13. The ratio of momenta of an electron and an $\alpha-$particle which are accelerated from rest by a potential difference of 100 *V* is

[MNR 1994; RPET 1997]

(1) 1 (2) $\sqrt{\frac{2m_e}{m_\alpha}}$

(3) $\sqrt{\frac{m_e}{m_\alpha}}$ (4) $\sqrt{\frac{m_e}{2m_\alpha}}$

14. When subjected to a transverse electric field, cathode rays move **[MP PET 1994]**

(1) Down the potential gradient

(2) Up the potential gradient

(3) Along a hyperbolic path

(4) Along a circular path

15. The fact that electric charges are integral multiples of the fundamental electronic charge was proved experimentally by

[MP PET 1994]

(1) Planck (2) J.J. Thomson

(3) Einstein (4) Millikan

16. In Millikan oil drop experiment, a charged drop of mass $1.8\times10^{-14}\,kg$ is stationary between its plates. The distance between its plates is 0.90 *cm* and potential difference is 2.0 *kilo volts*. The number of electrons on the drop is

[MP PMT 1994, 2003; MP PET 1997]

(1) 500 (2) 50

(3) 5 (4) 0

17. The charge on electron was discovered by

[BHU 1995; RPMT 1999; DCE 2004]

(1) J.J. Thomson (2) Neil Bohr

(3) Millikan (4) Chadwick

18. From the following, what charges can be present on oil drops in Millikan's experiment

[MP PET 1995]

(1) Zero, equal to the magnitude of charge on $\alpha-$particle

(2) $2e, 1.6\times10^{-18}\,C,$

(3) $1.6\times10^{-19}\,C, 2.5e$

(4) $1.5e, e$

(Here *e* is the electronic charge)

19. A narrow electron beam passes undeviated through an electric field $E=3\times10^4\,volt/m$ and an overlapping magnetic field $B=2\times10^{-3}\,Weber/m^2$. If electric field and magnetic field are mutually perpendicular. The speed of the electrons is

[MP PET 1995]

(1) 60 *m/s* (2) $10.3\times10^7\,m/s$

(3) $1.5\times10^7\,m/s$ (4) $0.67\times10^{-7}\,m/s$

20. In Thomson's method of determining *e/m* of electrons

[MP PMT 1997]

(1) Electric and magnetic fields are parallel to electrons beam

(2) Electric and magnetic fields are perpendicular to each other and perpendicular to electrons beam

(3) Magnetic field is parallel to the electrons beam

(4) Electric field is parallel to the electrons beam

21. Cathode rays enter into a uniform magnetic field perpendicular to the direction of the field. In the magnetic field their path will be

[MP PMT/PET 1998]

(1) Straight line (2) Circle

(3) Parabolic (4) Ellipse

22. The specific charge of an electron is **[MP PMT/PET 1998; J&K CET 2004; Pb. PET 2002; MH CET 1999]**

(1) $1.6\times10^{-19}\,coulomb$

(2) $4.8\times10^{-10}\,stat coulomb$

(3) $1.76\times10^{11}\,coulomb/kg$

(4) $1.76\times10^{-11}\,coulomb/kg$

23. An electron is moving with constant velocity along $x-$axis. If a uniform electric field is applied along $y-$axis, then its path in the $x-y$ plane will be **[MP PMT 1999]**

(1) A straight line (2) A circle

(3) A parabola (4) An ellipse

24. Cathode rays are similar to visible light rays in that

[SCRA 1994]

(1) They both can be deflected by electric and magnetic fields

(2) They both have a definite magnitude of wavelength

(3) They both can ionise a gas through which they pass

(4) They both can expose a photographic plate

25. Which one of the following devices makes use of the electrons to strike certain substances to produce fluorescence

[SCRA 1994]

(1) Thermionic valve (2) Photoelectric cell

(3) Cathode ray oscilloscope (4) Electron gun

26. An oxide coated filament is useful in vacuum tubes because essentially

[SCRA 1994]

(1) It has high melting point

(2) It can withstand high temperatures

(3) It has good machanical strength

(4) It can emit electrons at relatively lower temperatures

27. Gases begin to conduct electricity at low pressure because

[CBSE PMT 1994]

(1) At low pressure, gases turn to plasma

(2) Colliding electrons can acquire higher kinetic energy due to increased mean free path leading to ionisation of atoms

(3) Atoms break up into electrons and protons

(4) The electrons in atoms can move freely at low pressure

28. A beam of electrons is moving with constant velocity in a region having electric and magnetic fields of strength $20\ Vm^{-1}$ and 0.5 T at right angles to the direction of motion of the electrons. What is the velocity of the electrons

[CBSE PMT 1996]

(1) 20 ms^{-1} (2) 40 ms^{-1}

(3) 8 ms^{-1} (4) 5.5 ms^{-1}

29. Kinetic energy of emitted cathode rays is dependent on

[CPMT 1996]

(1) Only voltage

(2) Only work function

(3) Both (1) and (2)

(4) It does not depend upon any physical quantity

30. The radius of the orbital of electron in the hydrogen atom 0.5 Å. The speed of the electron is $2\times10^6\ m/s$. Then the current in the loop due to the motion of the electron is

[RPMT 1996]

(1) 1 mA (2) 1.5 mA

(3) 2.5 mA (4) $1.5\times10^{-2}\ mA$

31. The kinetic energy of an electron which is accelerated through a potential of 100 *volts* is

[MP PET 1986; CBSE PMT 1997; AIIMS 1998]

(1) $1.602\times10^{-17}\ J$ (2) 418.6 *calories*

(3) $1.16\times10^4\ K$ (4) 6.626×10^{-34} *W- sec*

32. When a proton is accelerated with 1 *volt* potential difference, then its kinetic energy is

[CPMT 1997; CBSE PMT 1999; RPET 2003]

(1) $\frac{1}{1840}\ eV$ (2) 1840 eV

(3) 1 eV (4) 1840 c^2 eV

33. Energy of electrons can be increased by allowing them

[JIPMER 1997]

(1) To fall through electric potential

(2) To move in high magnetic field

(3) To fall from great heights

(4) To pass through lead blocks

34. Cathode rays and canal rays produced in a certain discharge tube are deflected in the same direction if [SCRA 1998]

(1) A magnetic field is applied normally

(2) An electric field is applied normally

(3) An electric field is applied tangentially

(4) A magnetic field is applied tangentially

35. In a Millikan's oil drop experiment the charge on an oil drop is calculated to be $6.35\times10^{-19}\ C$. The number of excess electrons on the drop is

[MNR 1998]

(1) 3.9 (2) 4

(3) 4.2 (4) 6

36. Cathode rays consist of

(1) Photons (2) Electrons

(3) Protons (4) α-particles

37. A metal plate gets heated, when cathode rays strike against, it due to **[CPMT 2000; Pb. PET 2000]**

(1) Kinetic energy of cathode rays

(2) Potential energy of cathode rays

(3) Linear velocity of cathode rays

(4) Angular velocity of cathode rays

38. Cathode rays are **[RPET 2000]**

(1) Positive rays (2) Neutral rays

(3) He rays (4) Electron waves

39. An electron of charge '*e*' coulomb passes through a potential difference of V *volts*. Its energy in '*joules*' will be

[MP PET 2000]

(1) V/e (2) eV

(3) e/V (4) V

40. An electron is accelerated through a potential difference of 200 *volts*. If e/m for the electron be 1.6×10^{11} *coulomb/kg*, the velocity acquired by the electron will be

[MP PET 2000]

(1) $8\times10^{6}\ m/s$ (2) $8\times10^{5}\ m/s$

(3) $5.9\times10^{6}\ m/s$ (4) $5.9\times10^{5}\ m/s$

41. Which is not true with respect to the cathode rays

[Kerala PET 2001]

(1) A stream of electrons

(2) Charged particles

(3) Move with speed same as that of light

(4) Can be deflected by magnetic fields

42. In Milikan's experiment, an oil drop having charge *q* gets stationary on applying a potential difference *V* in between two plates separated by a distance '*d*'. The weight of the drop is

(1) qVd (2) $q\dfrac{d}{V}$

(3) $\dfrac{q}{Vd}$ (4) $q\dfrac{V}{d}$

43. Electron volt is a unit of

(1) Potential (2) Charge

(3) Power (4) Energy

44. In Thomson experiment of finding e/m for electrons, beam of electron is replaced by that of muons (particle with same charge as of electrons but mass 208 times that of electrons). No deflection condition in this case satisfied if **[DCE 1999]**

[Orissa (Engg.) 2002]

(1) *B* is increased 208 times

(2) *E* is increased 208 times

(3) *B* is increased 14.4 times

(4) None of these

45. The colour of the positive column in a gas discharge tube depends on

(1) The type of glass used to construct the tube

(2) The gas in the tube

(3) The applied voltage

(4) The material of the cathode

46. Cathode rays are produced when the pressure is of the order of **[Kerala (Engg.) 2002]**

(1) 2 *cm* of *Hg* (2) 0.1 *cm* of *Hg*

(3) 0.01 *mm* of *Hg* (4) 1 μm of *Hg*

47. The speed of an electron having a wavelength of $10^{-10}\ m$ is

[AIIMS 2002]

(1) $7.25\times10^{6}\ m/s$ (2) $6.26\times10^{6}\ m/s$

(3) $5.25\times10^{6}\ m/s$ (4) $4.24\times10^{6}\ m/s$

48. Which of the following is not the property of a cathode ray

[CBSE PMT 2002]

(1) It casts shadow

(2) It produces heating effect

(3) It produces flurosence

(4) It does not deflect in electric field

49. In a Thomson set-up for the determination of *e/m*, electrons accelerated by 2.5 kV enter the region of crossed electric and magnetic fields of strengths **[MP PMT 2001]** $3.6\times10^{4}\ Vm^{-1}$ and $1.2\times10^{-3}\ T$ respectively and go through undeflected. The measured value of e/m of the electron is equal to

[AMU 2002]

[MP PMT 2001]

(1) $1.0\times10^{11}\ C\text{-}kg^{-1}$ (2) $1.76\times10^{11}\ C\text{-}kg^{-1}$

(3) $1.80\times10^{11}\ C\text{-}kg^{-1}$ (4) $1.85\times10^{11}\ C\text{-}kg^{-1}$

50. The ratio of specific charge of an α-particle to that of a proton is **[BCECE 2003]**

(1) 2 : 1 (2) 1 : 1

(3) 1 : 2 (4) 1 : 3

51. In Bainbridge mass spectrograph a potential difference of 1000 *V* is applied between two plates distant 1 *cm* apart and magnetic field in *B* = 1*T*. The velocity of undeflected positive ions in *m/s* from the velocity selector is **[RPMT 1998]**

(1) $10^7 m/s$ (2) $10^4 m/s$

(3) $10^5 m/s$ (4) $10^2 m/s$

52. When cathode rays (tube voltage ~ 10 *kV*) collide with the anode of high atomic weight then we get **[MP PET 1985]**

(1) Positive rays (2) *X*-rays

(3) Gamma rays (4) Canal rays

53. In Thomson's experiment if the value of *q/m* is the same for all positive ions striking the photographic plate, then the trace would be **[RPMT 1986]**

(1) Straight line (2) Parabolic

(3) Circular (4) Elliptical

54. In a discharge tube at 0.02 *mm*, there is a formation of **[CBSE PMT 1996]**

(1) FDS (2) CDS

(3) Both space (4) None of these

55. Electric field and magnetic field in Thomson mass spectrograph are applied **[RPMT 1998]**

(1) Simultaneously, perpendicular

(2) Perpendicular but not simultaneously

(3) Parallel but not simultaneously

(4) Parallel simultaneously

56. The current conduction in a discharged tube is due to **[CBSE PMT 1999]**

(1) Electrons only

(2) +*ve* ions and electrons

(3) – *ve* ions and electrons

(4) + *ve* ions, – *ve* ions and electrons

57. In Milikan's oil drop experiment, a charged drop falls with terminal velocity *V*. If an electric field *E* is applied in vertically upward direction then it starts moving in upward direction with terminal velocity 2*V*. If magnitude of electric field is decreased to $\frac{E}{2}$, then terminal velocity will become **[CBSE PMT 1999]**

(1) $\frac{V}{2}$ (2) *V*

(3) $\frac{3V}{2}$ (4) 2*V*

58. An electron is accelerated through a p.d. of 45.5 *volt*. The velocity acquired by it is (in ms^{-1}) **[AIIMS 2004]**

(1) 4×10^6 (2) 4×10^4

(3) 10^6 (4) Zero

59. A cathode emits 1.8×10^{14} electrons per second, when heated. When 400*V* is applied to anode all the emitted electrons reach the anode. The charge on electron is $1.6\times10^{-19} C$. The maximum anode current is **[MP PMT 2004]**

