 5 A



(b) 2 A

(c) Zero

(d) 4 A

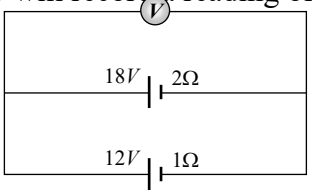
78. Two batteries, one of emf 18 *volts* and internal resistance 2Ω and the other of emf 12 *volt* and internal resistance 1Ω, are connected as shown. The voltmeter V will record a reading of

(a) 15 *volt*

(b) 30 *volt*

(c) 14 *volt*

(d) 18 *volt*



79. Two sources of equal emf are connected to an external resistance R. The internal resistances of the two sources are R_1 and $R_2 (R_2 > R_1)$. If the potential difference across the source having internal resistance R_2 is zero, then

[AIEEE 2005]

(a) $R = R_1 R_2/(R_1 + R_2)$

(b) $R = R_1 R_2/(R_2 - R_1)$

(c) $R = R_2 \times (R_1 + R_2)/(R_2 - R_1)$

(d) $R = R_2 - R_1$

80. An energy source will supply a constant current into the load if its internal resistance is

(a) Zero

(b) Non-zero but less than the resistance of the load

(c) Equal to the resistance of the load

(d) Very large as compared to the load resistance

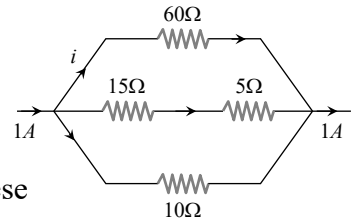
81. The magnitude of i in ampere unit is **[KCET 2005]**

(a) 0.1

(b) 0.3

(c) 0.6

(d) None of these



82. To draw maximum current from a combination of cells, how should the cells be grouped **[IIT-JEE (Screening) 2005]**

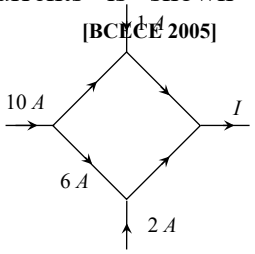
(a) Series

(b) Parallel

(c) Mixed

(d) Depends upon the relative values of external and internal resistance

83. The figure shows a network of currents. The magnitude of currents is shown here. The current I will be **[BCECE 2005]**



(a) 3 A

(b) 9 A

(c) 13 A

(d) 19 A

84. The n rows each containing m cells in series are joined in parallel. Maximum current is taken from this combination across an external resistance of 3Ω resistance. If the total number of cells used are 24 and internal resistance of each cell is 0.5 Ω then **[J & K CET 2005]**

(a) $m=8, n=3$ (b) $m=6, n=4$

(c) $m=12, n=2$ (d) $m=2, n=12$

85. A cell of constant e.m.f. first connected to a resistance R_1 and then connected to a resistance R_2. If power delivered in both cases is then the internal resistance of the cell is **[Orissa JEE 2005]**

(a) $\sqrt{R_1 R_2}$ (b) $\sqrt{\frac{R_1}{R_2}}$

(c) $\frac{R_1 - R_2}{2}$ (d) $\frac{R_1 + R_2}{2}$

Different Measuring Instruments

1. In meter bridge or Wheatstone bridge for measurement of resistance, the known and the unknown resistances are interchanged. The error so removed is **[MNR 1988; MP PET 1995]**

(a) End correction

(b) Index error

(c) Due to temperature effect

(d) Random error

2. A galvanometer can be converted into an ammeter by connecting **[MP PMT 1987, 93; CPMT 1973, 75, 96, 2000; MP PET 1994; AFMC 1993, 95; RPET 2000; DCE 2000]**

(a) Low resistance in series

(b) High resistance in parallel

(c) Low resistance in parallel

(d) High resistance in series

3. A cell of internal resistance 1.5Ω and of e.m.f. 1.5 volt balances 500 cm on a potentiometer wire. If a wire of 15Ω is connected between the balance point and the cell, then the balance point will shift **[MP PMT 1985]**

(a) To zero (b) By 500 cm

(c) By 750 cm (d) None of the above

4. 10^{-3} amp is flowing through a resistance of 1000Ω. To measure the correct potential difference, the voltmeter is to be used of which the resistance should be **[MP PMT 1985]**

(a) 0Ω (b) 500Ω

(c) 1000Ω (d) $>> 1000\Omega$

5. A galvanometer of 100Ω resistance gives full scale deflection when 10 mA of current is passed. To convert it into 10 A range ammeter, the resistance of the shunt required will be **[MP PMT 1985]**

(a) -10Ω (b) 1Ω

(c) 0.1Ω (d) 0.01Ω

6. 50Ω and 100Ω resistors are connected in series. This connection is connected with a battery of 2.4 $volts$. When a voltmeter of 100Ω resistance is connected across 100Ω resistor, then the reading of the voltmeter will be **[MP PMT 1985]**

(a) 1.6 V (b) 1.0 V

(c) 1.2 V (d) 2.0 V

7. A 2 $volt$ battery, a 15Ω resistor and a potentiometer of 100 cm length, all are connected in series. If the resistance of potentiometer wire is 5Ω, then the potential gradient of the potentiometer wire is **[AIIMS 1982]**

(a) 0.005 V/cm (b) 0.05 V/cm

(c) 0.02 V/cm (d) 0.2 V/cm

8. An ammeter gives full scale deflection when current of 1.0 A is passed in it. To convert it

into 10 A range ammeter, the ratio of its resistance and the shunt resistance will be [MP PMT 1985]

(a) 1 : 9 (b) 1 : 10

(c) 1 : 11 (d) 9 : 1

9. By ammeter, which of the following can be measured [MP PET 1981; DPMT 2001]

(a) Electric potential (b) Potential difference

(c) Current (d) Resistance

10. The resistance of 1 A ammeter is 0.018Ω. To convert it into 10 A ammeter, the shunt resistance required will be [MP PET 1982]

(a) 0.18Ω (b) 0.0018Ω

(c) 0.002Ω (d) 0.12Ω

11. For measurement of potential difference, potentiometer is preferred in comparison to voltmeter because [MP PET 1983]

(a) Potentiometer is more sensitive than voltmeter

(b) The resistance of potentiometer is less than voltmeter

(c) Potentiometer is cheaper than voltmeter

(d) Potentiometer does not take current from the circuit

12. In order to pass 10% of main current through a moving coil galvanometer of 99 *ohm*, the resistance of the required shunt is [MP PET 1990, 99; MP PMT 1994; RPET 2001; KCET 2003, 05]

(a) 9.9Ω (b) 10Ω

(c) 11Ω (d) 9Ω

13. An ammeter of 5 *ohm* resistance can read 5 mA. If it is to be used to read 100 volts, how much resistance is to be connected in series [MP PET 1991; MP PMT 1996; MP PMT 2000]

(a) 19.9995Ω (b) 199.995Ω

(c) 1999.95Ω (d) 19995Ω

14. The potential gradient along the length of a uniform wire is $10\,volt/metre$. B and C are the two points at $30\,cm$ and $60\,cm$ point on a meter scale fitted along the wire. The potential difference between B and C will be [CPMT 1986]

(a) $3\,volt$ (b) $0.4\,volt$

(c) $7\,volt$ (d) $4\,volt$

15. $100\,mA$ current gives a full scale deflection in a galvanometer of 2Ω resistance. The resistance connected with the galvanometer to convert it into a voltmeter to measure $5\,V$ is [MNR 1994; UPSEAT 2000]

(a) 98Ω (b) 52Ω

(c) 50Ω (d) 48Ω

16. When a 12Ω resistor is connected with a moving coil galvanometer then its deflection reduces from 50 divisions to 10 divisions. The resistance of the galvanometer is [CPMT 2002; DPMT 2003]

(a) 24Ω (b) 36Ω

(c) 48Ω (d) 60Ω

17. A galvanometer can be used as a voltmeter by connecting a [AFMC 1993; MP PMT 1993, 95; CBSE PMT 2004]

(a) High resistance in series (b) Low resistance in series

(c) High resistance in parallel (d) Low resistance in parallel

18. The tangent galvanometer, when connected in series with a standard resistance can be used as [MP PET 1994]

(a) An ammeter

(b) A voltmeter

(c) A wattmeter

(d) Both an ammeter and a voltmeter

19. In Wheatstone's bridge $P=9\,ohm$, $Q=11\,ohm$, $R=4\,ohm$ and $S=6\,ohm$. How much resistance must be put in parallel to the resistance S to balance the bridge [DPMT 1999]

(a) 24 *ohm* (b) $\frac{44}{9}\,ohm$

(c) 26.4 *ohm* (d) 18.7 *ohm*

20. A Daniel cell is balanced on 125 *cm* length of a potentiometer wire. Now the cell is short-circuited by a resistance 2 *ohm* and the balance is obtained at 100 *cm*. The internal resistance of the Daniel cell is **[UPSEAT 2002]**

(a) 0.5 *ohm* (b) 1.5 *ohm*

(c) 1.25 *ohm* (d) 4/5 *ohm*

21. Sensitivity of potentiometer can be increased by **[MP PET 1994]**

(a) Increasing the e.m.f. of the cell

(b) Increasing the length of the potentiometer wire

(c) Decreasing the length of the potentiometer wire

(d) None of the above

22. A potentiometer is an ideal device of measuring potential difference because

(a) It uses a sensitive galvanometer

(b) It does not disturb the potential difference it measures

(c) It is an elaborate arrangement

(d) It has a long wire hence heat developed is quickly radiated

23. A battery of 6 volts is connected to the terminals of a three metre long wire of uniform thickness and resistance of the order of $100\,\Omega$. The difference of potential between two points separated by 50 *cm* on the wire will be **[CPMT 1984; CBSE PMT 2004]**

(a) 1 *V* (b) 1.5 *V*

(c) 2 *V* (d) 3 *V*

24. A galvanometer of 10 *ohm* resistance gives full scale deflection with 0.01 ampere of current. It is to be converted into an ammeter for measuring 10 ampere current. The value of shunt resistance required will be **[MP PET 1984]**

(a) $\frac{10}{999}$ *ohm* (b) 0.1 *ohm*

(c) 0.5 *ohm* (d) 1.0 *ohm*

25. A potentiometer is used for the comparison of e.m.f. of two cells E_1 and E_2. For cell E_1 the no deflection point is obtained at 20 *cm* and for E_2 the no deflection point is obtained at 30 *cm*. The ratio of their e.m.f.'s will be **[MP PET 1984]**

(a) 2/3 (b) 1/2

(c) 1 (d) 2

26. Potential gradient is defined as **[MP PET 1994]**

(a) Fall of potential per unit length of the wire

(b) Fall of potential per unit area of the wire

(c) Fall of potential between two ends of the wire

(d) Potential at any one end of the wire

27. In an experiment of meter bridge, a null point is obtained at the centre of the bridge wire. When a resistance of 10 *ohm* is connected in one gap, the value of resistance in other gap is **[MP PET 1994]**

(a) $10\,\Omega$ (b) $5\,\Omega$

(c) $\frac{1}{5}\Omega$ (d) $500\,\Omega$

28. If the length of potentiometer wire is increased, then the length of the previously obtained balance point will

(a) Increase (b) Decrease

(c) Remain unchanged (d) Become two times

29. In potentiometer a balance point is obtained, when

(a) The e.m.f. of the battery becomes equal to the e.m.f. of the experimental cell

(b) The p.d. of the wire between the +*ve* end to jockey becomes equal to the e.m.f. of the experimental cell

(c) The p.d. of the wire between +*ve* point and jockey becomes equal to the e.m.f. of the battery

(d) The p.d. across the potentiometer wire becomes equal to the e.m.f. of the battery

30. In the experiment of potentiometer, at balance, there is no current in the

(a) Main circuit

(b) Galvanometer circuit

(c) Potentiometer circuit

(d) Both main and galvanometer circuits

31. If in the experiment of Wheatstone's bridge, the

positions of cells and galvanometer are interchanged, then balance points will

(a) Change

(b) Remain unchanged

(c) Depend on the internal resistance of cell and resistance of galvanometer

(d) None of these

32. The resistance of a galvanometer is 90 *ohm*s. If only 10 percent of the main current may flow through the galvanometer, in which way and of what value, a resistor is to be used **[MP PET 1996]**

(a) 10 *ohm*s in series (b) 10 *ohm*s in parallel

(c) 810 *ohm*s in series (d) 810 *ohm*s in parallel

33. Two cells when connected in series are balanced on 8*m* on a potentiometer. If the cells are connected with polarities of one of the cell is reversed, they balance on 2*m*. The ratio of e.m.f.'s of the two cells is

(a) $3:5$ (b) $5:3$

(c) $3:4$ (d) $4:3$

34. A voltmeter has a resistance of *G ohm*s and range *V volts*. The value of resistance used in series to convert it into a voltmeter of range *nV* volts is **[MP PMT 1999; MP PET 2002; DPMT 2004; MH CET 2004]**

