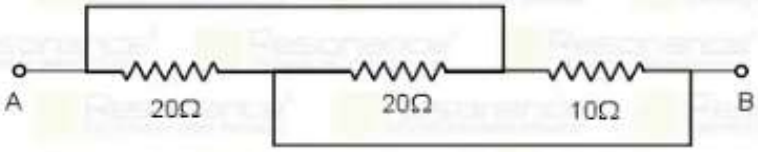
1.



Find equivalent resistance between points A and B

(1) 5 k Ω (2) 10 k Ω (3) 50 k Ω (4) 40 k Ω

Ans. **(1)**

Sol. Resistance are in parallel equipment = $\frac{1}{R} = \frac{1}{20} + \frac{1}{20} + \frac{1}{10} = R = 5\ k\Omega$

2. Ratio of wavelength of H_α & H_β in Balmer series

(1) $\frac{18}{20}$ (2) $\frac{27}{20}$ (3) $\frac{3}{4}$ (4) $\frac{4}{3}$

Ans. **(2)**

Sol. For H_α $n = 3 \rightarrow n = 2$

$$\frac{1}{\lambda_\alpha} = R\left[\frac{1}{4} - \frac{1}{9}\right] = \frac{5R}{36}$$

for H_β $n = 4 \rightarrow n = 2$

$$\frac{1}{\lambda_\beta} = R\left[\frac{1}{4} - \frac{1}{16}\right] = \frac{12R}{64} = \frac{3R}{16}$$

$$\frac{\lambda_\beta}{\lambda_\alpha} = \frac{3R}{16} \times \frac{36}{5R} = \frac{3}{5} \times \frac{9}{4} = \frac{27}{20}$$

3. At what temperature KE of oxygen molecule will be double that of kinetic energy at 27°C :

(1) 927°C (2) 627°C (3) 327°C (4) 2127°C

Ans. (3)

Sol. K.E. $\propto$ T

$$\frac{K.E_{T_2}}{K.E_{T_1}} = 2 = \frac{T_2}{300}$$

$T_2 = 600k = 327°C$

Statement-2 : Area under the acceleration-time curve gives change in velocity.

(1) Statement-1 and statement-2 both are correct

(2) Statement-1 and statement-2 both are incorrect

(3) Statement-1 is correct but statement-2 is incorrect

(4) Statement-1 is incorrect and statement-2 is correct

Ans. **(4)**

5. For a small height-h, the ratio of acceleration due to gravity at a height h & at the surface of a planet of radius R is

(1) $1-\frac{2h}{R}$ (2) $1-\frac{h}{R}$ (3) $1+\frac{2h}{R}$ (4) $1+\frac{h}{R}$

Ans. (1)

Sol. $g_h = g(1 - 2h/R)$

6. For a series L-C-R Circuit at resonance find the quality factor if C = 6.25 pF, R=100 Ω L = 1 H

(1) 4000 (2) 2000 (3) 1000 (4) 6000

Ans. (1)

Sol. $\frac{X_L}{R} = \frac{1}{\sqrt{LC}} \times \frac{L}{R} = \frac{1}{R}\sqrt{\frac{L}{C}} = \frac{1}{100}\sqrt{\frac{1}{6.25\times10^{-12}}} = 4000$

7. A body of mass 5kg having momentum of 10 kg m/s. Then a force of 2N acts for 5 sec in the direction of initial momentum. Find change in kinetic energy of body:

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

Ans. **(1)**

Sol. New momentum = 20 kg-m/s

$K_i = \frac{10^2}{2\times5} = 10, K_f = \frac{20^2}{2\times5} = 40$

Change in K.E. = 30J

8. Length of a string is 90 cm & its fundamental frequency is 120Hz find length of another string under same tension and same linear mass density if it's fundamental frequency is 180 Hz

