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## JEE MAINS 2020 2nd SEPT SHIFT 1

### Physics

Question 1. There are two magnets P and T; P is used as permanent magnet while T is used in transformers; Then correct options are -

- (1) P has high retentivity and low coercivity
- (2) P has low retentivity and low coercivity
- (3) T has low coercivity and low retentivity
- (4) T has high coercivity and high retentivity

Ans. (3)

Sol. Permanent magnets are made of materials with high retentivity and high coercivity. Transformer cores are made of materials with low retentivity and low coercivity.

Question 2. In a hypothetical spherical galaxy the mass

density is given by  $\rho = \frac{K}{r}$ . If a planet is rotating at  $R_0$

distance from centre of galaxy. Find relation between time period T and radius  $R_0$ .

$$(1) T = \sqrt{\frac{R_0}{KG}}$$

$$(2) T = \sqrt{\frac{2R_0}{KG}}$$

$$(3) T = \sqrt{\frac{2\pi R_0}{KG}}$$

$$(4) T = \sqrt{\frac{\pi R_0}{KG}}$$

Ans. (3)

Sol.  $M = \int \rho dV$

$$M = \int_0^{R_0} \frac{k}{r} 4\pi r^2 dr$$

$$M = 4\pi k \int_0^{R_0} r dr$$

$$M = \frac{4\pi k R_0^2}{2} = 2\pi k R_0^2$$



$$F_c = \frac{GMm}{R_0^2} = m\omega_0^2 R_0$$

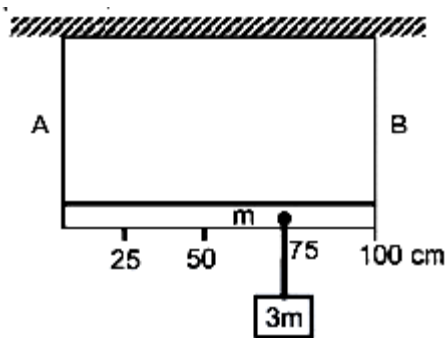
$$\Rightarrow \frac{G \frac{4\pi k R_0^2}{2}}{R_0^2} = \omega_0^2 R_0$$

$$\Rightarrow \omega_0 = \sqrt{\frac{2\pi KG}{R_0}}$$

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$$\therefore T = \frac{2\pi}{\omega_0} = \frac{2\pi\sqrt{R_0}}{\sqrt{2\pi KG}} = \sqrt{\frac{2\pi R_0}{KG}}$$

Question 3. A block of mass  $3m$  is suspended by a meter scale rod of mass  $m$  as shown in figure. If the tension in string A is equal to  $kmg$  in equilibrium, then value of  $k$  will be:



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

Ans. (1)

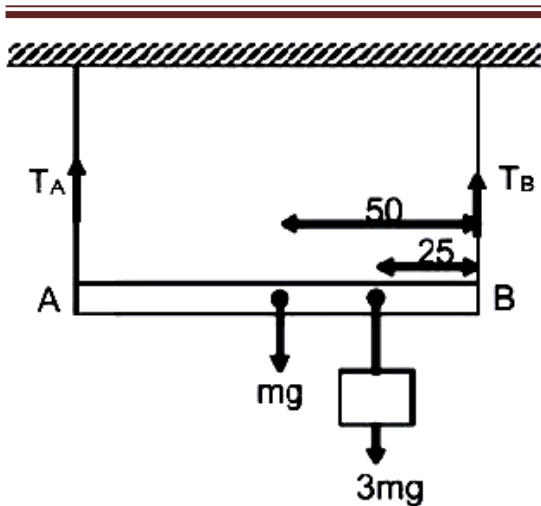
Sol.  $\tau_{\text{net}}$  about B is zero at equilibrium

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$$T_A \times 100 - mg \times 50 - 3mg \times 25 = 0$$

$$T_A \times 100 - mg \times 50 - 3mg \times 25 = 0$$

$$T_A \times 100 = 125mg$$

$$T_A = \frac{5}{4}mg$$

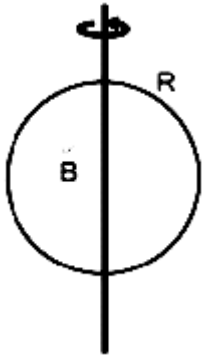
$$T_A = kmg \text{ (given)}$$

$$\frac{5}{4} = k \text{ Ans.}$$

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Question 4. A coil of radius  $R$  rotating about a diametrical axis with angular velocity  $\omega$  in a uniform magnetic field  $B$ . Find the value of maximum voltage developed.

$$R = 10 \text{ cm}, B = 5 \times 10^{-5} \text{ T}$$



For half rotation it takes a time of 0.2 sec.

- (1)  $3 \times 10^{-5} \text{ V}$
- (2)  $5 \times 10^{-6} \text{ V}$
- (3)  $2.5 \times 10^{-5} \text{ V}$
- (4)  $5 \times 10^{-5} \text{ V}$

Ans. (3)

Sol. Flux as a function of time  $\phi = \vec{B} \cdot \vec{A} = AB \cos(\omega t)$

Emf induced,

$$e = \frac{-d\phi}{dt} = AB\omega \sin(\omega t)$$

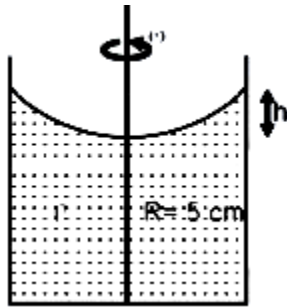
Max. Value of Emf =  $AB\omega = \pi R^2 B\omega$

$$= 3.14 \times 0.1 \times 0.1 \times 5 \times 10^{-5} \times \frac{\pi}{0.2}$$

$$= 2.46 \times 10^{-5} \text{ V}$$

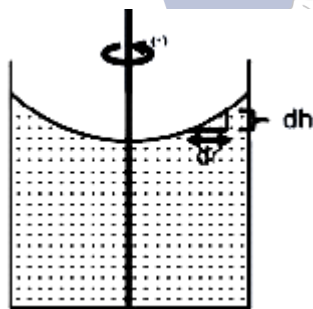
$$= 2.5 \times 10^{-5} \text{ V}$$

Question 5. A cylindrical container rotates with constant angular speed  $\omega = 10$  radian/s. Radius of cylinder is  $R = 5$  cm. Find height  $h$  as shown at which water is in equilibrium with respect to container



- (1) 2.25 cm
- (2) 1.25 cm
- (3) 2.50 cm
- (4) 1.00 cm

Ans. (2)






Sol.

$$\rho dr \omega^2 r = \rho g dh$$

$$\omega^2 \int_0^R r dr = g \int_0^h dh$$

$$\frac{\omega^2 R^2}{2} = gh$$

  
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$$h = \frac{\omega^2 R^2}{2g}$$

Question 6. If force, velocity and area is considered as a fundamental physical quantities then find the dimensional formula of Young modulus of elasticity:

(1)  $Y = F^1 V^0 A^{-1}$

(2)  $Y = F^{-1} V^1 A^{-1/2}$

(3)  $Y = F^1 V^{-1} A^{1/2}$

(4)  $Y = F^1 V^1 A^{1/2}$

Ans. (1)

Sol.  $Y \propto F^a V^b A^c$

$$Y = \left( \frac{F}{A} \right)$$

$$\frac{MLT^{-2}}{L^2} \propto (MLT^{-2})^a (LT^{-1})^b (L^2)^c$$

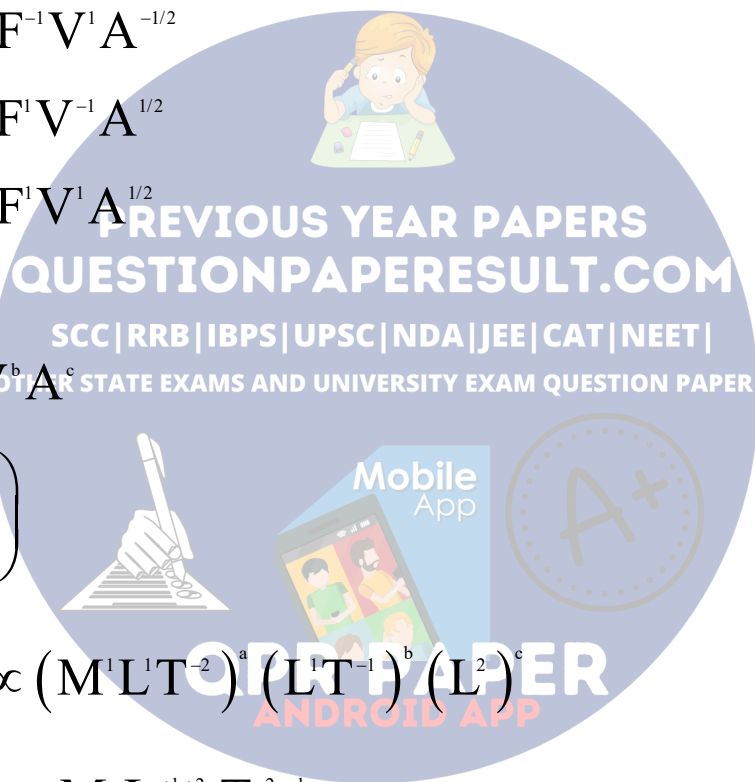
$$M^1 L^{-1} T^{-2} \propto M^a L^{a+b+2c} T^{-2a-b}$$

$$a + b + 2c = -1$$

$$-2a + b = -2$$

$$a = 1, b = 0, c = -1$$

$$Y = F^1 V^0 A^{-1}$$



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Question 7. Correct order of resistivity will be for Al, Hg, Cu, W

(1)  $\rho_{\text{Cu}} < \rho_{\text{Al}} < \rho_{\text{W}} < \rho_{\text{Hg}}$

(2)  $\rho_{\text{W}} < \rho_{\text{Hg}} < \rho_{\text{Al}} < \rho_{\text{Cu}}$

(3)  $\rho_{\text{Cu}} < \rho_{\text{Hg}} < \rho_{\text{Al}} < \rho_{\text{W}}$

(4)  $\rho_{\text{Hg}} < \rho_{\text{W}} < \rho_{\text{Al}} < \rho_{\text{Cu}}$

Ans. (1)

Sol.  $\rho_{\text{Hg}} = 98 \times 10^{-8}$

$\rho_{\text{Al}} = 2.65 \times 10^{-8}$

$\rho_{\text{Cu}} = 1.724 \times 10^{-8}$

$\rho_{\text{W}} = 5.65 \times 10^{-8}$

Question 8. Two train A and B moving with speed of 36 km/hr and 72 km/hr respectively in opposite direction. A man moving in train A with speed of 1.8 km/hr opposite to direction of train. Find velocity of man as seen from train B (in m/s).