(a) nG (b) $(n-1)G$

(c) $\frac{G}{n}$ (d) $\frac{G}{(n-1)}$

35. Which of the following statement is wrong **[MP PET 1994]**

(a) Voltmeter should have high resistance

(b) Ammeter should have low resistance

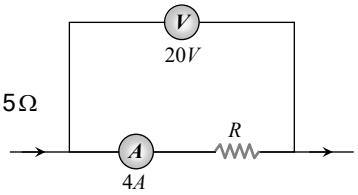
(c) Ammeter is placed in parallel across the conductor in a circuit

(d) Voltmeter is placed in parallel across the conductor in a circuit

36. In the diagram shown, the reading of voltmeter is 20 *V* and that of ammeter is 4 *A*. The value of *R* should be (Consider given ammeter and voltmeter are not ideal) **[RPMT 1997]**

(a) Equal to 5Ω

(b) Greater from 5Ω



(c) Less than 5Ω

(d) Greater or less than 5Ω depends on the material of *R*

37. A moving coil galvanometer has a resistance of 50Ω and gives full scale deflection for 10 *mA*. How could it be converted into an ammeter with a full scale deflection for 1*A* **[MP PMT 1996]**

(a) $50/99\Omega$ in series (b) $50/99\Omega$ in parallel

(c) 0.01Ω in series (d) 0.01Ω in parallel

38. The current flowing through a coil of resistance 900 *ohm*s is to be reduced by 90%. What value of shunt should be connected across the coil **[Roorkee 1992]**

(a) 90Ω (b) 100Ω

(c) 9Ω (d) 10Ω

39. A galvanometer of resistance 25Ω gives full scale deflection for a current of 10 *milliampere*, is to be changed into a voltmeter of range 100 *V* by connecting a resistance of '*R*' in series with galvanometer. The value of resistance *R* in Ω is **[MP PET 1994]**

(a) 10000 (b) 10025

(c) 975 (d) 9975

40. In a potentiometer circuit there is a cell of e.m.f. 2 *volt*, a resistance of 5 *ohm* and a wire of uniform thickness of length 1000 *cm* and resistance 15 *ohm*. The potential gradient in the wire is **[MP PMT 1994]**

(a) $\frac{1}{500}$ *V/ cm* (b) $\frac{3}{2000}$ *V/ cm*

(c) $\frac{3}{5000}$ *V/ cm* (d) $\frac{1}{1000}$ *V/ cm*

41. The resistance of a galvanometer is 25 *ohm* and it requires $50\,\mu A$ for full deflection. The value of the shunt resistance required to convert it into an ammeter of 5 *amp* is **[MP PMT 1994; BHU 1997]**

(a) 2.5×10^{-4} *ohm* (b) 1.25×10^{-3} *ohm*

(c) 0.05 *ohm* (d) 2.5 *ohm*

42. Which is a *wrong* statement **[MP PMT 1994]**

(a) The Wheatstone bridge is most sensitive when all the four resistances are of the same order

(b) In a balanced Wheatstone bridge, interchanging the positions of galvanometer and cell affects the balance of the bridge

(c) Kirchhoff's first law (for currents meeting at a junction in an electric circuit) expresses the conservation of charge

(d) The rheostat can be used as a potential divider

43. A voltmeter having a resistance of 998 *ohm*s is connected to a cell of e.m.f. 2 *volt* and internal resistance 2 *ohm*. The error in the measurement of e.m.f. will be **[MP PMT 1994]**

(a) 4×10^{-1} *volt* (b) 2×10^{-3} *volt*

(c) 4×10^{-3} *volt* (d) 2×10^{-1} *volt*

44. For comparing the e.m.f.'s of two cells with a potentiometer, a standard cell is used to develop a potential gradient along the wires. Which of the following possibilities would make the experiment unsuccessful **[MP PMT 1994]**

(a) The e.m.f. of the standard cell is larger than the *E* e.m.f.'s of the two cells

(b) The diameter of the wires is the same and uniform throughout

(c) The number of wires is ten

(d) The e.m.f. of the standard cell is smaller than the e.m.f.'s of the two cells

45. Which of the following is correct **[BHU 1995]**

(a) Ammeter has low resistance and is connected in series

(b) Ammeter has low resistance and is connected in parallel

(c) Voltmeter has low resistance and is connected in parallel

(d) None of the above

46. An ammeter with internal resistance 90Ω reads 1.85 *A* when connected in a circuit containing a battery and two resistors 700Ω and 410Ω in series. Actual current will be **[Roorkee 1995]**

(a) 1.85 *A* (b) Greater than 1.85 *A*

(c) Less than 1.85 *A* (d) None of these

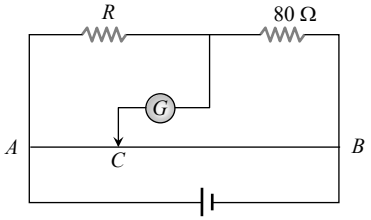
47. *AB* is a wire of uniform resistance. The galvanometer *G* shows no current when the length AC = 20*cm* and *CB* = 80 *cm*. The resistance *R* is equal to **[MP PMT 1995; RPET 2001]**

(a) 2Ω

(b) 8Ω

(c) 20Ω

(d) 40Ω



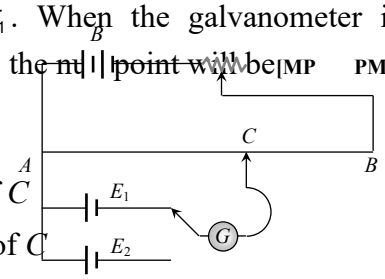
48. The circuit shown here is used to compare the e.m.f. of two cells E_1 and $E_2 (E_1 > E_2)$. The null point is at *C* when the galvanometer is connected to E_1. When the galvanometer is connected to E_2, the null point will be **[MP PMT 1995]**

(a) To the left of *C*

(b) To the right of *C*

(c) At *C* itself

(d) Nowhere on *AB*

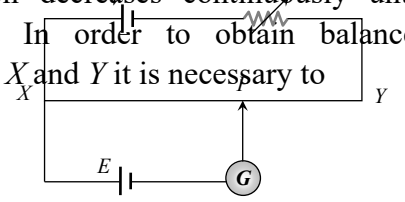


49. In an experiment to measure the internal resistance of a cell by potentiometer, it is found that the balance point is at a length of 2*m* when the cell is shunted by a 5Ω resistance; and is at a length of 3*m* when the cell is shunted by a 10Ω resistance. The internal resistance of the cell is, then **[Haryana CEE 1996]**

(a) 1.5Ω (b) 10Ω

(c) 15Ω (d) 1Ω

50. A potentiometer circuit shown in the figure is set up to measure e.m.f. of a cell *E*. As the point *P* moves from *X* to *Y* the galvanometer *G* shows deflection always in one direction, but the deflection decreases continuously until *Y* is reached. In order to obtain balance point between *X* and *Y* it is necessary to



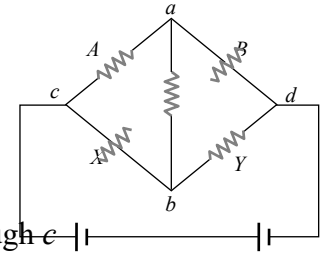
(a) Decreases the resistance R

(b) Increase the resistance R

(c) Reverse the terminals of battery V

(d) Reverse the terminals of cell E

51. In the Wheatstone's bridge (shown in figure) $X = Y$ and $A > B$. The direction of the current between ab will be



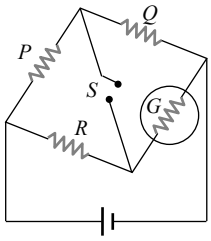
(a) From a to b

(b) From b to a

(c) From b to a through c

(d) From a to b through c

52. The figure shows a circuit diagram of a 'Wheatstone Bridge' to measure the resistance G of the galvanometer. The relation $\frac{P}{Q} = \frac{R}{G}$ will be satisfied only when



(a) The galvanometer shows a deflection when switch S is closed

(b) The galvanometer shows a deflection when switch S is open

(c) The galvanometer shows no change in deflection whether S is open or closed

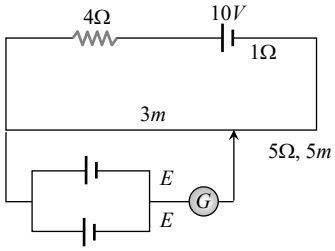
(d) The galvanometer shows no deflection

53. The resistance of a galvanometer is 50 *ohm*s and the current required to give full scale deflection is $100\,\mu A$. In order to convert it into an ammeter, reading upto $10A$, it is necessary to put a resistance of **[MP PMT 1997; AIIMS 1999]**

(a) $5\times10^{-3}\,\Omega$ in parallel (b) $5\times10^{-4}\,\Omega$ in parallel

(c) $10^{5}\,\Omega$ in series (d) $99{,}950\,\Omega$ in series

54. A resistance of $4\,\Omega$ and a wire of length 5 *metres* and resistance $5\,\Omega$ are joined in series and connected to a cell of e.m.f. 10 V and internal resistance $1\,\Omega$. A parallel combination of two identical cells is balanced across 300 *cm* of the wire. The e.m.f. E of each cell is **[MP PMT 1997]**



(a) 1.5 V

(b) 3.0 V

(c) 0.67 V

(d) 1.33 V

55. The resistivity of a potentiometer wire is $40\times10^{-8}\ ohm-m$ and its area of cross-section is $8\times10^{-6}\ m^2$. If 0.2 *amp* current is flowing through the wire, the potential gradient will be **[MP PMT/PET 1998]**

(a) $10^{-2}\ volt/m$ (b) $10^{-1}\ volt/m$

(c) $3.2\times10^{-2}\ volt/m$ (d) $1\ volt/m$

56. If only 2% of the main current is to be passed through a galvanometer of resistance G, then the resistance of shunt will be **[MP PMT/PET 1998]**

(a) $\frac{G}{50}$ (b) $\frac{G}{49}$

(c) $50\,G$ (d) $49\,G$

57. The resistance of an ideal voltmeter is **[EAMCET (Med.) 1995; MP PMT/PET 1998; Pb. PMT 1999; CPMT 2000]**

(a) Zero (b) Very low

(c) Very large (d) Infinite

58. A 100 V voltmeter of internal resistance $20\,k\Omega$ in series with a high resistance R is connected to a 110 V line. The voltmeter reads 5 V, the value of R is **[MP PET 1999]**

(a) $210\,k\Omega$ (b) $315\,k\Omega$

(c) $420\,k\Omega$ (d) $440\,k\Omega$

59. Constantan wire is used in making standard resistances because its **[MP PET 1999]**

(a) Specific resistance is low

(b) Density is high

(c) Temperature coefficient of resistance is negligible

(d) Melting point is high

60. The net resistance of a voltmeter should be large to ensure that **[MP PMT 1999]**

(a) It does not get overheated

(b) It does not draw excessive current

(c) It can measure large potential difference

(d) It does not appreciably change the potential difference to be measured

61. A galvanometer has resistance of 7Ω and gives a full scale deflection for a current of 1.0 A. How will you convert it into a voltmeter of range 10 V **[MP PMT 1999]**

(a) 3Ω in series (b) 3Ω in parallel

(c) 17Ω in series (d) 30Ω in series

62. A potentiometer consists of a wire of length 4 m and resistance 10Ω. It is connected to a cell of e.m.f. 2 V. The potential difference per unit length of the wire will be **[CBSE PMT 1999; AFMC 2001]**

(a) 0.5 V/m (b) 2 V/m

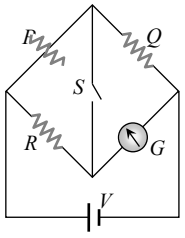
(c) 5 V/m (d) 10 V/m

63. In a meter bridge, the balancing length from the left end (standard resistance of one *ohm* is in the right gap) is found to be 20 cm. The value of the unknown resistance is **[CBSE PMT 1999; Pb PMT 2004]**

(a) 0.8Ω (b) 0.5Ω

(c) 0.4Ω (d) 0.25Ω

64. In the circuit shown $P \neq R$, the reading of the galvanometer is same with switch S open or closed. Then **[IIT-JEE (Screening) 1999]**



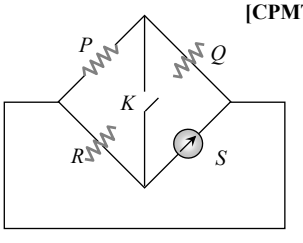
(a) $I_R = I_G$

(b) $I_P = I_G$

(c) $I_Q = I_G$

(d) $I_Q = I_R$

65. In the following Wheatstone bridge $P/Q = R/S$. If key K is closed, then the galvanometer will show deflection **[CPMT 1999]**