(1) $2.7\mu A$ (2) $29\mu A$

(3) $72\mu A$ (4) 29 *mA*

60. Order of *q/m* ratio of proton, α-particle and electron is **[AFMC 2004]**

(1) $e > p > \alpha$ (2) $p > \alpha > e$

(3) $e > \alpha > p$ (4) None of these

61. A charge of magnitude $3e$ and mass $2m$ is moving in an electric field $\vec{E}$. The acceleration imparted to the charge is **[DCE 2004]**

(1) $2Ee/3m$ (2) $3Ee/2m$

(3) $2m/3Ee$ (4) $3m/2Ee$

62. An electron initially at rest, is accelerated through a potential difference of 200 *volt,* so that it acquires a velocity $8.4\times10^6 m/s$. The value of *e/m* of electron will be **[DPMT 2003]**

(1) $2.76\times10^{12} C/kg$ (2) $1.76\times10^{11} C/kg$

(3) $0.76\times10^{12} C/kg$ (4) None of these

63. An α particle is accelerated through a *p.d* of 10^6 volt then *K.E.* of particle will be **[Pb. PET 2003]**

(1) 8 *MeV* (2) 4 *MeV*

(3) 2 *MeV* (4) 1 *MeV*

64. Positive rays consists of
[RPMT 1996, 2003]

(1) Electrons (2) Neutrons

(3) Positive ions (4) Electro magnetic waves

65. O^{++}, C^{+}, He^{++} and H^{+} ions are projected on the photographic plate with same velocity in a mass spectrograph. Which one will strike farthest
[RPMT 2003]

(1) O^{++} (2) C^{+}

(3) He^{++} (4) H_2^{+}

66. An electron beam is moving between two parallel plates having electric field $1.125 \times 10^{-6}\ N/m$. A magnetic field $3 \times 10^{-10}\ T$ is also applied so that beam of electrons do not deflect. The velocity of the electron is **[MH CHT 2004]**

(1) $4225\ m/s$ (2) $3750\ m/s$

(3) $2750\ m/s$ (4) $3200\ m/s$

67. Positive rays was discovered by
[RPMT 1998]

(1) Thomson (2) Goldstem

(3) W. Crookes (4) Rutherford

68. An electron is moving in electric field and magnetic field it will gain energy from
[DCE 1998]

(1) Electric field (2) Magnetic field

(3) Both of these (4) None of these

69. If an electron oscillates at a frequency of 1 *GHz* it gives
[DCE 1999]

(1) *X*-rays (2) Mirowaves

(3) Infrared rays (4) None of these

70. In an electron gun, the electrons are accelerated by the potential *V*. If *e* is the charge and *m* is the mass of an electron, then the maximum velocity of these electrons will be
[MP PMT 1987, 96; BHU 1995; MNR 1998]

(1) $\frac{2eV}{m}$ (2) $\sqrt{\frac{2eV}{m}}$

(3) $\sqrt{\frac{2m}{eV}}$ (4) $\frac{V^2}{2em}$

71. Which of the following have highest specific charge
[BHU 2005]

(1) Positron (2) Proton

(3) *He* (4) None of these

72. In Millikan's oil drop experiment, an oil drop of mass $16 \times 10^{-6}\ kg$ is balanced by an electric field of $10^6\ V/m$. The charge in coulomb on the drop, assuming $g = 10\ m/s^2$ is
[UP SEAT 2005]

(1) 6.2×10^{-11} (2) 16×10^{-9}

(3) 16×10^{-11} (4) 16×10^{-13}

Matter Waves

1. The idea of matter waves was given by

(1) Davisson and Germer (2) de-Broglie

(3) Einstein (4) Planck

2. Wave is associated with matter

(1) When it is stationary

(2) When it is in motion with the velocity of light only

(3) When it is in motion with any velocity

(4) None of the above

3. The de-Broglie wavelength associated with the particle of mass *m* moving with velocity *v* is
[CBSE PMT 1992]

(1) h/mv (2) mv/h

(3) mh/v (4) m/hv

4. A photon, an electron and a uranium nucleus all have the same wavelength. The one with the most energy
[MP PMT 1992]

(1) Is the photon

(2) Is the electron

(3) Is the uranium nucleus

(4) Depends upon the wavelength and the properties of the particle.

5. A particle which has zero rest mass and non-zero energy and momentum must travel with a speed
[MP PMT 1992; DPMT 2001; Kerala PMT 2004]

(1) Equal to *c*, the speed of light in vacuum

(2) Greater than *c*

(3) Less than c

(4) Tending to infinity

6. When the kinetic energy of an electron is increased, the wavelength of the associated wave will

(1) Increase

(2) Decrease

(3) Wavelength does not depend on the kinetic energy

(4) None of the above

7. If the de-Broglie wavelengths for a proton and for a $\alpha-$particle are equal, then the ratio of their velocities will be

[NCERT 1972]

(1) 4 : 1 (2) 2 : 1

(3) 1 : 2 (4) 1 : 4

8. The de-Broglie wavelength λ associated with an electron having kinetic energy E is given by the expression

[MP PMT 1990; CPMT 1996]

(1) $\frac{h}{\sqrt{2mE}}$ (2) $\frac{2h}{mE}$

(3) $2mhE$ (4) $\frac{2\sqrt{2mE}}{h}$

9. Dual nature of radiation is shown by **[MP PET 1991]**

(1) Diffraction and reflection

(2) Refraction and diffraction

(3) Photoelectric effect alone

(4) Photoelectric effect and diffraction

10. For the Bohr's first orbit of circumference $2\pi r$, the de-Broglie wavelength of revolving electron will be

[MP PMT 1987]

(1) $2\pi r$ (2) πr

(3) $\frac{1}{2\pi r}$ (4) $\frac{1}{4\pi r}$

11. An electron of mass m when accelerated through a potential difference V has de-Broglie wavelength λ. The de-Broglie wavelength associated with a proton of mass M accelerated through the same potential difference will be

[CBSE PMT 1995; EAMCET 2001; J & K CET 2004]

(1) $\lambda\frac{m}{M}$ (2) $\lambda\sqrt{\frac{m}{M}}$

(3) $\lambda\frac{M}{m}$ (4) $\lambda\sqrt{\frac{M}{m}}$

12. What will be the ratio of de-Broglie wavelengths of proton and $\alpha-$particle of same energy

[RPET 1991, 96; DCE 2002; Kerala PET 2005]

(1) 2 : 1 (2) 1 : 2

(3) 4 : 1 (4) 1 : 4

13. What is the de-Broglie wavelength of the $\alpha-$particle accelerated through a potential difference V **[RPMT 1996]**

(1) $\frac{0.287}{\sqrt{V}}$ Å (2) $\frac{12.27}{\sqrt{V}}$ Å

(3) $\frac{0.101}{\sqrt{V}}$ Å (4) $\frac{0.202}{\sqrt{V}}$ Å

14. de-Broglie hypothesis treated electrons as

[BHU 2000]

(1) Particles (2) Waves

(3) Both 'a' and 'b' (4) None of these

15. The energy that should be added to an electron, to reduce its de-Broglie wavelengths from $10^{-10}\,m$ to $0.5\times10^{-10}\,m$, will be **[KCET (Engg./Med.) 2000]**

(1) Four times the initial energy

(2) Thrice the initial energy

(3) Equal to the initial energy

(4) Twice the initial energy

16. The de-Broglie wavelength of an electron having $80 eV$ of energy is nearly

($1 eV = 1.6\times10^{-19}\,J$, Mass of electron $= 9\times10^{-31} kg$

Plank's constant $= 6.6\times10^{-34}$ J-sec)

[EAMCET (Engg.) 2001]

(1) 140 Å (2) 0.14 Å

(3) 14 Å (4) 1.4 Å

17. If particles are moving with same velocity, then maximum de-Broglie wavelength will be for

(1) Neutron (2) Proton

(3) β-particle (4) α-particle

18. If an electron and a photon propagate in the form of waves having the same wavelength, it implies that they have the same **[CBSE PMT 1995; DCE 2001; AIIMS 2003]**

(1) Energy (2) Momentum

(3) Velocity (4) Angular momentum

19. The de-Broglie wavelength is proportional to **[RPET 2003]**

(1) $\lambda \propto \frac{1}{v}$ (2) $\lambda \propto \frac{1}{m}$

(3) $\lambda \propto \frac{1}{p}$ (4) $\lambda \propto p$

20. Particle nature and wave nature of electromagnetic waves and electrons can be shown by **[AIIMS 2000]**

(1) Electron has small mass, deflected by the metal sheet

(2) X-ray is diffracted, reflected by thick metal sheet

(3) Light is refracted and defracted

(4) Photoelectricity and electron microscopy

21. The de-Broglie wavelength of a particle moving with a velocity 2.25×10^8 *m/s* is equal to the wavelength of photon. The ratio of kinetic energy of the particle to the energy of the photon is (velocity of light is 3×10^8 *m/s*) **[EAMCET (Med.) 2003]**

(1) 1/8 (2) 3/8

(3) 5/8 (4) 7/8

22. According to de-Broglie, the de-Broglie wavelength for electron in an orbit of hydrogen atom is 10^{-9} *m*. The principle quantum number for this electron is **[RPMT 2003]**

(1) 1 (2) 2

(3) 3 (4) 4

23. The speed of an electron having a wavelength of $10^{-10} m$ is **[Manipal 1997; AIIMS 2002]**

(1) 7.25×10^6 *m/s* (2) $6.26 \times 10^6 m/s$

(3) $5.25 \times 10^6 m/s$ (4) $4.24 \times 10^6 m/s$

24. The kinetic energy of electron and proton is $10^{-32} J$. Then the relation between their de-Broglie wavelengths is **[CPMT 1999]**

(1) $\lambda_p < \lambda_e$ (2) $\lambda_p > \lambda_e$

(3) $\lambda_p = \lambda_e$ (4) $\lambda_p = 2\lambda_e$

25. The de-Broglie wavelength of a particle accelerated with 150 *volt* potential is 10^{-10} *m*. If it is accelerated by 600 *volts* p.d., its wavelength will be **[RPET 1988]**

(1) 0.25 *Å* (2) 0.5 *Å*

(3) 1.5 *Å* (4) 2 *Å*

26. The de-Broglie wavelength associated with a hydrogen molecule moving with a thermal velocity of 3 *km/s* will be

(1) 1 *Å* (2) 0.66 *Å*

(3) 6.6 *Å* (4) 66 *Å*

27. When the momentum of a proton is changed by an amount P_0, the corresponding change in the de-Broglie wavelength is found to be 0.25%. Then, the original momentum of the proton was **[CPMT 2002]**

(1) p_0 (2) 100 p_0

(3) 400 p_0 (4) 4 p_0

28. The de-Broglie wavelength of a neutron at 27°*C* is λ. What will be its wavelength at 927°*C*

(1) $\lambda / 2$ (2) $\lambda / 3$

(3) $\lambda / 4$ (4) $\lambda / 9$

29. An electron and proton have the same de-Broglie wavelength. Then the kinetic energy of the electron is **[Kerala PMT 2004]**

(1) Zero

(2) Infinity

(3) Equal to the kinetic energy of the proton

(4) Greater than the kinetic energy of the proton

30. For moving ball of cricket, the correct statement about de-Broglie wavelength is

(1) It is not applicable for such big particle

(2) $\frac{h}{\sqrt{2mE}}$

(3) $\sqrt{\frac{h}{2mE}}$

(4) $\frac{h}{2mE}$

31. Photon and electron are given same energy $(10^{-20} J)$. Wavelength associated with photon and electron are λ_{Ph} and λ_{el} then correct statement will be **[RPMT 2001]**

(1) $\lambda_{Ph} > \lambda_{el}$ (2) $\lambda_{Ph} < \lambda_{el}$

(3) $\lambda_{Ph} = \lambda_{el}$ (4) $\frac{\lambda_{el}}{\lambda_{Ph}} = C$

32. The kinetic energy of an electron with de-Broglie wavelength of 0.3 nanometer is

(1) 0.168 *eV* (2) 16.8 *eV*

(3) 1.68 *eV* (4) 2.5 *eV*

33. A proton and an α-particle are accelerated through a potential difference of 100 *V*. The ratio of the wavelength associated with the proton to that associated with an α-particle is

(1) $\sqrt{2}:1$ (2) $2:1$

(3) $2\sqrt{2}:1$ (4) $\frac{1}{2\sqrt{2}}:1$

34. The wavelength of de-Broglie wave is $2\mu m$, then its momentum is ($h = 6.63 \times 10^{-34}$ *J-s*) **[DCE 2004]**

(1) 3.315×10^{-28} *kg-m/s* (2) 1.66×10^{-28} *kg-m/s*

(3) 4.97×10^{-28} *kg-m/s* (4) 9.9×10^{-28} *kg-m/s*

35. de-Broglie wavelength of a body of mass 1 *kg* moving with velocity of 2000 *m/s* is

(1) 3.32×10^{-27} Å (2) 1.5×10^{7} Å

(3) 0.55×10^{-22} Å (4) None of these

36. The kinetic energy of an electron is 5 *eV*. Calculate the de-Broglie wavelength associated with it ($h = 6.6 \times 10^{-34}$ *Js*, $m_e = 9.1 \times 10^{-31}$ *kg*)

