

BITSAT Solved Paper 2026 Session-I

1. An ideal gas is enclosed in a cylinder at pressure of 2 atm and temperature, 300 K. The mean time between two successive collisions is 6×10^{-8} s. If the pressure is doubled and temperature is increased to 500 K, the mean time between two successive collisions will be close to:

[2019 : 12 Jan Shift 2]

- (A) 4×10^{-8} s (B) 3×10^{-6} s
(C) 2×10^{-7} s (D) 0.5×10^{-8} s

Correct Option: A**Solution:**

$$t \propto \frac{\text{Volume}}{\text{velocity}} \quad \text{volume} \propto \frac{T}{P} \quad \frac{t_1}{6 \times 10^{-8}} = \frac{\sqrt{500}}{2P} \times \frac{P}{\sqrt{300}} \quad t_1 = 3.8 \times 10^{-8} \approx 4 \times 10^{-8}$$

2. Proton with kinetic energy of 1 MeV moves from south to north. It gets an acceleration of 10^{12} m/s² by an applied magnetic field (west to east). The value of magnetic field: (Rest mass of proton is 1.6×10^{-27} kg)

- (A) 0.71 mT (B) 7.1 mT (C) 0.071 mT (D) 71 mT

Correct Option: A**Solution:**

3. A stone is thrown vertically upward. On its way up it passes point A with speed of v , and point B, 3 m higher than A, with speed $\frac{v}{2}$. The maximum height reached by stone above point B is:

- (A) 1 m (B) 2 m (C) 3 m (D) 5 m

Correct Option: A**Solution:**

$$\left(\frac{v}{2}\right)^2 = v^2 - 2g \times 3$$

$$\therefore v = \sqrt{8g}$$

If h is the further height, then

$$0 = \left(\frac{v}{2}\right)^2 - 2gh$$

$$\therefore h = \frac{v^2}{8g} = \frac{8g}{8g} = 1\text{m}$$

4. A sphere of radius R has a volume density of charge $\rho = kr$, where r is the distance from the centre of the sphere and k is constant. The magnitude of the electric field which exists at the surface of the sphere is given by (ϵ_0 = permittivity of the free space)

- (A) $\frac{4\pi k R^4}{3\epsilon_0}$

(B) $\frac{kR}{3\epsilon_0}$

(C) $\frac{4\pi k R}{\epsilon_0}$

(D) $\frac{kR^2}{4\epsilon_0}$

Correct Option: D**Solution:**

5. A cylinder with fixed capacity of 67.2 l contains helium gas at STP. The amount of heat needed to raise the temperature of the gas by 20°C is : [Given that $R = 8.31 \text{ Jmol}^{-1}\text{K}^{-1}$]

- (A) 350 J (B) 374 J (C) 748 J (D) 700 J

Correct Option: C**Solution:**

6. A light wave is incident normally on a glass slab of refractive index 1.5. If 4% of light gets reflected and the amplitude of the electric field of the incident light is 30 V/m, then the amplitude of the electric field for the wave propagating in the glass medium will be:

- (A) 10 V/m (B) 24 V/m
(C) 30 V/m (D) 6 V/m

Correct Option: B**Solution:**

$$P_{\text{refracted}} = \frac{96}{100} P_I \Rightarrow K_2 A_t^2 = \frac{96}{100} K_1 A_i^2$$

$$\Rightarrow r_2 A_t^2 = \frac{96}{100} r_1 A_i^2$$

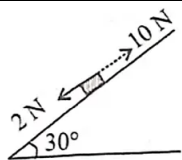
$$\Rightarrow A_t^2 = \frac{96}{100} \times \frac{1}{\frac{1}{2}} \times (30)^2$$

$$A_t = \sqrt{\frac{64}{100} \times (30)^2} = 24$$

7. A block kept on a rough inclined plane, as shown in the figure, remains at rest up to a maximum force 2 N down the inclined plane. The maximum external force up the inclined plane that does not move the block is 10 N. The coefficient of static friction between the block and the plane is: [Take $g = 10 \text{ m/s}^2$]

- (A) $\frac{\sqrt{3}}{2}$ (B) $\frac{\sqrt{3}}{4}$
(C) $\frac{1}{2}$ (D) $\frac{2}{3}$

Correct Option: A**Solution:**



(a) From figure, $2 + mg \sin 30^\circ = \mu mg \cos 30^\circ$ and $10 = mg \sin 30^\circ + \mu mg \cos 30^\circ = 2\mu mg \cos 30^\circ - 2$

$\Rightarrow 6 = \mu mg \cos 30^\circ$ and $4 = mg \cos 30^\circ$ By dividing above two $\Rightarrow \frac{3}{2} = \mu \times \sqrt{3}$

$\therefore$ Coefficient of friction, $\mu = \frac{\sqrt{3}}{2}$

8. A Carnot engine operating between temperatures T_1 and T_2 has efficiency 0.2. When T_2 is reduced by 50 K, its efficiency increases to 0.4. Then T_1 and T_2 are respectively

- (A) 200 K, 150 K (B) 250 K, 200 K
(C) 300 K, 250 K (D) 300 K, 200 K

Correct Option: B

Solution:

When efficiency of Carnot engine, $\eta = 0.2$ Efficiency of a Carnot engine,

$$\eta = 1 - \frac{T_2}{T_1} \text{ or } 0.2 = 1 - \frac{T_2}{T_1}$$

$$\text{or } \frac{T_2}{T_1} = 0.8 \dots$$

When T_2 is reduced by 50 K, its efficiency becomes 0.4

$$\therefore 0.4 = 1 - \frac{T_2 - 50}{T_1} \text{ or } \frac{T_2 - 50}{T_1} = 0.6$$

Dividing eqn. (i) by (ii)

$$\frac{T_2}{T_2 - 50} = \frac{0.8}{0.6} = \frac{4}{3}$$

$$\Rightarrow 3T_2 = 4T_2 - 200 \text{ or } T_2 = 200 \text{ K}$$

$$\text{From eqn. (ii), } T_1 = \frac{T_2 - 50}{0.6} = \frac{200 - 50}{0.6} = 250 \text{ K}$$

9. A particle P is moving in a circle of radius ' a ' with a uniform speed v . C is the centre of the circle and AB is a diameter. When passing through B the angular velocity of P about A and C are in the ratio

- (A) 1 : 1 (B) 1 : 2 (C) 2 : 1 (D) 4 : 1

Correct Option: B

Solution:

10. When M_1 gram of ice at -10°C (specific heat = $0.5 \text{ cal g}^{-1} \text{ } ^\circ\text{C}^{-1}$) is added to M_2 gram of water at 50°C finally no ice is left and the water is at 0°C . The value of latent heat of ice, in cal g^{-1} is

- (A) $\frac{5M_1}{M_2} - 50$ (B) $\frac{50M_2}{M_1}$
(C) $\frac{50M_2}{M_1} - 5$ (D) $\frac{5M_2}{M_1} - 5$

Correct Option: C

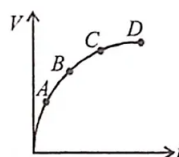
Solution:

Heat lost = Heat gain

$$\Rightarrow M_2 \times 1 \times 50 = M_1 \times 0.5 \times 10 + M_1 \cdot L_f$$

$$\Rightarrow L_f = \frac{50M_2 - 5M_1}{M_1} = \frac{50M_2}{M_1} - 5$$

11. Variation of current passing through a conductor as the voltage applied across its ends is varied as shown in the adjoining diagram. If the resistance (R) is determined at the points A , B , C and D , we will find that



- (A) $R_C = R_D$ (B) $R_B > R_A$
(C) $R_C > R_B$ (D) None of these

Correct Option: D

Solution:

From the curve it is clear that slopes at points A , B , C , D have following order $A > B > C > D$.

And also resistance at any point equals to slope of the V vs i curve.