(1) 32 m/s

(2) 29.5 m/s

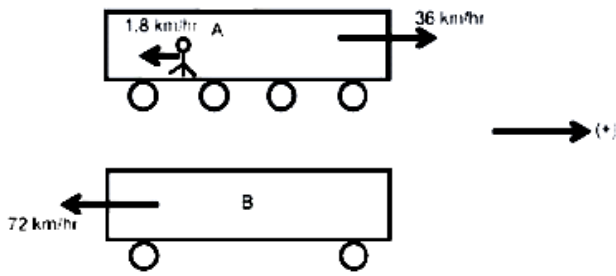
(3) 32.5 m/s

(4) 28 m/s

Ans. (2)



Sol.



$$V_A = 36 \text{ km/hr} = 10 \text{ m/s}$$

$$V_B = -72 \text{ km/hr} = -20 \text{ m/s}$$

$$V_{MA} = -1.8 \text{ km/hr} = -0.5 \text{ m/s}$$

$$V_{\text{man, B}} = V_{\text{man, A}} + V_{A, B}$$

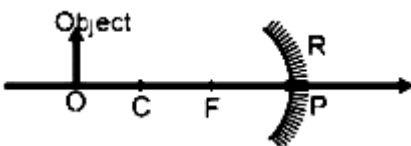
$$= V_{\text{man, A}} + V_A - V_B$$

$$= -0.5 + 10 - (-20)$$

$$= -0.5 + 30$$

$$= 29.5 \text{ m/s}$$

Question 9. Discuss the properties of image formed by shown mirror of a real object place beyond centre of curvature.

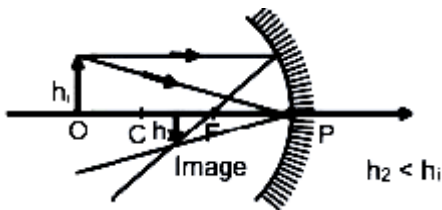


- (1) Real, magnified and inverted
- (2) Virtual, diminished and inverted
- (3) Real, diminished and inverted

(4) Virtual, magnified and inverted

Ans. (3)

Sol.



Question 10. 3 mole of O<sub>2</sub> mixed with 5 mole Argon at temperature T. Find total internal energy of system.

(1) 12RT

(2) 19RT

(3) 15RT

(4) 10RT

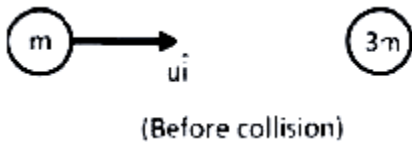
Ans. (3)

Sol.  $U = \frac{f_1}{2} n_1 RT + \frac{f_2}{2} n_2 RT$

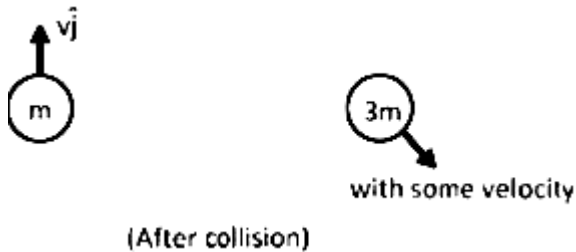
$$= \frac{5}{2}(3)(R) + \frac{3}{2}(5)RT$$

$$= 15 RT$$

Question 11. A body of mass m moving with velocity  $u\hat{i}$ , collides elastically with a stationary body of mass 3m as shown.



If velocity of  $m$  after collision is  $v \hat{j}$  as shown



The value of  $v$  is

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

(2)  $\frac{u}{\sqrt{3}}$

(3)  $\frac{u}{2}$

(4)  $\frac{u}{3}$

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Ans. (1)

Sol. From momentum conservation

$$m u \hat{i} + 0 = m v \hat{j} + 3m \vec{v}'$$

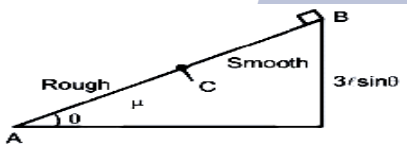
$$\vec{v}' = \frac{u}{3} \hat{i} - \frac{v}{3} \hat{j}$$

From kinetic energy conservation

$$\frac{1}{2}mu^2 = \frac{1}{2}mv^2 + \frac{1}{2}(3m)\left(\left(\frac{u}{3}\right)^2 + \left(\frac{v}{3}\right)^2\right)$$

Solving  $v = \frac{u}{\sqrt{2}}$ .

Question 12. A block of mass  $m$  starts slipping from top of inclined plane at B and comes to rest when it reaches lowest point A of the inclined plane, if  $BC = 2 AC$  & friction coefficient of part AC is  $\mu = k \tan \theta$  then, find the value of  $k$ .



(1) 2

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

(3) 3

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

Ans. (3)

Sol. Let  $AC = 1 \therefore BC = 2 \therefore AB = 3$

Apply work - Energy theorem

$$W_f + W_{mg} = \Delta KE$$

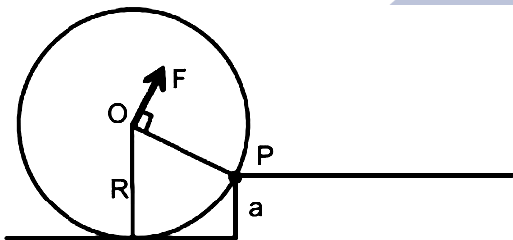
$$mg(3l)\sin\theta - \mu mg\cos\theta(1) = 0 + 0$$

$$\mu m\cos\theta l = 3mgl\sin\theta$$

$$\mu = 3\tan\theta = k\tan\theta$$

$$\therefore k = 3$$

Question 13. Find minimum value of  $F$  applied perpendicular to line  $OP$  where  $O$  is centre of the ball of mass  $m$  and radius  $R$  required to lift the ball ( $a < R$ )



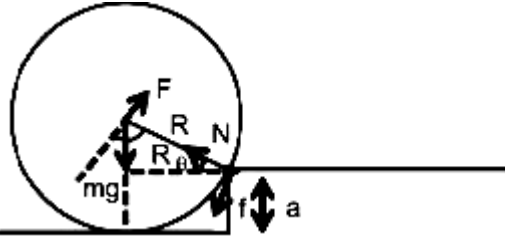
(1)  $\frac{mg\sqrt{2aR + a^2}}{R}$

(2)  $\frac{mg\sqrt{2aR - a^2}}{R}$

(3)  $\frac{mg\sqrt{2aR - a^2}}{a}$

(4)  $\frac{mg\sqrt{2aR + a^2}}{a}$

Ans. (2)



Sol.

$$FR > mg \cos \theta R$$

$$F > mg \cos \theta$$

$$F > mg \frac{\sqrt{R^2 - (R - a)^2}}{R}$$

$$F > \frac{mg \sqrt{2aR - a^2}}{R}$$

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Question 14. Stopping potential of emitted photo electron is  $V$  when mono chromatic light of wavelength  $\lambda$  incident on a

metal surface. If wavelength of light incident becomes  $\frac{\lambda}{3}$

stopping potential of photo electrons becomes  $\frac{V}{4}$  then, the

threshold wavelength of metal is  $k\lambda$  then  $k$  will be.

(1) 3

(2) 6

(3) 9

(4) 2

Ans. (3)

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Sol.  $\frac{hc}{\lambda} = \phi + eV \dots (1)$

$$\frac{hc}{3\lambda} = \phi + \frac{eV}{4} \dots (2)$$

from (1) & (2)

$$\frac{hc}{\lambda} \left(1 - \frac{1}{3}\right) = \frac{3}{4} eV$$

$$\frac{hc}{\lambda} \frac{2}{3} = \frac{3}{4} eV$$

$$eV = \frac{8}{9} \frac{hc}{\lambda}$$

$$\frac{hc}{\lambda} = \phi + \frac{8}{9} \frac{hc}{\lambda}$$

$$\phi = \frac{hc}{9\lambda} = \frac{hc}{\lambda_{th}}$$

$$\lambda_{th} = 9\lambda$$

$$\therefore k = 9$$

Question 15. Fundamental frequency of two identical strings x and y are 450 Hz and 300 Hz respectively, then find the ratio of tension in string x and y will be.