(a) In left side

(b) In right side

(c) No deflection

(d) In either side

66. A galvanometer having a resistance of 8 *ohm* is shunted by a wire of resistance 2 *ohm*. If the total current is 1 *amp*, the part of it passing through the shunt will be **[CBSE PMT 1998]**

(a) 0.25 *amp* (b) 0.8 *amp*

(c) 0.2 *amp* (d) 0.5 *amp*

67. A potentiometer wire has length 10 m and resistance 20Ω. A 2. 5 V battery of negligible internal resistance is connected across the wire with an 80Ω series resistance. The potential gradient on the wire will be **[KCET 1994]**

(a) 5×10^{-5} V/mm (b) 2.5×10^{-4} V/cm

(c) 0.62×10^{-4} V/mm (d) 1×10^{-5} V/mm

68. An ammeter whose resistance is 180Ω gives full scale deflection when current is 2 mA. The shunt required to convert it into an ammeter reading 20 mA (in *ohm*s) is **[EAMCET (Engg.) 1995]**

(a) 18 (b) 20

(c) 0.1 (d) 10

69. A galvanometer whose resistance is 120Ω gives full scale deflection with a current of 0.05 A so that it can read a maximum current of 10 A. A shunt resistance is added in parallel with it. The resistance of the ammeter so formed is **[Bihar MEE 1995]**

(a) 0.06Ω (b) 0.006Ω

(c) 0.6Ω (d) 6Ω s

70. In a potentiometer experiment, the galvanometer shows no deflection when a cell is connected across 60 cm of the potentiometer wire. If the cell is shunted by a resistance of 6Ω, the balance is obtained across 50 cm of the wire. The internal resistance of the cell is **[SCRA 1994]**

(a) 0.5Ω (b) 0.6Ω

(c) 1.2Ω (d) 1.5Ω

71. A voltmeter of resistance 1000Ω gives full scale deflection when a current of 100 *mA* flow through it. The shunt resistance required across it to enable it to be used as an ammeter reading 1 *A* at full scale deflection is **[SCRA 1994]**

(a) 10000Ω (b) 9000Ω

(c) 222Ω (d) 111Ω

72. The resistance of 10 *metre* long potentiometer wire is 1*ohm*/*meter*. A cell of e.m.f. 2.2 *volts* and a high resistance box are connected in series to this wire. The value of resistance taken from resistance box for getting potential gradient of 2.2 *millivolt*/*metre* will be **[RPET 1997]**

(a) 790Ω (b) 810Ω

(c) 990Ω (d) 1000Ω

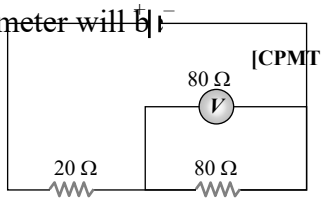
73. We have a galvanometer of resistance 25Ω. It is shunted by a 2.5Ω wire. The part of total current that flows through the galvanometer is given as

[AFMC 1998; MH CET 1999; Pb. PMT 2002]

(a) $\frac{I}{I_0}=\frac{1}{11}$ (b) $\frac{I}{I_0}=\frac{1}{10}$

(c) $\frac{I}{I_0}=\frac{3}{11}$ (d) $\frac{I}{I_0}=\frac{4}{11}$

74. In the adjoining circuit, the e.m.f. of the cell is 2 *volt* and the internal resistance is negligible. The resistance of the voltmeter is 80 *ohm*. The reading of the voltmeter will be **[CPMT 1991]**



(a) 0.80 *volt*

(b) 1.60 *volt*

(c) 1.33 *volt*

(d) 2.00 *volt*

75. If the resistivity of a potentiometer wire be ρ and area of cross-section be *A*, then what will be potential gradient along the wire **[RPET 1996]**

(a) $\frac{I\rho}{A}$ (b) $\frac{I}{A\rho}$

(c) $\frac{IA}{\rho}$ (d) $IA\rho$

76. A voltmeter has resistance of 2000 *ohm*s and it can measure upto 2*V*. If we want to increase its range to 10 *V*, then the required resistance in series will be **[CPMT 1997, SCRA 1994]**

(a) 2000Ω (b) 4000Ω

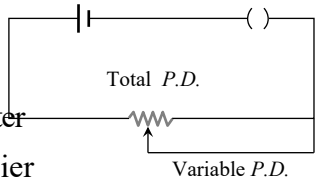
(c) 6000Ω (d) 8000Ω

77. For a cell of e.m.f. 2*V*, a balance is obtained for 50 *cm* of the potentiometer wire. If the cell is shunted by a 2Ω resistor and the balance is obtained across 40 *cm* of the wire, then the internal resistance of the cell is **[SCRA 1998]**

(a) 0.25Ω (b) 0.50Ω

(c) 0.80Ω (d) 1.00Ω

78. The arrangement as shown in figure is called as **[CPMT 1999]**



(a) Potential divider

(b) Potential adder

(c) Potential substracter

(d) Potential multiplier

79. A potentiometer wire of length $1m$ and resistance 10 Ω is connected in series with a cell of *emf* 2*V* with internal resistance 1 Ω and a resistance box including a resistance *R*. If potential difference between the ends of the wire is 1 *mV*, the value of *R* is **[KCET 1999]**

(a) 20000 Ω (b) 19989 Ω

(c) 10000 Ω (d) 9989 Ω

80. In a balanced Wheatstone's network, the resistances in the arms *Q* and *S* are interchanged. As a result of this **[KCET 1999]**

(a) Network is not balanced

(b) Network is still balanced

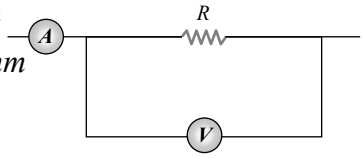
(c) Galvanometer shows zero deflection

(d) Galvanometer and the cell must be interchanged to balance

81. The ammeter *A* reads 2 *A* and the voltmeter *V* reads 20 *V*. the value of resistance *R* is (Assuming finite resistance's of ammeter and voltmeter) **[JIPMER 1999; MP PMT 2004]**

(a) Exactly 10 *ohm*

(b) Less than 10 *ohm*



(c) More than 10 *ohm*

(d) We cannot definitely say

82. The resistance of a galvanometer coil is R. What is the shunt resistance required to convert it into an ammeter of range 4 times

(a) $\frac{R}{5}$ (b) $\frac{R}{4}$

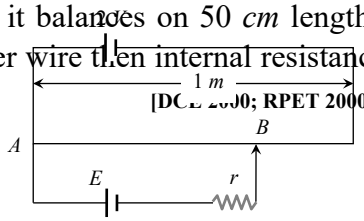
(c) $\frac{R}{3}$ (d) 4 R

83. If an ammeter is connected in parallel to a circuit, it is likely to be damaged due to excess

(a) Current (b) Voltage

(c) Resistance (d) All of these

84. In the given figure, battery E is balanced on 55 *cm* length of potentiometer wire but when a resistance of 10 Ω is connected in parallel with the battery then it balances on 50 *cm* length of the potentiometer wire then internal resistance r of the battery is [DCE 2000; RPET 2000]



(a) 1 Ω

(b) 3 Ω

(c) 10 Ω

(d) 5 Ω

85. A galvanometer with a resistance of 12 Ω gives full scale deflection when a current of 3 *mA* is passed. It is required to convert it into a voltmeter which can read up to 18 *V*. the resistance to be connected is

(a) 6000 Ω (b) 5988 Ω

(c) 5000 Ω (d) 4988 Ω

86. The resistance of an ideal ammeter is [KCET 2000]

(a) Infinite (b) Very high

(c) Small (d) Zero

87. A galvanometer of 25 Ω resistance can read a maximum current of 6*mA*. It can be used as a voltmeter to measure a maximum of 6 *V* by connecting a resistance to the galvanometer. Identify the correct choice in the given answers

(a) 1025 Ω in series (b) 1025 Ω in parallel

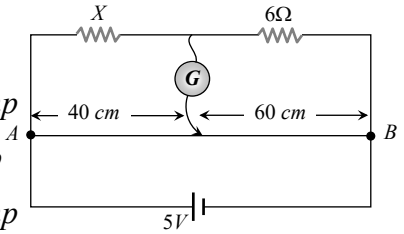
(c) 975 Ω in series (d) 975 Ω in parallel

88. A galvanometer has a resistance of 25 *ohm* and a maximum of 0.01 *A* current can be passed through it. In order to change it into an ammeter of range 10 *A*, the shunt resistance required is [MP PET 2000] [BHU 2000]

(a) 5/999 *ohm* (b) 10/999 *ohm*

(c) 20/999 *ohm* (d) 25/999 *ohm*

89. In the circuit shown, a *meter* bridge is in its balanced state. The *meter* bridge wire has a resistance 0.1 *ohm*/*cm*. The value of unknown resistance *X* and the current drawn from the battery of negligible resistance is [AMU (Engg.) 2000] [BHU 2000; RCECH 2004]



(a) 6 Ω, 5 *amp*

(b) 10 Ω, 0.1 *amp*

(c) 4 Ω, 1.0 *amp*

(d) 12 Ω, 0.5 *amp*

90. A galvanometer has 30 divisions and a sensitivity 16 $\mu A/\text{div}$. It can be converted into a voltmeter to read 3 *V* by connecting

(a) Resistance nearly 6 $k\Omega$ in series

(b) $6k\Omega$ in parallel

(c) 500Ω in series

(d) It cannot be converted

91. Voltmeters V_1 and V_2 are connected in series across a *D.C.* line. V_1 reads 80 *volts* and has a per *volt* resistance of 200 *ohms*. V_2 has a total resistance of 32 *kilo ohms*. The line voltage is [Pb. PMT 2000]

(a) 120 *volts* (b) 160 *volts*

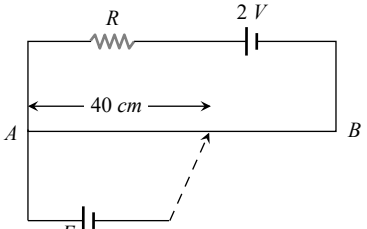
(c) 220 *volts* (d) 240 *volts*

92. A potentiometer having the potential gradient of 2 *mV*/*cm* is used to measure the difference of potential across a resistance of 10 *ohm*. If a length of 50 *cm* of the potentiometer wire is required to get the null point, the current passing through the 10 *ohm* resistor is (in *mA*) [AMU (Med.) 2000]

(a) 1 (b) 2

(c) 5 (d) 10

93. *AB* is a potentiometer wire of length 100 *cm* and its resistance is 10 *ohms*. It is connected in series with a resistance R = 40 *ohms* and a battery of e.m.f. 2 *V* and negligible internal [EAMCET (Med.) 2000]



resistance. If a source of unknown e.m.f. E is balanced by 40 *cm* length of the potentiometer wire, the value of E is **[MP PET 2001]**

(a) 0.8 V

(b) 1.6 V

(c) 0.08 V

(d) 0.16 V

94. An ammeter gives full deflection when a current of 2 *amp.* flows through it. The resistance of ammeter is 12 *ohms*. If the same ammeter is to be used for measuring a maximum current of 5 *amp.*, then the ammeter must be connected with a resistance of

(a) 8 *ohms* in series (b) 18 *ohms* in series

(c) 8 *ohms* in parallel (d) 18 *ohms* in parallel

95. In a circuit 5 percent of total current passes through a galvanometer. If resistance of the galvanometer is G then value of the shunt is

(a) 19 G (b) 20 G

(c) $\frac{G}{20}$ (d) $\frac{G}{19}$

96. A voltmeter having resistance of 50×10^3 *ohm* is used to measure the voltage in a circuit. To increase the range of measurement 3 times the additional series resistance required is

(a) 10^5 *ohm* (b) 150 *k.ohm*

(c) 900 *k.ohm* (d) 9×10^6 *ohm*

97. In a potentiometer experiment two cells of e.m.f. E_1 and E_2 are used in series and in conjunction and the balancing length is found to be 58 *cm* of the wire. If the polarity of E_2 is reversed, then the balancing length becomes 29 *cm*. The ratio $\frac{E_1}{E_2}$ of the e.m.f. of the two cells is **[Kerala (Engg.) 2001]**

(a) 1 : 1 (b) 2 : 1

(c) 3 : 1 (d) 4 : 1

98. A milliammeter of range 10 *mA* has a coil of resistance 1 Ω. To use it as voltmeter of range 10 *volt*, the resistance that must be connected in series with it, will be **[KCET 2001]**

(a) 999 Ω (b) 99 Ω

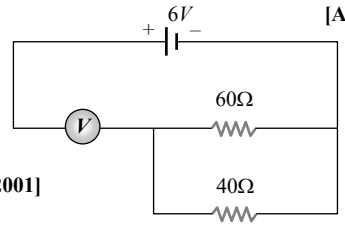
(c) 1000 Ω (d) None of these

99. A voltmeter has a range 0-V with a series resistance R. With a series resistance $2R$, the range is 0-V'. The correct relation between V and V' is **[CPMT 2001]**