So order of resistance at three points will be

$$R_A > R_B > R_C > R_D.$$

12. For a prism kept in air it is found that for an angle of incidence 60° , the angle of prism A , angle of deviation δ and angle of emergence 'e' become equal. Then the refractive index of the material of prism is

- (A) 1.73 (B) 1.15 (C) 1.5 (D) 1.33

Correct Option: A

Solution:

Given $i = 60^\circ$

$$A = \delta = e$$

$$\delta = i + e - A \Rightarrow \delta = i \quad (\because e = A)$$

Here angle of deviation is minimum. ($\because i = e$)

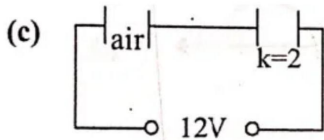
$$\therefore \mu = \frac{\sin\left(\frac{60^\circ + 60^\circ}{2}\right)}{\sin\frac{60^\circ}{2}} = 1.73$$

13. Two parallel plate capacitors X and Y have the same area of plates and same separation between plates. X has air and Y with dielectric of constant 2 between its plates. They are connected in series to a battery of 12 V. The ratio of electrostatic energy stored in X and Y is

(A) 4:1 (B) 1:4 (C) 2:1 (D) 1:2

Correct Option: C

Solution:



$A = \text{Same } d = \text{Same } Q = \text{Same in series}$

$$C_x = \frac{\epsilon_0 A}{d}, C_y = \frac{2\epsilon_0 A}{d}$$

$$U_x = \frac{Q^2}{2C_x}, U_y = \frac{Q^2}{2C_y}$$

$$\therefore \frac{U_x}{U_y} = \frac{C_y}{C_x} = \frac{2C_x}{C_x} = 2$$

14. Two vibrating strings of the same material but lengths L and $2L$ have radii $2r$ and r respectively. They are stretched under the same tension. Both the strings vibrate in their fundamental modes, the one of length L with frequency f_1 and the other with frequency f_2 . The ratio $\frac{f_1}{f_2}$ is given by :-

(A) 2 (B) 4 (C) 8 (D) 1

Correct Option: D

Solution:

$$\frac{f_1}{f_2} = \frac{v_1}{v_2} \times \frac{L_2}{L_1} = \sqrt{\frac{T_1}{\mu_1} \times \frac{\mu_2}{T_2}} \times \frac{L_2}{L_1}$$

Material is same

$$\Rightarrow m_1 = \rho \text{ volume} = \rho \times A_1 L_1 = \rho \pi r_1^2 L_1$$

$$\frac{f_1}{f_2} = \sqrt{\frac{m_2}{L_2} \times \frac{L_1}{m_1} \times \frac{L_2^2}{L_1^2}} = \sqrt{\frac{m_2 L_2}{m_1 L_1}} = \sqrt{\frac{r_2^2 L_2}{r_1^2 L_1} \times \frac{L_2}{L_1}}$$

$$= \frac{r_2 L_2}{r_1 L_1} = \frac{r(2L)}{(2r)(L)} = 1$$

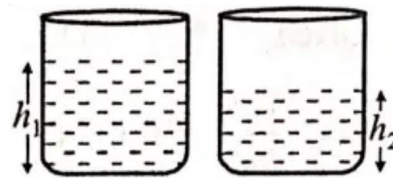
15. Some liquid is filled in a cylindrical vessel of radius R . Let F_1 be the force applied by the liquid on the bottom of the cylinder. Now the same liquid is poured into a vessel of uniform square cross-section of side R . Let F_2 be the force applied by the liquid on the bottom of this new vessel. (Neglect atmosphere pressure) Then

(A) $F_1 = \pi F_2$ (B) $F_1 = \frac{F_2}{\pi}$
(C) $F_1 = \sqrt{\pi} F_2$ (D) $F_1 = F_2$

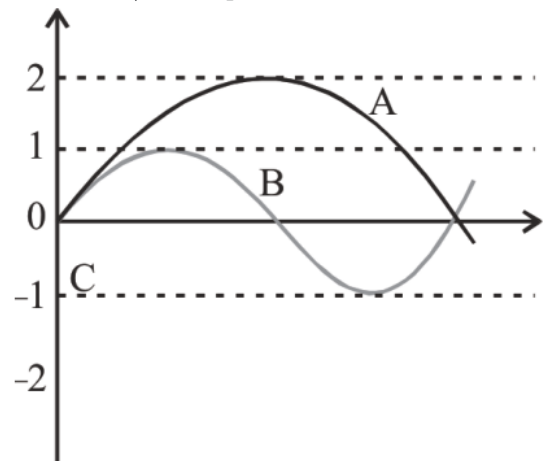
Correct Option: D

Solution:

$$\begin{aligned} (d) \quad \pi R^2 h_1 &= \pi R^2 h_2 \\ \therefore \pi h_1 &= h_2 \\ \frac{F_1}{F_2} &= \frac{\rho g h_1 \times \pi R^2}{\rho g h_2 \times R^2} \\ &= \frac{\pi h_1}{h_2} = 1 \end{aligned}$$



16. The displacement-time graphs for two sound waves A and B are shown in the figure, then the ratio of their intensities I_A/I_B is equal to :-



(A) 1 : 4 (B) 1:16 (C) 1 : 2 (D) 1 : 1

Correct Option: D

Solution:

Intensity $\propto a^2 \omega^2$ Here $\frac{a_A}{a_B} = \frac{2}{1}$ and $\frac{\omega_A}{\omega_B} = \frac{1}{2}$

$$\Rightarrow \frac{I_A}{I_B} = \left(\frac{2}{1}\right)^2 \times \left(\frac{1}{2}\right)^2 = 1$$



17. The Young's double slit experiment is performed with blue and with green light of wavelengths $4360 \text{ \AA}$ and $5460 \text{ \AA}$ respectively. If x is the distance of 4th maxima from the central one, then

- (A) $x(\text{blue}) = x(\text{green})$
 (B) $x(\text{blue}) > x(\text{green})$
 (C) $\frac{x(\text{blue})}{x(\text{green})} \approx 0.79$
 (D) $\frac{x(\text{blue})}{x(\text{green})} = 1.25$

Correct Option: C

Solution:

Distance of n th maxima, $x = n \cdot \frac{D}{d} \propto \lambda$. As $\lambda_b < \lambda_g$,

therefore $x_{\text{blue}} < x_{\text{green}}$.

18. The cathode of a photoelectric cell is changed such that the work function changes from W_1 to W_2 ($W_2 > W_1$). If the current before and after change are I_1 and I_2 , all other conditions remaining unchanged, then (assuming $h\nu > W_2$)

- (A) $I_1 = I_2$ (B) $I_1 < I_2$
 (C) $I_1 > I_2$ (D) $I_1 < I_2 < 2I_2$

Correct Option: A

Solution:

The work function has no effect on current so long as $h\nu > W_0$. The photoelectric current is proportional to the intensity of light. There is no change in the intensity of light, therefore $I_1 = I_2$.

19. While approaching a planet circling a distant star, an astronaut determines the radius of a planet is half of that of the earth. After landing on its surface, he finds its acceleration due to gravity is twice as that of the earth. The ratio of the mass of planet and that of the earth.

- (A) 1 : 2 (B) 2 : 3 (C) 3 : 4 (D) 4 : 5

Correct Option: A

Solution:

$$\frac{g_p}{g_e} = \frac{2}{1}; \frac{R_p}{R_e} = \frac{1}{2} \text{ So, } M_p/M_e = 1 : 2$$

20. A ball rolls without slipping. The radius of gyration of the ball about an axis passing through its centre of mass K. If radius of the ball be R , then the fraction of total energy associated with its rotational energy will be

- (A) $\frac{K^2}{R^2}$
 (B) $\frac{K^2}{K^2 + R^2}$

- (C) $\frac{R^2}{K^2 + R^2}$
 (D) $\frac{K^2 + R^2}{R^2}$

Correct Option: B

Solution:

$$\begin{aligned} \frac{R.K.E}{T.K.E} &= \frac{\frac{1}{2}I\omega^2}{\frac{1}{2}Mv^2(1 + \frac{K^2}{R^2})} \\ &= \frac{\frac{1}{2}MK^2\omega^2}{\frac{1}{2}MR^2\omega^2(1 + \frac{K^2}{R^2})} \\ &= \frac{K^2}{R^2(1 + \frac{K^2}{R^2})} \\ &= \frac{K^2}{R^2 + K^2} \end{aligned}$$

21. A current through a wire depends on time as $i = \alpha_0 t + \beta t^2$ where $\alpha_0 = 20 \text{ A/s}$ and $\beta = 8 \text{ As}^{-2}$. Find the charge crossed through a section of the wire in 15 s.

- (A) 2250 C (B) 11250 C (C) 2100 C (D) 260 C

Correct Option: B

Solution:

$$\text{Given, } i = \alpha_0 t + \beta t^2$$

$$\text{Put } \alpha_0 = 20 \text{ and } \beta = 8,$$

$$\text{we get } i = 20t + 8t^2$$

$$\text{Current, } i = \frac{dq}{dt} \Rightarrow \int dq = \int i dt$$

$$\begin{aligned} \Rightarrow q &= \int_0^{15} (20t + 8t^2) dt \\ \Rightarrow q &= \left(\frac{20t^2}{2} + \frac{8t^3}{3} \right)_0^{15} \\ &= 20 \times \left(\frac{15^2 - 0^2}{2} \right) + \frac{8}{3} (15^3 - 0^3) \\ \Rightarrow q &= 10 \times (15)^2 + \frac{8(15)^3}{3} \\ \Rightarrow q &= 2250 + 9000 = 11250 \text{ C} \end{aligned}$$

22. The maximum load a wire can withstand without breaking, when its length is reduced to half of its original length, will:

- (A) be double (B) be half
 (C) be four times (D) remain same

Correct Option: D

Solution:

We know that,

$$\text{Breaking stress} = \frac{\text{Breaking force}}{\text{Area of cross-section}}$$

When length of the wire changes, area of cross section remains same.