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

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$$(2) \frac{9}{4}$$

$$(3) \sqrt{\frac{4}{3}}$$

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

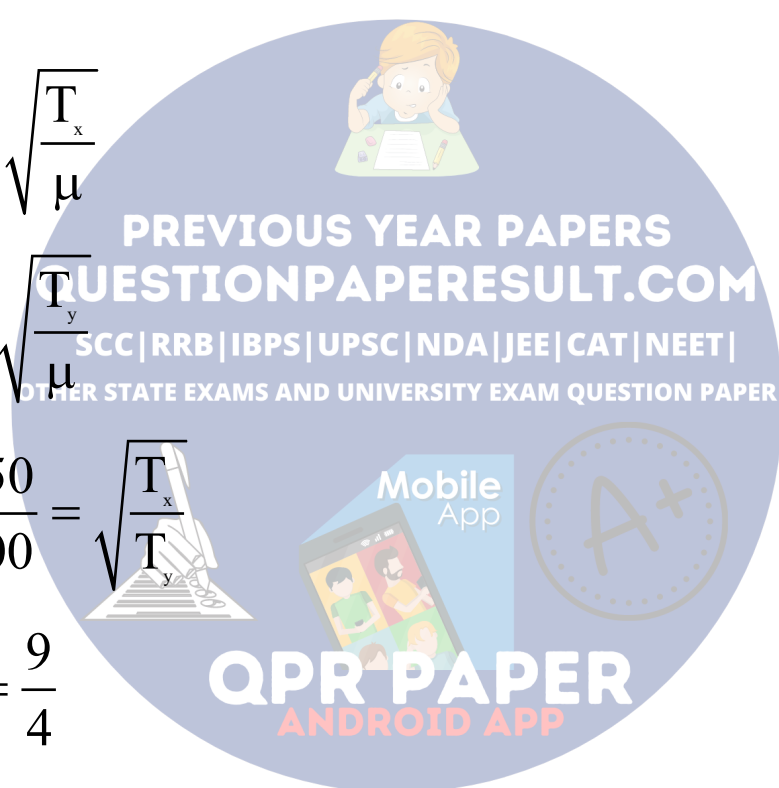
Ans. (2)

Sol.  $f_x = \frac{1}{2l} \sqrt{\frac{T_x}{\mu}}$

$$f_y = \frac{1}{2l} \sqrt{\frac{T_y}{\mu}}$$

$$\frac{f_x}{f_y} = \frac{450}{300} = \sqrt{\frac{T_x}{T_y}}$$

$$\Rightarrow \frac{T_x}{T_y} = \frac{9}{4}$$



Question 16. A capacitor of capacity  $5\mu\text{F}$  is charged up 220 Volt, & is disconnected from battery. Now charged  $5\mu\text{F}$  capacitance is connected by another uncharged capacitor of  $2.5\mu\text{F}$  capacitor. Find heat loss in the process.

$$(1) \frac{121}{3} \times 10^{-3} \text{ J}$$



$$(2) \frac{1210}{5} \times 10^{-3} \text{ J}$$

$$(3) 200 \times 10^{-3} \text{ J}$$

$$(4) \frac{1210}{3} \times 10^{-3} \text{ J}$$

Ans. (4)

Sol.  $C_1 = 5 \mu\text{F}$   $V_1 = 220 \text{ Volt}$

$$C_2 = 2.5 \mu\text{F} \quad V_2 = 0$$

$$\text{Heat loss; } \Delta H = U_i - U_f = \frac{1}{2} \frac{c_1 c_2}{c_1 + c_2} (V_1 - V_2)^2$$

$$= \frac{1}{2} \times \frac{5 \times 2.5}{(5 + 2.5)} (220 - 0)^2 \mu\text{J}$$

$$= \frac{5}{2 \times 3} \times 22 \times 22 \times 100 \times 10^{-6} \text{ J}$$

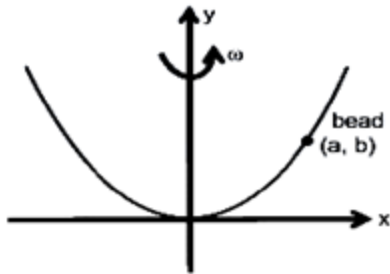
$$= \frac{5 \times 11 \times 22}{3} \times 10^{-4} \text{ J}$$

$$= \frac{55 \times 22}{3} \times 10^{-4} \text{ J}$$

$$= \frac{1210}{3} \times 10^{-4} \text{ J}$$

$$= \frac{1210}{3} \times 10^{-3} \text{ J}$$

Question 17. Angular velocity of smooth parabolic wire  $y = 4cx^2$  about axis of parabola in vertical plane if bead of mass  $m$  does not slip at  $(a, b)$  will be.



(1)  $\sqrt{2gc}$

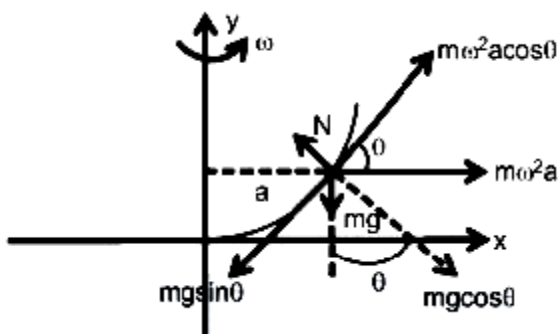
(2)  $2\sqrt{\frac{2gc}{b}}$

(3)  $2\sqrt{\frac{2gc}{ab}}$





(4)  $2\sqrt{2gc}$

Ans. (4)

Sol.



$$m\omega^2 a \cos \theta = mg \sin \theta$$

  
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$$\omega = \sqrt{\frac{g \tan \theta}{a}}$$

$$y = 4cx^2$$

$$\tan \theta = \frac{dy}{dx} = 8 \times C(\tan \theta)_{a,b} = 8ac$$

$$\omega = \sqrt{\frac{g \times 8ac}{a}} = 2\sqrt{2gc}$$

Question 18. In a standard YDSE slit width is 1 mm and distance of screen from the slit is 1m. If wavelength of light is 632 nm and bright fringe formed at  $y = 1.270$  mm. then find the path difference for the point.

- (1)  $1.27 \mu\text{m}$
- (2)  $2.45 \mu\text{m}$
- (3)  $0.27 \mu\text{m}$
- (4)  $2.27 \mu\text{m}$

Ans. (1)

Sol.  $\Delta P = d \sin \theta$

$$= d\theta$$

$$= \frac{dy}{D} = \frac{10^{-3} \times 1.270 \text{mm}}{1 \text{m}} = 1.270 \mu\text{m}$$

Question 19. A proton enter in a uniform magnetic field of 2.0 mT at an angle of  $60^\circ$  with the magnetic field with speed 10 m/s. Find the pitch of path.

- (1)  $30 \pi \mu\text{m}$
- (2)  $50 \pi \mu\text{m}$
- (3)  $80 \pi \mu\text{m}$
- (4)  $10 \pi \mu\text{m}$

Ans. (2)

Sol. Pitch =  $(V \cos \theta) T$

$$\begin{aligned}
 &= (V \cos \theta) \frac{2\pi m}{eB} \\
 &= (10 \cos 60^\circ) \frac{2\pi}{2 \times 10^{-3}} \left( \frac{m}{e} \right) \\
 \therefore \frac{m}{e} &= \frac{10^{-27}}{10^{-19}} = 10^{-8} = \frac{5\pi}{10^{-3}} \times 10^{-8} = 5\pi \times 10^{-5} = 50\pi \mu\text{m}
 \end{aligned}$$

Question 20. A charge particle having charge  $q$  and speed  $V$  is moving in  $xy$  plane in  $x$  directions, it enters in a region of uniform electric field directed in  $y$  direction and extended up to  $x = 0$  to  $x = d$ , then what is equation of path in terms of  $d$ .

(1)  $y = \frac{1}{2} \frac{qE}{m} \frac{d^2}{v^2}$

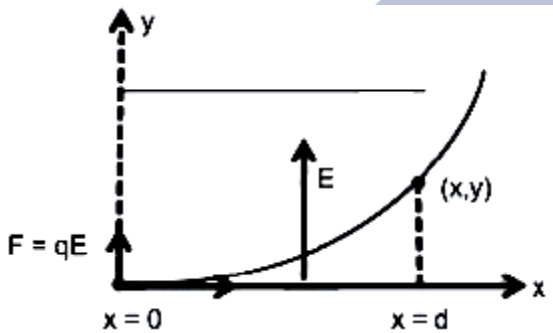
$$(2) y = \frac{qE d^2}{m v^2}$$

$$(3) y = \frac{2}{3} \frac{qE d^2}{m v^2}$$

$$(4) y = \frac{2qE d^2}{m v^2}$$

Ans. (1)

Sol.



$$x = Vt$$

$$y = \frac{1}{2} at^2 = \frac{1}{2} \frac{qE}{m} t^2$$

$$y = \frac{1}{2} \frac{qE}{m} \frac{x^2}{v^2}$$

$$y = \frac{1}{2} \frac{qE d^2}{m v^2}$$

Question 21. Amplitude of carrier wave and message wave are 5 unit and 3 unit respectively, then ratio of maximum and

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minimum amplitude of Amplitude of Amplitude of modulated wave.

(1) 2

(2) 4

(3) 6

(4) 8

Ans. (2)

Sol.  $\frac{A_{\max}}{A_{\min}} = \frac{A_m + A_c}{A_m - A_c} = \frac{5+3}{5-3} = \frac{8}{2} = 4$

Question 22. Which of the following combination should be selected for better tuning of an L.C.R circuit used for communication?

(1)  $R = 25\Omega$ ,  $L = 1.5H$ ,  $C = 45\mu F$

(2)  $R = 25\Omega$ ,  $L = 1.5H$ ,  $C = 35\mu F$

(3)  $R = 25\Omega$ ,  $L = 2.5H$ ,  $C = 45\mu F$

(4)  $R = 15\Omega$ ,  $L = 3.5H$ ,  $C = 30\mu F$

Ans. (4)

Sol. For tuning an LCR circuit, its selectivity should be high. High selectivity is observed in circuits with high-quality factor.

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$$Q = \frac{\sqrt{L}}{R\sqrt{C}}$$

Putting value in above equation:

For option (a),  $Q = 7.3$

For option (b),  $Q = 8.28$

For option (c),  $Q = 9.43$

For option (d),  $Q = 13.67$

$$\text{As } Q = \frac{\sqrt{3.5}}{15\sqrt{30 \times 10^{-6}}} = 13.67$$

Hence, option (d) is the best combination.

## Chemistry

Question 23.  $\text{Cu}^{+2} + \text{Sn} \rightarrow \text{Sn}^{+2} + \text{Co(S)}$

1M

1M

E0 value given find  $\Delta G$

-0.16 and +0.34

Answer: -F

Question 24. If a compound  $\text{AB}_4$  is polar then its structure is

- (1) square planar
- (2) rectangular planar
- (3) tetrahedral

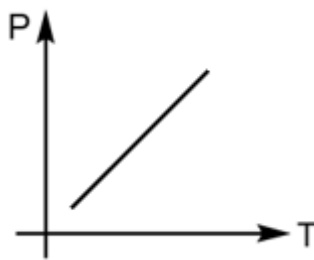
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(4) trigonal bipyramidal

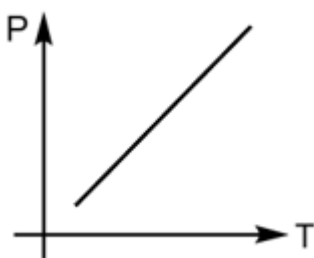
Answer: (4)

Question 25.