(a) $V' = 2V$ (b) $V' > 2V$

(c) $V' >> 2V$ (d) $V' < 2V$

100. The measurement of voltmeter in the following circuit is **[AFMC 2001]**



(a) 2.4 V

(b) 3.4 V

(c) 4.0 V

(d) 6.0 V **[MP PET 2001]**

101. A 36 Ω galvanometer is shunted by resistance of 4Ω. The percentage of the total current, which passes through the galvanometer is **[MP PET 2001]**

(a) 8 % (b) 9 %

(c) 10 % (d) 91 %

102. An ammeter and a voltmeter of resistance R are connected in series to an electric cell of negligible internal resistance. Their readings are A and V respectively. If another resistance R is connected in parallel with the voltmeter **[MP PET 2001]** **[EAMCET 2000; KCET 2002]**

(a) Both A and V will increase

(b) Both A and V will decrease

(c) A will decrease and V will increase

(d) A will increase and V will decrease

103. A wire of length 100 *cm* is connected to a cell of *emf* 2 V and negligible internal resistance. The resistance of the wire is 3 Ω. The additional resistance required to produce a potential drop of 1 *milli volt* per *cm* is **[Kerala PET 2002]**

(a) 60 Ω (b) 47 Ω

(c) 57 Ω (d) 35 Ω

104. A galvanometer of resistance 20 Ω is to be converted into an ammeter of range 1 A. If a current of 1 *mA* produces full scale deflection, the shunt required for the purpose is **[Kerala PET 2002]**

(a) 0.01 Ω (b) 0.05 Ω

(c) 0.02 Ω (d) 0.04 Ω

105. There are three voltmeters of the same range but of resistances 10000Ω, 8000Ω and 4000Ω respectively. The best voltmeter among these is the one whose resistance is

(a) 10000 Ω (b) 8000 Ω

(c) 4000 Ω (d) All are equally good

106. If an ammeter is to be used in place of a voltmeter then we must connect with the ammeter a **[AIEEE 2002; AFMC 2002]**

(a) Low resistance in parallel

(b) High resistance in parallel

(c) High resistance in series

(d) Low resistance in series

107. A 10 *m* long wire of 20Ω resistance is connected with a battery of 3 *volt* e.m.f. (negligible internal resistance) and a 10 Ω resistance is joined to it is series. Potential gradient along wire in volt per meter is

(a) 0.02 (b) 0.3

(c) 0.2 (d) 1.3

108. A potentiometer has uniform potential gradient across it. Two cells connected in series (i) to support each other and (ii) to oppose each other are balanced over 6*m* and 2*m* respectively on the potentiometer wire. The e.m.f.'s of the cells are in the ratio of **[MP PMT 2002]**

(a) 1 : 2 (b) 1 : 1

(c) 3 : 1 (d) 2 : 1

109. The material of wire of potentiometer is **[MP PMT 2002]**

(a) Copper (b) Steel

(c) Manganin (d) Aluminium

110. To convert a galvanometer into a voltmeter, one should connect a **[CBSE PMT 2002]**

(a) High resistance in series with galvanometer

(b) Low resistance in series with galvanometer

(c) High resistance in parallel with galvanometer

(d) Low resistance in parallel with galvanometer

111. To convert a 800 *mV* range *milli voltmeter* of resistance 40 Ω into a galvanometer of 100 *mA* range, the resistance to be connected as shunt is

(a) 10 Ω (b) 20 Ω

(c) 30 Ω **[Kerala PET 2002]** (d) 40 Ω

112. A 100 *ohm* galvanometer gives full scale deflection at 10 *mA*. How much shunt is required to read 100 *mA* **[MP PET 2002]**

(a) 11.11 *ohm* (b) 9.9 *ohm*

(c) 1.1 *ohm* (d) 4.4 *ohm*

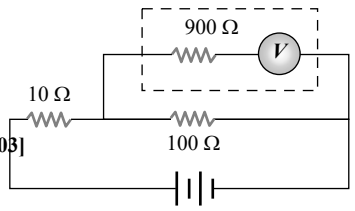
113. The potential difference across the 100Ω resistance in the following circuit is measured by a voltmeter of 900 Ω resistance. The percentage error made in reading the potential difference is **[AMU (Med.) 2002]**

(a) $\frac{10}{9}$

(b) 0.1

(c) 1.0 **[MP PMT 2003]**

(d) 10.0



114. A cell of internal resistance 3 *ohm* and *emf* 10 *volt* is connected to a uniform wire of length 500 *cm* and resistance 3 *ohm*. The potential gradient in the wire is **[MP PET 2003]**

(a) 30 *mV/cm* (b) 10 *mV/cm*

(c) 20 *mV/cm* (d) 4 *mV/cm*

115. An ammeter of 100 Ω resistance gives full deflection for the current of 10^{-5} *amp*. Now the shunt resistance required to convert it into ammeter of 1 *amp*. range, will be **[RPET 2003]**

(a) 10^{-4} Ω (b) 10^{-5} Ω

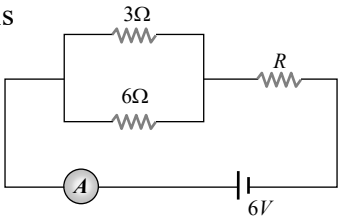
(c) 10^{-3} Ω (d) 10^{-1} Ω

116. A galvanometer of resistance 36 Ω is changed into an ammeter by using a shunt of 4 Ω. The fraction f_0 of total current passing through the galvanometer is **[BCECE 2003]**

(a) $\frac{1}{40}$ (b) $\frac{1}{4}$

(c) $\frac{1}{140}$ (d) $\frac{1}{10}$

117. If the ammeter in the given circuit reads 2 *A*, the resistance *R* is



(a) 1 *ohm*
(b) 2 *ohm*
(c) 3 *ohm*
(d) 4 *ohm*

118. A 50 *ohm* galvanometer gets full scale deflection when a current of 0.01 *A* passes through the coil. When it is converted to a 10 *A* ammeter, the shunt resistance is **[Orissa JEE 2003]**

(a) 0.01 Ω (b) 0.05 Ω
(c) 2000 Ω (d) 5000 Ω

119. Resistance in the two gaps of a *meter* bridge are 10 *ohm* and 30 *ohm* respectively. If the resistances are interchanged the balance point shifts by **[Orissa JEE 2003]**

(a) 33.3 *cm* (b) 66.67*cm*
(c) 25 *cm* (d) 50 *cm*

120. A potentiometer has uniform potential gradient. The specific resistance of the material of the potentiometer wire is 10^{-7} *ohm–meter* and the current passing through it is 0.1 *ampere*; cross-section of the wire is 10^{-6} m^2. The potential gradient along the potentiometer wire is **[KCET 2003]**

(a) 10^{-4} *V/m* (b) 10^{-6} *V/m*
(c) 10^{-2} *V/m* (d) 10^{-8} *V/m*

121. Two resistances of 400 Ω and 800 Ω are connected in series with 6 *volt* battery of negligible internal resistance. A voltmeter of resistance 10,000 Ω is used to measure the potential difference across 400 Ω. The error in the measurement of potential difference in *volts* approximately is

(a) 0.01 (b) 0.02
(c) 0.03 (d) 0.05

122. A galvanometer, having a resistance of 50 Ω gives a full scale deflection for a current of 0.05 *A*. The length in *meter* of a resistance wire of area of cross-section 2.97× 10^{-2} cm^2 that can be used to convert the galvanometer into an ammeter which can read a maximum of 5 *A* current is (Specific resistance of the wire = 5 × 10^{-7} Ω*m*)

(a) 9 (b) 6
(c) 3 (d) 1.5

123. An ammeter reads upto 1 *ampere*. Its internal resistance is 0.81 *ohm*. To increase the range to 10 *A* the value of the required shunt is

(a) 0.09 Ω (b) 0.03 Ω
(c) 0.3 Ω (d) 0.9 Ω

124. The length of a wire of a potentiometer is 100 *cm*, and the *emf* of its standard cell is *E volt*. It is employed to measure the *e.m.f* of a battery whose internal resistance is 0.5 Ω. If the balance point is obtained at l = 30 *cm* from the positive end, the e.m.f. of the battery is

(a) $\frac{30E}{100}$
(b) $\frac{30E}{100.5}$
(c) $\frac{30E}{(100-0.5)}$
(d) $\frac{30(E-0.5i)}{100}$, where i is the current in the potentiometer

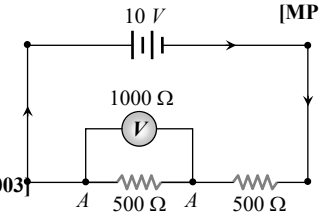
125. Resistance of 100 *cm* long potentiometer wire is 10Ω, it is connected to a battery (2 *volt*) and a resistance R in series. A source of 10 *mV* gives null point at 40 *cm* length, then external resistance R is **[MP PMT 2003]**

(a) 490 Ω (b) 790 Ω
(c) 590 Ω (d) 990 Ω

126. The e.m.f. of a standard cell balances across 150 *cm* length of a wire of potentiometer. When a resistance of 2Ω is connected as a shunt with the cell, the balance point is obtained at 100 *cm*. The internal resistance of the cell is **[MP PET 1993]**

[EAMCET 2003]
(a) 0.5Ω (b) 1Ω
(c) 2Ω (d) 0.5Ω

127. What is the reading of voltmeter in the following figure **[MP PMT 2004]**



(a) 3 *V*
(b) 2 *V*
(c) 5 *V*
(d) 4 *V* **[EAMCET 2003]**

128. The current flowing in a coil of resistance 90 Ω is to be reduced by 90%. What value of

resistance should be connected in parallel with it [MP PMT 2004]

(a) 9 Ω (b) 90 Ω

(c) 1000 Ω (d) 10 Ω

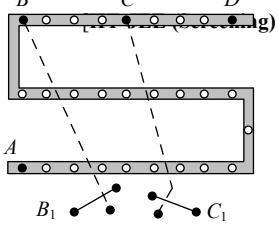
129. The maximum current that can be measured by a galvanometer of resistance 40 Ω is 10 *mA*. It is converted into a voltmeter that can read upto 50 *V*. The resistance to be connected in series with the galvanometer is ... (in *ohm*)

[KCET 2004]

(a) 5040 (b) 4960

(c) 2010 (d) 4050

130. For the post office box arrangement to determine the value of unknown resistance the unknown resistance should be connected between



[...g) 2004]

(a) *B* and *C*

(b) *C* and *D*

(c) *A* and *D*

(d) B_1 and C_1

131. A galvanometer of 50 *ohm* resistance has 25 divisions. A current of 4×10^{-4} *ampere* gives a deflection of one division. To convert this galvanometer into a voltmeter having a range of 25 *volts*, it should be connected with a resistance of

[CBSE PMT 2004]

(a) 2500 Ω as a shunt (b) 2450 Ω as a shunt

(c) 2550 Ω in series (d) 2450 Ω in series

132. In a metre bridge experiment null point is obtained at 20 *cm* from one end of the wire when resistance *X* is balanced against another resistance *Y*. If $X < Y$, then where will be the new position of the null point from the same end, if one decides to balance a resistance of $4X$ against *Y*

[AIEEE 2004]

(a) 50 *cm* (b) 80 *cm*

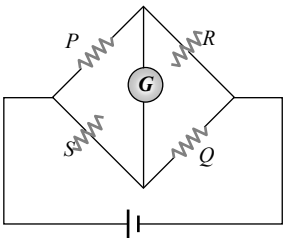
(c) 40 *cm* (d) 70 *cm*

133. In the circuit given, the correct relation to a balanced Wheatstone bridge is

(a) $\frac{P}{Q} = \frac{R}{S}$

(b) $\frac{P}{Q} = \frac{S}{R}$

(c) $\frac{P}{R} = \frac{S}{Q}$



(d) None of these

134. A galvanometer coil of resistance 50 Ω, show full deflection of $100\mu A$. The shunt resistance to be added to the galvanometer, to work as an ammeter of range 10 *mA* is

[Pb PET 2000]

(a) 5 Ω in parallel (b) 0.5 Ω in series

(c) 5 Ω in series (d) 0.5 Ω in parallel

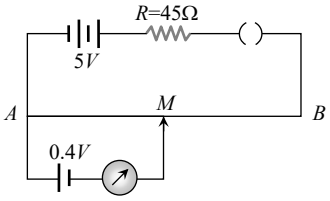
135. In given figure, the potentiometer wire *AB* has a resistance of 5 Ω and length 10 *m*. The balancing length *AM* for the emf of 0.4 *V* is