Hence, breaking force will be same when length changes.

23. Suppose we have an airplane, the compass in the plane indicates that it is headed due east and is moving through air with speed 215 km/h. A steady wind of 65 km/h is blowing due north. What is the speed of the plane with respect to the ground ?

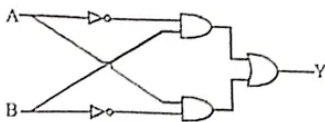
(A) 215 km/h (B) 225 km/h (C) 280 km/h (D) 150 km/h

Correct Option: B

Solution:

$$v = \sqrt{215^2 + 65^2} \approx 225 \text{ km/h}$$

24. The following circuit represents



- (A) OR gate (B) AND gate
(C) NAND gate (D) None of these

Correct Option: D

Solution:

25. A hydrogen atom at rest emits a photon of wavelength 122 nm. Then the recoil speed of the hydrogen atom is approximately:

(A) 3.25 m/s (B) 6.5 m/s (C) 1.75 m/s (D) 4.5 m/s

Correct Option: A

Solution:

26. A plumb line is suspended from a ceiling of a car moving with horizontal acceleration a . What will be the angle of inclination with vertical?

- (A) $\tan^{-1}(a/g)$ (B) $\tan^{-1}(g/a)$
(C) $\cos^{-1}(a/g)$ (D) $\cos^{-1}(g/a)$

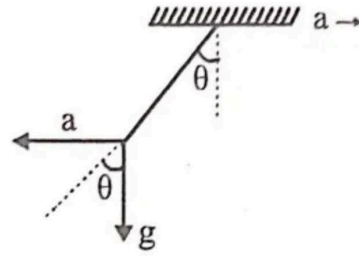
Correct Option: A

Solution:

When car moves towards right with acceleration a then due to pseudo force the plumb line will tilt in backward direction making an angle θ with vertical. From the figure

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

$$\therefore \theta = \tan^{-1}\left(\frac{a}{g}\right)$$



27. The activity of a radioactive material is

$$2.56 \times 10^{-3}$$

Ci. If the half life of the material is 5 days, after how many days the activity will become

$$2 \times 10^{-5} \text{ Ci?}$$

(A) 30 days (B) 35 days (C) 40 days (D) 25 days

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Correct Option: B

Solution:

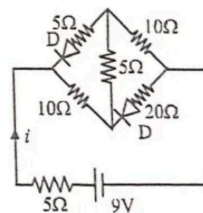
$$\frac{A}{A_0} = \frac{N}{N_0}$$

$$\frac{2 \times 10^{-5}}{2.56 \times 10^{-3}} = \frac{N}{N_0}$$

$\frac{N}{N_0} = \frac{1}{128} \Rightarrow N = \frac{N_0}{128}$ After 7 half lives activity comes down to given value

$$T = 7 \times 5 = 35 \text{ days}$$

28. The current i in the network is:



(A) 0.2A (B) 0.6A (C) 0.3A (D) 0A

Correct Option: C

Solution:

29. In an A.C. circuit, a resistance of R ohm is connected in series with an inductance L . If phase angle between voltage and current is 45° , what is the value of inductive reactance?

(A) $R/4$ (B) $R/2$ (C) R (D) $R/8$

Correct Option: C

Solution:

30. An electromagnetic wave passes through space and its equation is given by $E = E_0 \sin(\omega t - kx)$ where E is electric field. Energy density of electromagnetic wave in space is

- (A) $\frac{1}{2} \epsilon_0 E_0^2$
 (B) $\frac{1}{4} \epsilon_0 E_0^2$
 (C) $\epsilon_0 E_0^2$
 (D) $2\epsilon_0 E_0^2$

Correct Option: A

Solution:

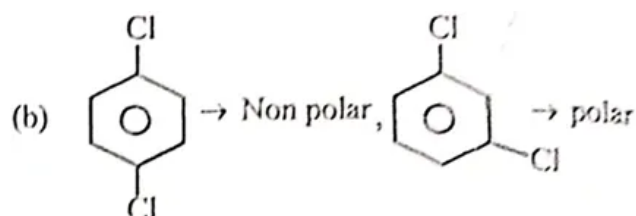
31. The pair from the following pairs having unii compounds with net non-zero dipole moment is

- (A) Benzene, anisidine
 (B) 1,4-Dichlorobenzene, 1,3-Dichlorobenzene
 (C) CH_2Cl_2 , CHCl_3
 (D) cis-butene, trans-butene

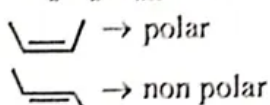
Correct Option: C

Solution:

- (a) Benzene $\rightarrow$ non polar Anisidine $\rightarrow$ polar



- (c) CH_2Cl_2 , $\mu_{\text{net}} \neq 0$, polar; CHCl_3 , $\mu_{\text{net}} \neq 0$, polar

- (d) 

32. The correct order of electron gain enthalpy of N, O, Cl, Al is

- (A) $\text{Cl} < \text{N} < \text{O} < \text{Al}$
 (B) $\text{Al} < \text{N} < \text{O} < \text{Cl}$
 (C) $\text{O} < \text{N} < \text{Al} < \text{Cl}$
 (D) $\text{N} < \text{O} < \text{Cl} < \text{Al}$

Correct Option: B

Solution:

33. Match Column-I with Column-II.

	Column-I (Quantum number)		Column-II (Information provided)
(A)	Principal		(p) orbital quantum number
(B)	Azimuthal		(q) orbital quantum number
(C)	Magnetic		(r) quantum number
(D)	Spin quantum		(s) number

(A) A - (q), B - (s), C - (p), D - (r)

(B) A - (s), B - (q), C - (p), D - (r)

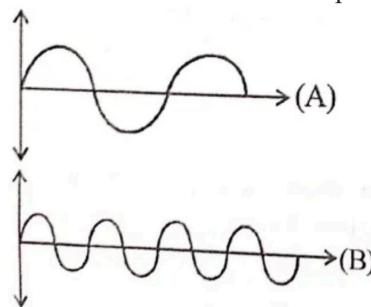
(C) A - (q), B - (p), C - (s), D - (r)

(D) A-(q), B-(s), C-(r), D-(p)

Correct Option: A

Solution:

34. What will be the difference between electromagnetic radiation shown in A and B respectively?



- (i) Velocity (ii) Wavelength (iii) Frequency (iv) Energy

(A) (ii) only

(B) (ii) and (iv)

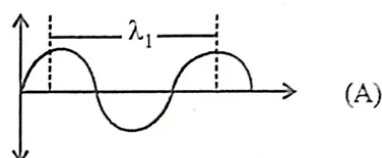
(C) (ii), (iii) and (iv)

(D) (iv) only

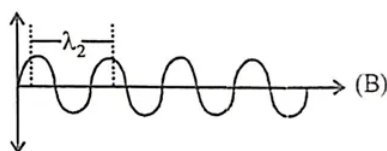
Correct Option: C

Solution:

(c) e/m waves shown in figure A has higher wavelength in comparison to e/m waves shown in figure B. Thus these waves also differ in frequency and energy. $v = \frac{c}{\lambda}$



$$\Rightarrow E_1 = \frac{hc}{\lambda_1}$$



$$\Rightarrow E_2 = \frac{hc}{\lambda_2} \lambda_1 > \lambda_2 \Rightarrow E_1 < E_2$$

35. An organic compound has 42.1% carbon, 6.4% hydrogen and remainder is oxygen. If its molecular weight is 342, then its molecular formula is:

- (A) $C_{11}H_{18}O_{12}$
 (B) $C_{12}H_{20}O_{12}$
 (C) $C_{14}H_{20}O_{10}$
 (D) $C_{12}H_{22}O_{11}$

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Correct Option: D**Solution:**

only $C_{12}H_{22}O_{11}$ has 42.1% carbon, 6.4% hydrogen & 51.5 percent oxygen.

36. The standard enthalpy of atomization of ethane according to the equation $C_2H_6(g) \rightarrow 2C(g) + 6H(g)$ is 622 kJ mol^{-1} . If standard mean C – H bond dissociation enthalpy is 90 kJ mol^{-1} , the standard mean dissociation enthalpy of C-C bond (in kJ mol^{-1}) is

- (A) 540 (B) 90 (C) 85 (D) 82

Correct Option: D**Solution:**

37. Solid $AgNO_3$ is slowly added to a solution containing each of 0.01 M NaCl and 0.001 M NaBr. What will be the concentration of Cl^- ions in solution when AgBr will just start to precipitate? $K_{sp}(AgBr) = 3.6 \times 10^{-13}$, $K_{sp}(AgCl) = 1.8 \times 10^{-10}$.