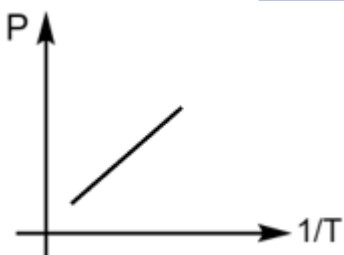
(1)



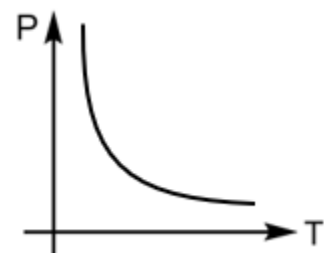
(2)



(3)



(4)



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Answer: (2)

Question 26. When a gas is heated, other gas is obtained which is the constituent of air. When this gas is heated again, other gas will be obtained which has basic nature. This gas cannot be

$\text{PbNO}_3$   $\text{NH}_4\text{NO}_2$   $\text{NH}_4(\text{CrO}_4)$   $\text{NaN}_3$

Question 27. Which method is used for the preparation of colloids?

- (1) Van Arkel
- (2) Oswald
- (3) Bredig's arc method
- (4) Oswald

Answer: (3)

Question 28. Wrong about  $\text{O}_3$ ?

- (1) Cl bond breaks in cfc
- (2) cfc can destroy ozone layer
- (3) It can oxidise NO to  $\text{NO}_2$
- (4) It form Chlorine dioxide

Answer: (4)

---

Question 29. Which property has diff order w.r.t to others?

- (1) Electronegativity
- (2) Ionization energy
- (3) Electron gain enthalpy
- (4) Atomic radius

Answer: (4)

Question 30. Benzyl amine may be alkylahyde as shown in following equations



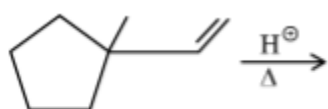
Which of the following alkyl halides is best suited for this reaction through SN1 mechanism?

- (1)  $\text{CH}_3 - \text{Br}$
- (2)  $\text{C}_6\text{H}_5 - \text{Br}$
- (3)  $\text{C}_6\text{H}_5 - \text{CH}_2 - \text{Br}$
- (4)  $\text{C}_2\text{H}_5 - \text{Br}$

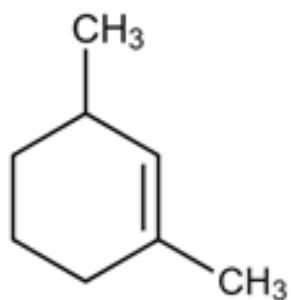
Answer: (3)

Solution: Benzyl carbocation is most stable.

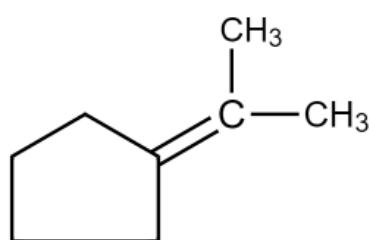
Question 31.



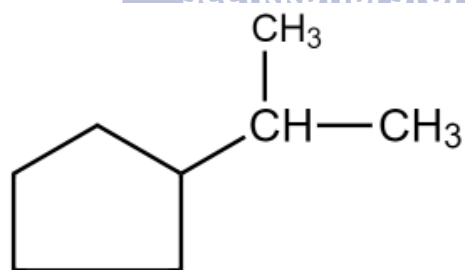
(1)



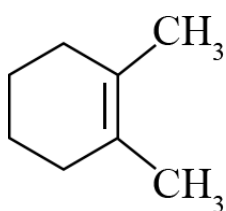
(2)



(3)



(4)



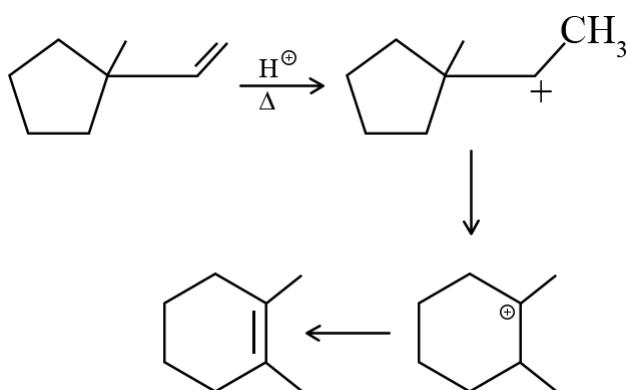
Answer: (4)

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Question 32. Which of the following is an example of a solid solution?

- (1) Butter
- (2) Gemstones
- (3) Paint
- (4) None of these

Answer: (2)

Solution: Gemstone is an example of a solid solution. solid sol is the colloidal dispersion which is solid in the state but is little soft.

### Integer question

Question 33. 5 moles of Ar and 3 moles of O<sub>2</sub> are mixed. Find total internal energy, in terms of RT

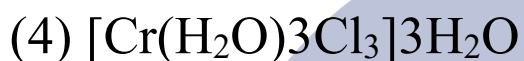
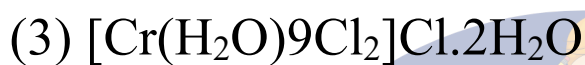
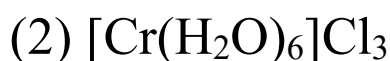
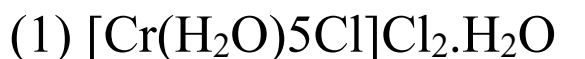
Answer: 15RT

$$\left(5 \times \frac{3}{2} RT\right) + \left(3 \times \frac{5}{2} RT\right)$$

---

$$= 15RT$$

Question 34. When mole  $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$  is treated with an excess of  $\text{AgNO}_3$ , 3 Mole of  $\text{AgCl}$  are obtained. The formula of the complex is



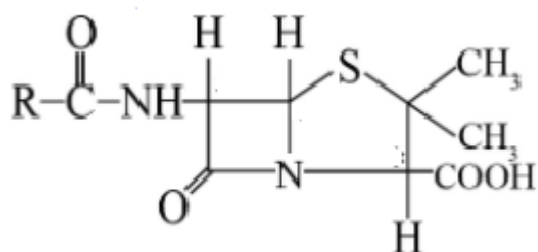
Answer: (2)

Solution:



3 moles of  $\text{AgCl}$  represents that 3  $\text{Cl}^-$  will form by the complex.

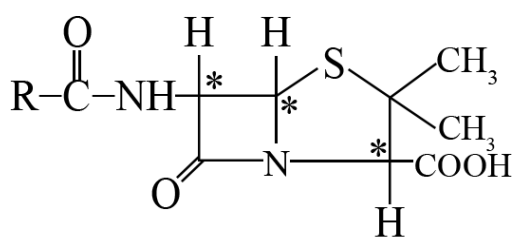
Question 35. Find the number of chiral centres in penicillin



General Structure of Pencillin

Answer: 3.00

Solution:



General Structure of Penicillin

Question 36. Uncertainty in position of a 0.25g particle is  $10^{-5}$  m. Then the uncertainty in its velocity will be

(1)  $1.2 \times 10^{34}$

(2)  $2.1 \times 10^{-26}$

(3)  $1.6 \times 10^{-20}$

(4)  $1.7 \times 10^{-9}$

Answer: (2)

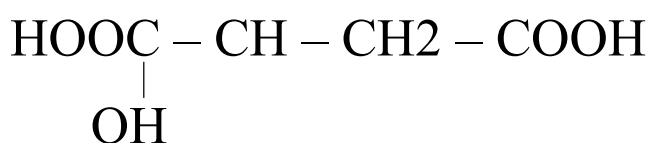
Solution:

$$\Delta x \Delta p > \frac{h}{2\pi}$$

$$\Delta x m \Delta v > \frac{h}{2\pi}$$

$$\Delta v > \frac{h}{2\pi m \Delta x}$$

Question 37. Write the IUPAC name



2-hydroxybutan-1, 2-dioic acid

Answer:

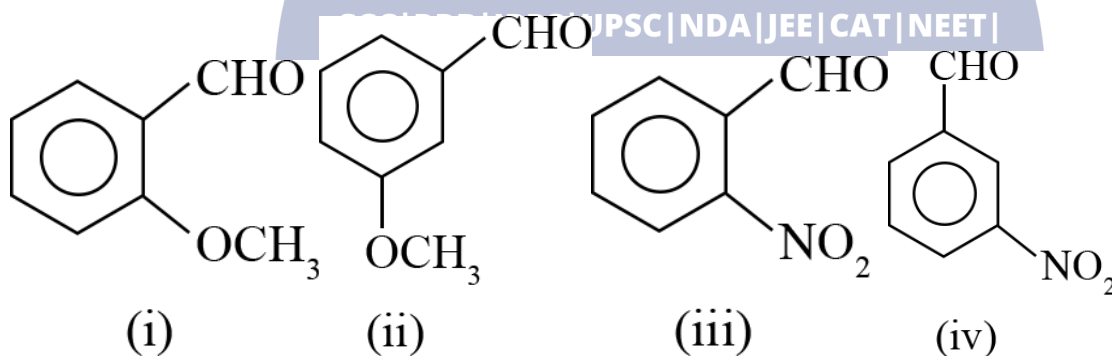
Solution:

Question 38. 90 gm of water was heated  $\Delta H$  vap given, find  $\Delta U$  at 100 degree C

Answer:

Solution:

Question 39. Arrange the following in increasing order of reaction with HCN



(1) (iv) > (iii) > (ii) > (i)

(2) (i) > (ii) > (iii) > (iv)

(3) (iii) > (iv) > (ii) > (i)

(4) (ii) > (iv) > (iii) > (i)

Answer: (3)

Solutions: -I, -M effect of  $\text{NO}_2$  increases reactivity towards nucleophilic addition reaction with HCN.

---

Question 40. Which metal is used in devising Photo-chemical cell?

- (1) Li
- (2) Na
- (3) Rb
- (4) Cs

Answer: (4)

Solution: Cesium has lowest ionization enthalpy and hence it can show photoelectric effect to the maximum extent hence it is used in photo chemical cell.

