NEET ANSWER KEY & SOLUTIONS

SUBJECT :- PHYSICS
CLASS :- 11th **PAPER CODE :- CWT-9**
CHAPTER :- GRAVITAION

ANSWER KEY

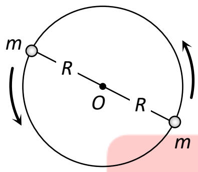
1.	(C)	**2.**	(A)	**3.**	(A)	**4.**	(A)	**5.**	(B)	**6.**	(B)	**7.**	(C)
8.	(D)	**9.**	(B)	**10.**	(D)	**11.**	(A)	**12.**	(B)	**13.**	(A)	**14.**	(B)
15.	(B)	**16.**	(A)	**17.**	(C)	**18.**	(B)	**19.**	(D)	**20.**	(C)	**21.**	(C)
22.	(D)	**23.**	(C)	**24.**	(B)	**25.**	(B)	**26.**	(D)	**27.**	(B)	**28.**	(B)
29.	(A)	**30.**	(A)	**31.**	(A)	**32.**	(D)	**33.**	(B)	**34.**	(A)	**35.**	(B)
36.	(D)	**37.**	(C)	**38.**	(C)	**39.**	(C)	**40.**	(D)	**41.**	(C)	**42.**	(B)
43.	(C)	**44.**	(C)	**45.**	(B)	**46.**	(C)	**47.**	(A)	**48.**	(D)	**49.**	(A)
50.	(C)												

SOLUTIONS

SECTION-A

1. (C)

Sol. Centripetal force provided by the gravitational force of attraction between two particles



i.e. $\frac{mv^2}{R} = \frac{Gm \times m}{(2R)^2}$

$\Rightarrow v = \frac{1}{2}\sqrt{\frac{Gm}{R}}$

2. (A)

Sol. k represents gravitational constant which depends only on the system of units.

3. (A)

Sol. Gravitational force does not depend on the medium.

4. (A)

Sol. $g = \frac{4}{3}\pi\rho GR$. If ρ = constant then $\frac{g_1}{g_2} = \frac{R_1}{R_2}$

5. (B)

Sol. Time of decent $t = \sqrt{\frac{2h}{g}}$. In vacuum no other force works except gravity so time period will be exactly equal.

6. (B)

Sol. We know that $g = \frac{GM}{R^2}$

On the planet $g_p = \frac{GM/7}{R^2/4} = \frac{4g}{7} = \frac{4}{7}g$

Hence weight on the planet

$= 700 \times \frac{4}{7} = 400 \ \ gm\,wt$

7. (C)

Sol. For the condition of weightlessness at equator

$\omega = \sqrt{\frac{g}{R}} \ \therefore \ \omega = \sqrt{\frac{1}{640 \times 10^3}} = \frac{1}{800}\, rad/s$

8. (D)

Sol. $g = \frac{4}{3}\pi\rho GR \ \therefore \ \frac{g_1}{g_2} = \frac{R_1\rho_1}{R_2\rho_2}$

9. (B)

Sol. $g' = g\left(\frac{R}{R+h}\right)^2 \Rightarrow$ when $h = R$ then $g' = \frac{g}{4}$

So the weight of the body at this height will become one-fourth.

10. (D)

Sol. The correct option is D 100 N

$g' = g\left(1 - \frac{d}{R}\right)$

$\Rightarrow g' = g\left(1 - \frac{R/2}{R}\right)$

$\Rightarrow mg' = mg\left(\frac{1}{2}\right)$

$\therefore W' = \frac{200}{2} = 100\,N$

11. (A)

Sol. $g' = g\left(\frac{R}{R+h}\right)^2 = g\left(\frac{R}{R + \frac{R}{2}}\right)^2 = \frac{4}{9}g$

$\therefore \ W' = \frac{4}{9} \times W = \frac{4}{9} \times 72 = 32\,N$

12. (B)

Sol. $g' = g\left(1 - \frac{d}{R}\right) \Rightarrow \frac{g}{n} = g\left(1 - \frac{d}{R}\right) \Rightarrow d = \left(\frac{n-1}{n}\right)R$

13. (A)

