RK VISION ACADEMY

PHYSICS

XI – GRAVITATION

SECTION A

1. **The weight of a body at the centre of the earth is**
   (1) Zero
   (2) Infinite
   (3) Same as on the surface of earth
   (4) None of the above

2. **If the distance between two masses is doubled, the gravitational attraction between them**
   (1) Is doubled
   (2) Becomes four times
   (3) Is reduced to half
   (4) Is reduced to a quarter

3. **The gravitational force between two stones of mass 1 kg each separated by a distance of 1 metre in vacuum is**
   (1) Zero
   (2) 6.675×10^{-5} newton
   (3) 6.675×10^{-11} newton
   (4) 6.675×10^{-8} newton

4. **The gravitational force between two point masses m_1 and m_2 at separation r is given by $F = k (m_1 m_2)/r^2$. The constant k**
   (1) Depends on system of units only
   (2) Depends on medium between masses only
   (3) Depends on both (1) and (2)
   (4) Is independent of both (1) and (2)

5. **The distance of the centres of moon and earth is D. The mass of earth is 81 times the mass of the moon. At what distance from the centre of the earth, the gravitational force will be zero**
   (1) D/2
   (2) 2D/3
   (3) 4D/3
   (4) 9D/10

6. **The centripetal force acting on a satellite orbiting round the earth and the gravitational force of earth acting on the satellite both equal F. The net force on the satellite is**
   (1) Zero
   (2) F
   (3) F√2
   (4) 2 F

7. **Mass M is divided into two parts xM and (1-x)M. For a given separation, the value of x for which the gravitational attraction between the two pieces becomes maximum is**
   (1) 1/2
   (2) 3/5
   (3) 1
   (4) 2

8. **The force of gravitation is**
   (1) Repulsive
   (2) Electrostatic
   (3) Conservative
   (4) Non-conservative

9. **If the change in the value of 'g' at a height h above the surface of the earth is the same as at a depth x below it, then (both x and h being much smaller than the radius of the earth)**
   (1) x=h
   (2) x=2h
   (3) x=h/2
   (4) $x=h^2$

10. **The time period of a simple pendulum on a freely moving artificial satellite is**
    (1) Zero
    (2) 2 sec
    (3) 3 sec
    (4) Infinite

11. **Two planets have the same average**

density but their radii are R_1 and $_2$. If acceleration due to gravity on these plane be g_1 and g_2 respectively, then

(1) $g_1/g_2 = R_1/R_2$

(2) $g_1/g_2 = R_2/R_1$

(3) $g_1/g_2 = (R_1^2)/(R_2^2)$

(4) $g_1/g_2 = (R_1^3)/(R_2^3)$

12. A body weighs 700 gm wt on the surface of the earth. How much will it weigh on the surface of a planet whose mass is 1/7 and radius is half that of the earth

(1) 200 gm wt

(2) 400 gm wt

(3) 50 gm wt

(4) 300 gm wt

13. A spherical planet far out in space has a mass M_0 and diameter D_0. A particle of mass m falling freely near the surface of this planet will experience an acceleration due to gravity which is equal to

(1) GM_0/D_0^2

(2) $4mGM_0/D_0^2$

(3) $4GM_0/D_0^2$

(4) GmM_0/D_0^2

14. Force of gravity is least at

(1) The equator

(2) The poles

(3) A point in between equator and any pole

(4) None of these

15. The radius of the earth is 6400 km and $g=10m/s^2$. In order that a body of 5 kg weighs zero at the equator, the angular speed of the earth is

(1) 1/80 radian/sec

(2) 1/400 radian/sec

(3) 1/800 radian/sec

(4) 1/1600 radian/sec

16. If R is the radius of the earth and g the acceleration due to gravity on the earth's surface, the mean density of the earth is

(1) $4\pi G/3gR$

(2) $3\pi R/4gG$

(3) $3g/4\pi RG$

(4) $\pi RG/12G$

17. The mass of the earth is 81 times that of the moon and the radius of the earth is 3.5 times that of the moon. The ratio of the acceleration due to gravity at the surface of the moon to that at the surface of the earth is

(1) 0.15

(2) 0.04

(3) 1

(4) 6

18. Which of the following statements is true

(1) g is less at the earth's surface than at a height above it or a depth below it

(2) g is same at all places on the surface of the earth

(3) g has its maximum value at the equator

(4) g is greater at the poles than at the equator

19. The diameters of two planets are in the ratio 4 : 1 and their mean densities in the ratio 1 : 2. The acceleration due to gravity on the planets will be in ratio