(1) 5.47 Å (2) 10.9 Å

(3) 2.7 Å (4) None of these

37. The wavelength associated with an electron accelerated through a potential difference of 100 *V* is nearly **[RPMT 2003]**

(1) 100 Å (2) 123 Å

(3) 1.23 Å (4) 0.123 Å

38. The de-Broglie wavelength λ

(1) is proportional to mass

(2) is proportional to impulse

(3) Inversely proportional to impulse

(4) does not depend on impulse

39. Davission and Germer experiment proved **[RPET 2002; DCE 2004]**

(1) Wave nature of light (2) Particle nature of light

(3) Both (1) and (2) (4) Neither (1) nor (2)

40. If the kinetic energy of a free electron doubles, its de-Broglie wavelength changes by the factor **[AIEEE 2005]**

(1) $\frac{1}{\sqrt{2}}$ (2) $\sqrt{2}$

(3) $\frac{1}{2}$ (4) 2

[UPSEAT 2004]

41. The energy that should be added to an electron to reduce its de Broglie wavelength from one *nm* to 0.5 *nm* is **[KCET 2005]**

(1) Four times the initial energy

(2) Equal to the initial energy

(3) Twice the initial energy **[DCE 2002; DPMT 2003]**

(4) Thrice the initial energy

42. de-Broglie wavelength of a body of mass *m* and kinetic energy *E* is given by

(1) $\lambda = \frac{h}{mE}$ (2) $\lambda = \frac{\sqrt{2mE}}{h}$

(3) $\lambda = \frac{h}{2mE}$ (4) $\lambda = \frac{h}{\sqrt{2mE}}$

43. The wavelength of the matter wave is independent of **[Pb. PMT 2003]** **[Kerala PMT 2005]**

(1) Mass (2) Velocity

(3) Momentum (4) Charge

Photon and Photoelectric Effect

1. The momentum of a photon is 3.3×10^{-29} $kg-m/sec$. Its frequency will be **[Pb. PMT 2004]** **[CPMT 1980; MP PET 1992; DPMT 1999]**

(1) 3×10^{3} *Hz* (2) 6×10^{3} *Hz*

(3) 7.5×10^{12} *Hz* (4) 1.5×10^{13} *Hz*

2. The energy of a photon of wavelength λ is given by **[CPMT 1974; CBSE PMT 1992; DCE 1998; BHU 2000; DPMT 2001]**

(1) $h\lambda$ (2) $ch\lambda$

(3) λ / hc (4) hc / λ

[RPMT 2004]

3. The momentum of a photon is 2×10^{-16} *gm-cm/sec*. Its energy is **[CPMT 1974]**

(1) 0.61×10^{-26} *erg* (2) 2.0×10^{-26} *erg*

(3) 6×10^{-6} *erg* (4) 6×10^{-8} *erg*

4. The rest mass of the photon is **[MP PET 1994; CPMT 1996; RPMT 1999; JIPMER 2002]**

(1) 0

(2) ∞

(3) Between 0 and ∞

(4) Equal to that of an electron

5. The momentum of the photon of wavelength 5000$\mathring{A}$ will be **[CPMT 1987]**

(1) 1.3×10^{-27} $kg\text{-}m/sec$ (2) 1.3×10^{-28} $kg\text{-}m/sec$

(3) 4×10^{29} $kg\text{-}m/sec$ (4) 4×10^{-18} $kg\text{-}m/sec$

6. The momentum of a photon of energy $h\nu$ will be **[DCE 2000]**

(1) $h\nu$ (2) $h\nu/c$

(3) $h\nu c$ (4) h/ν

7. A photon in motion has a mass **[MP PMT 1992]**

(1) $c/h\nu$ (2) h/ν

(3) $h\nu$ (4) $h\nu/c^2$

8. If the momentum of a photon is p, then its frequency is **[MP PET 1989]**

(1) $\frac{ph}{c}$ (2) $\frac{pc}{h}$

(3) $\frac{mh}{c}$ (4) $\frac{mc}{h}$

Where m is the rest mass of the photon

9. An AIR station is broadcasting the waves of wavelength 300 metres. If the radiating power of the transmitter is 10 kW, then the number of photons radiated per second is **[MP PET 1989; RPMT 2000]**

(1) 1.5×10^{29} (2) 1.5×10^{31}

(3) 1.5×10^{33} (4) 1.5×10^{35}

10. The energy of a photon is $E=h\nu$ and the momentum of photon $p=\frac{h}{\lambda}$, then the velocity of photon will be **[CPMT 1991]**

(1) E/p (2) Ep

(3) $\left(\frac{E}{p}\right)^2$ (4) $3\times10^8\ m/s$

11. The approximate wavelength of a photon of energy 2.48 eV is **[MP PMT 1987]**

(1) 500 $\mathring{A}$ (2) 5000 $\mathring{A}$

(3) 2000 $\mathring{A}$ (4) 1000 $\mathring{A}$

12. An important spectral emission line has a wavelength of 21 cm. The corresponding photon energy is **[MP PMT 1993]**

(1) $5.9\times10^{-4}\ eV$ (2) $5.9\times10^{-6}\ eV$

(3) $5.9\times10^{-8}\ eV$ (4) $11.8\times10^{-6}\ eV$

($h=6.62\times10^{-34}\ Js;\ c=3\times10^8\ m/s$)

13. The momentum of a photon in an X-ray beam of 10^{-10} metre wavelength is **[MP PET 1996]**

(1) $1.5\times10^{-23}\ kg-m/sec$ (2) $6.6\times10^{-24}\ kg-m/sec$

(3) $6.6\times10^{-44}\ kg-m/sec$ (4) $2.2\times10^{-52}\ kg-m/sec$

14. The energy of a photon of light with wavelength 5000 Å is approximately 2.5 eV. This way the energy of an X-ray photon with wavelength 1Å would be **[MP PET 1997]**

(1) 2.5/5000 eV (2) $2.5/(5000)^2\ eV$

(3) $2.5\times5000\ eV$ (4) $2.5\times(5000)^2\ eV$

15. Energy of a quanta of frequency $10^{15}\ Hz$ and $h=6.6\times10^{-34}\ J\text{-sec}$ will be **[RPMT 1997]**

(1) $6.6\times10^{-19}\ J$ (2) $6.6\times10^{-12}\ J$

(3) $6.6\times10^{-49}\ J$ (4) $6.6\times10^{-41}\ J$

16. Momentum of a photon of wavelength λ is **[CBSE PMT 1993; JIPMER 2001, 02]**

(1) $\frac{h}{\lambda}$ (2) Zero

(3) $\frac{h\lambda}{c^2}$ (4) $\frac{h\lambda}{c}$

17. Wavelength of a 1 keV photon is $1.24\times10^{-9}\ m$. What is the frequency of 1 MeV photon **[CBSE PMT 1993; MP PET 2005]**

(1) $1.24\times10^{15}\ Hz$ (2) $2.4\times10^{20}\ Hz$

(3) $1.24\times10^{18}\ Hz$ (4) $2.4\times10^{23}\ Hz$

18. What is the momentum of a photon having frequency $1.5\times10^{13}\ Hz$ **[BHU 1997]**

(1) $3.3\times10^{-29}\ kg\,m/s$ (2) $3.3\times10^{-34}\ kg\,m/s$

(3) $6.6\times10^{-34}\ kg\,m/s$ (4) $6.6\times10^{-30}\ kg\,m/s$

19. The energy of a photon of light of wavelength 450 nm is **[BHU 1997; JIPMER 2000]**

(1) $4.4\times10^{-19}\ J$ (2) $2.5\times10^{-19}\ J$

(3) $1.25\times10^{-17}\ J$ (4) $2.5\times10^{-17}\ J$

20. Frequency of photon having energy 66 eV is **[CPMT PMT 1997]**

(1) $8\times10^{-15}\ Hz$ (2) $12\times10^{-15}\ Hz$

(3) $16\times10^{15}\ Hz$ (4) None of these

21. Which of the following statement is not correct **[AFMC 1999]**

(1) Photographic plates are sensitive to infrared rays

(2) Photographic plates are sensitive to ultraviolet rays

(3) Infra-red rays are invisible but can cast shadows like visible light

(4) Infrared photons have more energy than photons of visible light

22. If we express the energy of a photon in *KeV* and the wavelength in angstroms, then energy of a photon can be calculated from the relation

(1) $E = 12.4\, h\nu$ (2) $E = 12.4\, h/\lambda$

(3) $E = 12.4/\lambda$ (4) $E = h\nu$

23. The frequency of a photon, having energy 100 eV is $(h = 6.6 10^{-34}\ J\text{-}sec)$ **[AFMC 2000]**

(1) $2.42 \times 10^{26}\ Hz$ (2) $2.42 \times 10^{16}\ Hz$

(3) $2.42 \times 10^{12}\ Hz$ (4) $2.42 \times 10^{9}\ Hz$

24. A photon of wavelength 4400 Å is passing through vacuum. The effective mass and momentum of the photon are respectively

(1) $5 \times 10^{-36}\ kg,\ 1.5 \times 10^{-27}\ kg\text{-}m/s$

(2) $5 \times 10^{-35}\ kg,\ 1.5 \times 10^{-26}\ kg\text{-}m/s$

(3) Zero, $1.5 \times 10^{-26}\ kg\text{-}m/s$

(4) $5 \times 10^{-36}\ kg, 1.67 \times 10^{-43}\ kg\text{-}m/s$

25. Which of the following is true for photon **[RPET 2001]**

(1) $E = \frac{hc}{\lambda}$ (2) $E = \frac{1}{2}mu^2$

(3) $p = \frac{E}{2v}$ (4) $E = \frac{1}{2}mc^2$

26. Which of the following is incorrect statement regarding photon **[MH CET (Med.) 2001]**

(1) Photon exerts no pressure

(2) Photon energy is $h\nu$

(3) Photon rest mass is zero

(4) None of these

27. If a photon has velocity *c* and frequency ν, then which of following represents its wavelength

(1) $\frac{hc}{E}$ (2) $\frac{h\nu}{c}$

(3) $\frac{h\nu}{c^2}$ (4) $h\nu$

28. The mass of a photo electron is **[MP PMT 2002]**

(1) $9.1 \times 10^{-27}\ kg$ (2) $9.1 \times 10^{-29}\ kg$

(3) $9.1 \times 10^{-31}\ kg$ (4) $9.1 \times 10^{-34}\ kg$

29. Energy of photon whose frequency is $10^{12}\ MHz$, will be **[MH CET 2002]**

(1) $4.14 \times 10^{3}\ keV$ (2) $4.14 \times 10^{2}\ eV$

(3) $4.14 \times 10^{3}\ MeV$ (4) $4.14 \times 10^{3}\ eV$

30. There are n_1 photons of frequency γ_1 in a beam of light. In an equally energetic beam, there are n_2 photons of frequency γ_2. Then the correct relation is **[KCET 2003]**

(1) $\frac{n_1}{n_2} = 1$ (2) $\frac{n_1}{n_2} = \frac{\gamma_1}{\gamma_2}$

[AMU (Engg.) 1999]

(3) $\frac{n_1}{n_2} = \frac{\gamma_2}{\gamma_1}$ (4) $\frac{n_1}{n_2} = \frac{\gamma_1^2}{\gamma_2^2}$

31. Einstein's photoelectric equation states that $E_k = h\nu - \phi$. In this equation E_k refers to **[CPMT 1982; MP PMT 1997]**

(1) Kinetic energy of all the emitted electrons

(2) Mean kinetic energy of the emitted electrons

(3) Maximum kinetic energy of the emitted electrons **[AMU 2000]**

(4) Minimum kinetic energy of the emitted electrons

32. Kinetic energy with which the electrons are emitted from the metal surface due to photoelectric effect is **[CPMT 1973]**

(1) Independent of the intensity of illumination

(2) Independent of the frequency of light

(3) Inversely proportional to the intensity of illumination

(4) Directly proportional to the intensity of illumination

33. The threshold wavelength for photoelectric emission from a material is 5200 Å. Photo-electrons will be emitted when this material is illuminated with monochromatic radiation from **[AIEEE 2002] [IIT-JEE 1982; MP PMT 1992; MP PET 1999; UPSEAT 2001; KCET 2004; J & K CET 2004; BHU 2004]**

(1) 50 watt infrared lamp

(2) 1 watt infrared lamp

(3) 50 watt ultraviolet lamp

(4) 1 watt ultraviolet lamp

(e) Both (3) and (4)

34. Threshold frequency for a metal is 10^{15} *Hz*. Light of $\lambda = 4000 Å$ falls on its surface. Which of the following statements is correct