(1) 40 cm (2) 60 cm (3) 50 cm (4) 80 cm

Ans. **(2)**

Sol. $f\ell = f'\ell'$

$120 \times 90 = 180 \times \ell'$

$\ell' = 60$ cm

9. Electric potential due to a point charge 5×10^{-9}C at a point is 50V. Find distance of the point from charge

(1) 0.9 cm (2) 3 cm (3) 90 m (4) 90 cm

Ans. (4)

Sol. $v = \frac{kq}{r}$

$\Rightarrow 50 = \frac{9\times10^{9}\times5\times10^{-9}}{r}$

$\Rightarrow r = \frac{9}{10} = 0.9m$

$r = 0.9\times100 = 90\ cm$

10. After 3 days, amount of radioactive substance undecayed is 1/8 of its initial amount. After 5 days amount undecayed is 8×10^{-3}kg. Find its initial amount

(1) 32 gm (2) 256 gm (3) 64 gm (4) 40 gm

Ans. (2)

Sol. $T_{\frac{1}{2}} = 1$ days

$m_0 \times \frac{1}{32} = 8\times10^{-3}$

$m_0 = 32\times8\times10^{-3} = 256gm$

11. High energy electrons, bombarded on a metal target then which of the following rays emitted will be

(1) visible rays (2) X–Rays (3) Microwaves (4) Infrared

Ans. (2)

12. A bullet of mass 0.1 kg moving at 400 m/s strikes a wooden block of mass 3.9 kg & get embedded in it. If wooden box is on rough surface and system stops after 20 m displacement. Find coefficient of friction.

(1) 0.30 (2) 0.50 (3) 0.60 (4) 0.25

Ans. (4)

Sol. By momentum conservation

$0.1 \times 400 = (3.9+0.1)V$

$V = 10$ m/s

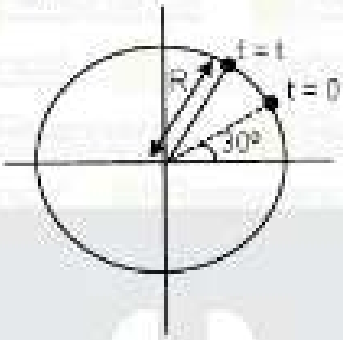
$v^2 = u^2 + 2as$

$0 = 10^2 - 2as$

$a = \frac{100}{40} = \frac{100}{400} = 2.5$

$\mu g = 2.5 \Rightarrow \mu = 0.25$

13. Write the equation of projection on x-axis at time 't' for a particle moving with constant angular velocity ω on a circular path of radius R. Time period of particle on circular path is 6 sec.



(1) $x = R\sin\left[\frac{\pi}{3}t + 30^\circ\right]$ (2) $x = R\cos\left[\frac{\pi}{6}t + 30^\circ\right]$

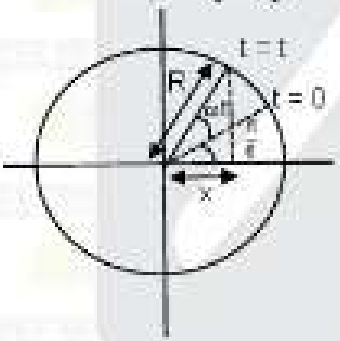
(3) $x = R\sin\left[\frac{\pi}{6}t + 30^\circ\right]$ (4) $x = R\cos\left[\frac{\pi}{3}t + 30^\circ\right]$

Ans. **(4)**

Sol. $\cos\left[\omega t + \frac{\pi}{6}\right] = \frac{x}{R}$

$x = R\cos\left[\omega t + \frac{\pi}{6}\right]$

where $\omega = \frac{2\pi}{T} = \frac{2\pi}{6} = \frac{\pi}{3}$



14. Equation of trajectory of a projectile is $y = x - x^2/20$ find its maximum height of projectile will be

(1) 20 m (2) 5 m (3) 10 m (4) 2.5 m

Ans. **(2)**

Sol. $dy/dx = 1 - x/10 = 0$

$x = 10$

$y_{max} = 10 - 100/20 = 5$ m

15. **Statement-1** : Electromagnet are made of soft iron

Statement-2 : Soft iron has height magnetic permeability (μ_r) and low retentively