(1) 1 : 2

(2) 2 : 1

(3) 2 : 1

(4) 4 : 1

20. If the angular speed of the earth is doubled, the value of acceleration due to gravity (g) at the north pole

(1) Doubles

(2) Becomes half

(3) Remains same

(4) Becomes zero

21. Radius of earth is around 6000 km. The weight of body at height of 6000 km from earth surface becomes

(1) Half

(2) One-fourth

(3) One third

(4) No change

22. Let g be the acceleration due to gravity at earth's surface and K be the rotational kinetic energy of the earth. Suppose the earth's radius decreases by 2% keeping all other quantities same, then
(1) g decreases by 2% and K decreases by 4%
(2) g decreases by 4% and K increases by 2%
(3) g increases by 4% and K increases by 4%
(4) g decreases by 4% and K increases by 4%

23. If mass of a body is M on the earth surface, then the mass of the same body on the moon surface is
(1) M/6
(2) Zero
(3) M
(4) None of these

24. Mass of moon is 7.34×10^{22}kg. If the acceleration due to gravity on the moon is 1.4m/s^2, the radius of the moon is ($G=6.667\times10^{-11}$ Nm^2/kg^2)
(1) 0.56×10^4 m
(2) 1.87×10^6 m
(3) 1.92×10^6 m
(4) 1.01×10^8 m

25. If radius of earth is R then the height 'h' at which value of 'g' becomes one-fourth is
(1) R/4
(2) 3R/4
(3) R
(4) R/8

26. At what height from the ground will the value of 'g' be the same as that in 10 km deep mine below the surface of earth
(1) 20 km
(2) 10 km
(3) 15 km
(4) 5 km

27. If both the mass and the radius of the earth decrease by 1%, the value of the acceleration due to gravity will
(a) Decrease by 1%
(b) Increase by 1%
(c) Increase by 2%
(d) Remain unchanged

28. The masses of two planets are in the ratio 1 : 2. Their radii are in the ratio 1 : 2. The acceleration due to gravity on the planets are in the ratio
(a) 1 : 2
(b) 2 : 1
(c) 3 : 5
(d) 5 : 3

29. A rocket is launched with velocity 10 km/s. If radius of earth is R, then maximum height attained by it will be
(a) 2R
(b) 3R
(c) 4R
(d) 5R

30. Escape velocity of a body of 1 kg mass on a planet is 100 m/sec. Gravitational Potential energy of the body at the Planet is
(1) – 5000 J
(2) – 1000 J
(3) – 2400 J
(4) 5000 J

31. v_e and v_p denotes the escape velocity from the earth and another planet having twice the radius and the same mean density as the earth. Then
(1) $v_e = v_p$
(2) $v_e = v_p/2$
(3) $v_e = 2v_p$
(4) $v_e = v_p/4$

32. The escape velocity for a rocket from earth is 11.2 km/sec. Its value on a planet

where acceleration due to gravity is double that on the earth and diameter of the planet is twice that of earth will be in km/sec

(1) 11.2

(2) 5.6

(3) 22.4

(4) 53.6

33. Gas escapes from the surface of a planet because it acquires an escape velocity. The escape velocity will depend on which of the following factors

I. Mass of the planet

II. Mass of the particle escaping

III. Temperature of the planet

IV. Radius of the planet

Select the correct answer from the codes given below

(1) I and II

(2) II and IV

(3) I and IV

(4) I, III and IV

34. The escape velocity of a body on the surface of the earth is 11.2 km/s. If the earth's mass increases to twice its present value and the radius of the earth becomes half, the escape velocity would become

(1) 5.6 km/s

(2) 11.2 km/s (remain unchanged)

(3) 22.4 km/s

(4) 44.8 km/s

35. Select the correct statement from the following

(1) The orbital velocity of a satellite increases with the radius of the orbit

(2)Escape velocity of a particle from the surface of the earth depends on the speed with which it is fired

(3) The time period of a satellite does not depend on the radius of the orbit

(4) The orbital velocity is inversely proportional to the square root of the radius of the orbit

SECTION B

36. The period of a satellite in a circular orbit around a planet is independent of

(1) The mass of the planet

(2) The radius of the planet

(3) The mass of the satellite

(4) All the three parameters (1), (2) and (3)

37. An astronaut orbiting the earth in a circular orbit 120 km above the surface of earth, gently drops a spoon out of space-ship. The spoon will