- (A) 1.8×10^{-7} (B) 3.6×10^{-10}
 (C) 0.01 (D) 2×10^{-4}

Correct Option: C**Solution:**

38. A compound of Xe and F is found to have 53.5% of Xe. What is oxidation number of Xe in this compound?

- (A) -4 (B) 0 (C) +4 (D) +6

Correct Option: D**Solution:**

$$Xe = 53.5\% \therefore F = 46.5\%$$

Relative number of atoms Xe

$$= \frac{53.5}{131.2} = 0.4 \text{ and } F = \frac{46.5}{19} = 2.4$$

Simple ratio Xe = 1 and F = 6;

Molecular formula is XeF_6

O.N.of Xe is +6

39. The correct order of melting points of Al, Ga, In is

- (A) $Ga < In < Al$
 (B) $In < Ga < Al$
 (C) $Al < Ga < In$
 (D) $Ga < Al < In$

Correct Option: A**Solution:**

40. In nucleophilic substitution reaction, order of halogens : incoming (attacking) nucleophile is: $I^- > Br^- > Cl^-$
 The order of halogens as departing nucleophile should be :

- (A) $Br^- > I^- > Cl^-$
 (B) $I^- > Br^- > Cl^-$
 (C) $Cl^- > Br^- > I^-$
 (D) $Cl^- > I^- > Br^-$

Correct Option: B**Solution:**

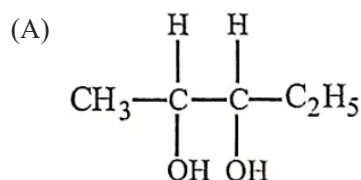
Since the leaving group breaks away as a base, it is easier to displace weaker bases as compared to stronger bases. Thus less basic the substituent, the more easily it is displaced. Since the basic strength of the given groups is in order.

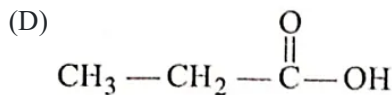
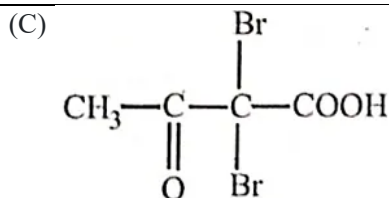


Thus the order of halogen leaving groups is



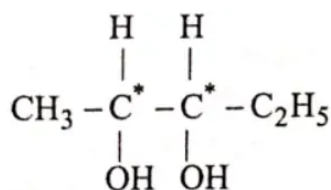
41. Which of the following is optically active ?





Correct Option: A

Solution:



42. If the E_{cell}° for a given reaction has a negative value, which of the following gives correct relationships for the values of ΔG° and K_{eq} ?

- (A) $\Delta G^\circ > 0$ and $K_{\text{eq}} < 1$
 (B) $\Delta G^\circ > 0$ and $K_{\text{eq}} > 1$
 (C) $\Delta G^\circ < 0$ and $K_{\text{eq}} > 1$
 (D) $\Delta G^\circ < 0$ and $K_{\text{eq}} < 1$

NEET 2016

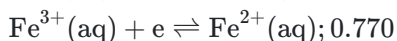
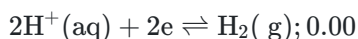
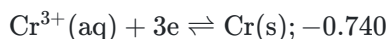
Correct Option: A

Solution:

$$\Delta G^\circ = -2.303RT \log K_{\text{eq}}$$

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

43. The standard reduction potentials at 298 K for the following half reactions are given against each $\text{Zn}^{2+}(\text{aq}) + 2\text{e} \rightleftharpoons \text{Zn}(\text{s}); -0.762$



reducing agent

Which is the strongest

- (A) $\text{Zn}(\text{s})$ (B) $\text{Cr}(\text{s})$
 (C) $\text{H}_2(\text{g})$ (D) $\text{Fe}^{2+}(\text{aq})$

Correct Option: A

Solution:

More negative is the reduction potential, higher will be the reducing property, i.e. the power to give up electrons.

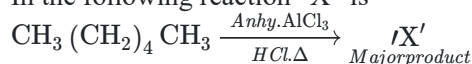
44. If 0.1 M solution of glucose and 0.1 M solution of urea are placed on two sides of the semipermeable membrane to equal heights, then it will be correct to say that

- (A) there will be no net movement across the membrane
 (B) glucose will flow towards urea solution
 (C) urea will flow towards glucose solution
 (D) water will flow from urea solution to glucose

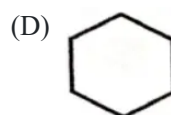
Correct Option: A

Solution:

45. In the following reaction 'X' is



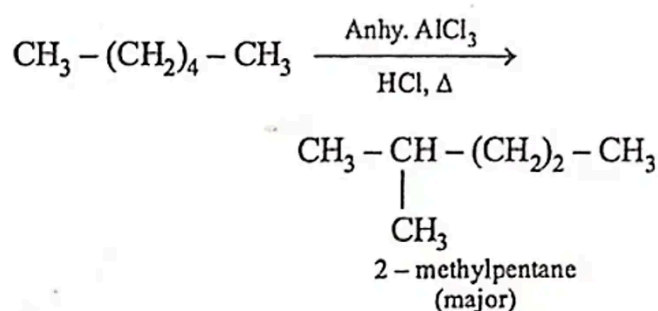
- (A) $\text{CH}_3(\text{CH}_2)_4\text{CH}_2\text{Cl}$
 (B) $\text{Cl}-\text{CH}_2-(\text{CH}_2)_4-\text{CH}_2-\text{Cl}$
 (C) $\text{CH}_3\text{CH}(\text{CH}_3)-(\text{CH}_2)_2\text{CH}_3$



Correct Option: C

Solution:

(c) n-alkanes on heating in this presence of anhydrous AlCl_3 and hydrogen chloride gas isomerise to branched chain alkanes. The major product has one methyl side chain.



46. Consider a gas phase reaction which occurs in a closed vessel



The concentration of B is found to be increased by $5 \times 10^{-3} \text{ mol L}^{-1}$ in 10 seconds.

The rate of disappearance of A (in $\text{mol L}^{-1} \text{ s}^{-1}$) is

- (A) 4.75×10^{-4} (B) 7.5×10^{-4}
 (C) 1.25×10^{-4} (D) 2.5×10^{-4}

Correct Option: D**Solution:**

47. In nitrogen family, the H-M-H bond angle in the hydrides gradually becomes closer to 90° on going from N to Sb. This shows that gradually

- (A) the basic strength of the hydrides increases.
 (B) almost pure p-orbitals are used for M-H bonding.
 (C) the bond energies of M-H bonds increases.
 (D) the bond pairs of electrons become nearer to the central atom.

Correct Option: B**Solution:**

48. Which group contains coloured ions out of following Cu^{2+} Ti^{4+} Co^{2+} Fe^{2+}

- (A) 1, 2, 3, 4 (B) 1, 3, 4
 (C) 2, 3 (D) 1, 2

Correct Option: B**Solution:**

49. Identify correct statements from below:

- I. The chromate ion is square planar.
 II. Dichromates are generally prepared from chromates.
 III. The green manganate ion is diamagnetic.
 IV. Dark green coloured K_2MnO_4 disproportionates in a neutral or acidic medium to give permanganate.
 V. With increasing oxidation number of transition metal, ionic character of the oxides decreases.

Choose the correct answer from the option given below:

- (A) II, III, IV only (B) I, IV, V only
 (C) I, II, III only (D) II, IV, V only

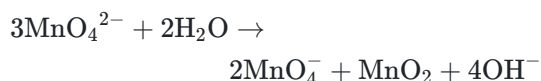
Correct Option: D**Solution:**

- (I) CrO_4^{2-} is tetrahedral

- (II) $2\text{Na}_2\text{CrO}_4 + 2\text{H}^+ \rightarrow \text{Na}_2\text{Cr}_2\text{O}_7 + 2\text{Na}^+ + \text{H}_2\text{O}$

- (III) Green manganate is paramagnetic with 1 unpaired electron.

- (IV) $3\text{MnO}_4^{2-} + 4\text{H}^+ \rightarrow 2\text{MnO}_4^- + \text{MnO}_2 + 2\text{H}_2\text{O}$



- (V) As the oxidation state increases ionic character decreases.