Question 41. 3 moles of  $O_2$  and 5 moles of Ar are present in a closed container, find sum of their internal energy in terms of RT

- (1) 15RT
- (2) 10RT
- (3) 5RT
- (4) 20RT

Answer: (1)

Solution:

$$\Delta U = \frac{f}{2} nRT$$



---

$$\text{For } O_2 \Rightarrow \Delta U = \frac{5}{2} \times 3(RT) = \frac{15}{2} RT$$

$$\text{For sHe} \Rightarrow \Delta U = \frac{3}{2} \times 5(RT) = \frac{15}{2} RT$$

So, sum of internal energy = 15RT

Question 42. Among the following properties, which property trend (in magnitude) is different from other across a period?

- (1) Atomic Radius
- (2) Electronegativity
- (3) Electron gain enthalpy
- (4) Ionisation Enthalpy

Answer: (1)

Solution:

On moving Left to Right along a period.

Atomic Radius  $\Rightarrow$  decreases.

Electronegativity  $\Rightarrow$  increases

Electron gain enthalpy  $\Rightarrow$  increases

Ionisation Enthalpy  $\Rightarrow$  increases

Question 43. Graph between  $\log\left(\frac{x}{m}\right)$  Vs  $\log P$  has a slope = 2 and intercept = 0.477. Find  $\left(\frac{x}{m}\right)$  at pressure 4 atm. [Given  $\log 3 = 0.477$ ]

- (1) 6
- (2) 3
- (3) 48
- (4) 9

Answer: (1)

Solution:

$$\left(\frac{x}{m}\right) = k(P)^{\frac{1}{n}}$$

$$\log\left(\frac{x}{m}\right) = \log k + \frac{1}{n} \log P \quad \text{Slope} = 2$$

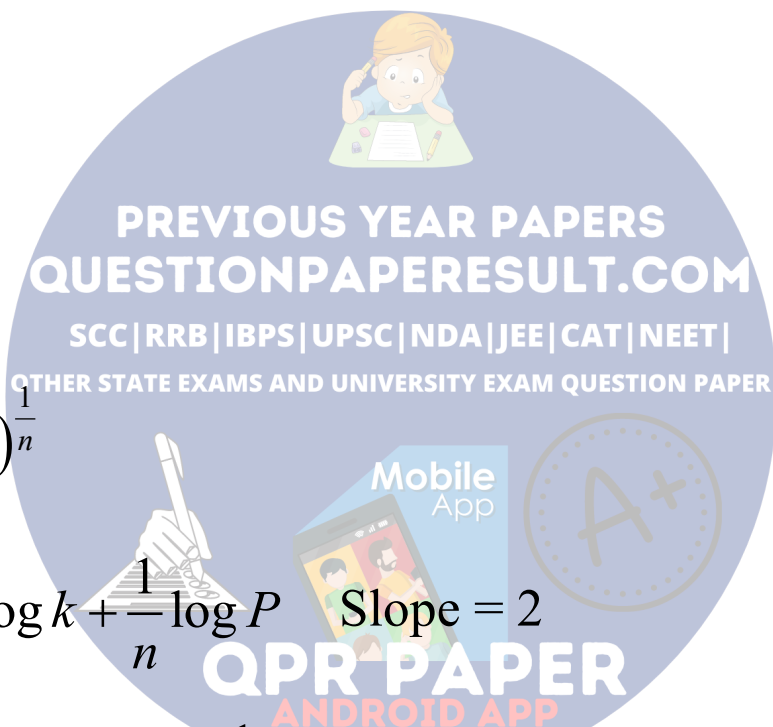
$$\text{Slope} = \frac{1}{n} = 2 \quad \text{So } n = \frac{1}{2} \quad \log k = 0.477$$

$$\text{Intercept} \Rightarrow \log k = 0.477 \quad \text{So } k = \text{Antilog}(0.477) = 3 \quad \log P$$

$$\text{So } \left(\frac{x}{m}\right) = k(P)^{\frac{1}{n}}$$

$$= 3[4]^{\frac{1}{2}}$$

$$= 6$$



---

Question 44. If a compound  $AB_4$  is polar covalent, then its possible geometry is:

- (1) Square planar
- (2) Tetrahedral
- (3) Sea-saw
- (4) Square Pyramidal

Answer: (3)

Solution:

For compound  $AB_4$  possible geometry are

S.No	Bond pair	Lon e pair	Total	Hybridisation	Geometry	Polarity
1	4	0	4	SP <sup>3</sup>	Tetrahedral	non polar
2	4	1	5	SP <sup>3</sup> d	Sea-saw	Polar
3	4	2	6	sp <sup>3</sup> d <sup>2</sup>	Square Planar	non-polar

Question 45. Which of the following statement about ozone is INCORRECT?

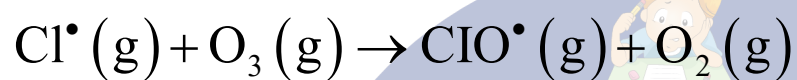
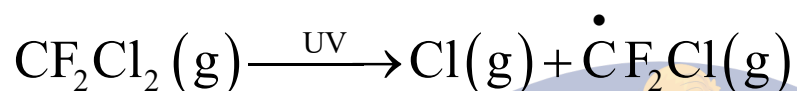
- (1) Ozone acts as a protective layer against UV rays
- (2) It is toxic layer and converts NO to NO<sub>2</sub>.
- (3) It converts Cl free radical of CFC's to chlorine dioxide

(4) It acts as shield to out atmosphere

Answer: (3)

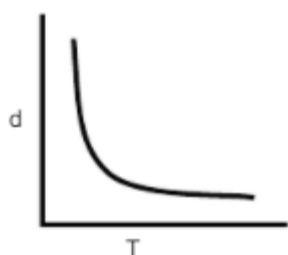
Solution:

In Presence of sunlight CFC's molecule divides & release chlorine free radical, which react with ozone give chlorine monoxide radical ( $\text{ClO}^\bullet$ ) and oxygen

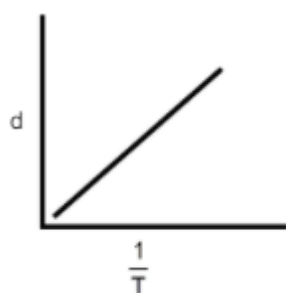


Question 46. Which of the following graph is incorrect for an ideal gas?

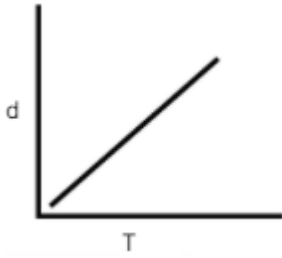
(1)



(2)



(3)



(d) None of these

Answer: (3)

Solution:

For ideal gas

$$PM = dRT$$

$$d = \left[ \frac{PM}{R} \right] \frac{1}{T}$$

So graph between d Vs. T is not straight line.

Question 47. An example of solid sol is

- (1) Butter
- (2) Gem stones
- (3) Paints
- (4) Cake

Answer: (2)

Solution:

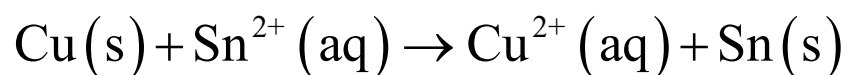
Solid sol has dispersed phase solid and dispersion medium solid.

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Example  $\Rightarrow$  Gem stones, some coloured glass

Question 48. For following cell reaction.



$$[\text{Cu}^{2+}] = [\text{Sn}^{2+}] = 1\text{M}$$

Find Gibb's energy change (in KJ). Given

$$[E_{\text{Cu}^{2+}/\text{Cu}}^0 = 0.34\text{V}, E_{\text{Sn}^{2+}/\text{Sn}}^0 = -0.16\text{V}]$$

Answer: 96.5KJ

Solution:

96.50

$$E_{\text{cell}}^0 = E_{\text{Sn}^{2+}/\text{Sn}}^0 - E_{\text{Cu}^{2+}/\text{Cu}}^0$$

$$= -0.16 - 0.34$$

$$= -0.50\text{V}$$

$$\Delta G^0 = -nFE_{\text{cell}}^0$$

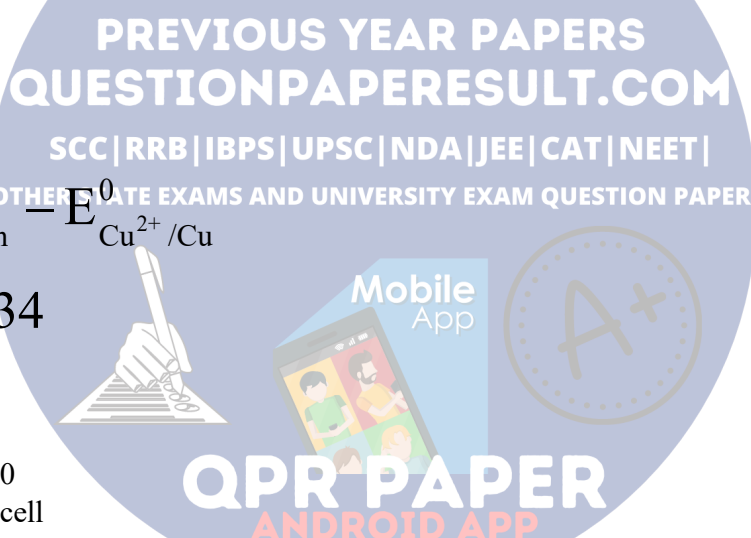
$$= -2 \times 96500 \times (-0.5)$$

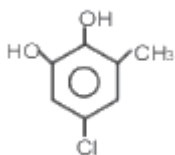
$$= 96500\text{J}$$

$$= 96.5\text{KJ}$$

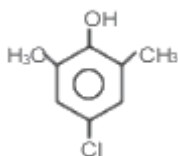
Question 49. Correct Structure of Dettol is?

(1)

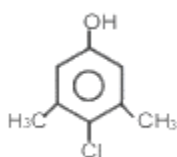




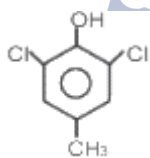
(2)



(3)



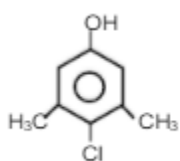
(4)



Answer: (3)

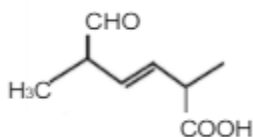
Solution:

Dettol







4-Chloro-3,5-dimethyl phenol.