(1) No photoelectric emission takes place

(2) Photo-electrons come out with zero speed

(3) Photo-electrons come out with 10^3 *m/sec* speed

(4) Photo-electrons come out with 10^5 *m/sec* speed

35. Photo cells are used for the

(1) Reproduction of pictures from the cinema film

(2) Reproduction of sound from the cinema film

(3) Automatic switching of street light

(4) (2) and (3) both

36. Einstein got Nobel prize on which of the following works **[DCE 1995]**

(1) Mass-energy relation

(2) Special theory of relativity

(3) Photoelectric equation

(4) (1) and (2) both

37. The photo-electrons emitted from a surface of sodium metal are such that **[MP PMT 1992]**

(1) They all are of the same frequency

(2) They have the same kinetic energy

(3) They have the same de Broglie wavelength

(4) They have their speeds varying from zero to a certain maximum

38. A metal surface of work function 1.07 *eV* is irradiated with light of wavelength 332 *nm*. The retarding potential required to stop the escape of photo-electrons is **[MP PMT 1992]**

(1) 4.81 *eV* (2) 3.74 *eV*

(3) 2.66 *eV* (4) 1.07 *eV*

39. In a photo cell, the photo-electrons emission takes place

(1) After 10^{-1}*sec* on incident of light rays

(2) After 10^{-3}*sec* on incident of light rays

(3) After 10^{-6}*sec* on incident of light rays

(4) After 10^{-8}*sec* on incident of light rays

40. When light falls on a metal surface, the maximum kinetic energy of the emitted photo-electrons depends upon **[MP PMT 1989; MP PET 1992, 93]**

(1) The time for which light falls on the metal

(2) Frequency of the incident light

(3) Intensity of the incident light

(4) Velocity of the incident light

41. The electrons are emitted in the photoelectric effect from a metal surface **[MP PET 1992]**

(1) Only if the frequency of the incident radiation is above a certain threshold value

(2) Only if the temperature of the surface is high

(3) At a rate that is independent of the nature of the metal

(4) With a maximum velocity proportional to the frequency of the incident radiation

42. The work function of a metal is 4.2 *eV*, its threshold wavelength will be **[BHU 2003; CPMT 2004]**

(1) 4000 *Å* (2) 3500 *Å*

(3) 2955 *Å* (4) 2500 *Å*

43. The number of photo-electrons emitted per second from a metal surface increases when **[EAMCET (Med.) 1995; CBSE PMT 1993; MP PMT 1994, 2002; MH CET 1999; KCET 2003]**

(1) The energy of incident photons increases

(2) The frequency of incident light increases

(3) The wavelength of the incident light increases

(4) The intensity of the incident light increases

44. The work function of metal is 1 *eV*. Light of wavelength 3000 *Å* is incident on this metal surface. The velocity of emitted photo-electrons will be **[MP PMT 1990]**

(1) 10 *m/sec* (2) 1×10^3 *m/sec*

(3) 1×10^4 *m/sec* (4) 1×10^6 *m/sec*

45. The retarding potential for having zero photo-electron current **[MP PMT/PET 1988]**

(1) Is proportional to the wavelength of incident light

(2) Increases uniformly with the increase in the wavelength of incident light

(3) Is proportional to the frequency of incident light

(4) Increases uniformly with the increase in the frequency of incident light wave

46. In a dark room of photography, generally red light is used. The reason is

(1) Most of the photographic films are not sensitive to red light

(2) The frequency for red light is low and hence the energy $h\nu$ of photons is less

(3) (1) and (2) both

(4) None of the above

47. The work function of a metal is $1.6\times10^{-19}J$. When the metal surface is illuminated by the light of wavelength 6400 Å, then the maximum kinetic energy of emitted photo-electrons will be

(Planck's constant $h = 6.4\times10^{-34}$ Js) **[MP PMT 1989]**

(1) 14×10^{-19} J (2) 2.8×10^{-19} J

(3) 1.4×10^{-19} J (4) 1.4×10^{-19} eV

48. Ultraviolet radiations of $6.2\,eV$ falls on an aluminium surface (work function 4.2 eV). The kinetic energy in joules of the fastest electron emitted is approximately

[MNR 1987; MP PET 1990; CBSE PMT 1993; Pb. PMT 2001; BVP 2003; Pb. PET 2004]

(1) 3.2×10^{-21} (2) 3.2×10^{-19}

(3) 3.2×10^{-17} (4) 3.2×10^{-15}

49. The work function of a metallic surface is 5.01 *eV*. The photo-electrons are emitted when light of wavelength 2000*Å* falls on it. The potential difference applied to stop the fastest photo-electrons is $[h = 4.14\times10^{-15}$ eVsec$]$

[MP PET 1991; DPMT 1999]

(1) 1.2 *volts* (2) 2.24 *volts*

(3) 3.6 *volts* (4) 4.8 *volts*

50. The photoelectric threshold wavelength for a metal surface is 6600 *Å*. The work function for this is **[MP PET 1991]**

(1) 1.87 *V* (2) 1.87 *eV*

(3) 18.7 *eV* (4) 0.18 *eV*

51. Photoelectric effect was successfully explained first by

(1) Planck (2) Hallwash

(3) Hertz (4) Einstein

52. The spectrum of radiation 1.0×10^{14} Hz is in the infrared region. The energy of one photon of this in joules will be

[MP PET 1982]

(1) 6.62×10^{-48} (2) 6.62×10^{-20}

(3) $\frac{6.62}{3}\times10^{-28}$ (4) $3\times6.62\times10^{-28}$

53. A radio transmitter operates at a frequency of 880 *kHz* and a power of 10 *kW*. The number of photons emitted per second are **[CBSE PMT 1990; MP PET 1990]**

(1) 1.72×10^{31} (2) 1327×10^{34}

(3) 13.27×10^{34} (4) 0.075×10^{-34}

54. A photo cell is receiving light from a source placed at a distance of 1 *m*. If the same source is to be placed at a distance of 2 *m*, then the ejected electron

[MNR 1986; UPSEAT 2000, 01]

(1) Moves with one-fourth energy as that of the initial energy

(2) Moves with one-fourth of momentum as that of the initial momentum

(3) Will be half in number

(4) Will be one-fourth in number

55. In a photoelectric experiment for 4000 *Å* incident radiation, the potential difference to stop the ejection is 2 *V*. If the incident light is changed to 3000 *Å*, then the potential required to stop the ejection of electrons will be

[MP PET 1995]

(1) 2 V (2) Less than 2 V

(3) Zero (4) Greater than 2 V

56. Light of wavelength 4000 Å is incident on a sodium surface for which the threshold wave length of photo – electrons is 5420 Å. The work function of sodium is **[MP PMT 1993; Pb. PMT 2002]**

(1) 4.58 eV (2) 2.29 eV

(3) 1.14 eV (4) 0.57 eV

57. Photo cell is a device to **[MP PET 1993]**

(1) Store photons

(2) Measure light intensity

(3) Convert photon energy into mechanical energy

(4) Store electrical energy for replacing storage batteries

58. If the work function for a certain metal is 3.2×10^{-19} *joule* and it is illuminated with light of frequency 8×10^{14} *Hz*. The maximum kinetic energy of the photo-electrons would be **[MP PET 1993]**

(1) $2.1\times10^{-19}\,J$ (2) $8.5\times10^{-19}\,J$

(3) $5.3\times10^{-19}\,J$ (4) $3.2\times10^{-19}\,J$

$(h = 6.63\times10^{-34}\,Js)$

59. Stopping potential for photoelectrons **[MP PET 1994]**

(1) Does not depend on the frequency of the incident light

(2) Does not depend upon the nature of the cathode material

(3) Depends on both the frequency of the incident light and nature of the cathode material

(4) Depends upon the intensity of the incident light

60. The maximum wavelength of radiation that can produce photoelectric effect in a certain metal is 200 *nm*. The maximum kinetic energy acquired by electron due to radiation of wavelength 100 *nm* will be **[MP PMT 1994]**

(1) 12.4 *eV* (2) 6.2 *eV*

(3) 100 *eV* (4) 200 *eV*

61. When the light source is kept 20 *cm* away from a photo cell, stopping potential 0.6 V is obtained. When source is kept 40 *cm* away, the stopping potential will be **[MP PMT 1994]**

(1) 0.3 V (2) 0.6 V

(3) 1.2 V (4) 2.4 V

62. The minimum energy required to remove an electron is called **[AFMC 1995; DPMT 2001]**

(1) Stopping potential (2) Kinetic energy

(3) Work function (4) None of these

63. Light of wavelength 4000 $\mathring{A}$ falls on a photosensitive metal and a negative 2V potential stops the emitted electrons. The work function of the material (in *eV*) is approximately

$(h = 6.6\times10^{-34}\,Js;\ e = 1.6\times10^{-19}\,C,\ c = 3\times10^{8}\,ms^{-1})$

[MP PMT 1995; MH CET 2004]

(1) 1.1 (2) 2.0

(3) 2.2 (4) 3.1

64. Assuming photoemission to take place, the factor by which the maximum velocity of the emitted photoelectrons changes when the wavelength of the incident radiation is increased four times, is **[Haryana CEE 1996]**

(1) 4 (2) $\frac{1}{4}$

(3) 2 (4) $\frac{1}{2}$

65. Work function of a metal is 2.51 *eV*. Its threshold frequency is **[MP PET 1996; Pb. PET 2003]**

(1) 5.9×10^{14} *cycle/sec* (2) 6.5×10^{14} *cycle/sec*

(3) 9.4×10^{14} *cycle/sec* (4) 6.08×10^{14} *cycle/sec*

66. Energy conversion in a photoelectric cell takes place from **[AFMC 1993; MP PET 1996; MP PMT 1996]**

(1) Chemical to electrical (2) Magnetic to electrical

(3) Optical to electrical (4) Mechanical to electrical

67. Which one of the following is true in photoelectric emission **[MP PMT 1996; JIPMER 2001, 02]**

(1) Photoelectric current is directly proportional to the amplitude of light of a given frequency
(2) Photoelectric current is directly proportional to the intensity of light of a given frequency at moderate intensities
(3) Above the threshold frequency, the maximum K.E. of photoelectrons is inversely proportional to the frequency of incident light
(4) The threshold frequency depends upon the wavelength of incident light

68. When a point source of light is at a distance of one metre from a photo cell, the cut off voltage is found to be V. If the same source is placed at 2 m distance from photo cell, the cut off voltage will be

(1) V (2) $V/2$
(3) $V/4$ (4) $V/\sqrt{2}$

69. The work function of a photoelectric material is 3.3 eV. The threshold frequency will be equal to **[UPSEAT 1999]**

(1) $8\times10^{4}\,Hz$ (2) $8\times10^{56}\,Hz$
(3) $8\times10^{10}\,Hz$ (4) $8\times10^{14}\,Hz$

70. If the work function of a metal is 'ϕ' and the frequency of the incident light is 'ν', there is no emission of photoelectron if

(1) $\nu<\frac{\phi}{h}$ (2) $\nu=\frac{\phi}{h}$
(3) $\nu>\frac{\phi}{h}$ (4) $\nu>=<\frac{\phi}{h}$

71. A photoelectric cell is illuminated by a point source of light 1 m away. When the source is shifted to 2 m then **[CBSE PMT 2003]**

(1) Number of electrons emitted is half the initial number
(2) Each emitted electron carries half the initial energy
(3) Number of electrons emitted is a quarter of the initial number
(4) Each emitted electron carries one quarter of the initial energy

72. Light of wavelength λ strikes a photo-sensitive surface and electrons are ejected with kinetic energy E. If the kinetic energy is to be increased to $2E$, the wavelength must be changed to λ' where **[MP PET 1997]**

(1) $\lambda'=\frac{\lambda}{2}$ (2) $\lambda'=2\lambda$
(3) $\frac{\lambda}{2}<\lambda'<\lambda$ (4) $\lambda'>\lambda$

73. If in a photoelectric experiment, the wavelength of incident radiation is reduced from 6000 Å to 4000 Å then **[MP PMT 1999]**

(1) Stopping potential will decrease
(2) Stopping potential will increase
(3) Kinetic energy of emitted electrons will decrease
(4) The value of work function will decrease

74. The photoelectric work function for a metal surface is 4.125 eV. The cut-off wavelength for this surface is **[CBSE PMT 1999; KCET 2001]**

(1) 4125 Å (2) 2062.5 Å
(3) 3000 Å (4) 6000 Å

75. As the intensity of incident light increases **[CPMT 1999; CBSE PMT 1999; MH CET (Med.) 2000; KCET (Engg./Med.) 2001; Pb. PET 2001]**

(1) Photoelectric current increases
(2) Photoelectric current decreases
(3) Kinetic energy of emitted photoelectrons increases
(4) Kinetic energy of emitted photoelectrons decreases

76. Light of wavelength 5000 Å falls on a sensitive plate with photoelectric work function of 1.9 eV. The kinetic energy of the photoelectron emitted will be **[CBSE PMT 1998]**

(1) 0.58 eV (2) 2.48 eV
(3) 1.24 eV (4) 1.16 eV

77. Which of the following is dependent on the intensity of incident radiation in a photoelectric experiment **[AIIMS 1998]**