50. The increasing order of field strength of ligands is

- (A) $\text{NH}_3 < \text{H}_2\text{O} < \text{Cl}^- < \text{CO} < \text{CN}^-$
 (B) $\text{Cl}^- < \text{H}_2\text{O} < \text{NH}_3 < \text{CN}^- < \text{CO}$
 (C) $\text{Cl}^- < \text{CO} < \text{CN}^- < \text{H}_2\text{O} < \text{NH}_3$
 (D) $\text{CN}^- < \text{CO} < \text{NH}_3 < \text{Cl}^- < \text{H}_2\text{O}$

Correct Option: B**Solution:**

51. Match List-I with List-II:

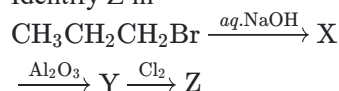
List-I (Complex)		List-II (Hybridization)	
(A)	$\text{Ni}(\text{CO})_4$	(p)	sp^3
(B)	$[\text{Ni}(\text{CN})_4]^{2-}$	(q)	$sp^3 d^2$
(C)	$[\text{Co}(\text{CN})_6]^{3-}$	(r)	$d^2 sp^3$
(D)	$[\text{CoF}_6]^{3-}$	(s)	dsp^2

Choose the correct answer from the options given below

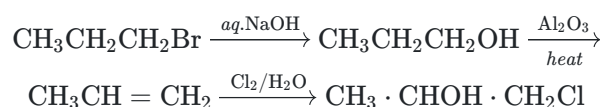
- (A) A – (s), B – (p), C – (r), D – (q)
 (B) A – (p), B – (s), C – (r), D – (q)
 (C) A – (p), B – (s), C – (q), D – (r)
 (D) A – (s), B – (p), C – (q), D – (r)

Correct Option: B**Solution:**

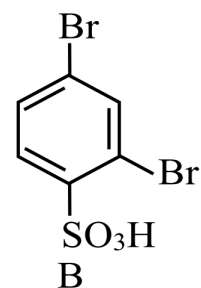
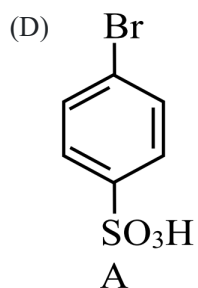
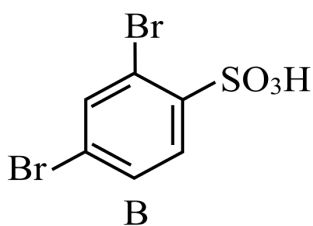
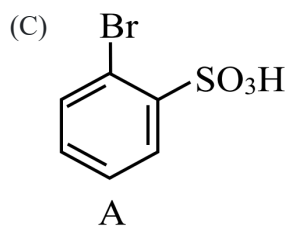
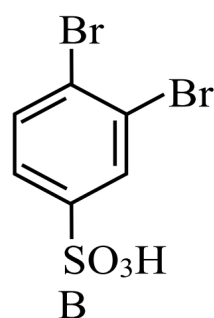
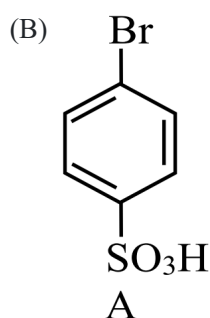
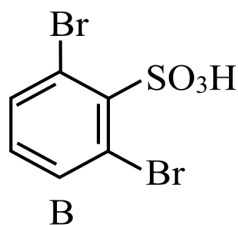
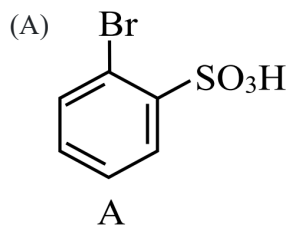
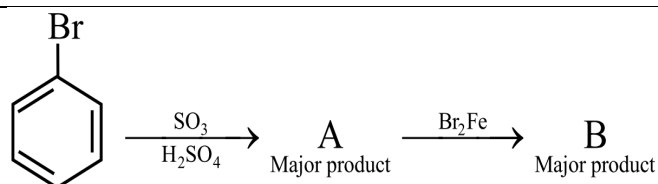
52. Identify Z in



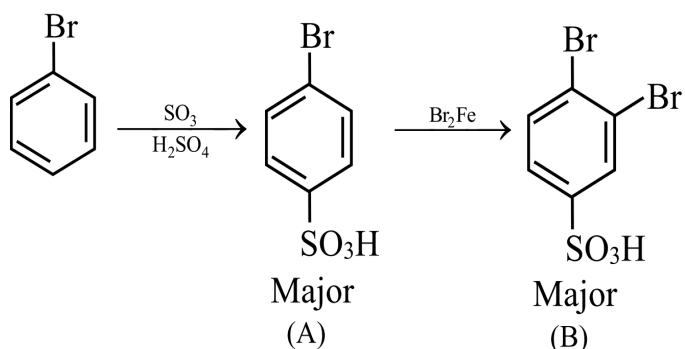
- (A) Mixture of $\text{CH}_3\text{CHClCH}_2\text{Cl}$ and $\text{CH}_3\text{CHOHCH}_2\text{Cl}$
 (B) $\text{CH}_3\text{CHOHCH}_2\text{Cl}$
 (C) $\text{CH}_3\text{CHClCH}_2\text{OH}$
 (D) $\text{CH}_3\text{CHClCH}_2\text{Cl}$

Correct Option: B**Solution:**

53. In the following series of reactions identify the major products A & B respectively.



JM 2025

Correct Option: B**Solution:**

∴ Both reactions are electrophilic substitution reaction first is sulphonation and second is halogenation.

-Br is o- and p-directing and gives a para product (major) while SO₃H is meta directing and so cumulative directive influence of -Br and SO₃H give the final product (B).

54. While titrating dilute HCl solution with aqueous NaOH, which of the following will not be required?

- (A) Burette and porcelain tile
(B) Pipette and distilled water
(C) Clamp and phenolphthalein
(D) Bunsen burner and measuring cylinder

Correct Option: D**Solution:**

55. In sodium fusion test of organic compounds, the nitrogen of the organic compound is converted into

- (A) Sodamide (B) Sodium cyanide
(C) Sodium nitrite (D) Sodium nitrate

Correct Option: B**Solution:**

When the nitrogen containing compound is heated with sodium, the nitrogen and carbon of organic compound converted into sodium cyanide.



56. The incorrect statements regarding enzymes are:

- (A) Enzymes are biocatalysts.
(B) Enzymes are non-specific and can catalyse different kinds of reactions.
(C) Most Enzymes are globular proteins.
(D) Enzyme - oxidase catalyses the hydrolysis of maltose into glucose.

Choose the correct answer from the option given below:

- (A) (B) and (C) (B) (B), (C) and (D)
(C) (B) and (D) (D) (A), (B) and (C)

Correct Option: C**Solution:**

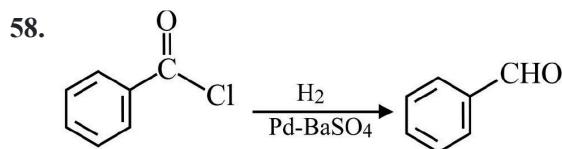
Directly NCERT Based

57. Which of the following reactions are used in the preparation of aliphatic primary amines?

- I. Gabriel-phthalimide reaction
II. Hoffmann Bromamide reaction
III. Carbylamine reaction

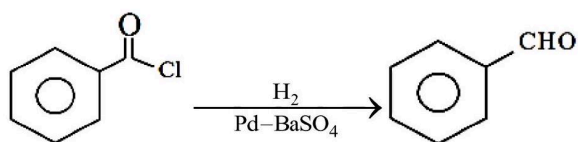
IV. Sandmeyer reaction

- (A) II & III only (B) I & II only
(C) III & IV only (D) I & IV only

Correct Option: B**Solution:**

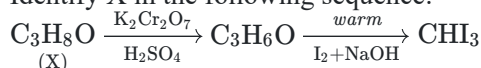
This reduction reaction is known as:

- (A) Rosenmund reduction (B) Wolff-Kishner reduction
(C) Stephen reduction (D) Etard reduction

Correct Option: A**Solution:**

It is known as rosenmund reduction that is the partial reduction of acid chloride to aldehyde

59. Identify X in the following sequence:



- (A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
(B) $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$
(C) $\text{CH}_3\text{OCH}_2\text{CH}_3$
(D) $\text{CH}_3\text{CH}_2\text{CHO}$

Correct Option: B**Solution:**

60. Incorrect method of preparation for alcohols from the following is:

- (A) Ozonolysis of alkene.
(B) Reaction of Ketone with RMgBr followed by hydrolysis.
(C) Hydroboration-oxidation of alkene.
(D) Reaction of alkyl halide with aqueous NaOH .

JM 2023**Correct Option: A****Solution:**

Ozonolysis of alkene, gives aldehyde, ketone & carboxylic acid.

61. The minister's unexpected resignation threw a spanner in the works of the proposed reform.

- (A) Accelerated the implementation of a plan
(B) Caused an unexpected obstacle in a planned activity
(C) Concealed a serious administrative failure
(D) Brought an unsuccessful project to completion

Correct Option: B**Solution:**

62. For much of human history, silence was not regarded merely as the absence of sound. It was a deliberate condition in which thought could mature without constant interruption. Monasteries, libraries, and secluded study rooms were designed around this principle, recognising that sustained attention often requires a temporary withdrawal from the noise of ordinary life. Modern societies however, increasingly treat silence as an uncomfortable void that must be filled with conversation, entertainment or digital stimulation.