Question 50.



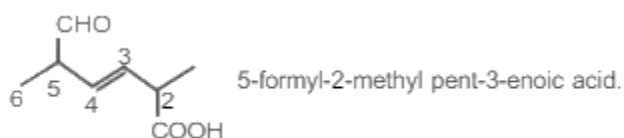
Correct IUPAC name of following compound is

  
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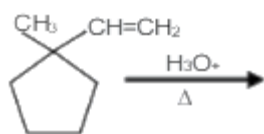
- (1) 2-Methyl-5-oxohet-3-enoic acid
- (2) 5-Formyl-2-methyl hex-3-enoic acid
- (3) 2,5-Dimethyl-5-oxo pent-5-oxo pent-3-enoic acid
- (4) 2,5-Dimethyl-5-formyl pent 3-enoic acid

Answer: (2)

Solution:

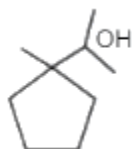


Question 51. [QUESTIONPAPERRESULT.COM](http://QUESTIONPAPERRESULT.COM)

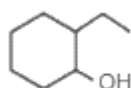


Find out end product of this reaction.

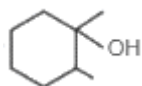
(1)



(2)



(3)



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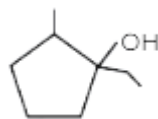
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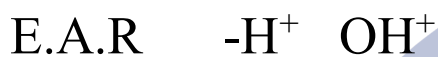


(4)



Answer: (3)

Solution:

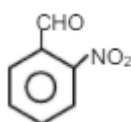


acc. to mark rule

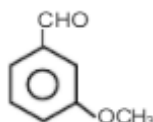
(Hydration addition of water acc. to Mark. Rule.)

Question 52. Most reactive with HCN out of the following

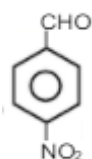
(1)



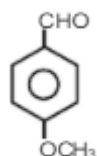
(2)



(3)



(4)

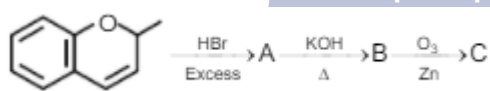


Answer: (3)

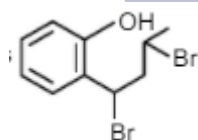
Solution:

-I, -M effect of  $\text{NO}_2$  increase reactivity towards nucleophilic addition reaction with HCN and as steric crowding  $\uparrow$  increase rate of NAR decrease

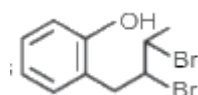
Question 53. Find out correct statement regarding this reaction?



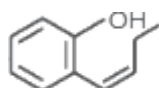
(1) Product A is



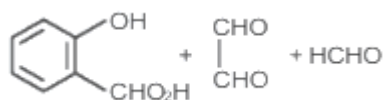
(2) Product A is



(3) Product B is

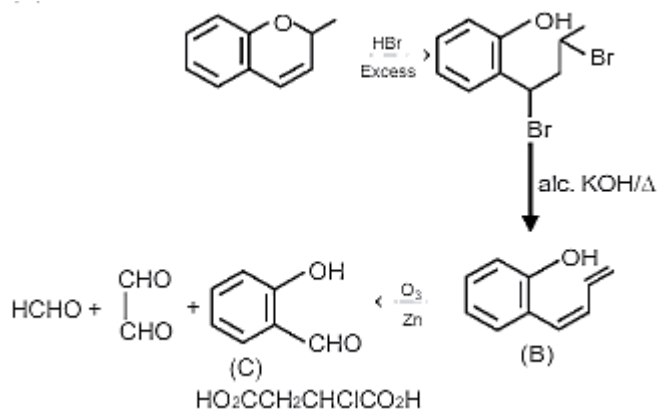


(4) Product C is

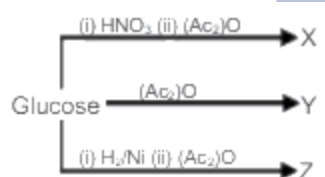


Answer: (1)

Solution:



Question 54.



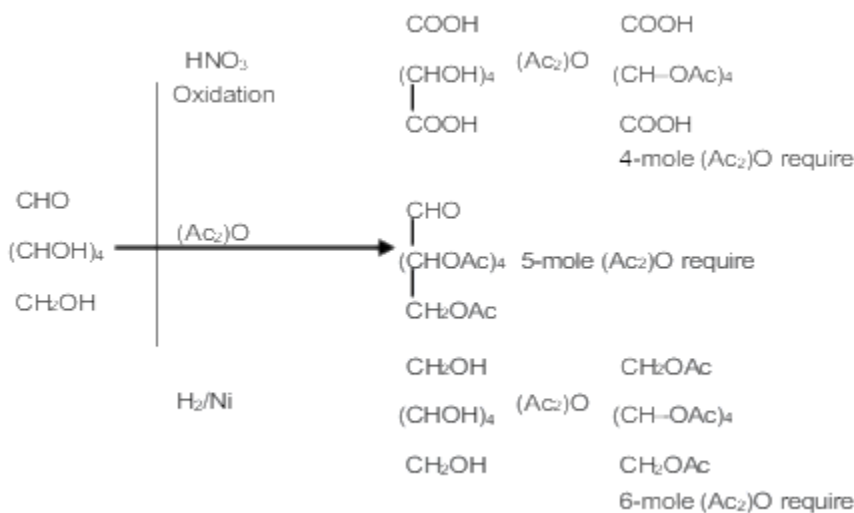
Calculate require moles of  $(\text{Ac}_2\text{O})$  in X, Y, Z production formation.

- (1) 2,3,4
- (2) 5,5,5
- (3) 4,5,6
- (4) 5,5,6

Answer: (3)

Solution:

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## Mathematics

Question 55. Box-I contains 30 cards marked from 1 to 30 and box-II contains 20 cards marked from 31 to 50. A box is selected and a card is drawn. If the number on card is non-prime then what is the probability that it came from box-I.

(1)  $\frac{4}{17}$

(2)  $\frac{6}{17}$

(3)  $\frac{7}{17}$

(4)  $\frac{8}{17}$

Ans. (4)

Sol.  $P(B_1) = \frac{1}{2} = P(B_2)$

---

$$P(\text{Non-prime}) = P(B1) \cdot P(N.P/B1) + P(B2) \cdot P(N.P/B2)$$

$$= \frac{1}{2} \cdot \frac{20}{30} + \frac{1}{2} \cdot \frac{15}{20}$$

$$P(B1/N.P) = \frac{\frac{1}{2} \cdot \frac{20}{30}}{\frac{1}{2} \cdot \frac{20}{30} + \frac{1}{2} \cdot \frac{15}{20}} = \frac{8}{17}$$

Question 56. The contrapositive of “If I reach the station on time then I will get the train” is-

- (1) If I reach the station on time then I will not get the train
- (2) If I will not get the train then I don't reach the station on time
- (3) If I will get the train then I reach the station on time
- (4) If I will not get the train then I reach the station on time

Ans. (2)

Sol. If I will not get the train then I don't reach the station on time

Question 57. Evaluate  $\int_0^2 ||x-1| -x| dx$

- (1)  $\frac{9}{2}$

---

$$(2) \frac{5}{2}$$

$$(3) \frac{7}{2}$$

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

Ans. (4)

Sol.  $\int_0^2 ||x-1|-x| dx = \int_0^1 |1-x-x| dx + \int_1^2 |x-1-x| dx$

$$= \int_0^{1/2} (1-2x) dx + \int_{1/2}^1 (2x-1) dx + \int_1^2 dx$$

$$= [x - x^2]_0^{1/2} [x^2 - x]_{1/2}^1 + [x]_1^2 = \frac{1}{2} - \frac{1}{4} + (1-1) - \left(\frac{1}{4} - \frac{1}{2}\right) + 2 - 1$$

$$= \frac{1}{4} + \frac{1}{4} + 1 = \frac{3}{2}$$

Question 58. If  $\frac{1 + \sin x}{1 + y} \frac{dy}{dx} = -\cos x$  such that  $y(0) = 1$ ,

$y(\pi) = a$  and  $\left(\frac{dy}{dx}\right)_{(x=\pi)} = b$ , then  $(a, b) =$

(1) (1, -2)

(2) (1, 2)

(3) (-1, -2)

(4) (-1, 2)

Ans. (2)

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$$\text{Sol. } \frac{dy}{1+y} = \frac{-\cos x}{1+\sin x} dx$$

$$\ln(1+y) = -\ln(1+\sin x) + \ln c$$

$$(1+y)(1+\sin x) = c$$

$$2 \cdot 1 = c \Rightarrow c = 2$$

$$1+y = \frac{2}{1+\sin x} \Rightarrow y = \frac{2}{1+\sin x} - 1$$

$$y(\pi) = 2 - 1 = 1$$

$$\frac{dy}{dx} = \frac{-2}{(1+\sin x)^2} \cdot \cos x = 2 \text{ at } x = \pi$$

$$(a, b) = (1, 2)$$

Question 59. Number of points of local maxima & minima of the function

$$f(x) = -\frac{3}{4}x^4 - 8x^3 - \frac{45}{2}x^2 + 105x$$

are

(1) 1

(2) 2

(3) 3

(4) 4

Ans. (3)

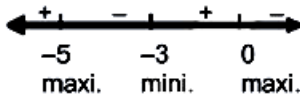
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$$\text{Sol. } f'(x) = -3x^3 - 24x^2 - 45x + 0$$

$$= -3x(x^2 + 8x + 15)$$

$$= -3x(x+3)(x+5)$$



Clearly  $x = -5, 0$  is point of maximum

$x = -3$  is point of minimum

Hence number of point of maximum and minimum are 3.