(1) Work function of the surface

(2) Amount of photoelectric current

(3) Stopping potential will be reduced

(4) Maximum kinetic energy of photoelectrons

78. The work function of a substance is 4.0 *eV*. The longest wavelength of light that can cause photoelectron emission from this substance is approximately

[IIT JEE 1998; UPSEAT 2002, 03; AIEEE 2004]

(1) 540 *nm* (2) 400 *nm*

(3) 310 *nm* (4) 220 *nm*

79. The maximum kinetic energy of photoelectrons emitted from a surface when photons of energy 6 *eV* fall on it is 4 *eV*. The stopping potential in *volts* is

[IIT JEE 1997 Re-Exam]

(1) 2 (2) 4

(3) 6 (4) 10

80. Work function of a metal is 2.1 *eV*. Which of the waves of the following wavelengths will be able to emit photoelectrons from its surface

[Bihar MEE 1995]

(1) 4000 Å, 7500 Å (2) 5500 Å, 6000 Å

(3) 4000 Å, 6000 Å (4) None of these

81. If mean wavelength of light radiated by 100 *W* lamp is 5000 Å, then number of photons radiated per second are

[RPET 1997]

(1) 3×10^{23} (2) 2.5×10^{22}

(3) 2.5×10^{20} (4) 5×10^{17}

82. The frequency of the incident light falling on a photosensitive metal plate is doubled, the kinetic energy of the emitted photoelectrons is

[Roorkee 1992]

(1) Double the earlier value (2) Unchanged

(3) More than doubled (4) Less than doubled

83. When light of wavelength 300 *nm* (nanometer) falls on a photoelectric emitter, photoelectrons are liberated. For another emitter, however light of 600 *nm* wavelength is sufficient for creating photoemission. What is the ratio of the work functions of the two emitters

[CBSE PMT 1993; JIPMER 2000]

(1) 1 : 2 (2) 2 : 1

(3) 4 : 1 (4) 1 : 4

84. Threshold wavelength for photoelectric effect on sodium is 5000 Å. Its work function is

[CBSE PMT 1993]

(1) 15 *J* (2) $16 \times 10^{-14}\ J$

(3) $4 \times 10^{-19}\ J$ (4) $4 \times 10^{-81}\ J$

85. The cathode of a photoelectric cell is changed such that the work function changes from W_1 to W_2 ($W_2 > W_1$). If the current before and after change are I_1 and I_2, all other conditions remaining unchanged, then (assuming $h\nu > W_2$)

[CBSE PMT 1992]

(1) $I_1 = I_2$ (2) $I_1 < I_2$

(3) $I_1 > I_2$ (4) $I_1 < I_2 < 2I_1$

86. A beam of light of wavelength λ and with illumination L falls on a clean surface of sodium. If N photoelectrons are emitted each with kinetic energy E, then **[BHU 1994]**

(1) $N \propto L$ and $E \propto L$ (2) $N \propto L$ and $E \propto \frac{1}{\lambda}$

(3) $N \propto \lambda$ and $E \propto L$ (4) $N \propto \frac{1}{\lambda}$ and $E \propto \frac{1}{L}$

87. Which of the following statements is correct

[CBSE PMT 1997]

(1) The current in a photocell increases with increasing frequency of light

(2) The photocurrent is proportional to applied voltage

(3) The photocurrent increases with increasing intensity of light

(4) The stopping potential increases with increasing intensity of incident light

88. What is the stopping potential when the metal with work function 0.6 *eV* is illuminated with the light of 2 *eV*

[BHU 1998; MH CET 2003]

(1) 2.6 *V* (2) 3.6 *V*

(3) 0.8 *V* (4) 1.4 *V*

89. When yellow light is incident on a surface, no electrons are emitted while green light can emit. If red light is incident on the surface, then

[MNR 1998; MP PET 2000; MH CET 2000]

(1) No electrons are emitted

(2) Photons are emitted

(3) Electrons of higher energy are emitted

(4) Electrons of lower energy are emitted

90. The photoelectric threshold wavelength of a certain metal is 3000Å. If the radiation of 2000Å is incident on the metal **[MNR 1998; KCET 1994]**

(1) Electrons will be emitted

(2) Positrons will be emitted

(3) Protons will be emitted

(4) Electrons will not be emitted

91. A photocell stops emission if it is maintained at $2V$ negative potential. The energy of most energetic photoelectron is **[JIPMER 1999]**

(1) $2eV$ (2) $2J$

(3) $2kJ$ (4) $2keV$

92. The work functions for sodium and copper are $2eV$ and $4eV$. Which of them is suitable for a photocell with 4000 Å light

(1) Copper (2) Sodium

(3) Both (4) Neither of them

93. For intensity I of a light of wavelength 5000Å the photoelectron saturation current is 0.40 μA and stopping potential is 1.36 V, the work function of metal is **[RPET 1999]**

(1) 2.47 eV (2) 1.36 eV

(3) 1.10 eV (4) 0.43 eV

94. The work function of aluminium is 4.2 eV. If two photons, each of energy 3.5 eV strike an electron of aluminium, then emission of electrons will be **[AFMC 1999]**

(1) Possible

(2) Not possible

(3) Data is incomplete

(4) Depend upon the density of the surface

95. In photoelectric effect if the intensity of light is doubled then maximum kinetic energy of photoelectrons will become **[RPMT 1999]**

(1) Double (2) Half

(3) Four time (4) No change

96. Energy required to remove an electron from aluminium surface is 4.2 eV. If light of wavelength 2000 $Å$ falls on the surface, the velocity of the fastest electron ejected from the surface will be **[AMU 1999]**

(1) $8.4 \times 10^5\, m/sec$ (2) $7.4 \times 10^5\, m/sec$

(3) $6.4 \times 10^5\, m/sec$ (4) $8.4 \times 10^6\, m/sec$

97. Mercury violet light $(\lambda = 4558 Å)$ is falling on a photosensitive material $(\phi = 2.5 eV)$. The speed of the ejected electrons is in ms^{-1}, about

(1) 3×10^5 (2) 2.65×10^5

(3) 4×10^4 (4) 3.65×10^7

98. The work functions of metals A and B are in the ratio 1 : 2. If light of frequencies f and $2f$ are incident on the surfaces of A and B respectively, the ratio of the maximum kinetic energies of photoelectrons emitted is (f is greater than threshold frequency of A, $2f$ is greater than threshold frequency of B)

(1) 1 : 1 (2) 1 : 2

(3) 1 : 3 **[RPET 1999]** (4) 1 : 4

99. Light of frequency ν is incident on a substance of threshold frequency ν_0 ($\nu_0 < \nu$). The energy of the emitted photo-electron will be

(1) $h(\nu - \nu_0)$ (2) h/ν

(3) $he(\nu - \nu_0)$ (4) h/ν_0

100. The stopping potential (V_0)

(1) Depends upon the angle of incident light

(2) Depends upon the intensity of incident light

(3) Depends upon the surface nature of the substance

(4) Is independent of the intensity of the incident light

101. If work function of metal is 3 eV then threshold wavelength will be **[RPMT 2000]**

(1) 4125 $Å$ (2) 4000 $Å$

(3) 4500 $Å$ (4) 5000 $Å$

102. When wavelength of incident photon is decreased then **[RPET 2000]**

(1) Velocity of emitted photo-electron decreases

(2) Velocity of emitted photoelectron increases

(3) Velocity of photoelectron do not charge

(4) Photo electric current increases

103. Quantam nature of light is explained by which of the following phenomenon

(1) Huygen wave theory

(2) Photoelectric effect

(3) Maxwell electromagnetic theory

(4) de-Broglie theory

104. When a metal surface is illuminated by light of wavelengths 400 *nm* and 250 *nm*, the maximum velocities of the photoelectrons ejected are v and $2v$ respectively. The work function of the metal is (*h* = Planck's constant, *c* = velocity of light in air) **[EAMCET (Engg.) 2000]**

(1) $2hc\times10^6\,J$ (2) $1.5hc\times10^6\,J$

(3) $hc\times10^6\,J$ (4) $0.5\,hc\times10^6\,J$

105. 4 *eV* is the energy of the incident photon and the work function in $2eV$. What is the stopping potential **[DCE 2000; AIIMS 2004]**

(1) 2*V* (2) 4*V*

(3) 6*V* (4) $2\sqrt{2}\,V$

106. Light of frequency ν is incident on a certain photoelectric substance with threshold frequency ν_0. The work function for the substance is **[MP PMT 2001]**

(1) $h\nu$ (2) $h\nu_0$

(3) $h(\nu-\nu_0)$ (4) $h(\nu+\nu_0)$

107. If threshold wavelength for sodium is 6800Å then the work function will be **[RPET 2001]**

(1) $1.8eV$ (2) $2.5eV$

(3) $2.1eV$ (4) $1.4eV$

108. If intensity of incident light is increased in PEE then which of the following is true

(1) Maximum *K.E.* of ejected electron will increase

(2) Work function will remain unchanged

(3) Stopping potential will decrease

(4) Maximum *K.E.* of ejected electron will decrease

109. Light of frequency $8\times10^{15}\,Hz$ is incident on a substance of photoelectric work function $6.125eV$. The maximum kinetic energy of the emitted photoelectrons is **[AFMC 2001]**

(1) 17 *eV* (2) 22 *eV*

(3) 27 *eV* (4) 37 *eV*

110. The photoelectric threshold wavelength for potassium (work function being $2eV$) is **[RPET 2000]**

(1) 310 *nm* (2) 620 *nm*

(3) 1200 *nm* (4) 2100 *nm*

111. Photons of energy 6 *eV* are incident on a metal surface whose work function is 4 *eV*. The minimum kinetic energy of the emitted photo-electrons will be **[MP PET 2001]**

(1) 0 *eV* (2) 1 *eV*

(3) 2 *eV* (4) 10 *eV*

112. According to photon theory of light which of the following physical quantities associated with a photon do not/does not change as it collides with an electron in vacuum **[AMU (Engg.) 2001]**

(1) Energy and momentum (2) Speed and momentum

(3) Speed only (4) Energy only

113. The lowest frequency of light that will cause the emission of photoelectrons from the surface of a metal (for which work function is 1.65 *eV*) will be **[JIPMER 2002]**

(1) $4\times10^{10}\,Hz$ (2) $4\times10^{11}\,Hz$

(3) $4\times10^{14}\,Hz$ (4) $4\times10^{-10}\,Hz$

114. Light of two different frequencies whose photons have energies $1eV$ and $2.5eV$ respectively, successively illuminates a metal of work function $0.5eV$. The ratio of maximum kinetic energy of the emitted electron will be **[AIEEE 2002]**

(1) 1 : 5 (2) 1 : 4

(3) 1 : 2 (4) 1 : 1

115. Sodium and copper have work functions 2.3 eV and 4.5 eV respectively. Then the ratio of their threshold wavelengths is nearest to **[RPET 2001]**

(1) 1: 2 (2) 4 : 1

(3) 2 : 1 (4) 1 : 4

116. Photon of 5.5 *eV* energy fall on the surface of the metal emitting photoelectrons of maximum kinetic energy 4.0 *eV*. The stopping voltage required for these electrons are **[Orissa (Engg.) 2002; DPMT 2004]**

(1) 5.5 V (2) 1.5 V

(3) 9.5 V (4) 4.0 V

117. A caesium photocell, with a steady potential difference of $60V$ across, is illuminated by a bright point source of light 50 *cm* away. When the same light is placed $1m$ away the photoelectrons emitted from the cell **[KCET 2002]**

(1) Are one quarter as numerous

(2) Are half as numerous

(3) Each carry one quarter of their previous momentum

(4) Each carry one quarter of their previous energy

118. A radio transmitter radiates 1 *kW* power at a wavelength 198.6 *metres*. How many photons does it emit per second

[Kerala (Engg.) 2002]

(1) 10^{10} (2) 10^{20}

(3) 10^{30} (4) 10^{40}

119. The number of photons of wavelength 540 *nm* emitted per second by an electric bulb of power $100W$ is (taking $h = 6\times10^{-34}$ $J\text{-}sec$) **[Kerala (Engg.) 2002; Pb. PET 2001]**

(1) 100 (2) 1000

(3) 3×10^{20} (4) 3×10^{18}

120. When radiation is incident on a photoelectron emitter, the stopping potential is found to be 9 volts. If e/m for the electron is $1.8\times10^{11}\ Ckg^{-1}$ the maximum velocity of the ejected electrons is **[Kerala (Engg.) 2002]**

(1) $6\times10^5\ ms^{-1}$ (2) $8\times10^5\ ms^{-1}$

(3) $1.8\times10^6\ ms^{-1}$ (4) $1.8\times10^5\ ms^{-1}$

121. Two identical metal plates show photoelectric effect by a light of wavelength λ_A falls on plate A and λ_B on plate B $(\lambda_A = 2\lambda_B)$. The maximum kinetic energy is **[CPMT 2002]**

(1) $2K_A = K_B$ (2) $K_A < K_B/2$

(3) $K_A = 2K_B$ (4) $K_A = K_B/2$

122. The threshold wavelength for photoelectric effect of a metal is 6500 Å. The work function of the metal is approximately