Yet silence can perform a function that noise cannot. It allows individuals to notice subtle distinctions, reconsider habitual assumptions, and listen to thoughts that might otherwise remain submerged beneath continual stimulation. This does not mean that silence is inherently superior to speech or activity. Excessive withdrawal can itself become unproductive, and meaningful dialogue is indispensable to intellectual development. The issue, therefore, is not whether one should choose silence over sound, but whether one possesses the freedom to choose between them.

In an environment saturated with competing demands for attention, the ability to remain silent may consequently represent something more significant than personal preference. It may be an exercise in intellectual autonomy—the capacity to determine what deserves one's attention rather than allowing external stimuli to determine automatically.

What does the passage primarily suggest about the value of silence?

- (A) Silence is essential for intellectual development and should replace frequent communication.
(B) Silence is mainly valuable because it protects individuals from technological distractions.
(C) Silence is superior to speech because it enables people to develop independent opinions.
(D) Silence can create conditions for reflection and focused thought when consciously chosen.



Correct Option: D

Solution:

63. For much of human history, silence was not regarded merely as the absence of sound. It was a deliberate condition in which thought could mature without constant interruption. Monasteries, libraries, and secluded study rooms were designed around this principle, recognising that sustained attention often requires a temporary withdrawal from the noise of ordinary life. Modern societies, however, increasingly treat silence as an uncomfortable void that must be filled with conversation, entertainment, or digital stimulation.

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In an environment saturated with competing demands for attention, the ability to remain silent may consequently represent something more significant than personal preference. It may be an exercise in intellectual autonomy—the capacity to determine what deserves one's attention rather than allowing external stimuli to determine it automatically.

Which of the following can be most reasonably inferred from the passage?

- (A) Intellectual autonomy partly depends on an individual's ability to control where attention is directed.
- (B) Modern individuals are incapable of concentrating because they are constantly exposed to noise.
- (C) Historical institutions such as monasteries deliberately discouraged intellectual exchange.
- (D) Meaningful dialogue becomes unnecessary when individuals regularly practise silence.

Correct Option: A

Solution:

64. Choose the word opposite in meaning to the word given in capital.

OBDURATE

- (A) Compliant
- (B) Resolute
- (C) Inflexible
- (D) Obstinate

Correct Option: A

Solution:

65. PERSPICACIOUS

- (A) Impulsive
- (B) Perceptive
- (C) Indifferent
- (D) Gullible

Correct Option: B

Solution:

66. The committee remained ____ despite repeated attempt to persuade its members to reconsider the proposal.

- (A) amenable
- (B) obsequious
- (C) recalcitrant
- (D) tentative

Correct Option: C

Solution:

67. The researcher refused to draw a definitive conclusion from the preliminary findings, maintaining a suitable ____ attitude until further evidence became available.

- (A) dogmatic
- (B) presumptuous
- (C) unequivocal
- (D) circumspect

Correct Option: D

Solution:

68. In the questions given below, find out the part of the sentence which contains an error.

- (A) The principal, along with several senior teachers
- (B) have agreed to reconsider
- (C) the proposed changes to the examination schedule
- (D) after receiving feedback from the students.

Correct Option: B

Solution:

69. In the questions given below, find out the part of the sentence which contains an error. No sooner had the negotiations begun when the representatives of both parties raised objections to the proposed terms and requested further clarification.

- (A) No sooner had the negotiations begun
- (B) when the representatives of both parties
- (C) raised objections to the proposed terms
- (D) and requested further clarification.

Correct Option: B

Solution:

70. In the question below, a part of the sentence is underlined. Below are given alternatives to the underlined part which may improve the sentence. Choose the correct alternative. In case no improvement is needed, mark your answer as option (d).

The new policy is not only intended to reduce administrative delays but also improving transparency.

- (A) not only intended to reduce administrative delays but also to improve transparency
(B) intended not only to reduce administrative delays but also improving transparency
(C) not only intending to reduce administrative delays but also to improve transparency
(D) No improvement

Correct Option: A

Solution:

71. MUSCLE: SUMLEC:: OUTPUT: ____

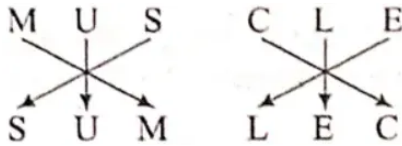
- (A) TOUTUP (B) UTOPUT (C) PUTOUT (D) TUOUTP

Correct Option: D

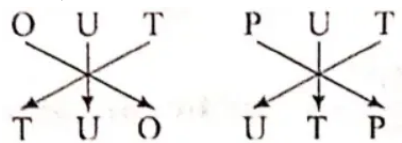
Solution:

MUSCLE: SUMLEC:: OUTPUT: ____

As,



Then,



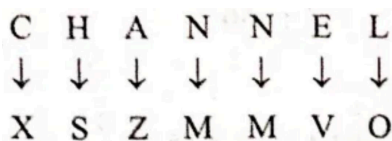
72. CHANNEL : XSZMMVO : MUSICAL : ?

- (A) NFHRXZ (B) NFHQYZ (C) NEHRXZ (D) NFIRXZO

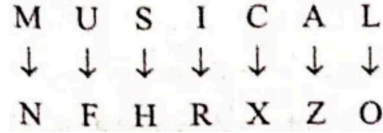
Correct Option: A

Solution:

As,



Similarly,



73. In the following question, four words have been give out of which three are alike in some manner and the fourth one is different. Choose out the odd one.

- (A) Fish : Pisciculture (B) Birds : Horticulture
(C) Bees : Apiculture (D) Silkworm : Sericulture

Correct Option: B

Solution:

74. Select the odd word from the given alternatives.

- (A) Obstetrician (B) Podiatrist
(C) Pulmonologist (D) Prosthetist

Correct Option: D

Solution:

75. Which one set of letters when sequentially placed at the gaps in the given series shall complete it ?

SH_ELAS_EELA_HEELASHEE_A

- (A) ELHA (B) EHSL (C) EEHS (D) HHSS

Correct Option: B

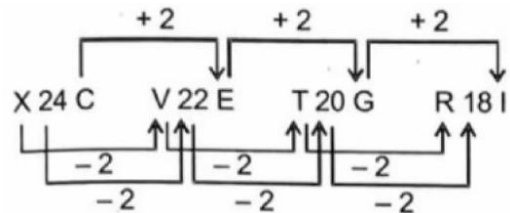
Solution:

76. Find the next term in the following series: X24C, V22E, T20G, ____

- (A) RI 19 (B) R19I (C) R18I (D) RI 18

Correct Option: C

Solution:



77. From the given alternatives select the word which can be formed using the letters of the given word ESTRANGE.

- (A) GENERATE (B) SERGEANT (C) REAGENT (D) GREAT

Correct Option: A

Solution:

There are only two Es in the keyword.

78. In a given code SISTER is coded as 535301. UNCLE as 84670 and BOY as 129. How is RUSTIC written in that code?

- (A) 633185 (B) 185336 (C) 363815 (D) 581363

Correct Option: B

Solution:

79. Pointing to a woman, Nirmal said, "She is the daughter of my wife's grandfather's only child". How is the woman related to Nirmal ?

- (A) Wife (B) Sister-in-law
(C) Sister (D) Data inadequate

Correct Option: D

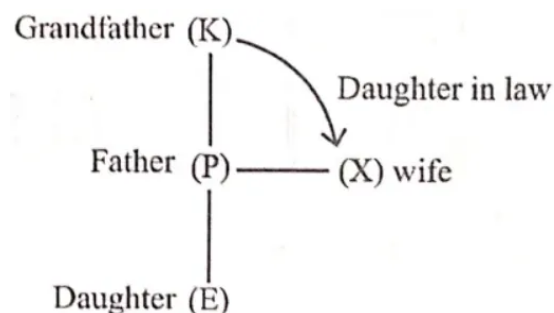
Solution:

80. E is the daughter of P who is the husband of the only daughter-in-law of K ? How is E related to K?

- (A) Daughter (B) Granddaughter
(C) Grandmother (D) Mother

Correct Option: B

Solution:



Here X is daughter in law of K and wife of P. Hence, E is the granddaughter of K.

81. In each question below, given two statements followed by four conclusions numbered I to IV. Consider the statements to be true even if they seem at variance with commonly known facts. Determine which conclusions logically follow from the given statements.

Statement:

All roads are bricks.
Some bricks are ropes.
All ropes are doors.

Conclusions:

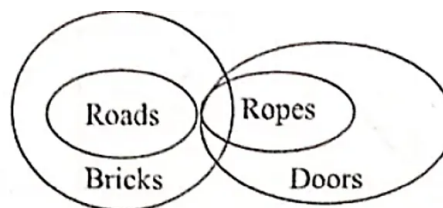
- Some roads are doors.
- Some doors are bricks.
- Some roads are not doors.
- All doors are ropes.