Sol. $g' = g\left(\frac{R}{R+h}\right)^2 = \frac{g}{\left(1+\frac{h}{R}\right)^2}$

14. (B)

Sol. Using $g = \frac{GM}{R^2}$ we get $g_m = g/5$

15. (B)

Sol. $\frac{g'}{g} = \frac{M'}{M} \times \frac{R^2}{R'^2} = \frac{1}{2} \times \frac{4}{1} = \frac{2}{1}$

16. (A)

Sol. Gravitational potential at mid point

$V = \frac{-GM_1}{d/2} + \frac{-GM_2}{d/2}$

Now, $PE = m \times V = \frac{-2Gm}{d}(M_1 + M_2)$

[m = mass of particle]

So, for projecting particle from mid point to infinity

$KE = |PE|$

$\Rightarrow \frac{1}{2}mv^2 = \frac{2Gm}{d}(M_1 + M_2)$

$\Rightarrow v = 2\sqrt{\frac{G(M_1+M_2)}{d}}$

17. (C)

Sol. $\frac{G \times 100}{x^2} = \frac{G \times 10000}{(1-x)^2}$

$\Rightarrow \frac{10}{x} = \frac{100}{1-x} \Rightarrow x = \frac{1}{11} m$

18. (B)

Sol. $v_e = \sqrt{\frac{2GM}{R}} \Rightarrow v_e \propto \sqrt{M}$ if $R = \text{constant}$

If the mass of the planet becomes four times then escape velocity will become 2 times.

19. (D)

Sol. Change in potential energy in displacing a body from r_1 to r_2 is given by

$\Delta U = GMm\left[\frac{1}{r_1} - \frac{1}{r_2}\right] = GMm\left(\frac{1}{2R} - \frac{1}{3R}\right) = \frac{GMm}{6R}$

20. (C)

Sol. $\frac{v_p}{v_e} = \sqrt{\frac{M_p}{M_e} \times \frac{R_p}{R_e}} = \sqrt{8 \times \frac{1}{2}} = 2$

$\therefore v_p = 2 \times v_e = 22.4 km/s$

21. (C)

Sol. On earth $v_e = \sqrt{\frac{2GM}{R}} = 11.2\ km/s$

On moon $v_m = \sqrt{\frac{2GM \times 4}{81 \times R}} = \frac{2}{9}\sqrt{\frac{2GM}{R}}$

$= \frac{2}{9} \times 11.2 = 2.5\ km/s$

22. (D)

Sol. Escape velocity does not depends upon the angle of projection.

23. (C)

Sol. $v = \sqrt{2gR} \Rightarrow \frac{v_p}{v_e} = \sqrt{\frac{g_p}{g_e} \times \frac{R_p}{R_e}} = \sqrt{1 \times 4} = 2$

$\Rightarrow v_p = 2 \times v_e = 2 \times 11.2 = 22.4\ km/s$

24. (B)

Sol. For a moving satellite kinetic energy $= \frac{GMm}{2r}$

Potential energy $= \frac{-GMm}{r}$

$\therefore \frac{\text{Kinetic energy}}{\text{Potential energy}} = \frac{1}{2}$

25. (B)

Sol. $v_e = \sqrt{2gR}$ and $v_0 = \sqrt{gR}$ $\therefore$ $\sqrt{2}v_0 = v_e$

26. (D)

Sol. Escape velocity from surface of earth $v_e = \sqrt{2gR}$

$= \sqrt{2 \times 9.8 \times 6.4 \times 10^6} = 11.2 \times 10^3\ m/s$

27. (B)

Sol. $v = \sqrt{\frac{GM}{R}} \Rightarrow \frac{v_A}{v_B} = \sqrt{\frac{R_B}{R_A}} = \sqrt{\frac{R}{4R}} = \frac{1}{2}$

$\therefore \frac{v_A}{v_B} = \frac{3V}{v_B} = \frac{1}{2} \therefore v_B = 6V$

28. (B)

Sol. $v = \sqrt{\frac{GM}{r}}$

29. (A)

Sol. Escape velocity is same for all angles of projection.

30. (A)

Sol. w = mg {g = 0 for artificially satelite}

So $\boxed{w = 0}$ for astronaut.