(a) 0.4 *m*

(b) 4 *m*

(c) 0.8 *m*

(d) 8 *m*



136. A potentiometer consists of a wire of length 4 *m* and resistance 10 Ω. It is connected to cell of emf 2 *V*. The potential difference per unit length of the wire will be

[Pb. PET 2002]

(a) 0.5 *V/m* (b) 10 *V/m*

(c) 2 *V/m* (d) 5 *V/m*

137. A voltmeter essentially consists of

(a) A high resistance, in series with a galvanometer

(b) A low resistance, in series with a galvanometer

(c) A high resistance in parallel with a galvanometer

(d) A low resistance in parallel with a galvanometer

138. In a potentiometer experiment the balancing with a cell is at length 240 *cm*. On shunting the cell with a resistance of 2 Ω, the balancing

length becomes 120 *cm*. The internal resistance of the cell is [DCE 2002; AIEEE 2005]

(a) 4 Ω (b) 2 Ω

(c) 1 Ω (d) 0.5 Ω

139. With a potentiometer null point were obtained at 140 *cm* and 180 *cm* with cells of emf 1.1 *V* and one unknown *X* volts. Unknown emf is

(a) 1.1 *V* (b) 1.8 *V*

(c) 2.4 *V* (d) 1.41 *V*

140. A moving coil galvanometer of resistance 100Ω is used as an ammeter using a resistance 0.1Ω. The maximum deflection current in the galvanometer is $100\mu A$. Find the minimum current in the circuit so that the ammeter shows maximum deflection [IIT-JEE (Screening) 2005]

(a) 100.1 *mA* (b) 1000.1 *mA*

(c) 10.01 *mA* (d) 1.01 *mA*

141. Two resistances are connected in two gaps of a metre bridge. The balance point is 20 *cm* from the zero end. A resistance of 15 *ohms* is connected in series with the smaller of the two. The null point shifts to 40 *cm.* The value of the smaller resistance in ohms is

(a) 3 (b) 6

(c) 9 (d) 12

142. If resistance of voltmeter is 10000Ω and resistance of ammeter is 2Ω then find *R* when voltmeter reads 12*V* and ammeter reads 0.1 *A*

(a) 118 Ω (b) 120 Ω

(c) 124 Ω (d) 114Ω

143. Potentiometer wire of length 1 *m* is connected in series with 490Ω resistance and 2*V* battery. If 0.2 *mV/cm* is the potential gradient, then resistance of the potentiometer wire is

(a) 4.9Ω (b) 7.9Ω

(c) 5.9Ω (d) 6.9Ω

Critical Thinking

Objective Questions

1. In an electrical cable there is a single wire of radius 9 *mm* of copper. Its resistance is 5Ω. The cable is replaced by 6 different insulated copper wires, the radius of each wire is 3*mm*. Now the total resistance of the cable will be [CPMT 1988]

(a) 7.5Ω [DCE 2002] (b) 45Ω

(c) 90Ω (d) 270Ω

2. Two uniform wires *A* and *B* are of the same metal and have equal masses. The radius of wire *A* is twice that of wire *B*. The total resistance of *A* and *B* when connected in parallel is [MNR 1994]

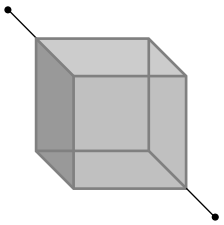
(a) 4Ω when the resistance of wire *A* is 4.25Ω

(b) 5Ω when the resistance of wire *A* is 4.25Ω

(c) 4Ω when the resistance of wire *B* is 4.25Ω

(d) 4Ω when the resistance of wire *B* is 4.25Ω

3. Twelve wires of equal length and same cross-section are connected in the form of a cube. If the resistance of each of the wires is *R*, then the effective resistance between the two diagonal ends would be [KCET 2005; J & K CET 2004]



(a) 2 *R*

(b) 12 *R*

(c) $\frac{5}{6}R$ [BCECE 2005]

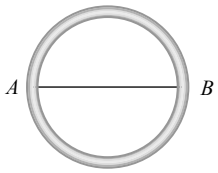
(d) 8 *R*

4. You are given several identical resistances each of value $R = 10\Omega$ and each capable of carrying maximum current of 1 ampere. It is required to make a suitable combination of these resistances to produce a resistance of 5Ω which can carry a current of 4 amperes. The minimum number of resistances of the type *R* that will be required for this job [DCE 2005; CBSE PMT 1990]

(a) 4 (b) 10

(c) 8 (d) 20

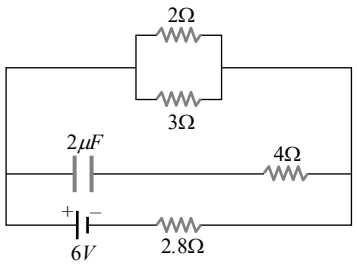
5. The resistance of a wire is $10^{-6}\Omega$ per metre. It is bend in the form of a circle of diameter $2m$. A wire of the same material is connected across its diameter. The total resistance across its diameter AB will be



(a) $\frac{4}{3}\pi\times10^{-6}\Omega$ (b) $\frac{2}{3}\pi\times10^{-6}\Omega$

(c) $0.88\times10^{-6}\Omega$ (d) $14\pi\times10^{-6}\Omega$

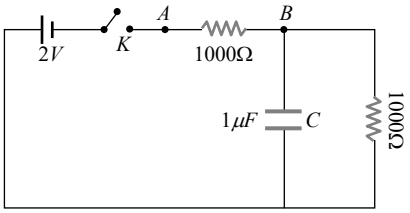
6. In the figure shown, the capacity of the condenser C is $2\mu F$. The current in 2Ω resistor is **[IIT 1982]**



(a) 9 A (b) 0.9 A

(c) $\frac{1}{9}A$ (d) $\frac{1}{0.9}A$

7. When the key K is pressed at time $t=0$, which of the following statements about the current I in the resistor AB of the given circuit is true **[CBSE PMT 1995]**



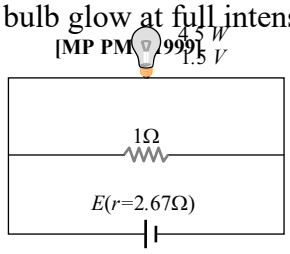
(a) $I=2\ mA$ at all t

(b) I oscillates between 1 mA and $2mA$

(c) $I=1\ mA$ at all t

(d) At $t=0$, $I=2\ mA$ and with time it goes to 1 mA

8. A torch bulb rated as 4.5 W, 1.5 V is connected as shown in the figure. The *e.m.f.* of the cell needed to make the bulb glow at full intensity is **[MP PMT 1999]**



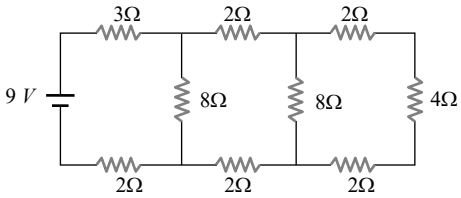
(a) 4.5 V

(b) 1.5 V

(c) 2.67 V

(d) 13.5 V

9. In the circuit shown in the figure, the current through **[IIT 1998]**



(a) The 3Ω resistor is 0.50A (b)The 3Ω resistor is 0.25 A

(c) The 4Ω resistor is 0.50A (d)The 4Ω resistor is 0.25 A

10. There are three resistance coils of equal resistance. The maximum number of resistances you can obtain by connecting them in any manner you choose, being free to use any number of the coils in any way is **[ISM Dhanbad 1994]**

(a) 3 (b) 4

(c) 6 (d) 5

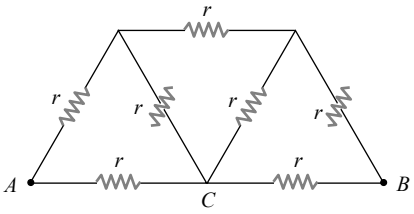
11. In the circuit shown, the value of each resistance is r, then equivalent resistance of circuit between points A and B will be

(a) (4/3) r

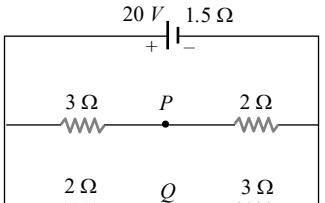
(b) $3r/2$

(c) $r/3$

(d) $8r/7$



12. If in the circuit shown below, the internal resistance of the battery is 1.5 Ω and V_P and V_Q are the potentials at P and Q respectively, what



is the potential difference between the points P and Q **[MP PET 2000]**

(a) Zero

(b) 4 *volts* ($V_P > V_Q$)

(c) 4 *volts* ($V_Q > V_P$)

(d) 2.5 *volts* ($V_Q > V_P$)

13. Two wires of resistance R_1 and R_2 have temperature coefficient of resistance α_1 and α_2, respectively. These are joined in series. The effective temperature coefficient of resistance is

(a) $\frac{\alpha_1 + \alpha_2}{2}$ (b) $\sqrt{\alpha_1 \alpha_2}$

(c) $\frac{\alpha_1 R_1 + \alpha_2 R_2}{R_1 + R_2}$ (d) $\frac{\sqrt{R_1 R_2 \alpha_1 \alpha_2}}{\sqrt{R_1^2 + R_2^2}}$

14. Two cells of equal *e.m.f.* and of internal resistances r_1 and $r_2 (r_1 > r_2)$ are connected in series. On connecting this combination to an external resistance R, it is observed that the potential difference across the first cell becomes zero. The value of R will be **[MP PET 1985; KCET 2005; Kerala PMT 2005]**

(a) $r_1 + r_2$ (b) $r_1 - r_2$

(c) $\frac{r_1 + r_2}{2}$ (d) $\frac{r_1 - r_2}{2}$

15. When connected across the terminals of a cell, a voltmeter measures $5V$ and a connected ammeter measures 10 A of current. A resistance of 2 *ohm*s is connected across the terminals of the cell. The current flowing through this resistance will be **[MP PMT 1997]**

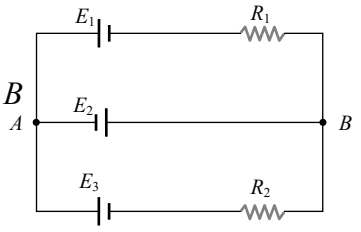
(a) 2.5 A (b) 2.0 A

(c) 5.0 A (d) 7.5 A

16. In the circuit shown here, $E_1 = E_2 = E_3 = 2$ V and $R_1 = R_2 = 4$ *ohms*. The current flowing between points A and B through battery E_2 is

(a) Zero

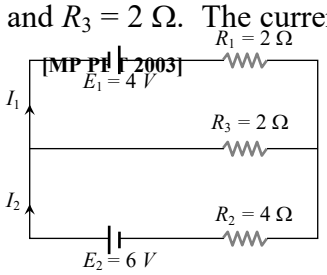
(b) 2 *amp* from A to B



(c) 2 *amp* from B to A

(d) None of the above

17. In the circuit shown below $E_1 = 4.0$ V, $R_1 = 2$ Ω, $E_2 = 6.0$ V, $R_2 = 4$ Ω and $R_3 = 2$ Ω. The current I_1 is **[MP PET 2003]**



(a) 1.6 A

(b) 1.8 A

(c) 1.25 A

(d) 1.0 A

18. A microammeter has a resistance of $100\,\Omega$ and full scale range of $50\,\mu A$. It can be used as a voltmeter or as a higher range ammeter provided a resistance is added to it. Pick the correct range and resistance combination **[SCRA 1996; AMU (Med.) 2001; Roorkee 2000]**

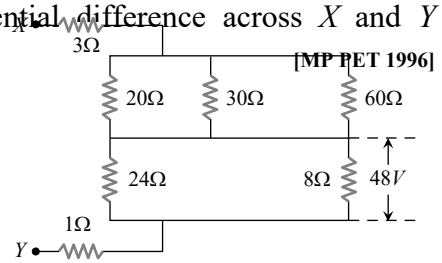
(a) 50 V range with $10\,k\Omega$ resistance in series

(b) 10 V range with $200\,k\Omega$ resistance in series

(c) 10 mA range with 1Ω resistance in parallel

(d) 10 mA range with 0.1Ω resistance in parallel

19. The potential difference across 8 *ohm* resistance is 48 *volt* as shown in the figure. The value of potential difference across X and Y points will be **[MP PET 1996]**



(a) 160 *volt*

(b) 128 *volt*

(c) 80 *volt*

(d) 62 *volt*

20. Two resistances R_1 and R_2 are made of different materials. The temperature coefficient of the material of R_1 is α and of the material of R_2 is $-\beta$. The resistance of the series combination of R_1 and R_2 will not change with temperature, if R_1 / R_2 equals **[MP PET 2001; MP PMT 1997]**