(1) Statement-1 and statement-2 both are correct

(2) Statement-1 and statement-2 both are incorrect

(3) Statement-1 is correct but statement-2 is incorrect

(4) Statement-1 is incorrect and statement-2 is correct

Ans. **(1)**

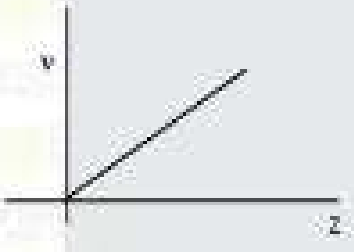
16. Which of the following numbers have same significant figure

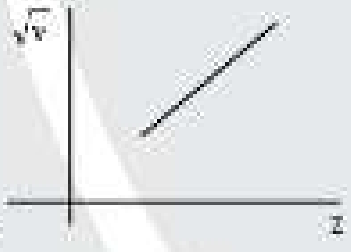
(a) 0.00235 (b) 0.3200 (c) 15.0 (d) 352

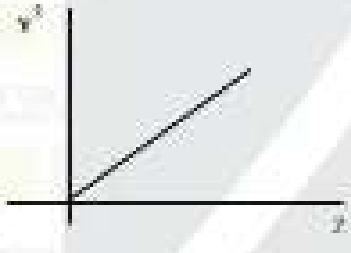
(1) Only (a) and (c) (2) (a), (c) and (d) (3) Only (b) and (c) (4) All a, b, c and d

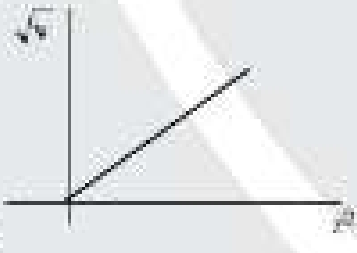
Ans. **(2)**

17. Correct graph for Moseley's law will be :

(1) 

(2) 

(3) 

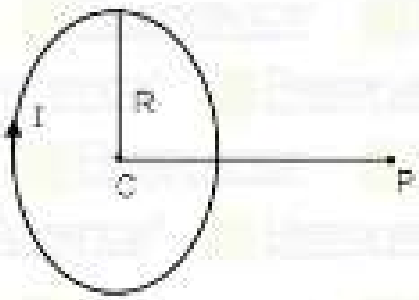
(4) 

Ans. **(2)**

Sol. Moseley's law

$$\sqrt{v} = a(z - b)$$

18.



Ratio of magnetic field at C and P, $\frac{B_C}{B_P} = \sqrt{x}$, then find the value of x.

(1) 4 (2) 2 (3) 8 (4) 1

Ans. **(3)**

Sol. $\frac{B_C}{B_P} = \frac{\mu_0 I}{2R} \times \frac{2(R^2+R^2)^{1/2}}{\mu_0 I R^2}$

$\frac{(2R^2)^{3/2}}{R^3} = \frac{2\sqrt{2}}{1} = \frac{\sqrt{8}}{1}$

19. Number density of free electrons is 8×10^{28} per m^3 and cross section area of wire is 2×10^{-6} m^2 and current in wire is 3.2 A. If drift speed is $n \times 10^{-4}$ m/s then n will be

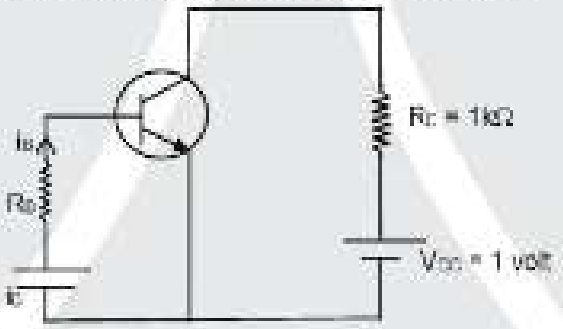
(1) 2.5×10^{-4} A (2) 1.25×10^{-4} A (3) 2.5×10^{-6} A (4) 1.25×10^{-5} A