[MP PMT 2002]

(1) 2 *eV* (2) 1 *eV*

(3) 0.1 *eV* (4) 3 *eV*

123. When ultraviolet rays are incident on metal plate, then photoelectric effect does not occurs. It occurs by the incidence of **[CBSE PMT 2002; DCE 1997; AII**

(1) X-rays (2) Radio wave

(3) Infrared rays (4) Green house effect

124. Light of frequency $4\nu_0$ is incident on the metal of the threshold frequency ν_0. The maximum kinetic energy of the emitted photoelectrons is

(1) $3h\nu_0$ (2) $2h\nu_0$

(3) $\frac{3}{2}h\nu_0$ (4) $\frac{1}{2}h\nu_0$

125. By photoelectric effect, Einstein, proved **[MP PET 2**

(1) $E = h\nu$ (2) $K.E. = \frac{1}{2}mv^2$

(3) $E = mc^2$ (4) $E = \frac{Rhc^2}{n^2}$

126. The work function of sodium is 2.3 *eV*. The threshold wavelength of sodium will be

(1) 2900 Å (2) 2500 Å

(3) 5380 Å (4) 2000 Å

127. Which of the following shown particle nature of light

[AFMC 2003; CBSE PMT 2001]

(1) Refraction (2) Interference

(3) Polarization (4) Photoelectric effect

128. Two identical photo-cathodes receive light of frequencies f_1 and f_2. If the velocities of the photo electrons (of mass m) coming out are respectively v_1 and v_2, then **[AIEEE 2003]**

(1) $v_1 - v_2 = \left[\frac{2h}{m}(f_1 - f_2)\right]^{1/2}$ (2) $v_1^2 - v_2^2 = \frac{2h}{m}(f_1 - f_2)$

(3) $v_1 + v_2 = \left[\frac{2h}{m}(f_1 + f_2)\right]^{1/2}$ (4) $v_1^2 + v_2^2 = \frac{2h}{m}(f_1 + f_2)$

129. Consider the two following statements A and B and identify the correct choice given in the answers;

(1) In photovlotaic cells the photoelectric current produced is not proportional to the, intensity of incident light.

(2) In gas filled photoemissive cells, the velocity of photoelectrons depends on the wavelength of the incident radiation.

(1) Both A and B are true (2) Both A and B are false

(3) A is true but B is false (4) A is false B is true

130. When radiation of wavelength λ is incident on a metallic surface, the stopping potential is 4.8 volts. If the same surface is illuminated with radiation of double the wavelength, then the stopping potential becomes 1.6 *volts*. Then the threshold wavelength for the surface is **[EAMCET (Engg.) 2003]**

(1) 2λ (2) 4λ
(3) 6λ (4) 8λ

131. The frequency and work function of an incident photon are ν and ϕ_0. If ν_0 is the threshold frequency then necessary condition for the emission of photo electron is **[RPET 2003]**

(1) $\nu < \nu_0$ (2) $\nu = \frac{\nu_0}{2}$
(3) $\nu \geq \nu_0$ (4) None of these

132. Light of wavelength 1824 Å, incident on the surface of a metal, produces photo-electrons with maximum energy 5.3 *eV*. When light of wavelength 1216 *Å* is used, the maximum energy of photoelectrons is 8.7 *eV*. The work function of the metal surface is

(1) 3.5 *eV* (2) 13.6 *eV*
(3) 6.8 *eV* (4) 1.5 *eV*

133. If the energy of a photon corresponding to a wavelength of 6000 *Å* is $3.32 \times 10^{-19} J$, the photon energy for a wavelength of 4000 *Å* will be **[DPMT 2004]**

(1) 1.4 *eV* (2) 4.9 *eV*
(3) 3.1 *eV* (4) 1.6 *eV*

134. If the wavelength of light is 4000 *Å*, then the number of waves in 1 *mm* length will be

(1) 25 (2) 0.25
(3) 0.25×10^4 (4) 25×10^4

135. The velocity of photon is proportional to (where ν is frequency) **[Pb. PMT 2004]**

(1) $\frac{\nu^2}{2}$ (2) $\frac{1}{\sqrt{\nu}}$
(3) $\sqrt{\nu}$ (4) ν

136. If the work function of a photometal is 6.825 *eV*. Its threshold wavelength will be $(c = 3 \times 10^8\ m/s)$ **[Pb. PET 2000; BHU 2004]**

(1) 1200 *Å* (2) 1800 *Å*
(3) 2400 *Å* (4) 3600 *Å*

137. A photon of energy 8 *eV* is incident on a metal surface of threshold frequency $1.6 \times 10^{15}\ Hz$, then the maximum kinetic energy of photoelectrons emitted is $(h = 6.6 \times 10^{-34}\ Js)$

(1) 4.8 *eV* (2) 2.4 *eV*
(3) 1.4 *eV* (4) 0.8 *eV*

138. If the energy of the photon is increased by a factor of 4, then its momentum

(1) Does not change
(2) Decreases by a factor of 4
(3) Increases by a factor of 4
(4) Decreases by a factor of 2

139. The ratio of the energy of a photon with $\lambda = 150\ nm$ to that with $\lambda = 300\ nm$ is

(1) 2 (2) 1/4
(3) 4 (4) 1/2

140. Photo-electric effect can be explained by **[DCE 2003]**

(1) Corpusular theory of light (2)
(3) Bohr's theory (4) Quantum theory of light

141. In photoelectric effect, the K.E. of electrons emitted from the metal surface depends upon **[DPMT 2004]**

(1) Intensity of light
(2) Frequency of incident light
(3) Velocity of incident light
(4) Both intensity and velocity of light

142. The photoelectric effect can be understood on the basis of **[Pb. PET 2004]**

(1) The principle of superposition
(2) The electromagnetic theory of light
(3) The special theory of relativity **[J&K CET 2004]**
(4) Line spectrum of the atom

143. If the threshold wavelength for sodium is 5420 *Å*, then the work function of sodium is

(1) 4.58 *eV* (2) 2.28 *eV*
(3) 1.14 *eV* (4) 0.23 *eV*

144. The work function of a metal is

(1) The energy for the electron to enter into the metal
(2) The energy for producing X-ray
(3) The energy for the electron to come out from metal surface
(4) None of these

145. The minimum wavelength of photon is 5000 $\mathring{A}$, its energy will be **[RPMT 2004]**

(1) 2.5 *eV* (2) 50 *V*
(3) 5.48 *eV* (4) 7.48 *eV*

146. Which of one is correct **[DCE 1998]**

(1) $E^2 = p^2c^2$ (2) $E^2 = p^2c$
(3) $E^2 = pc^2$ (4) $E^2 = p^2 / c^2$

147. The work function for metals *A*, *B* and *C* are respectively 1.92 *eV*, 2.0 *eV* and 5 *eV*. According to Einstein's equation, the metals which will emit photo electrons for a radiation of wavelength 4100 $\mathring{A}$ is/are **[CBSE PMT 2005]**

(1) None of these (2) *A* only
(3) *A* and *B* only (4) All the three metals

148. A photosensitive metallic surface has work function $h\nu_0$. If photons of energy $2h\nu_0$ fall on this surface the electrons come out with a maximum velocity of $4\times10^6\ m/s$. When the photon energy is increases to $5h\nu_0$ then maximum velocity of photo electron will be **[CBSE PMT 2005]**

(1) $2\times10^6\ m/s$ (2) $2\times10^7\ m/s$
(3) $8\times10^5\ m/s$ (4) $8\times10^6\ m/s$

149. A photocell is illuminated by a small bright source placed 1 *m* away. When the same source of light is placed $\frac{1}{2}m$ away, the number of electrons emitted by photo cathode would **[CBSE PMT 2001; AIEEE 2005]**

(1) Decrease by a factor of 2 (2) Increase by a factor of 2
(3) Decrease by a factor of 4 (4) Increase by a factor of 4

150. The magnitude of saturation photoelectric current depends upon **[AFMC 2005]**

(1) Frequency (2) Intensity
(3) Work function (4) Stopping potential

153. For photoelectric emission, tungsten requires light of 2300 $\mathring{A}$. If light of 1800 $\mathring{A}$ wavelength is incident then emission **[AFMC 2005]**

(1) Takes place
(2) Don't take place
(3) May or may not take place
(4) Depends on frequency

154. The light rays having photons of energy 1.8 *eV* are falling on a metal surface having a work function 1.2 *eV*. What is the stopping potential to be applied to stop the emitting electrons **[BHU 2005]**

(1) 3 e*V* (2) 1.2 *eV*
(3) 0.6 e*V* (4) 1.4 *eV*

155. The incident photon involved in the photoelectric effect experiment. **[EAMCET 2005]**

(1) Completely disappears
(2) Comes out with an increased frequency
(3) Comes out with a decreased frequency
(4) Comes out without change in frequency

156. A photon of energy 8 *eV* is incident on metal surface of threshold frequency $1.6\times10^{15} Hz$. The maximum kinetic energy of the photoelectrons emitted (in *eV*) (Take $h = 6\times10^{-34} Js$). **[MP. PET 2005]**

(1) 1.6 (2) 6
(3) 2 (4) 1.2

X-Rays

1. An *X*-ray tube is operated at 50 *kV*. The minimum wavelength produced is **[CPMT 1996]**

(1) 0.5 Å (2) 0.75 Å
(3) 0.25 Å (4) 1 Å

2. Which of the following wavelength falls in *X*-ray region **[CPMT 1975; MP PMT 1984]**

(1) 10000 Å (2) 1000 Å
(3) 1 Å (4) 10^{-2} Å

3. A metal block is exposed to beams of *X*-ray of different wavelength. *X*-rays of which wavelength penetrate most **[NCERT 1980; JIPMER 2002]**

(1) 2 Å (2) 4 Å
(3) 6 Å (4) 8 Å

4. *X*-rays and gamma rays are both electromagnetic waves. Which of the following statements is true **[NCERT 1973]**

(1) In general *X*-rays have larger wavelength than of gamma rays
(2) *X*-rays have smaller wavelength than that of gamma rays
(3) Gamma rays have smaller frequency than that of *X*-rays

(4) Wavelength and frequency of *X*-rays are both larger than that of gamma rays

5. In producing *X*-rays a beam of electrons accelerated by a potential difference *V* is made to strike a metal target. For what value of *V*, *X*-rays will have the lowest wavelength of 0.3094 Å **[CPMT 1982; NCERT 1986, 87]**

(1) 10 kV (2) 20 kV
(3) 30 kV (4) 40 kV

6. In radio theraphy, *X*-rays are used to **[CPMT 1972; BHU 2005]**

(1) Detect bone fractures
(2) Treat cancer by controlled exposure
(3) Detect heart diseases
(4) Detect fault in radio receiving circuits

7. Hydrogen atom does not emit X-rays because **[NCERT 1979; CPMT 1980, 90; RPET 1999]**

(1) Its energy levels are too close to each other
(2) Its energy levels are too apart
(3) It is too small in size
(4) It has a single electron

8. X-rays were discovered by **[NCERT 1977; BHU 2005]**

(1) Becquerel (2) Roentgen
(3) Marie Curie (4) Von Laue

9. X-rays are **[CPMT 1975; EAMCET 1995; RPET 2000; SCRA 1994]**

(1) Stream of electrons
(2) Stream of positively charged particles
(3) Electromagnetic radiations of high frequency
(4) Stream of uncharged particles

10. The voltage applied across an X-rays tube is nearly **[CPMT 1983]**

(1) 10 V (2) 100 V
(3) 10000 V (4) 10^6 V

11. The characteristic X-ray radiation is emitted, when **[CPMT 1975, 80, 90; RPET 1999]**

(1) The electrons are accelerated to a fixed energy
(2) The source of electrons emits a monoenergetic beam
(3) The bombarding electrons knock out electrons from the inner shell of the target atoms and one of the outer electrons falls into this vacancy
(4) The valence electrons in the target atoms are removed as a result of the collision

12. Molybdenum is used as a target element for production of *X*-rays because it is **[CPMT 1980; RPET 1999]**

(1) A heavy element and can easily absorb high velocity electrons
(2) A heavy element with a high melting point
(3) An element having high thermal conductivity
(4) Heavy and can easily deflect electrons

13. Mosley's law relates the frequencies of line X-rays with the following characteristics of the target element **[CPMT 1980; NCERT 1985]**

(1) Its density
(2) Its atomic weight
(3) Its atomic number
(4) Interplaner spacing of the atomic planes

14. Compton effect is associated with **[CPMT 1971]**

(1) $\alpha-$rays (2) $\beta-$rays
(3) X-rays (4) Positive rays

15. X-rays are in nature similar to

(1) Beta rays (2) Gamma rays
(3) de-Broglie waves (4) Cathode rays

16. If the cathode–anode potential difference in an X-ray tube be 10^5 V, then the maximum energy of X-ray photon can be

(1) 10^5 J (2) 10^5 MeV
(3) 10^{-1} MeV (4) 10^5 KeV

17. The shortest wavelength of X-rays emitted from an X-ray tube depends on the **[MP PMT 1987; CPMT 1988, 92; IIT 1982]**