- (A) Only I and II follow. (B) Only I, II and III follow.

- (C) Either I or III and II follow. (D) Either I or III and IV follow.

Correct Option: C

Solution:



Conclusions -

- Some roads are doors (O)
- Some doors are bricks (P)
- Some roads are not doors (O)
- All doors are ropes (O)

Some roads are doors $\Rightarrow$ either I or III.

82. Statement:

All aeroplanes are trains.
Some trains are chairs.

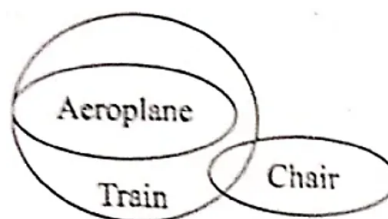
Conclusions:

- (I) Some aeroplanes are chairs.
(II) Some chairs are aeroplanes.
(III) Some chairs are trains.
(IV) Some trains are aeroplanes.

- (A) None follows (B) Only I and II follow
(C) Only II and III follow (D) Only III and IV follow

Correct Option: D

Solution:



Conclusion:-

- (I) Some aeroplane are chairs." O
(II) Some chairs are aeroplane. "O
(III) Some chairs are trains P
(IV) Some trains are aeroplanes. P

83. In the following questions, arrange the given words in a meaningful sequence and then choose the most appropriate sequence from amongst the alternatives provided below each question:

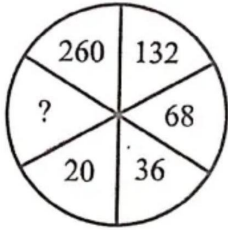
Police, Crime, Judgement, Punishment, Justice

- (A) 1,2,3,4,5 (B) 3, 1, 2, 4, 5
(C) 3, 1, 4, 5, 2 (D) 5,4,3,2,1

Correct Option: C

Solution:

84. Find the missing number from the given responses.

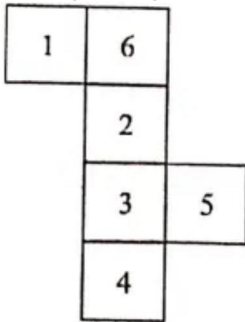


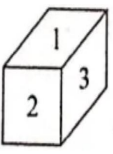
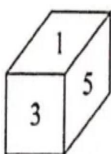
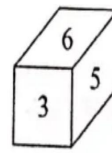
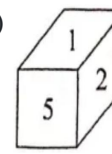
- (A) 12 (B) 10 (C) 9 (D) 8

Correct Option: A

Solution:

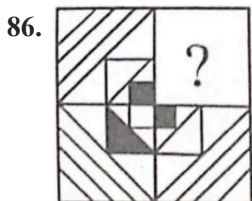
85. From the given options, which figure can be formed by folding the figure in the question?



- (A)  (B)  (C)  (D) 

Correct Option: A

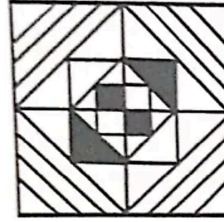
Solution:



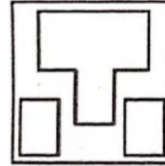
- (A)  (B)  (C)  (D) 

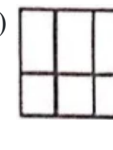
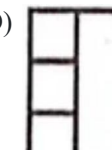
Correct Option: D

Solution:



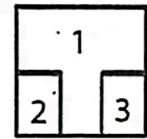
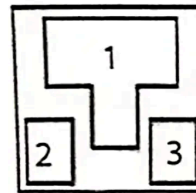
87. Question figure.



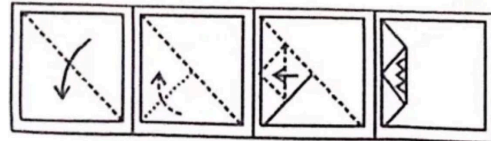
- (A)  (B)  (C)  (D) 

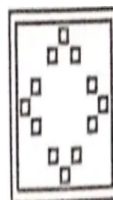
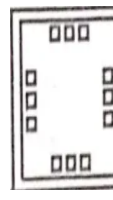
Correct Option: B

Solution:



88. In each of the following questions, a piece of paper folded and cut as shown below in the question figure. From the given answer figures, indicate how it will appear when opened?

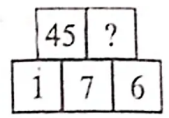
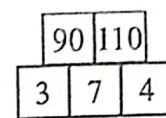
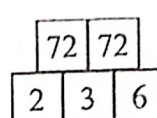


- (A)  (B)  (C)  (D) 

Correct Option: C

Solution:

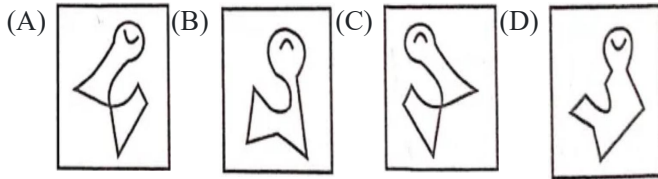
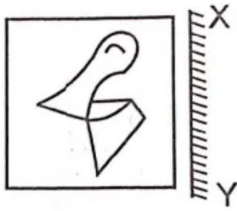
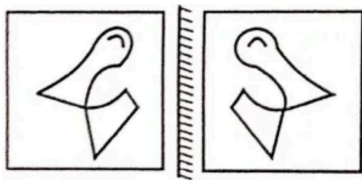
89. In the following question, select the number which can be placed at the sign of question mark (?) from the given alternatives.



(A) 112 (B) 144 (C) 156 (D) 186

Correct Option: C**Solution:**

90. Question Figure:

**Correct Option: C****Solution:**91. The sum of all the integers in the domain of the real valued function $f(x) = \sqrt{\log_{\frac{1}{3}} \left(\frac{9x-30}{x-26} \right)}$ is

(A) 6 (B) 9 (C) 12 (D) 10

Correct Option: A**Solution:**92. If both α and β lie in $(-\frac{\pi}{4}, 0)$, $\sin(\alpha + \beta) = -\frac{33}{65}$ and $\sin \alpha = -\frac{3}{5}$, then $\tan(2\alpha + \beta) =$ (A) $-\frac{9}{323}$ (B) $-\frac{9}{125}$
(C) $\frac{75}{323}$ (D) $-\frac{12}{5}$ **Correct Option: D****Solution:**93. a_1, a_2, a_3 are in arithmetic progression where the common difference is 2 and the first term is 2. If $\cos a_1 + \cos a_2 + \cos a_3 = \frac{\sin \alpha}{\sin \beta} \cos \gamma$, then find $\alpha + \beta$.(A) 2γ (B) γ
(C) $\frac{\gamma}{2}$ (D) $\gamma + 2$ **Correct Option: B****Solution:**94. If the complex conjugate of $\frac{(1-i)^3}{(\sqrt{3}-i)^2}$ is $x + iy$, then $y - x =$ (A) 1 (B) $\frac{1}{2}$
(C) $2\sqrt{3}$ (D) $\frac{2}{\sqrt{3}}$ **Correct Option: B****Solution:**95. If $z_1 = 8 + 4i$, $z_2 = 6 + 4i$ and $\text{Arg} \left(\frac{z-z_1}{z-z_2} \right) = \frac{\pi}{4}$ then z satisfies.(A) $|z - 7 - 4i| = 1$
(B) $|z - 7 - 5i| = \sqrt{2}$
(C) $|z - 4i| = 8$
(D) $|z - 1 - 7i| = \sqrt{18}$ **Correct Option: B****Solution:**

96. All possible 3 digit numbers are formed using all the digits 2, 3, 5, 7, 9 without using any digit more than once. Among these 3 digit numbers, then number of numbers which are divisible by 3 but not divisible by 5 is

(A) 24 (B) 22 (C) 20 (D) 18

Correct Option: C**Solution:**

97. A student has to answer 10 out of 13 questions in an examination choosing at least 3 from the 5 particular questions. The number of choices available to the student is

(A) 196 (B) 276 (C) 326 (D) 156

Correct Option: B**Solution:**

98. Bag A contains 3 red and 5 black balls, bag B contains 5 red and 3 black balls and bag C contains 4 red and 4 black balls. A bag is chosen randomly and a ball is drawn randomly from the bag. If the ball drawn is found to be black, then the probability that it is drawn from bag B is

(A) $\frac{7}{12}$ (B) $\frac{1}{4}$
(C) $\frac{5}{12}$ (D) $\frac{1}{3}$ **Correct Option: B****Solution:**99. $\int \frac{\sin 4x}{\sin x} dx =$ (A) $4(3 \sin x + 3 \sin 3x) + c$
(B) $\frac{4}{3}(2 \sin 3x + 3 \sin x) + c$
(C) $4(3 \sin x - 3 \sin 3x) + c$
(D) $\frac{4}{3}(3 \sin x - 2 \sin 3x) + c$

Correct Option: D**Solution:**

100. If $\frac{x+3}{(1-x)^2(1+x^2)} = \frac{A}{1-x} + \frac{B}{(1-x)^2} + \frac{Cx+D}{2(1+x^2)}$ then $B^2 + C^2 + D^2 =$

- (A) $\frac{3}{4}$ (B) $4\frac{1}{2}$
(C) 14 (D) 4

Correct Option: C**Solution:**

101. $\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} \frac{x+\frac{\pi}{2}}{2-\sin^2 x} dx =$

- (A) $\frac{\pi^2}{6\sqrt{3}}$
(B) $\frac{\pi}{\sqrt{2}} \tan^{-1}(\frac{\sqrt{3}}{2})$
(C) $\frac{\pi^2}{3\sqrt{2}}$
(D) $\frac{\pi}{2} \tan^{-1}(\frac{\sqrt{3}}{2})$

Correct Option: B**Solution:**

102. If $f: \mathbb{R} - \{\frac{2a}{3}\} \rightarrow \mathbb{R}$ is a function defined by $f(x) = \frac{2x+a}{3x-2a}$ and $(f \circ f)(x) = x$ for all $x \in \mathbb{R} - \{\frac{2a}{3}\}$, then find $f(3)$.

