

18. The value of the acceleration due to gravity is g_1 at a height $h = \frac{R}{2}$ ($R =$ radius of the earth) from the surface of the earth. It is again equal to g_1 at a depth d below the surface of the earth.

The ratio $\left(\frac{d}{R}\right)$ equals :

- (1) $\frac{7}{9}$ (2) $\frac{4}{9}$ (3) $\frac{1}{3}$ (4) $\frac{5}{9}$

Official Ans. by NTA (4)

19. An electron is constrained to move along the y -axis with a speed of $0.1c$ (c is the speed of light) in the presence of electromagnetic wave, whose electric field is

$$\vec{E} = 30\hat{j} \sin(1.5 \times 10^7 t - 5 \times 10^{-2} x) \text{ V/m}.$$

The maximum magnetic force experienced by the electron will be :

(given $c = 3 \times 10^8 \text{ ms}^{-1}$ and electron charge $= 1.6 \times 10^{-19} \text{ C}$)

- (1) $1.6 \times 10^{-19} \text{ N}$ (2) $4.8 \times 10^{-19} \text{ N}$
 (3) $3.2 \times 10^{-18} \text{ N}$ (4) $2.4 \times 10^{-18} \text{ N}$

Official Ans. by NTA (2)

20. Two capacitors of capacitances C and $2C$ are charged to potential differences V and $2V$, respectively. These are then connected in parallel in such a manner that the positive terminal of one is connected to the negative terminal of the other. The final energy of this configuration is:

- (1) $\frac{9}{2} CV^2$ (2) $\frac{25}{6} CV^2$
 (3) zero (4) $\frac{3}{2} CV^2$

Official Ans. by NTA (4)

21. Two concentric circular coils, C_1 and C_2 , are placed in the XY plane. C_1 has 500 turns, and a radius of 1 cm. C_2 has 200 turns and radius of 20 cm. C_2 carries a time dependent current $I(t) = (5t^2 - 2t + 3) \text{ A}$ where t is in s. The emf induced in C_1 (in mV), at the instant $t = 1 \text{ s}$ is $\frac{4}{x}$. The value of x is ____.

Official Ans. by NTA (5.00)

22. A force $\vec{F} = (\hat{i} + 2\hat{j} + 3\hat{k}) \text{ N}$ acts at a point $(4\hat{i} + 3\hat{j} - \hat{k}) \text{ m}$. Then the magnitude of torque about the point $(\hat{i} + 2\hat{j} + \hat{k}) \text{ m}$ will be $\sqrt{x} \text{ N-m}$. The value of x is ____.

Official Ans. by NTA (195)

23. A beam of electrons of energy E scatters from a target having atomic spacing of 1 \AA . The first maximum intensity occurs at $\theta = 60^\circ$. Then E (in eV) is ____.

(Planck constant $h = 6.64 \times 10^{-34} \text{ Js}$, $1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$, electron mass $m = 9.1 \times 10^{-31} \text{ kg}$)

Official Ans. by NTA (50.00)

24. A particle of mass $200 \text{ MeV}/c^2$ collides with a hydrogen atom at rest. Soon after the collision the particle comes to rest, and the atom recoils and goes to its first excited state. The initial

kinetic energy of the particle (in eV) is $\frac{N}{4}$. The

value of N is :

(Given the mass of the hydrogen atom to be $1 \text{ GeV}/c^2$) _____.

Official Ans. by NTA (51.00)

25. A compound microscope consists of an objective lens of focal length 1 cm and an eye piece of focal length 5 cm with a separation of 10 cm .

The distance between an object and the objective lens, at which the strain on the eye

is minimum is $\frac{n}{40} \text{ cm}$. The value of n is ____.

Official Ans. by NTA (50.00)