(1) Current in the tube
(2) Voltage applied to the tube
(3) Nature of gas in the tube
(4) Atomic number of target material

18. The wavelength of X-rays is of the order of

[CPMT 1983; MP PMT 1987; KCET 1994; JIPMER 1997]

(1) *Centimetre* (2) *Micron* (10^{-6} *m*)

(3) *Angstrom* (10^{-10} *m*) (4) *Metre*

19. X – rays and γ – rays of the same energies may be distinguished by **[CPMT 1985]**

(1) Their velocity (2) Their ionising power

(3) Their intensity (4) Method of production

20. When a beam of accelerated electrons hits a target, a continuous X-ray spectrum is emitted from the target. Which of the following wavelength is absent in the X-ray spectrum, if the X-ray tube is operating at 40,000 *volts*

[MP PMT 1993; NCERT 1984; MNR 1995; RPMT 2002]

(1) 0.25 Å (2) 0.5 Å

(3) 1.5 Å (4) 1.0 Å

21. For continuous X-rays produced wavelength is

(1) Inversely proportional to the energy of the electrons hitting the target

(2) Inversely proportional to the intensity of the electron beam

(3) Proportional to intensity of the electron beam

(4) Proportional to target temperature

22. An X-ray has a wavelength of 0.010 Å. Its momentum is

[AFMC 1980; RPMT 1995; Pb. PMT 2004]

(1) 2.126×10^{-23} *kg-m/sec* (2) 6.626×10^{-22} *kg-m/sec*

(3) 3.456×20^{-25} *kg-m/sec* (4) 3.313×10^{-22} *kg-m/sec*

23. X-rays are not used for radar purpose because

(1) They are not reflected by the target

(2) They are not electromagnetic waves

(3) They are completely absorbed by the air

(4) They sometimes damage the target

24. A direct X-ray photograph of the intestines is not generally taken by the radiologists because **[CPMT 1986, 88]**

(1) Intestines would burst on exposure to X-rays

(2) The X-rays would not pass through the intestines

(3) The X-rays will pass through the intestines without causing a good shadow for any useful diagnosis

(4) A very small exposure of X-rays causes cancer in the intestines

25. The patient is asked to drink $BaSO_4$ for examining the stomach by *X*-rays because *X*-rays are

(1) Reflected by heavy atoms

(2) Refracted by heavy atoms

(3) Less absorbed by heavy atoms

(4) More absorbed by heavy atoms

26. X-rays can be used to study crystal structure, if the wavelength lies in the range

(1) 2 Å to 0.1 Å (2) 10 Å to 5 Å

(3) 50 Å to 10 Å (4) 100 Å to 50 Å

27. When the accelerating voltage applied on the electrons increased beyond a critical value **[CPMT 1975]**

(1) Only the intensity of the various wavelengths is increased

(2) Only the wavelength of characteristic relation is affected

(3) The spectrum of white radiation is unaffected

(4) The intensities of characteristic lines relative to the white spectrum are increased but there is no change in their wavelength

28. The *X*-ray beam coming from an *X*-ray tube will be

[IIT 1985; SCRA 1996; MP PET 1999]

(1) Monochromatic

(2) Having all wavelengths smaller than a certain maximum wavelength

(3) Having all wavelengths larger than a certain minimum wavelength

(4) Having all wavelengths lying between a minimum and a maximum wavelength

29. The continuous X-rays spectrum produced by an X-ray machine at constant voltage has **[DPMT 1999]**

(1) A maximum wavelength (2) A minimum wavelength

(3) A single wavelength (4) A minimum frequency

30. The penetrating power of X-rays increases with the **[MP PMT 1984]**

(1) Increase in its velocity (2) Increase in its frequency

(3) Increase in its intensity (4) Decrease in its velocity

31. If λ_1 and λ_2 are the wavelengths of characteristic X-rays and gamma rays respectively, then the relation between them is **[MP PMT 1987]**

(1) $\lambda_1 = \frac{1}{\lambda_2}$ (2) $\lambda_1 = \lambda_2$

(3) $\lambda_1 > \lambda_2$ (4) $\lambda_1 < \lambda_2$

32. The wavelength λ of the K_α line of characteristic *X*-ray spectra varies with atomic number approximately **[MP PMT 1987]**

(1) $\lambda \propto Z$ (2) $\lambda \propto \sqrt{Z}$

(3) $\lambda \propto \frac{1}{Z^2}$ (4) $\lambda \propto \frac{1}{\sqrt{Z}}$

33. The minimum frequency ν of continuous *X*-rays is related to the applied potential difference *V* as

(1) $\nu \propto \sqrt{V}$ (2) $\nu \propto V$

(3) $\nu \propto V^{3/2}$ (4) $\nu \propto V^2$

34. If *V* be the accelerating voltage, then the maximum frequency of continuous *X*-rays is given by **[NCERT 1971; CPMT 1991; MP PET 2000; RPMT 2001; MP PMT 2002]**

(1) $\frac{eh}{V}$ (2) $\frac{hV}{e}$

(3) $\frac{eV}{h}$ (4) $\frac{h}{eV}$

35. The minimum wavelength of *X*-rays produced by electrons accelerated by a potential difference of *volts* is equal to **[CPMT 1986, 88, 91; RPMT 1997; RPMT 1997, 98; MP PET 1997, 98; MP PMT 1996, 98, 2003; UPSEAT 2005]**

(1) $\frac{eV}{hc}$ (2) $\frac{eh}{cV}$

(3) $\frac{hc}{eV}$ (4) $\frac{cV}{eh}$

36. The potential difference applied to an *X*-ray tube is increased. As a result, in the emitted radiation **[IIT 1988; ISM Dhanbad 1994; AIIMS 1997; MP PMT 1995, 2004]**

(1) The intensity increases

(2) The minimum wavelength increases

(3) The intensity decreases

(4) The minimum wavelength decreases

37. A potential difference of 42,000 *volts* is used in an *X*-ray tube to accelerate electrons. The maximum frequency of the *X*–radiations produced is **[MP PMT 1993]**

(1) 10^{19} *Hz* (2) 10^{18} *Hz*

(3) 10^{16} *Hz* (4) 10^{20} *Hz*

($1\,eV = 1.6\times10^{-19}\,J$ and $h = 6.63\times10^{-34}\,J-\text{sec}$)

38. Which of the following is accompanied by the characteristic *X*-ray emission **[MP PET 1993]**

(1) $\alpha-$particle emission (2) Electron emission

(3) Positron emission (4) *K*–electron capture

39. *X*-rays are known to be electromagnetic radiations. Therefore the *X*-ray photon has **[MP PET 1993]**

(1) Electric charge

(2) Magnetic moment

(3) Both electric charge and magnetic moment

(4) Neither electric charge nor magnetic moment

40. *X*-rays of which of the following wavelengths are hardest

(1) 4 Å (2) 1 Å

(3) 0.1 Å (4) 2 Å

41. *X*-ray beam can be deflected by **[CPMT 2000; BHU 2001; Pb. PMT 2002]**

(1) Magnetic field (2) Electric field

(3) Both (1) and (2) (4) None of these

42. *X*-rays are produced due to **[CPMT 1985; JIPMER 2002]**

(1) Break up of molecules

(2) Changing in atomic energy level

(3) Changing in nuclear energy level

(4) Radioactive disintegration

43. *X*-rays region lies between **[CPMT 1990]**

(1) Short radiowave and visible region

(2) Visible and ultraviolet region

(3) Gamma rays and ultraviolet region

(4) Short radiowave and long radiowave

44. The structure of solid crystals is investigated by using **[CPMT 1992; NCERT 1975; CBSEPMT 1992]**

(1) Cosmic rays (2) *X*-rays
(3) Infrared radiations (4) γ – rays

45. In an *X*-rays tube, the intensity of the emitted *X*-rays beam is increased by **[MNR 1992; RPMT 1996; UPSEAT 2000]**

(1) Increasing the filament current
(2) Decreasing the filament current
(3) Increasing the target potential
(4) Decreasing the target potential

46. The binding energy of the innermost electron in tungsten is 40 *keV*. To produce characteristic *X*-rays using a tungsten target in an *X*-rays tube the potential difference *V* between the cathode and the anti-cathode should be **[IIT 1985]**

(1) V< 40 *kV* (2) V $\le$ 40 *kV*
(3) V > 40 *kV* (4) V >/< 40 *kV*

47. In above question the energy of the characteristic *X*-rays given out is **[IIT 1985]**

(1) Less than 40 *keV* (2) More than 40 *keV*
(3) Equal to 40 *keV* (4) $\ge$ 40 *keV*

48. The wavelength of most energetic *X*-rays emitted when a metal target is bombarded by 40*KeV* electrons, is approximately

($h = 6.62 \times 10^{-34}$ *J-sec*; 1 *eV* = 1.6×10^{-19} *J; c* = $3 \times 10^8\ m/s$)
[MNR 1991; MP PMT 1999; UPSEAT 2000; Pb. PET 2004]

(1) 300 Å (2) 10 Å
(3) 4 Å (4) 0.31 Å

49. *X*-rays which can penetrate through longer distances in substance are called **[EAMCET 1983]**

(1) Soft *X*-rays (2) Continuous *X*-rays
(3) Hard *X*-rays (4) None of the above

50. An *X*-ray machine has an accelerating potential difference of 25,000 volts. By calculation the shortest wavelength will be obtained as

($h = 6.62 \times 10^{-34}$ *J–sec*; e = 1.6×10^{-19} *coulomb*) **[MP PET 1994]**

(1) 0.25 Å (2) 0.50 Å
(3) 1.00 Å (4) 2.50 Å

51. For the production of *X*-rays of wavelength 0.1 Å the minimum potential difference will be **[MP PMT 1994; RPMT 1995]**

(1) 12.4 *kV* (2) 24.8 *kV*
(3) 124 *kV* (4) 248 *kV*

52. Mosley measured the frequency (*f*) of the characteristic *X*-rays from many metals of different atomic number (Z) and represented his results by a relation known as Mosley's law. This law is (a, b are constants) **[MP PMT 1994; RPMT 1996]**

(1) $f = a(Z-b)^2$ (2) $Z = a(f-b)^2$
(3) $f^2 = a(Z-b)$ (4) $f = a(Z-b)^{1/2}$

53. Penetrating power of *X*-rays depends on **[MP PMT 1994]**

(1) Current flowing in the filament
(2) Applied potential difference
(3) Nature of the target
(4) All the above

54. The energy of a photon of characteristic *X*-rays from a Coolidge tube comes from **[MP PET 1995]**

(1) The kinetic energy of the striking electron
(2) The kinetic energy of the free electrons of the target
(3) The kinetic energy of the ions of the target
(4) An electronic transition of the target atom

55. An *X*-ray tube operates on 30 *kV*. What is the minimum wavelength emitted

($h = 6.6 \times 10^{-34}$ *Js*, $e = 1.6 \times 10^{-19}$ *Coulomb*, $c = 3 \times 10^8\ ms^{-1}$)
[MP PMT 1995; DPMT 2001, 03]

(1) 0.133 Å (2) 0.4 Å
(3) 1.2 Å (4) 6.6 Å

56. The wavelength of the most energetic X–ray emitted when a metal target is bombarded by 100 *KeV* electrons is approximately **[MP PET 1996]**

(1) 12 Å (2) 4
(3) 0.31 Å (4) 0.124 Å

57. An electron beam in an *X*-ray tube is accelerated through a potential difference of 50000 *volts*. These are then made to fall on a tungsten target. The shortest wavelength of the *X*-ray emitted by the tube is **[MP PET 1997]**

(1) 2.5 Å (2) 0.25 *nm*
(3) 0.25 *cm* (4) 0.025 *nm*

58. For harder *X*-rays **[MP PET 1997]**

(1) The wavelength is higher

(2) The intensity is higher

(3) The frequency is higher

(4) The photon energy is lower

59. When cathode rays strike a metal target of high melting point with very high velocity, then **[MP PMT 1997; AIIMS 1999]**

(1) *X*-rays are produced

(2) Ealpha-rays are produced

(3) TV waves are produced

(4) Ultrasonic waves are produced

60. Penetrating power of *X*-rays can be increased by **[MP PMT 1997, 2000]**

(1) Increasing the potential difference between anode and cathode

(2) Decreasing the potential difference between anode and cathode

(3) Increasing the cathode filament current

(4) Decreasing the cathode filament current

61. K_α characteristic *X*-ray refers to the transition **[MP PMT 1999]**

(1) $n=2$ to $n=1$ (2) $n=3$ to $n=2$

(3) $n=3$ to $n=1$ (4) $n=4$ to $n=2$

62. *X*-rays are produced in *X*-ray tube operating at a given accelerating voltage. The wavelength of the continuous *X*-rays has values from **[IIT 1998; BVP 2003]**