31. (A)

Sol. $v = \sqrt{\frac{GM}{r}} = \sqrt{\frac{6.67\times10^{-11}\times6\times10^{24}}{384000\times10^{3}}} = 1\,km/s$

32. (D)

Sol. $v_0 = \sqrt{\frac{GM}{r}}$

33. (B)

Sol. Gravitational force provides the required centripetal force for orbiting the satellite

$\frac{mv^2}{R} = \frac{K}{R}$ because $\left(F \propto \frac{1}{R}\right)$

$\therefore\ v \propto R^{\circ}$

34. (A)

Sol. Potential energy =

$\frac{-GMm}{r} = \frac{GMm}{R_e+h} = \frac{-GMm}{2R_e}$

$= -\frac{gR_e^2m}{2R_e} = -\frac{1}{2}mgR_e = -0.5mgR_e$

35. (B)

Sol. $T^2 \propto r^3$

It is depends on distance.

SECTION-B

36. (D)

Sol. $T_2 = T_1\left(\frac{R_2}{R_1}\right)^{3/2} = T_1(4)^{3/2} = 8T_1 = 40hr$

37. (C)

Sol. $\frac{T_1}{T_2} = \left(\frac{R_1}{R_2}\right)^{3/2} = \left(\frac{10^{13}}{10^{12}}\right)^{3/2} = (1000)^{1/2}$

$= 10\sqrt{10}$

38. (C)

Sol. Areal velocity of the planet remains constant. If the areas *A* and *B* are equal then $t_1 = t_2$.

39. (C)

Sol. $\frac{T_1}{T_2} = \left(\frac{R_1}{R_2}\right)^{3/2} = \left(\frac{R}{4R}\right)^{3/2} \Rightarrow T_2 = 8T_1$

40. (D)

Sol. Mass of the satellite does not effects on time period

$\frac{T_A}{T_B} = \left(\frac{r_1}{r_2}\right)^{3/2} = \left(\frac{r}{2r}\right)^{3/2} = \left(\frac{1}{8}\right)^{1/2} = \frac{1}{2\sqrt{2}}$

41. (C)

Sol. $T^2 \propto r^3$. If *r* made half then *T* will become $\frac{T}{8}$.

42. (B)

Sol. $T_2 = T_1\left(\frac{R_2}{R_1}\right)^{3/2} = 1\times(2)^{3/2} = 2.8\ year$

43. (C)

44. (C)

Sol. $g = \frac{GM}{R^2}$. If mass remains constant then

$g \propto \frac{1}{R^2}$

% increase in *g* = 2(% decrease in *R*) =2 × 1% = 2%.

45. (B)

Sol. $\Delta U = \frac{mgh}{1+\frac{h}{R}} = \frac{1}{2}mgR\ (\because\ h = R)$

46. (C)

Sol. Kepler's law $T^2 \propto R^3$

47. (A)

Sol. If a pendulum is suspended in a lift and lift is moving downward with some acceleration *a*, then time period of pendulum is given by, $T = 2\pi\sqrt{\frac{l}{g-a}}$.

In the case of free fall, $a = g$ then $T = \infty$

i.e., the time period of pendulum becomes infinite.

48. (D)

Sol. $v_e = \sqrt{\frac{2GM}{R}} = \sqrt{\frac{2GM}{R}\times\frac{4}{3}\pi R^3\rho}$

$= \sqrt{\frac{8\pi G\rho}{3}R^2}$

$\Rightarrow v_e \propto R$

$\Rightarrow \frac{v_e}{\upsilon} = \frac{4R}{R} \Rightarrow v_e = 4v$

49. (A)

Sol. Gravitational force $F_G = E_g \times m$, where

E_g=Gravitational field at the given point

$E_g = \frac{F_G}{m} = \frac{3}{60\times10^{-3}} = 50\,N\,kg^{-1}$

50. (C)

Sol. Kepler's law = $T^2 \propto R^3$

g = $\frac{GM}{R^2}$

g = $g_0\left(1+\frac{h}{R}\right)^{-2}$

$v_e = \sqrt{\frac{2GM}{R}}$