(a) $\frac{\alpha}{\beta}$ (b) $\frac{\alpha + \beta}{\alpha - \beta}$

(c) $\frac{\alpha^2+\beta^2}{\alpha\beta}$ (d) $\frac{\beta}{\alpha}$

21. An ionization chamber with parallel conducting plates as anode and cathode has 5×10^7 electrons and the same number of singly-charged positive ions per cm^3. The electrons are moving at 0.4 *m/s*. The current density from anode to cathode is $4\,\mu A/m^2$. The velocity of positive ions moving towards cathode is

[CBSE PMT 1992]

(a) 0.4 *m/s* (b) 16 *m/s*

(c) Zero (d) 0.1 *m/s*

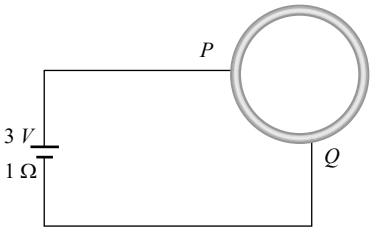
22. A wire of resistance 10 Ω is bent to form a circle. *P* and *Q* are points on the circumference of the circle dividing it into a quadrant and are connected to a Battery of 3 *V* and internal resistance 1 Ω as shown in the figure. The currents in the two parts of the circle are

(a) $\frac{6}{23}A$ and $\frac{18}{23}A$

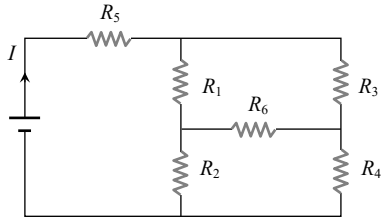
(b) $\frac{5}{26}A$ and $\frac{15}{26}A$

(c) $\frac{4}{25}A$ and $\frac{12}{25}A$

(d) $\frac{3}{25}A$ and $\frac{9}{25}A$



23. In the given circuit, it is observed that the current *I* is independent of the value of the resistance R_6. Then the resistance values must satisfy **[IIT-JEE (Screening) 2001]**



(a) $R_1R_2R_5 = R_3R_4R_6$

(b) $\frac{1}{R_5}+\frac{1}{R_6}=\frac{1}{R_1+R_2}+\frac{1}{R_3+R_4}$

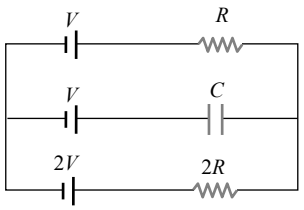
(c) $R_1R_4 = R_2R_3$

(d) $R_1R_3 = R_2R_4 = R_5R_6$

24. In the given circuit, with steady current, the potential drop across the capacitor must be

(a) *V*

(b) *V* / 2



(c) *V* / 3

(d) 2*V* / 3

25. A wire of length *L* and 3 identical cells of negligible internal resistances are connected in series. Due to current, the temperature of the wire is raised by ΔT in a time *t*. A number *N* of similar cells is now connected in series with a wire of the same material and cross–section but of length 2 *L*. The temperature of the wire is raised by the same amount ΔT in the same time *t*. the value of *N* is

[IIT-JEE (Screening) 2001]

(a) 4 (b) 6

(c) 8 (d) 9

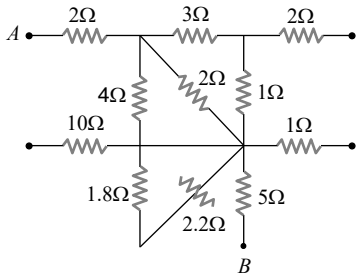
26. What is the equivalent resistance between the points *A* and *B* of the network

(a) $\frac{57}{7}\Omega$ **[Roorkee 1999]**

(b) 8 Ω

(c) 6 Ω

(d) $\frac{57}{5}\Omega$



27. The effective resistance between points *P* and *Q* of the electrical circuit shown in the figure is

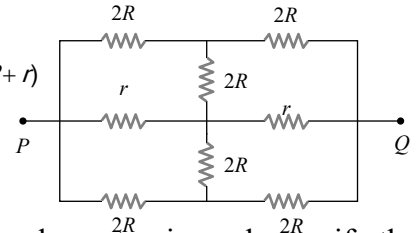
[IIT-JEE (Screening) 2002]

(a) $2Rr/(R+r)$

(b) $8R(R+r)/(3R+r)$

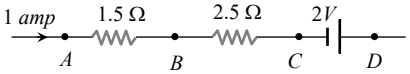
(c) $2r+4R$

(d) $5R/2+2r$



28. In the circuit element given here, if the potential at point *B*, $V_B = 0$, then the potentials of *A* and *D* are given as

[AMU (Med.) 2002]



(a) $V_A = -1.5\ V, V_D = +2\ V$ (b) $V_A = +1.5\ V, V_D = +2\ V$

(c) $V_A = +1.5\ V, V_D = +0.5\ V$ (d) $V_A = +1.5\ V, V_D = -0.5\ V$

29. The equivalent resistance between the points *P* and *Q* in the network given here is equal to (given $r=\frac{3}{2}\Omega$)

[IIT-JEE (Screening) 2001]

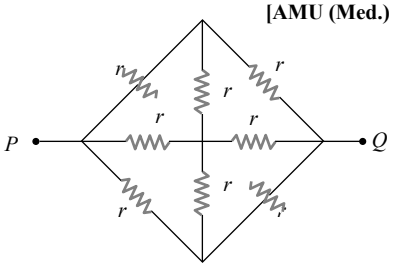
[AMU (Med.) 2002]

(a) $\frac{1}{2}\ \Omega$

(b) 1 Ω

(c) $\frac{3}{2}\ \Omega$

(d) 2 Ω



30. The current in a conductor varies with time t as $I = 2t + 3t^2$ where I is in *ampere* and t in *seconds*. Electric charge flowing through a section of the conductor during $t = 2$ *sec* to $t = 3$ *sec* is [Orissa JEE 2003]

(a) 10 C (b) 24 C

(c) 33 C (d) 44 C

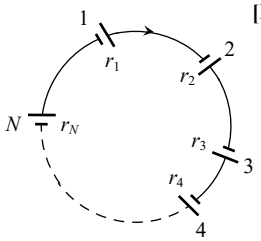
31. A group of N cells whose *emf* varies directly with the internal resistance as per the equation $E_N = 1.5\ r_N$ are connected as shown in the figure below. The current I in the circuit is [KCET 2003]

(a) 0.51 *amp*

(b) 5.1 *amp*

(c) 0.15 *amp*

(d) 1.5 *amp*



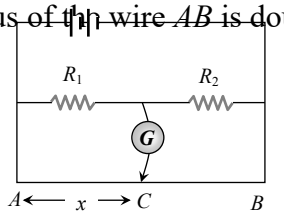
32. In the shown arrangement of the experiment of the meter bridge if AC corresponding to null deflection of galvanometer is x, what would be its value if the radius of the wire AB is doubled

(a) x

(b) $x/4$

(c) $4x$

(d) $2x$



33. The resistance of a wire of iron is 10 *ohms* and temp. coefficient of resistivity is $5 \times 10^{-3}/^\circ C$. At $20^\circ C$ it carries 30 *milliamperes* of current. Keeping constant potential difference between its ends, the temperature of the wire is raised to $120^\circ C$. The current in *milliamperes* that flows in the wire is [MP PMT 1994]

(a) 20 (b) 15

(c) 10 (d) 40

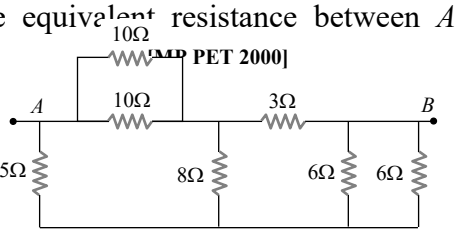
34. Seven resistances are connected as shown in the figure. The equivalent resistance between A and B is [MP PET 2000]

(a) 3 Ω

(b) 4 Ω

(c) 4.5 Ω

(d) 5 Ω



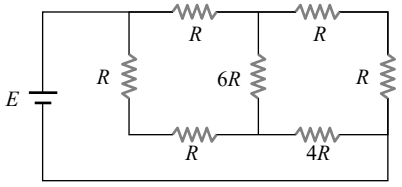
35. A battery of internal resistance 4Ω is connected to the network of resistances as shown. In order to give the maximum power to the network, the value of R (in Ω) should be [IIT 1995]

(a) 4/9

(b) 8/9

(c) 2

(d) 18



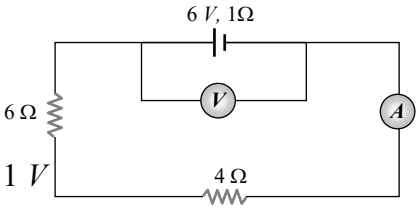
36. In the circuit shown here, the readings of the ammeter and voltmeter are

(a) 6 A, 60 V

(b) 0.6 A, 6 V

(c) 6/11 A, 60/11 V

(d) 11/6 A, 11/60 V



37. Length of a hollow tube is 5m, it's outer diameter is 10 cm and thickness of it's wall is 5 mm. If resistivity of the material of the tube is $1.7 \times 10^{-8}\ \Omega \times m$ then resistance of tube will be [IIT JEE (Screening) 2003]

(a) $5.6 \times 10^{-5}\ \Omega$ (b) $2 \times 10^{-5}\ \Omega$

(c) $4 \times 10^{-5}\ \Omega$ (d) None of these

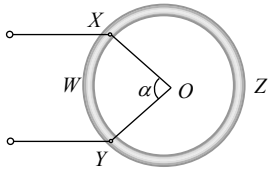
38. A wire of resistor R is bent into a circular ring of radius r. Equivalent resistance between two points X and Y on its circumference, when angle XOY is α, can be given by

(a) $\frac{R\alpha}{4\pi^2}(2\pi - \alpha)$

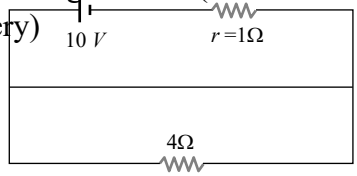
(b) $\frac{R}{2\pi}(2\pi - \alpha)$

(c) $R\,(2\pi - \alpha)$

(d) $\frac{4\pi}{R\alpha}(2\pi - \alpha)$



39. Potential difference across the terminals of the battery shown in figure is (r = internal resistance of battery)



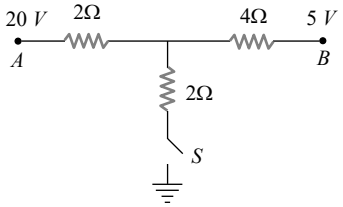
(a) 8 V

(b) 10 V

(c) 6 V

(d) Zero

40. As the switch S is closed in the circuit shown in figure, current passed through it is



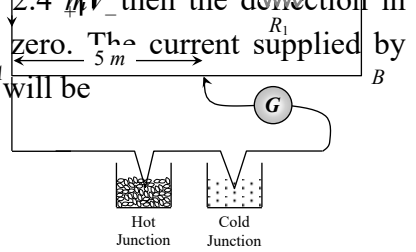
(a) 4.5 A

(b) 6.0 A

(c) 3.0 A

(d) Zero

41. In the following circuit a 10 m long potentiometer wire with resistance 1.2 ohm/m, a resistance R_1 and an accumulator of emf 2 V are connected in series. When the emf of thermocouple is 2.4 mV then the deflection in galvanometer is zero. The current supplied by the accumulator will be



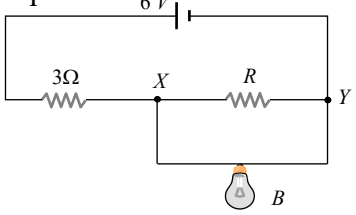
(a) 4×10^{-4} A

(b) 8×10^{-4} A

(c) 4×10^{-3} A

(d) 8×10^{-3} A

42. In the following circuit, bulb rated as 1.5 V, 0.45 W. If bulbs glows with full intensity then what will be the equivalent resistance between X and Y



(a) 0.45 Ω

(b) 1 Ω

(c) 3 Ω

(d) 5 Ω

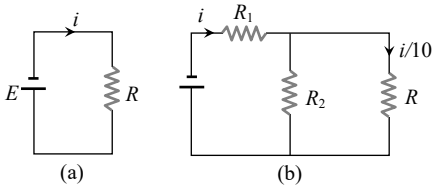
43. Consider the circuits shown in the figure. Both the circuits are taking same current from battery but current through R in the second circuit is $\frac{1}{10}$ th of current through R in the first circuit. If R is 11 Ω, the value of R_1

(a) 9.9 Ω

(b) 11 Ω

(c) 8.8 Ω

(d) 7.7 Ω



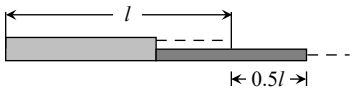
44. In order to quadruple the resistance of a uniform wire, a part of its length was uniformly stretched till the final length of the entire wire was 1.5 times the original length, the part of the wire was fraction equal to