(1) 0 to ∞

(2) $\lambda_{\min}$ to ∞, where $\lambda_{\min} > 0$

(3) 0 to $\lambda_{\max}$ where $\lambda_{\max} < \infty$

(4) $\lambda_{\min}$ to $\lambda_{\max}$, where $0 < \lambda_{\min} < \lambda_{\max} < \infty$

63. The wavelength of *X*-rays is **[EAMCET (Med.) 1995]**

(1) 2000 Å (2) 2 Å

(3) 1 *mm* (4) 1 *cm*

64. The ratio of the energy of an *X*-ray photon of wavelength 1 Å to that of visible light of wavelength 5000 Å is **[EAMCET (Med.) 1995]**

(1) 1: 5000 (2) 5000 : 1

(3) 1 :25 $\times 10^6$ (4) 25 $\times 10^6$

65. According to Mosley's law, the frequency of a spectral line in *X*-ray spectrum varies as **[EAMCET (Med.) 1995; Pb. PMT 1999]**

(1) Atomic number of the element

(2) Square of the atomic number of the element

(3) Square root of the atomic number of the element

(4) Fourth power of the atomic number of the element

66. For the structural analysis of crystals, *X*-rays are used because **[IIT 1992; JIPMER 2000]**

(1) *X*-rays have wavelength of the order of interatomic spacing

(2) *X*-rays are highly penetrating radiations

(3) Wavelength of *X*-rays is of the order of nuclear size

(4) *X*-rays are coherent radiations

67. The essential distinction between *X*-rays and $\gamma-$ rays is that **[BHU 1994; RPMT 1991; JIPMER 2001, 02]**

(1) $\gamma-$ rays have smaller wavelength than *X*-rays

(2) $\gamma-$ rays emanate from nucleus while *X*-rays emanate from outer part of the atom

(3) $\gamma-$ rays have greater ionizing power than *X*-rays

(4) $\gamma-$ rays are more penetrating than *X*-rays

68. The minimum wavelength of the *X*-rays produced by electrons accelerated through a potential difference of *V volts* is directly proportional to **[CBSE PMT 1996]**

(1) $\sqrt{V}$ (2) V^2

(3) $1/\sqrt{V}$ (4) $1/V$

69. What determines the hardness of the *X*-rays obtained from the Coolige tube **[RPMT 1996]**

(1) Current in the filament

(2) Pressure of air in the tube

(3) Nature of target

(4) Potential difference between cathode and target

70. The most penetrating radiation out of the following is **[CBSE PMT 1997]**

(1) *X*-rays (2) β-rays

(3) α – particles (4) γ – rays

71. On increasing the number of electrons striking the anode of an X-ray tube, which one of the following parameters of the resulting X-rays would increase **[SCRA 1998; DPMT 2000]**

(1) Penetration power (2) Frequency

(3) Wavelength (4) Intensity

72. What kV potential is to be applied on X-ray tube so that minimum wavelength of emitted X-rays may be 1Å ($h = 6.625 \times 10^{-34}$ J-sec) **[UPSEAT 1999]**

(1) $12.42 kV$ (2) $12.84 kV$

(3) $11.98 kV$ (4) $10.78 kV$

73. X-rays cannot be deflected by means of an ordinary grating due to **[Pb. PMT 1999; MH CET 2000; BCECE 2004]**

(1) Large wavelength (2) High speed

(3) Short wavelength (4) None of these

74. Consider the following two statements A and B and identify the correct choice in the given answer

A: The characteristic X-ray spectrum depends on the nature of the material of the target.

B: The short wavelength limit of continuous X-ray spectrum varies inversely with the potential difference applied to the X-rays tube **[EAMCET (Med.) 2000]**

(1) A is true and B is false (2) A is false and B is true

(3) Both A and B are true (4) Both A and B are false

75. The energy of an X- ray photon of wavelength 1.65 Å is

($h = 6.6 \times 10^{-34}$ J-sec, $c = 3 \times 10^8$ ms^{-1}, $1 eV = 1.6 \times 10^{-19}$ J)

[EAMCET (Engg.) 2000]

(1) 3.5 keV (2) 5.5 keV

(3) 7.5 keV (4) 9.5 keV

76. If λ =10Å, then it corresponds to **[DCE 2000]**

(1) Infra-red (2) Microwave

(3) Ultra-violet (4) X-rays

77. Bragg's law for X-rays is **[UPSEAT 2001]**

(1) $d \sin \theta = 2n\lambda$ (2) $2d \sin\theta = n\lambda$

(3) $n \sin\theta = 2\lambda d$ (4) None of these

78. The X-rays produced in a coolidge tube of potential difference $40V$ have minimum wavelength of

[MH CET (Med.) 2001]

(1) $3.09 \times 10^{-8} m$ (2) $5.09 \times 10^{8} m$

(3) $4.09 \times 10^{-8} m$ (4) $1.09 \times 10^{8} m$

79. For the production of X-rays, the target should be made of **[BHU 2000; CPMT 2001]**

(1) Steel (2) Copper

(3) Aluminum (4) Tungsten

80. Intensity of X-rays depends upon the number of **[SCRA 1998; DPMT 2000; AFMC 2001]**

(1) Electrons (2) Protons

(3) Neutrons (4) Positrons

81. In an X-ray tube electrons bombarding the target produce X-rays of minimum wavelength 1 Å. What must be the energy of bombarding electrons **[KCET 2001]**

(1) 13375 eV (2) 12375 eV

(3) 14375 eV (4) 15375 eV

82. If energy of K-shell electron is – 40000 eV and If 60000 V potential is applied at coolidge tube then which of the following X-ray will get form

(1) Continuous

(2) White X-rays

(3) Continuous and all series of characteristic

(4) None of these

83. For production of characteristic K_β X-rays, the electron transition is **[MP PET 2001]**

(1) $n = 2$ to $n = 1$ (2) $n = 3$ to $n = 2$

(3) $n = 3$ to $n = 1$ (4) $n = 4$ to $n = 2$

84. Penetrating power of X-rays does not depend on **[MP PET 2001]**

(1) Wavelength (2) Energy

(3) Potential difference (4) Current in the filament

85. The potential difference applied to an X-ray tube is $5kV$ and the current through it is 3.2 mA. Then the number of electrons striking the target per second is **[IIT-JEE (Screening) 2002]**

(1) 2×10^{16} (2) 5×10^{16}

(3) 1×10^{17} (4) 4×10^{15}

86. For the production of characteristic K_γ, X-ray, the electron transition is

(1) $n = 2$ to $n = 1$ (2) $n = 3$ to $n = 2$

(3) $n = 3$ to $n = 1$ (4) $n = 4$ to $n = 1$

87. When X rays pass through a strong uniform magnetic field, Then they **[MP PET 2002; RPMT 2002, 03]**

(1) Do not get deflected at all
(2) Get deflected in the direction of the field
(3) Get deflected in the direction opposite to the field
(4) Get deflected in the direction perpendicular to the field

88. If the potential difference applied across *X*-ray tube is *V* volts, then approximately minimum wavelength of the emitted *X*-rays will be

RPMT 1995; CBSE PMT 1996]

(1) $\frac{1227}{\sqrt{V}}\mathring{A}$ (2) $\frac{1240}{V}\mathring{A}$
(3) $\frac{2400}{V}\mathring{A}$ (4) $\frac{12400}{V}\mathring{A}$

89. What is the difference between soft and hard *X*-rays

[MP PMT 2002; AIIMS 2002]

(1) Velocity (2) Intensity
(3) Frequency (4) Polarization

90. *X*-ray will travel minimum distance in **[MP PET 2003]**
(1) Air (2) Iron
(3) Wood (4) Water

91. The minimum wavelength of *X*-ray emitted by *X*-rays tube is 0.4125 Å. The accelerating voltage is

[BHU 2003; CPMT 2004; MP PMT 2005]

(1) 30 *kV* (2) 50 *kV*
(3) 80 *kV* (4) 60 *kV*

92. Characteristic *X*-rays are produced due to **[AIIMS 2003]**
(1) Transfer of momentum in collision of electrons with target atoms
(2) Transition of electrons from higher to lower electronic orbits in an atom
(3) Heating of the target
(4) Transfer of energy in collision of electrons with atoms in the target

93. *X*-rays when incident on a metal **[BCECE 2003; RPMT 2003]**
(1) Exert a force on it (2) Transfer energy to it
(3) Transfer pressure to it (4) All of the above

94. The minimum wavelength of *X*-rays produced in a coolidge tube operated at potential difference of 40 *kV* is

[BCECE 2003; RPET 2002, 03]

(1) 0.31 $\mathring{A}$ (2) 3.1 $\mathring{A}$
(3) 31 $\mathring{A}$ (4) 311 $\mathring{A}$

95. The potential difference between the cathode and the target in a Collidge tube is 100 *kV*. The minimum wavelength of the X-rays emitted by the tube is **[Pb. PMT 2004]**
(1) 0.66 $\mathring{A}$ (2) 9.38 $\mathring{A}$
(3) 0.246 $\mathring{A}$ (4) 0.123 $\mathring{A}$

96. X-rays are produced by accelerating electrons by voltage *V* and let they strike a metal of atomic number *Z*. The highest frequency of X-rays produced is proportional to **[MP PET 2003]**

[UPSEAT 2004]

(1) *V* (2) *Z*
(3) $(Z-1)$ (4) $(Z-1)^2$

97. If the operating potential of an X-ray tube is 50 *kV*, the velocity of X-rays coming out of it is
(1) $4\times10^4\ m/s$ (2) $3\times10^8\ m/s$
(3) $10^8\ m/s$ (4) $3\ m/s$

98. If the voltage of X-ray tube is doubled, the intensity of X-rays will become
(1) Half (2) Unchanged
(3) Double (4) Four times

99. If the minimum wavelength obtained in an X-ray tube is $2.5\times10^{-10}m$, the operating potential of the tube will be

[RPMT 2003]

(1) 2 *kV* (2) 3 *kV*
(3) 4 *kV* (4) 5 *kV*

100. The wavelength of X-rays decreases, when **[RPMT 2002]**
(1) Temperature of target is increased
(2) Intensity of electron beam is increased
(3) K.E. of electrons striking the target is increased
(4) K.E. of electrons striking the target is decreased

101. X-rays are produced in laboratory by **[RPMT 1998]**
(1) Radiation
(2) Decomposition of the atom
(3) Bombardment of high energy electron on heavy metal
(4) None of these

102. In vacuum an electron of energy 10 *keV* hits tungsten target, then emitted radiation will be
(1) Cathode rays (2) X-rays
(3) Infrared rays (4) Visible spectrum

103. X-rays of $\lambda = 1\,\mathring{A}$ have frequency
(1) $3\times10^8\ Hz$ (2) $3\times10^{18}\ Hz$

(3) $3\times10^{10}\ Hz$ (4) $3\times10^{15}\ Hz$

104. Solid targets of different elements are bombarded by highly energetic electron beams. The frequency (f) of the characteristic X-rays emitted from different targets varies with atomic number Z as **[AIIMS 2005]**

(1) $f\propto\sqrt{Z}$ (2) $f\propto Z^2$

(3) $f\propto Z$ (4) $f\propto Z^{3/2}$

105. Compton effect shows that **[DPMT 1995]**

(1) X-rays are waves

(2) X-rays have high energy

(3) X-rays can penetrate matter

(4) Photons have momentum

106. An X-ray tube with a copper target emits *Cu* K_α line of wavelength 1.50 $\mathring{A}$. What should be the minimum voltage through which electrons are to be accelerated to produce this wavelength of X rays

$(h=6.63\times10^{-34}\ J\text{-sec}, c=3\times10^8\ m/s)$ **[Orissa JEE 1996]**

(1) 8280 V (2) 828 V

(3) 82800 V (4) 8.28 V

107. In X-ray spectrum wavelength λ of line K_α depends on atomic number Z as **[RPMT 1995; DCE 2002]**

(1) $\lambda\propto Z^2$ (2) $\lambda\propto(Z-1)^2$

(3) $\lambda\propto\frac{1}{(Z-1)}$ (4) $\lambda\propto\frac{1}{(Z-1)^2}$

108. Absorption of X-ray is maximum in which of the following different sheets **[RPMT 1995]**

(1) Copper (2) Gold

(3) Beryllium (4) Lead

109. The wavelength of K_α line in copper is 1.54 $\mathring{A}$. The ionisation energy of K electron in copper in *Joule* is

[EAMCET 1984]

(1) 11.2×10^{-27} (2) 12.9×10^{-16}

(3) 1.7×10^{-15} (4) 10×10^{-16}

110. The wavelength of K_α line for an element of atomic number 43 is λ. Then the wavelength of K_α line for an element of atomic number 29 is

(1) $\frac{43}{29}\lambda$ (2) $\frac{42}{28}\lambda$

(3) $\frac{9}{4}\lambda$ (4) $\frac{4}{9}\lambda$

111. In X-ray experiment K_α, K_β denotes **[DCE 2005]**

(1) Characteristic

(2) Continuous wavelength

(3) α, β-emissions respectively

(4) None of these