(1) Fall vertically down to the earth

(2) Move towards the moon

(3) Will move along with space-ship

(4) Will move in an irregular way then fall down to earth

38. A satellite is moving around the earth with speed v in a circular orbit of radius r. If the orbit radius is decreased by 1%, its speed will

(1) Increase by 1%

(2) Increase by 0.5%

(3) Decrease by 1%

(4) Decrease by 0.5%

39. Two identical satellites are at R and 7R away from earth surface, the wrong statement is (R = Radius of earth)

(1) Ratio of total energy will be 4

(2) Ratio of kinetic energies will be 4

(3) Ratio of potential energies will be 4

(4) Ratio of total energy will be 4 but ratio of potential and kinetic energies will be 2

40. A satellite is to revolve round the earth in a circle of radius 8000 km. The speed at which this satellite be projected into an orbit, will be

(1) 3km/s

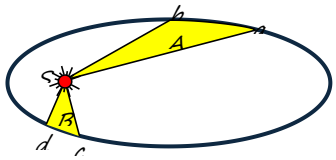
(2) 16km/s

(3) 7.15km/s

(4) 8km/s

41. The figure shows the motion of a planet around the sun in an elliptical orbit with

sun at the focus. The shaded areas A and B are also shown in the figure which can be assumed to be equal. If t_1 and t_2 represent the time for the planet to move from a to b and d to c respectively, then

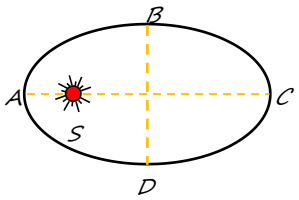


(1) $t_1 < t_2$
(2) $t_1 > t_2$
(3) $t_1 = t_2$
(4) $t_1 \leq t_2$

42. According to Kepler, the period of revolution of a planet (T) and its mean distance from the sun (r) are related by the equation
(1) $T^3 r^3 = \text{constant}$
(2) $T^2 r^{-3} = \text{constant}$
(3) $T r^3 = \text{constant}$
(4) $T^2 r = \text{constant}$

43. Planetary system in the solar system describes
(1) Conservation of energy
(2) Conservation of linear momentum
(3) Conservation of angular momentum
(4) None of these

44. A planet is revolving around the sun as shown in elliptical path



The correct option is
(1) The time taken in travelling DAB is less than that for BCD
(2) The time taken in travelling DAB is greater than that for BCD
(3) The time taken in travelling CDA is less than that for ABC
(4) The time taken in travelling CDA is greater than that for ABC

45. In an elliptical orbit under gravitational force, in general
(1) Tangential velocity is constant
(2) Angular velocity is constant
(3) Radial velocity is constant
(4) Areal velocity is constant

46. The eccentricity of earth's orbit is 0.0167. The ratio of its maximum speed in its orbit to its minimum speed is
(1) 2.507
(2) 1.033
(3) 8.324
(4) 1.000

47. A body of mass 60 g experiences a gravitational force of 3.0 N, when placed at a particular point. The magnitude of the gravitational field intensity at that point is:
(1) 50 N/kg
(2) 20 N/kg
(3) 180 N/kg
(4) 0.05 N/kg

48. Assuming the earth to be a sphere of uniform density, its acceleration due to gravity acting on a body
(1) increases with increasing depth
(2) is independent of the mass of the earth
(3) is independent of the mass of the body
(4) increases with increasing altitude

49. Orbital velocity of an artificial satellite depends upon
I. Mass of the earth
II. Mass of the satellite
III. Radius of the earth
(1) I, II
(2) I, III
(3) II, III
(4) I, II, III

50. The minimum energy required to launch a satellite of mass m from the surface of earth of mass M and radius R in a

circular orbit at an altitude of 2R from the surface of the earth is

(1) 5GmM / 6R

(2) 2GmM / 3R

(3) GmM / 2R

(4) GmM / 3R

RK VISION ACADEMY

PHYSICS

XI – GRAVITATION

SECTION A

1. 1
2. 4
3. 3
4. 1
5. 4
6. 2
7. 1
8. 3
9. 2
10. 4
11. 1
12. 2
13. 3
14. 1
15. 3
16. 3
17. 1
18. 4
19. 3
20. 3
21. 2
22. 3
23. 3
24. 2
25. 3
26. 1
27. 2
28. 2
29. 3
30. 1
31. 2
32. 3
33. 3
34. 3
35. 4

SECTION B

36. 3
37. 3
38. 2
39. 4
40. 3
41. 3
42. 2
43. 3
44. 1
45. 4
46. 2
47. 1
48. 3
49. 2
50. 1