Question 60. Length of perpendicular and foot of perpendicular from the point  $\left(1, \frac{3}{2}, 2\right)$  to the plane

$2x - 2y + 4z + 5 = 0$  is

(1)  $\sqrt{6}, \left(0, \frac{-5}{2}, 0\right)$

(2)  $\sqrt{6}, \left(0, \frac{5}{2}, 0\right)$

(3)  $\sqrt{6}, \left(1, \frac{5}{2}, 1\right)$

(4)  $\sqrt{6}, \left(1, \frac{-5}{2}, 1\right)$

Ans. (2)



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Sol.  $p\left(1, \frac{3}{2}, 2\right), 2x - 2y + 4z + 5 = 0$

Foot of perpendicular

$$\frac{x-1}{2} = \frac{y-\frac{3}{2}}{-2} = \frac{z-2}{4} = \frac{-(2-3+8+5)}{4+4+16}$$

$$\Rightarrow \frac{x-1}{2} = \frac{y-\frac{3}{2}}{-2} = \frac{z-2}{4} = \frac{-12}{24} = \frac{-1}{2}$$

$$\Rightarrow x = 1-1, y = \frac{3}{2}+1, z = 2-2$$

$$\Rightarrow x = 0, y = \frac{5}{2}, z = 0$$

$\therefore$  Length of perpendicular

$$= \sqrt{(1-0)^2 + \left(\frac{3}{2}-\frac{5}{2}\right)^2 + (2-0)^2} = \sqrt{1+1+4} = \sqrt{6}$$

Question 61. Solution of equation  $\sin^{-1} 6x + \sin^{-1} 6\sqrt{3}x = -\frac{\pi}{2}$

is

(1)  $\pm \frac{1}{12}$

(2)  $\frac{1}{12}$

---

(3)  $-\frac{1}{12}$

(4) None of these

Ans. (3)

Sol.  $\sin^{-1} 6x = \sin^{-1} (-1) - \sin^{-1} (6\sqrt{3}x)$

$$\Rightarrow \sin^{-1} 6x = \sin^{-1} \left( -1\sqrt{1-108x^2} - 6\sqrt{3}x\sqrt{1-1} \right)$$

$$\Rightarrow 36x^2 = 1 - 108x^2 \Rightarrow 144x^2 = 1$$

$$\Rightarrow x = \pm \frac{1}{12}$$

Question 62. If all letters of word 'MOTHER' are written in all possible order and these words are written in dictionary form then find position of word 'MOTHER'

(1) 307

(2) 309

(3) 311

(4) 305

Ans. (2)

Sol. MOTHER

$$3\ 4\ 6\ 2\ 1\ 5 \Rightarrow 2\ 5! + 2\ 4! + 3\ 3! + 2! + 1 = 240 + 48 + 18 + 2 + 1 = 309$$

Question 63. Area enclosed by the region given by

$$\frac{|x|}{2} + \frac{|y|}{3} \geq 1 \text{ and } \frac{x^2}{4} + \frac{y^2}{9} \leq 1 \text{ is}$$

(1)  $6\pi - 10$

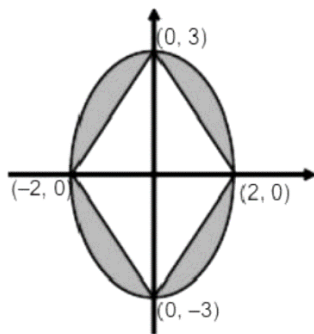
(2)  $6\pi - 11$

(3)  $6\pi - 12$

(4)  $6\pi - 13$

Ans. (3)

Sol.



Area of Ellipse =  $\pi ab = 6\pi$

Area enclosed by  $\frac{|x|}{2} + \frac{|y|}{3} = 1$  is

$$= \frac{1}{2}(d_1 d_2) = \frac{1}{2}(4)(6) = 12$$

So required Area is =  $6\pi - 12$

Question 64. A plane passes through (2, 1, 2) and (1, 2, 1) and parallel to line  $2x = 3y$  and  $z = 1$ , then plane also passes through the point

- (1) (-6, 2, 0)
- (2) (6, -2, 0)
- (3) (-2, 0, 1)
- (4) (2, 0, 1)

Ans. (3)

Sol. Plane passes through (2, 1, 2) is

$$a(x - 2) + b(y - 1) + (z - 2) = 0$$

it also passes through (1, 2, 1)

$$\therefore -a + b - c = 0 \Rightarrow a - b + c = 0 \quad \dots(i)$$

Given line

$$\frac{x}{3} = \frac{y}{2} = \frac{z-1}{0} \text{ is parallel to } (1)$$

$$\therefore 3a + 2b + c = 0$$

$$\Rightarrow \frac{a}{0-2} = \frac{b}{3-0} = \frac{c}{2+3}$$

$$\frac{a}{2} = \frac{b}{-3} = \frac{c}{2+3}$$

$$\frac{a}{2} = \frac{b}{-3} = \frac{c}{-5}$$

---

---

$\therefore$  plane is  $2x - 4 - 3y + 3 - 5z + 10 = 0 \Rightarrow 2x - 3y - 5z + 9 = 0$

Question 65.  $P(x)$  is a polynomial of degree 3 which have maximum value 8 at  $x = 1$ , min 6 at  $x = 2$  find  $P(0)$ .

Sol. Clearly  $P'(x) = \lambda(x-1)(x-2)$  where  $\lambda > 0$

$$P(x) = \lambda \left[ \frac{x^3}{3} - \frac{3x^2}{2} + 2x \right] + C$$

Given  $P(1) = 8 = \lambda \left[ \frac{1}{3} - \frac{3}{2} + 2 \right] + C = 8$

$$\Rightarrow \frac{5\lambda}{6} + C = 8$$

Also  $P(2) = 6 \Rightarrow \lambda \left( \frac{8}{3} - 6 + 4 \right) + C = 6$

$$\Rightarrow \frac{2}{3}\lambda + C = 6$$

By (i) and (ii)  $\Rightarrow C = -2$

$$\Rightarrow P(0) = -2$$

Question 66. Sum of series  $(x + y) + (x^2 + xy + y^2) + (x^3 + x^2y + xy^2 + y^3) + \dots$  is

$$(1) \frac{x + y - xy}{(1-x)(1-y)}$$

$$(2) \frac{x + y + xy}{(1-x)(1-y)}$$

$$(3) \frac{x - y - xy}{(1+x)(1+y)}$$

$$(4) \frac{x - y + xy}{(1+x)(1+y)}$$

Ans. (1)

Sol.  $(x + y) + (x^2 + xy + y^2) + (x^3 + x^2y + xy^2 + y^3) + \dots$

$$\begin{aligned} &= \frac{1}{x-y} \left( \frac{x^2}{1-x} - \frac{y^2}{1-y} \right) \\ &= \frac{1}{x-y} \left( \frac{x^2 - x^2y - y^2 + xy^2}{(1-x)(1-y)} \right) \\ &= \frac{x + y - xy}{(1-x)(1-y)} \end{aligned}$$

Question 67. Value of  $\left( \frac{1 - \sin \frac{2\pi}{9} + i \cos \frac{2\pi}{9}}{1 + \sin \frac{2\pi}{9} - i \cos \frac{2\pi}{9}} \right)^3$  is

$$(1) -\frac{\sqrt{3}}{2} + i \frac{1}{2}$$

$$(2) \frac{\sqrt{3}}{2} + i\frac{1}{2}$$

$$(3) -\frac{\sqrt{3}}{2} - i\frac{1}{2}$$

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

Ans. (1)

Sol.

$$\left( \frac{1 + \cos \frac{5\pi}{18} + i \sin \frac{5\pi}{18}}{1 + \cos \frac{5\pi}{18} - i \sin \frac{5\pi}{18}} \right)^3 = \left( \frac{2 \cos^2 \frac{5\pi}{36} + i 2 \sin \frac{5\pi}{36} \cdot \cos \frac{5\pi}{36}}{2 \cos^2 \frac{5\pi}{36} - i 2 \sin \frac{5\pi}{36} \cdot \cos \frac{5\pi}{36}} \right)^3$$

$$\left( \frac{\cos \frac{5\pi}{36} + i \sin \frac{5\pi}{36}}{\cos \frac{5\pi}{36} - i \sin \frac{5\pi}{36}} \right)^3 = \left( \cos \frac{5\pi}{36} + i \sin \frac{5\pi}{36} \right)^6$$

$$= \cos \left( 6 \times \frac{5\pi}{36} \right) + i \sin \left( 6 \times \frac{5\pi}{36} \right) = \cos \frac{5\pi}{6} + i \sin \frac{5\pi}{6}$$

$$\Rightarrow -\frac{\sqrt{3}}{2} + i\frac{1}{2}$$

Question 68.  $\frac{z - \alpha}{z + \alpha}$  is purely imaginary and  $|z| = 82$  then  $|\alpha|$

is

(1) 80

(2) 82

(3)  $\sqrt{82}$

(4)  $2\sqrt{82}$

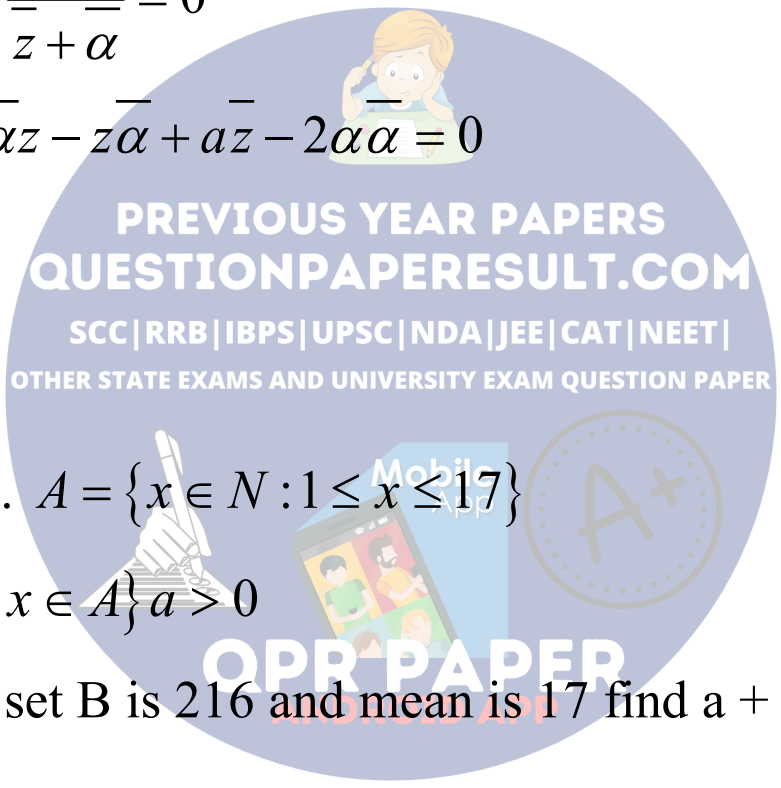
Ans. (2)