(a) 1 / 8

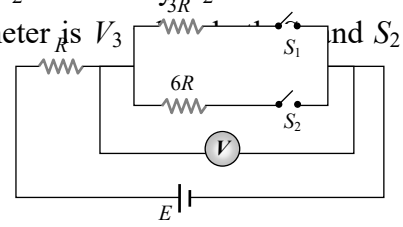
(b) 1 / 6

(c) 1 / 10

(d) 1 / 4



45. In the circuit shown in figure reading of voltmeter is V_1 when only S_1 is closed, reading of voltmeter is V_2 when only S_2 is closed and reading of voltmeter is V_3 [illegible] and S_2 are closed. Then



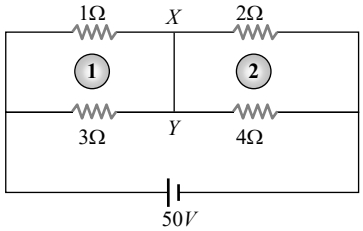
(a) $V_3 > V_2 > V_1$

(b) $V_2 > V_1 > V_3$

(c) $V_3 > V_1 > V_2$

(d) $V_1 > V_2 > V_3$

46. Current through wire XY of circuit shown is



(a) 1 A

(b) 4 A

(c) 2 A

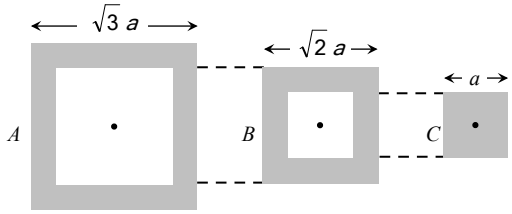
(d) 3 A

47. 12 cells each having same emf are connected in series with some cells wrongly connected. The arrangement is connected in series with an ammeter and two cells which are in series. Current is 3 A when cells and battery aid each other and is 2 A when cells and battery oppose each other. The number of cells wrongly connected is

(a) 4 (b) 1

(c) 3 (d) 2

48. Following figure shows cross-sections through three long conductors of the same length and material, with square cross-section of edge lengths as shown. Conductor B will fit snugly within conductor A, and conductor C will fit snugly within conductor B. Relationship between their end to end resistance is



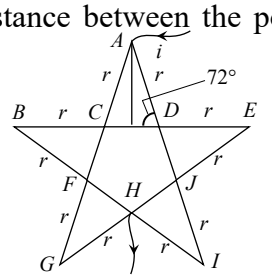
(a) $R_A = R_B = R_C$

(b) $R_A > R_B > R_C$

(c) $R_A < R_B < R$

(d) Information is not sufficient

49. In the following star circuit diagram (figure), the equivalent resistance between the points A and H will be



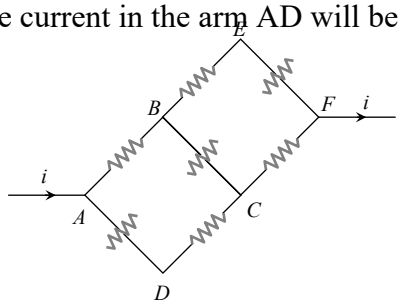
(a) 1.944 r

(b) 0.973 r

(c) 0.486 r

(d) 0.243 r

50. In the adjoining circuit diagram each resistance is of 10 Ω. The current in the arm AD will be



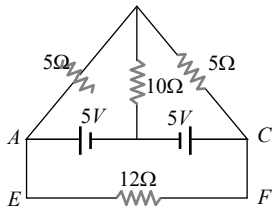
(a) $\frac{2i}{5}$

(b) $\frac{3i}{5}$

(c) $\frac{4i}{5}$

(d) $\frac{i}{5}$

51. In the circuit of adjoining figure the current through 12 Ω resister will be



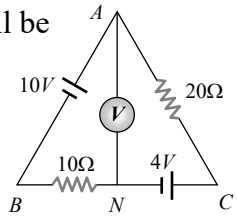
(a) 1 A

(b) $\frac{1}{5}$ A

(c) $\frac{2}{5}$ A

(d) 0 A

52. The reading of the ideal voltmeter in the adjoining diagram will be



(a) 4 V

(b) 8 V

(c) 12 V

(d) 14 V

53. The resistance of the series combination of two resistance is S. When they are joined in parallel the total resistance is P. If $S = nP$, then the minimum possible value of n is

[AIEEE 2004]

(a) 4 (b) 3

(c) 2 (d) 1

54. A moving coil galvanometer has 150 equal divisions. Its current sensitivity is 10 *divisions per milliampere* and voltage sensitivity is 2 *divisions per millivolt*. In order that each division reads 1 *volt*, the resistance in ohms needed to be connected in series with the coil will be **[AIEEE 2005]**

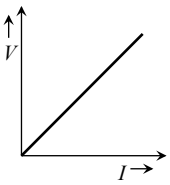
(a) 99995 (b) 9995

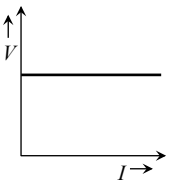
(c) 10^3 (d) 10^5

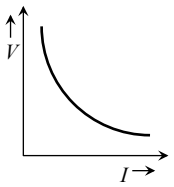
Graphical Questions

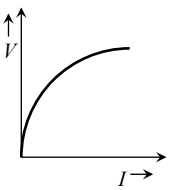
1. Which of the adjoining graphs represents *ohm*ic resistance

[CPMT 1981; DPMT 2002]

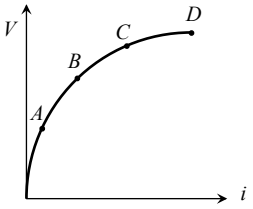
(a) 

(b) 

(c) 

(d) 

2. Variation of current passing through a conductor as the voltage applied across its ends as varied is shown in the adjoining diagram. If the resistance (R) is determined at the points A, B, C and D, we will find that **[CPMT 1988]**



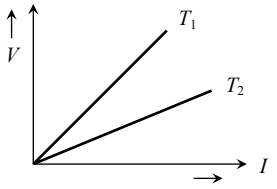
(a) $R_C = R_D$

(b) $R_B > R_A$

(c) $R_C > R_B$

(d) None of these

3. The voltage V and current I graph for a conductor at two different temperatures T_1 and T_2 are shown in the figure. The relation between T_1 and T_2 is **[MP PET 1996; KCET 2002]**



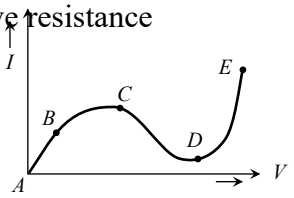
(a) $T_1 > T_2$

(b) $T_1 \approx T_2$

(c) $T_1 = T_2$

(d) $T_1 < T_2$

4. From the graph between current I and voltage V shown below, identify the portion corresponding to negative resistance



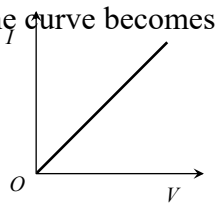
(a) AB

(b) BC

(c) CD

(d) DE

5. I-V characteristic of a copper wire of length L and area of cross-section A is shown in figure. The slope of the curve becomes



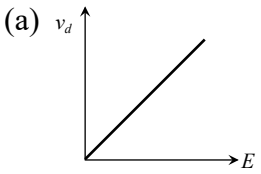
(a) More if the experiment is performed at higher temperature

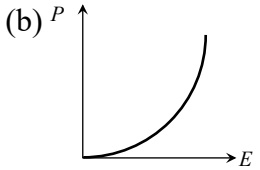
(b) More if a wire of steel of same dimension is used

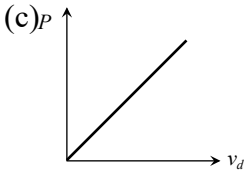
(c) More if the length of the wire is increased

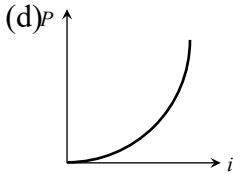
(d) Less if the length of the wire is increased

6. E denotes electric field in a uniform conductor, I corresponding current through it, v_d drift velocity of electrons and P denotes thermal power produced in the conductor, then which of the following graph is incorrect

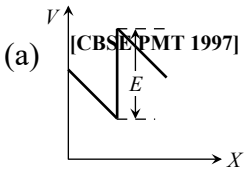
(a) 

(b) 

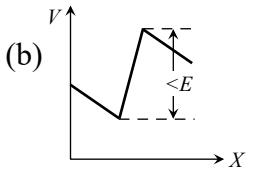
(c) 

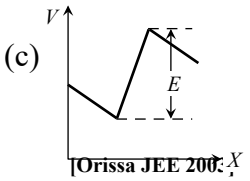
(d) 

7. The two ends of a uniform conductor are joined to a cell of e.m.f. E and some internal resistance. Starting from the midpoint P of the conductor, we move in the direction of current and return to P. The potential V at every point on the path is plotted against the distance covered (x). Which of the following graphs best represents the resulting curve

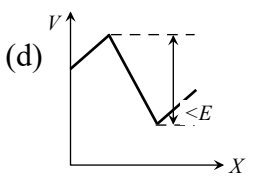
(a) 

[CBSE PMT 1997]

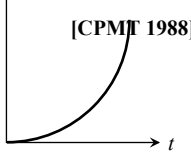
(b) 

(c) 

[Orissa JEE 2003]

(d) 

8. The resistance R_t of a conductor varies with temperature t as shown in the figure. If the variation is represented by $R_t = R_0[1 + \alpha t + \beta t^2]$, then **[CPMT 1988]**



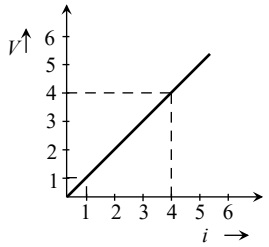
(a) α and β are both negative

(b) α and β are both positive

(c) α is positive and β is negative

(d) α is negative and β are positive

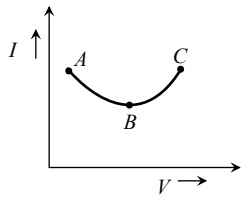
9. Variation of current and voltage in a conductor has been shown in the diagram below. The resistance of the conductor is.



(a) 4 *ohm* (b) 2 *ohm*

(c) 3 *ohm* (d) 1 *ohm*

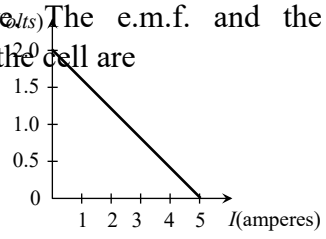
10. Resistance as shown in figure is negative at **[CPMT 1997]**



(a) *A* (b) *B*

(c) *C* (d) None of these

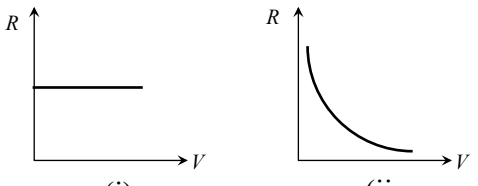
11. For a cell, the graph between the potential difference (V) across the terminals of the cell and the current (I) drawn from the cell is shown in the figure. The e.m.f. and the internal resistance of the cell are



(a) $2V, 0.5\Omega$ (b) $2V, 0.4\Omega$

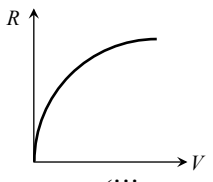
(c) $> 2V, 0.5\Omega$ (d) $> 2V, 0.4\Omega$

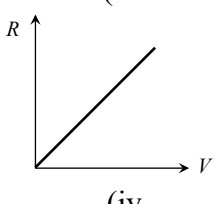
12. The graph which represents the relation between the total resistance R of a multi range moving coil voltmeter and its full scale deflection V is



(i)

(ii)





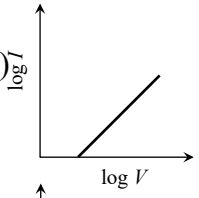
(iv)

(a) (i) (b) (ii)

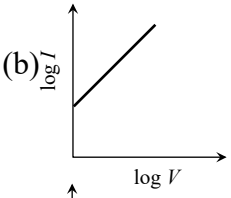
(c) (iii) (d) (iv)

13. When a current I is passed through a wire of constant resistance, it produces a potential difference V across its ends. The graph drawn between log I and log V will be

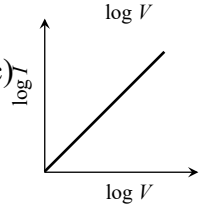
(a)



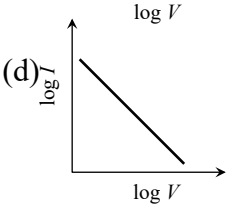
(b)



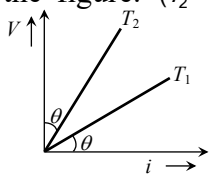
(c)



(d)