Ans. **(2)**

Sol. $i = neAv_d$

$v_d = \frac{i}{neA} = \frac{3.2}{8\times10^{28}\times1.6\times10^{-19}\times2\times10^{-6}} = \frac{1}{8\times10^{3}} = \frac{5}{4}\times10^{-4} = 1.25\times10^{-4}$ A

20. An n-p-n transistor is arranged in common emitter mode, for which $\beta = 100$, $V_{cc} = 1$ volt. Find the minimum required current i_B, so that the transistor reaches to the active region



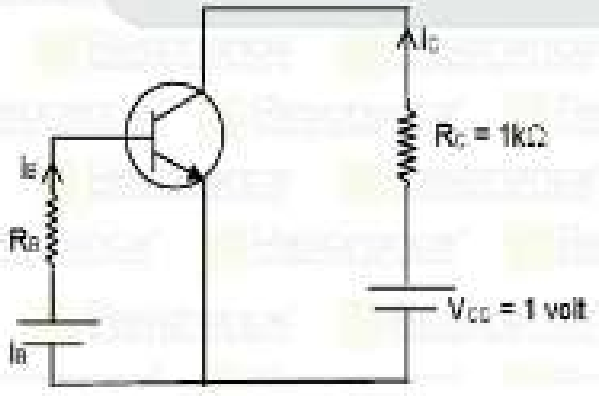
(1) 1 μA (2) 10 μA (3) 20 μA (4) 30 μA

Ans. **(2)**

Sol. For saturation region $V_{CE} \to 0$

$V_{CE} = V_{CC} - i_C R_C = 1 - (i_C)(1000) = 0 \Rightarrow i_C = 1$mA

$i_B = \frac{i_C}{\beta} = \frac{1\text{mA}}{100} = 10\mu\text{A}$



21. Dimension of some physical quantities are given

(a)	Stress	1	$ML^{-1}T^{-1}$
(b)	torque	2	$ML^{-1}T^{-2}$
(c)	coefficient of viscosity	3	$ML^{2}T^{-2}$
(d)	pressure gradient	4	$ML^{-2}T^{-2}$

(1) (a) 2 (b) 3 (c) 4 (d) 1 (2) (a) 2 (b) 1 (c) 4 (d) 4

(3) (a) 2 (b) 3 (c) 1 (d) 4 (4) (a) 3 (b) 2 (c) 1 (d) 4

Ans. (3)

22. Power of wave emitted from a linear antenna is given as :

(1) λ^2/r (2) $(\lambda/r)^2$ (3) (r^2/λ) (4) $(r/\lambda)^2$

Ans. (4)

23 If λ used in Y.D.S.E. is 400 nm then fringe width is 2mm. If wavelength used is 600nm, find the new fringe width

(1) 1 mm (2) 4 mm (3) 2mm (4) 3mm

Ans. **(4)**

Sol. $\beta \propto \lambda$

$$\frac{\beta_1}{\beta_2} = \frac{\lambda_1}{\lambda_2}$$

$\beta_2 = 3mm$

24. Orbital angular momentum of a satellite is L. If radius of orbit is increased by 8 times the original radius. Find new angular momentum of satellite :

(1) aL (2) 3L (3) 8L (4) 2L

Ans. **(2)**

Sol. $L = mvr = m\sqrt{\frac{GM}{r}}r = m\sqrt{GM}\sqrt{r}$

so $L \propto \sqrt{r}$ $\frac{L_f}{L_i} = \sqrt{\frac{9r}{r}}$ $\frac{L_f}{L_i} = \sqrt{\frac{9r}{r}} \Rightarrow L_f = 3L_i = 3LR$