Sol.  $\frac{z - \alpha}{z + \alpha} + \frac{\overline{z - \alpha}}{\overline{z + \alpha}} = 0$

$2z\overline{z} - \alpha\overline{z} + \overline{\alpha}z - z\overline{\alpha} + a\overline{z} - 2\overline{\alpha}\alpha = 0$

$2|z|^2 = 2|\alpha|^2$

$|\alpha| = 82.$



Question 69.  $A = \{x \in N : 1 \leq x \leq 17\}$

$B = \{ax + b; x \in A\} a > 0$

Variance of set B is 216 and mean is 17 find a + b

(1) -7

(2) 7

(3) 6

(4) -6

Ans. (1)



$$\text{Sol. } B(\bar{x}) = a\bar{x} + b = \frac{a(1+2+3+\dots+17)}{17} + b = 17$$

$$\frac{a.(17.18)}{17.2} + b = 17$$

$$9a + b = 17 \quad \dots(i)$$

$$\sigma A^2 = \frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2 = \frac{1^2 + 2^2 + \dots + 17^2}{17} - \left(\frac{1+2+\dots+17}{17}\right)^2$$

$$= \frac{17.18.35}{6.17} - \left(\frac{17.18}{2.17}\right)^2$$

$$= 105 - 81 = 24$$

$$\therefore \sigma^2 B = a^2 \sigma A^2 = a^2 \cdot 24 = 216$$

$$a^2 = \frac{216}{24} = 9$$

$$A = 3 \therefore b = 17 - 27$$

$$B = -10$$

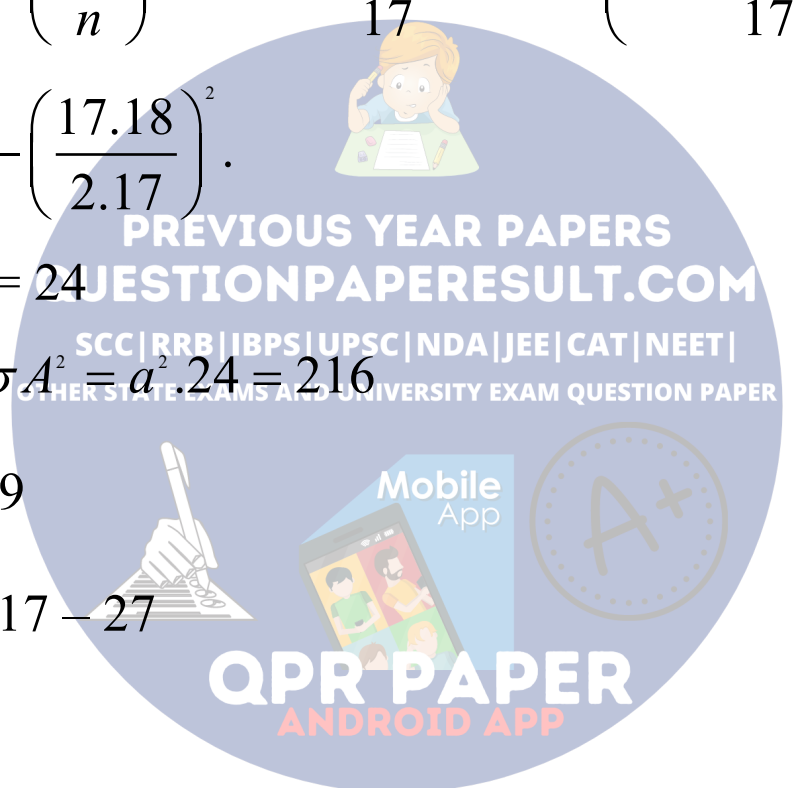
$$\therefore a + b = -7$$

Question 70.  $\lim_{x \rightarrow 1} \frac{x + x^2 + x^3 + \dots + x^n - n}{x - 1} = 820$

(1) 39

(2) 40

(3) 41



(4) 42

Ans. (b)

$$\text{Sol. } \lim_{x \rightarrow 1} \frac{x + x^2 + x^3 + \dots + x^n - n}{x - 1} = 820 \left( \frac{0}{0} \right)$$

$$\lim_{x \rightarrow 1} \frac{1 + 2x + 3x^2 + \dots + nx^{n-1}}{1} = 820$$

$$\Rightarrow 1 + 2 + 3 + \dots + n = 820$$

$$\Rightarrow \frac{n(n+1)}{2} = 820$$

$$\Rightarrow n^2 + n - 1640 = 0$$

$$\Rightarrow n = 40$$

$$n \in \mathbb{N}$$

OTHER STATE EXAMS AND UNIVERSITY EXAM QUESTION PAPER

Question 71. If equation  $6x^2 + 5x - 2 = 0$  has roots  $\alpha, \beta$  and  $S_n = \alpha^n + \beta^n$ . Then select the correct option

(1)  $6S_6 + 5S_5 = 2S_4$

(2)  $6S_4 + 2S_5 = 5S_6$

(3)  $6S_2 + 5S_6 = 6S_4$

(4)  $6S_2 + 5S_4 = 2S_6$

Ans. (1)

$$\text{Sol. } 6\alpha^2 + 5\alpha = 2$$

$$6S_6 + 5S_5 = \alpha^4 (6\alpha^2 + 5\alpha) + \beta^4 (6\beta^2 + 5\beta)$$

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$$= 2(\alpha^4 + \beta^4) = 2S_4$$

Question 72. The sum of three consecutive positive terms of a G.P. is  $S$  and their product is 27. Then the minimum value of  $S$  is.

Ans. (9)

Sol. Let terms are  $\frac{a}{r}, a, ar$

$$\text{Then } a^3 = 27 \Rightarrow a = 3$$

$$\text{Now, } \frac{3}{r} + 3 + 3r = S$$

$$3\left(\frac{1}{r} + r\right) + 3 = S$$

$$r + \frac{1}{r} \geq 2 \Rightarrow S \geq 9$$

Question 73. If  $a, b, c$  are the AM between two numbers such that  $a + b + c = 15$  and  $p, q, r$  be the HM between the same numbers such that  $\frac{1}{p} + \frac{1}{q} + \frac{1}{r} = \frac{5}{3}$ , then number are

(1) (3, 3)

(2) (-1, -9)

(3) (-3, -3)

(4) (9, 1)

Ans. (4)

Sol. Let number are  $x$  and  $y$  then  $x, a, b, c, y$  are in A.P.

$$\text{Then } 2b = a + c = x + y$$

$$b = 5 \text{ and } a + c = 10 = x + y$$

$$\frac{1}{x}, \frac{1}{p}, \frac{1}{q}, \frac{1}{r}, \frac{1}{y} \text{ are in A.P.}$$

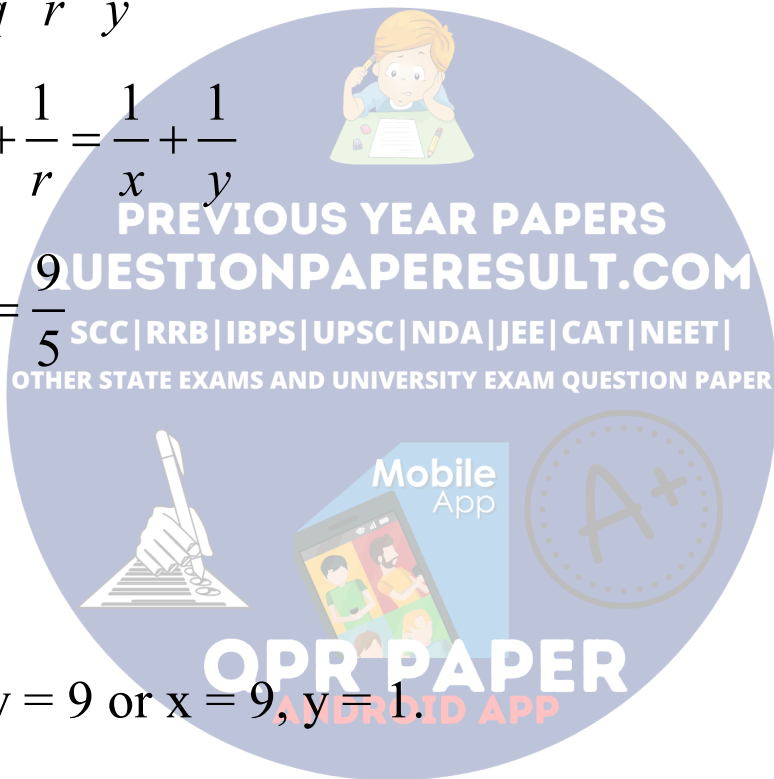
$$\frac{2}{q} = \frac{1}{p} + \frac{1}{r} = \frac{1}{x} + \frac{1}{y}$$

$$\frac{3}{q} = \frac{5}{3} \Rightarrow q = \frac{9}{5}$$

$$\frac{1}{x} + \frac{1}{y} = \frac{10}{9}$$

$$xy = 9$$

$$\text{then } x = 1, y = 9 \text{ or } x = 9, y = 1.$$



Question 74. If a line  $3x + 4y = k$  touching the circle  $x^2 + y^2 - 2x - 4y + 4 = 0$  then value of  $k$  can be

(1) -6

(2) -16

(3) 16

(4) 5

---

Ans. (3)

Sol. Circle  $x^2 + y^2 - 2x - 4y + 4 = 0 \Rightarrow (x - 1)^2 + (y - 2)^2 = 1$

line  $3x + 4y - k = 0$  touches the circle

$$\therefore \frac{|3 + 8 - k|}{\sqrt{9 + 16}} = 1$$

$$|k - 11| = 5$$

$$k = 11 \pm 5$$

$$k = 16, 6$$