14. The V-i graph for a conductor at temperature T_1 and T_2 are as shown in the figure. $(T_2 - T_1)$ is proportional to



(a) $\cos 2\theta$

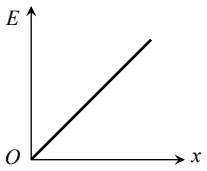
(b) $\sin\theta$

(c) $\cot 2\theta$

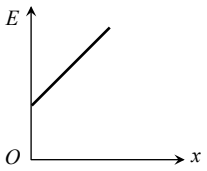
(d) $\tan\theta$

15. A cylindrical conductor has uniform cross-section. Resistivity of its material increase linearly from left end to right end. If a constant current is flowing through it and at a section distance x from left end, magnitude of electric field intensity is E, which of the following graphs is correct

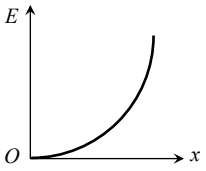
(a)

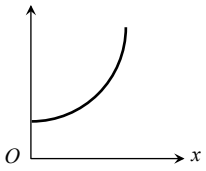


(b)



E

(c) 

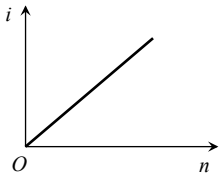
(d) 

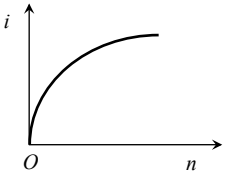
16. The V-i graph for a conductor makes an angle θ with V-axis. Here V denotes the voltage and i denotes current. The resistance of conductor is given by

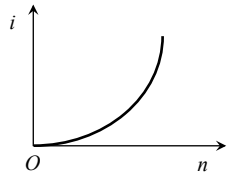
(a) $\sin\theta$ (b) $\cos\theta$

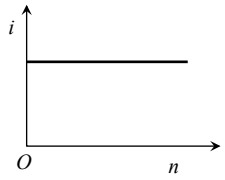
(c) $\tan\theta$ (d) $\cot\theta$

17. A battery consists of a variable number 'n' of identical cells having internal resistances connected in series. The terminals of battery are short circuited and the current i is measured. Which of the graph below shows the relation ship between i and n

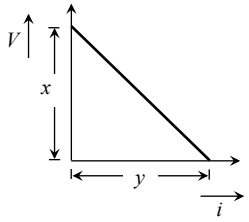
(a) 

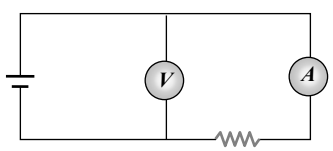
(b) 

(c) 

(d) 

18. In an experiment, a graph was plotted of the potential difference V between the terminals of a cell against the circuit current i by varying load rheostat. Internal conductance of the cell is given by

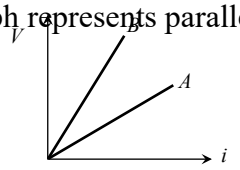




(a) xy (b) $\frac{y}{x}$

(c) $\frac{x}{y}$ (d) $(x-y)$

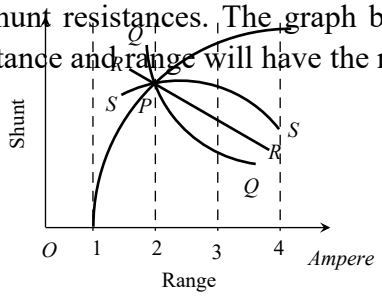
19. V-i graphs for parallel and series combination of two identical resistors are as shown in figure. Which graph represents parallel combination



(a) A (b) B

(c) A and B both (d) Neither A nor B

20. The ammeter has range 1 *ampere* without shunt. the range can be varied by using different shunt resistances. The graph between shunt resistance and range will have the nature



(a) P (b) Q

(c) R (d) S

AR Assertion & Reason

For AIIMS Aspirants

Read the assertion and reason carefully to mark the correct option out of the options given below :

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.

(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.

(c) If assertion is true but reason is false.

(d) If the assertion and reason both are false.

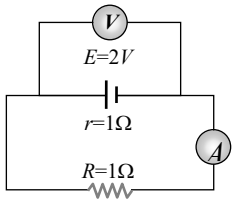
(e) If assertion is false but reason is true.

1. Assertion : The resistivity of a semiconductor increases with temperature.
Reason : The atoms of a semiconductor vibrate with larger amplitude at higher temperatures thereby increasing its resistivity **[AIIMS 2003]**

2. Assertion : In a simple battery circuit the point of lowest potential is positive terminal of the battery
Reason : The current flows towards the point of the higher potential as it flows in such a circuit from the negative to the positive terminal. **[AIIMS 2002]**

3. Assertion : The temperature coefficient of resistance is positive for metals and negative for *p*-type semiconductor.
Reason : The effective charge carriers in metals are negatively charged whereas in *p*-type semiconductor they are positively charged. **[AIIMS 1996]**

4. Assertion : In the following circuit emf is $2V$ and internal resistance of the cell is $1\ \Omega$ and $R = 1\Omega$, then reading of the voltmeter is $1V$.



Reason : $V = E - ir$ where $E = 2V$, $i = \frac{2}{2} = 1A$ and $R = 1\ \Omega$ **[AIIMS 1995]**

5. Assertion : There is no current in the metals in the absence of electric field.
Reason : Motion of free electron are randomly. **[AIIMS 1994]**

6. Assertion : Electric appliances with metallic body have three connections, whereas an electric bulb has a two pin connection.
Reason : Three pin connections reduce heating of connecting wires.

7. Assertion : The drift velocity of electrons in a metallic wire will decrease, if the temperature of the wire is increased.
Reason : On increasing temperature, conductivity of metallic wire decreases.

8. Assertion : The electric bulbs glows immediately when switch is on.
Reason : The drift velocity of electrons in a metallic wire is very high.

9. Assertion : Bending a wire does not effect electrical resistance.
Reason : Resistance of wire is proportional to resistivity of material.

10. Assertion : In meter bridge experiment, a high resistance is always connected in series with a galvanometer.
Reason : As resistance increases current through the circuit increases.

11. Assertion : Voltameter measures current more accurately than ammeter.
Reason : Relative error will be small if measured from voltameter.

12. Assertion : Electric field outside the conducting wire which carries a constant current is zero.
Reason : Net charge on conducting wire is zero.

13. Assertion : The resistance of super-conductor is zero.
Reason : The super-conductors are used for the transmission of electric power.

14. Assertion : A potentiometer of longer length is used for accurate measurement.
Reason : The potential gradient for a potentiometer of longer length with a given source of e.m.f. becomes small.

15. Assertion : The e.m.f. of the driver cell in the potentiometer experiment should be greater than the e.m.f. of the cell to be determined.
Reason : The fall of potential across the potentiometer wire should not be

less than the e.m.f. of the cell to be determined.

16. Assertion : A person touching a high power line gets stuck with the line.

Reason : The current carrying wires attract the man towards it.

17. Assertion : The connecting wires are made of copper.

Reason : The electrical conductivity of copper is high.

Answers

Electric Conduction, Ohm's Law and Resistance

1	a	2	c	3	b	4	b	5	c
6	a	7	a	8	a	9	d	10	c
11	d	12	d	13	a	14	c	15	a
16	a	17	c	18	b	19	c	20	b
21	d	22	b	23	b	24	b	25	d
26	c	27	b	28	b	29	b	30	a
31	c	32	d	33	b	34	d	35	c
36	b	37	b	38	c	39	a	40	d
41	b	42	b	43	a	44	b	45	c
46	a	47	b	48	b	49	c	50	a
51	c	52	c	53	b	54	b	55	b
56	a	57	a	58	a	59	c	60	c
61	a	62	b	63	b	64	c	65	c
66	d	67	a	68	b	69	d	70	d
71	a	72	a	73	c	74	b	75	b
76	c	77	c	78	c	79	d	80	b
81	a	82	d	83	b	84	b	85	c
86	b	87	c	88	a	89	a	90	d
91	a	92	c	93	b	94	a	95	b
96	b	97	c	98	a	99	c	100	d
101	c	102	a	103	d	104	b	105	b
106	d	107	d	108	a	109	d	110	d
111	d	112	d	113	a	114	a	115	c
116	a	117	a	118	b	119	c	120	a
121	d	122	a	123	a	124	d	125	c
126	b	127	c	128	a	129	a	130	c
131	c	132	b	133	c				

Grouping of Resistances

1	c	2	d	3	a	4	c	5	b
6	c	7	c	8	b	9	a	10	b
11	d	12	d	13	b	14	d	15	b
16	d	17	c	18	c	19	b	20	d
21	a	22	a	23	b	24	b	25	c
26	b	27	d	28	d	29	d	30	c
31	b	32	d	33	a	34	b	35	c
36	d	37	d	38	b	39	c	40	b
41	a	42	c	43	b	44	d	45	c
46	d	47	c	48	b	49	b	50	d
51	d	52	c	53	d	54	a	55	c
56	d	57	c	58	c	59	d	60	c
61	d	62	c	63	d	64	c	65	c
66	c	67	b	68	c	69	d	70	b
71	a	72	c	73	a	74	b	75	a
76	c	77	c	78	b	79	c	80	a
81	a	82	b	83	b	84	d	85	d
86	a	87	a	88	a	89	b	90	b
91	b	92	c	93	b	94	d	95	a
96	d	97	b	98	b	99	d	100	a
101	c	102	a	103	b	104	d	105	a
106	a	107	b	108	d	109	bc	110	b
111	d	112	c	113	a	114	a	115	d
116	a	117	d	118	c	119	d	120	c
121	b	122	b	123	b	124	c	125	b
126	a	127	c	128	b	129	c	130	a
131	a	132	a	133	c	134	a	135	b
136	b	137	a	138	b	139	c	140	b
141	b								

Kirchhoff's Law, Cells

1	b	2	d	3	c	4	a	5	a
6	b	7	a	8	a	9	b	10	a
11	c	12	d	13	a	14	d	15	b
16	c	17	c	18	c	19	d	20	b
21	c	22	c	23	b	24	d	25	a
26	a	27	b	28	b	29	a	30	b
31	a	32	c	33	b	34	a	35	a
36	b	37	a	38	b	39	b	40	c
41	d	42	d	43	d	44	a	45	c
46	c	47	b	48	a	49	a	50	d
51	b	52	d	53	b	54	c	55	a
56	b	57	c	58	a	59	d	60	b
61	c	62	c	63	c	64	b	65	a
66	c	67	a	68	d	69	b	70	a
71	a	72	d	73	c	74	b	75	b

76	b	77	c	78	c	79	d	80	d
81	a	82	d	83	c	84	c	85	a

Different Measuring Instruments

1	a	2	c	3	d	4	d	5	c
6	c	7	a	8	d	9	c	10	c
11	d	12	c	13	d	14	a	15	d
16	c	17	a	18	b	19	c	20	a
21	b	22	b	23	a	24	a	25	a
26	a	27	a	28	a	29	b	30	b
31	b	32	b	33	b	34	b	35	c
36	c	37	b	38	b	39	d	40	b
41	a	42	b	43	c	44	d	45	a
46	b	47	c	48	a	49	b	50	a
51	b	52	c	53	b	54	b	55	a
56	b	57	d	58	c	59	c	60	d
61	a	62	a	63	d	64	a	65	d
66	b	67	a	68	b	69	c	70	c
71	d	72	c	73	a	74	c	75	a
76	d	77	b	78	a	79	b	80	a
81	c	82	c	83	a	84	a	85	b
86	d	87	c	88	d	89	c	90	a
91	d	92	d	93	d	94	c	95	d
96	a	97	c	98	a	99	d	100	d
101	c	102	d	103	c	104	c	105	a
106	c	107	c	108	d	109	c	110	a
111	a	112	a	113	c	114	b	115	c
116	d	117	a	118	b	119	d	120	c
121	d	122	c	123	a	124	a	125	b
126	b	127	d	128	d	129	b	130	c
131	d	132	a	133	c	134	d	135	d
136	a	137	a	138	b	139	d	140	a
141	c	142	a	143	a				

Critical Thinking Questions

1	a	2	a	3	c	4	c	5	c
6	b	7	d	8	d	9	d	10	b
11	d	12	d	13	c	14	b	15	b
16	b	17	b	18	b	19	a	20	d
21	d	22	a	23	c	24	c	25	b
26	b	27	a	28	d	29	b	30	b
31	d	32	a	33	a	34	b	35	c
36	c	37	a	38	a	39	d	40	a
41	a	42	b	43	a	44	a	45	b
46	c	47	b	48	a	49	b	50	a
51	d	52	b	53	a	54	b		

Graphical Questions

1	a	2	d	3	a	4	c	5	d
6	c	7	b	8	b	9	d	10	a
11	b	12	d	13	a	14	c	15	b
16	d	17	d	18	b	19	a	20	b