(A) 3 (B) 7 (C) 1 (D) 9

Correct Option: C**Solution:**

103. The sum of the coefficients of fractional powers of x in the expansion of $(1 - 3x^{\frac{1}{2}})^{2026}$ is

(A) $2^{2025} - 2^{2026}$ (B) $2^{2025} (2^{2026} - 1)$
(C) $2^{2025} (1 - 2^{2026})$ (D) $2^{2026} - 2^{2025}$

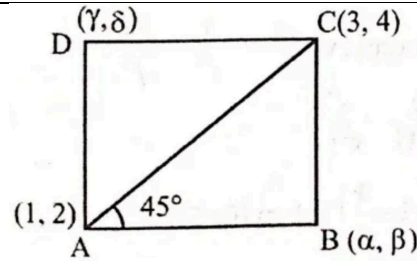
Correct Option: C**Solution:**

104. Let $A(1, 2)$ and $C(3, 4)$ be the end points of one of the diagonals of a square ABCD. If $B(\alpha, \beta)$ and $D(\gamma, \delta)$ are the end points of the other diagonal of this square, then find the value of $\alpha + \beta - \gamma + \delta$.

(A) 0 (B) 6 (C) 8 (D) 4

Correct Option: C**Solution:**

Slope of $AC = \frac{4-2}{3-1} = 1$.



AC makes 45° with x-axis and y-axis.

$BC \parallel AD$.

BC is parallel to y-axis.

$AB \parallel x$ -axis.

$B(3, 2), D(1, 4)$.

$\alpha = 3, \beta = 2, \gamma = 1, \delta = 4$.

$\alpha + \beta - \gamma + \delta = 8$.

105. Two adjacent sides of a parallelogram $ABCD$ are $x - y + 1 = 0$ and $3x - y = 9$. If one of its diagonals $7x - 5y + 3 = 0$, then the equation of the other diagonal is

- (A) $x - 3y + 13 = 0$ (B) $5x + 7y = 13$
(C) $x + y - 2 = 0$ (D) $x + 3y = 4$

Correct Option: A**Solution:**

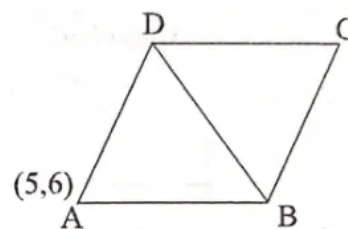
Two adjacent sides of a parallelogram $ABCD$ are given by the equations:

$x - y + 1 = 0 \Rightarrow y = x + 1 \quad \dots(i)$

$3x - y = 9 \quad \dots(ii)$

Substitute the value of y from the first equation into the second:

$3x - (x + 1) = 9 \Rightarrow 2x = 10 \Rightarrow x = 5$



So, $y = 5 + 1 = 6$.

Thus, the sides intersect at point $A(5, 6)$.



Given the equation of one diagonal is: $7x - 5y + 3 = 0$

Substitute $A(5, 6)$ into this equation:

$$\Rightarrow 7(5) - 5(6) + 3 = 35 - 30 + 3 = 8 \neq 0$$

Thus, the given diagonal does not pass through point A . It intersects the other two vertices B and D . From the given diagonal equation, find points B and D as $(1, 2)$ and $(6, 9)$ respectively.

Let M be the midpoint of diagonal BD :

$$M = \left(\frac{1+6}{2}, \frac{2+9}{2} \right) = \left(\frac{7}{2}, \frac{11}{2} \right)$$

Since the diagonal AC passes through $A(5, 6)$ and midpoint $M\left(\frac{7}{2}, \frac{11}{2}\right)$, its slope is:

$$\text{So, slope of } C = m = \frac{\frac{11}{2} - 6}{\frac{7}{2} - 5} = \frac{1}{3}$$

Thus, equation of diagonal AC passes through

$A(5, 6)$ and slope $(m) = \frac{1}{3}$'s:

$$y - 6 = \frac{1}{3}(x - 5)$$

$$\Rightarrow x - 3y + 13 = 0$$

$$8 + 7 + 15 + 12 + 12 + 60 + 15$$

- 106.** Mean deviation from the mean for the ungrouped data 8, 7, 15, 12, 12, 60, 15, 6, 65, 4, 6, 18 is

(A) 14.5 (B) 11.16 (C) 12.6 (D) 13.4

Correct Option: A

Solution:

- 107.** The mean deviation from the median of the given frequency distribution is:

Class-interval	1-7	7-13	13-19	19-25	25-31
Frequency	4	5	3	6	2

(A) 7 (B) 7.5 (C) 6 (D) 5

Correct Option: A

Solution:

- 108.** If the sets A and B are given by $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8, 10\}$ and the universal set $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, then

(A) $(A \cup B)' = \{5, 7, 9\}$

(B) $(A \cap B)' = \{1, 3, 5, 6, 7\}$

(C) $(A \cap B)' = \{1, 3, 5, 6, 7, 8\}$

(D) None of these

Correct Option: A

Solution:

- 109.** Let $L = 0$ be the chord of contact of $(5, 1)$ with respect to the circle $S \equiv x^2 + y^2 + 8x + 10y - 8 = 0$. If the pole of $L = 0$ with respect to the circle $S' = x^2 + y^2 + 4y - 21 = 0$ is $(-k, -h)$, then $k + h =$

(A) 35 (B) 77 (C) 143 (D) 15

Correct Option: B

Solution:

- 110.** The distance of a point $(1, 2)$ from the directrix of the parabola $y^2 - 4x - 4y + 8 = 0$ is

(A) 2 (B) 1 (C) 4 (D) 3

Correct Option: B

Solution:

- 111.** If the eccentricity of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ ($a > b$) is $e = \frac{\sqrt{3}}{2}$ and the equation of one of its directrices is $\sqrt{3}x - 4 = 0$, then $ab =$

(A) a (B) b

(C) $a^2 - b^2$ (D) $\frac{e}{a}$

Correct Option: A

Solution:

- 112.** If the straight line $x + y + k = 0$ touches the hyperbola $x^2 - 5y^2 = 5$ and it makes intercepts on positive coordinate axes then its point of contact is

(A) $(5, 2)$

(B) $(5, -2)$

(C) $(-\frac{5}{2}, \frac{1}{2})$

(D) $(\frac{5}{2}, -\frac{1}{2})$

Correct Option: D

Solution:

- 113.** $\lim_{x \rightarrow \frac{\pi}{2}} \frac{(1 - \tan \frac{x}{2})(1 - \sin x)}{(1 + \tan \frac{x}{2})(\pi - 2x)^3}$

(A) 0 (B) $\frac{1}{8}$

(C) $\frac{1}{16}$ (D) $\frac{1}{32}$

Correct Option: D

Solution:

114. Three numbers are chosen at random from $\{1, 2, \dots, 10\}$. The probability that the minimum of the chosen numbers is 3 or their maximum is 7, is

(A) $\frac{11}{40}$ (B) $\frac{3}{10}$
(C) $\frac{3}{4}$ (D) $\frac{13}{40}$

Correct Option: A

Solution:

115. $\sin [2 \tan^{-1} (\frac{1}{2}) + \sin^{-1} (\frac{3}{5})] =$

(A) 0 (B) 1
(C) $\frac{1}{2}$ (D) $\frac{\sqrt{3}}{2}$

Correct Option: B

Solution:

116. The number of skew symmetric matrices of order 3×3 that can be formed by using all the elements $0, \pm a, \pm b, \pm c$ is

(A) 36 (B) 24 (C) 72 (D) 48

Correct Option: D

Solution:

117. If $D = \begin{vmatrix} x-3 & 2 & 1 \\ 3 & x-2 & 1 \\ 3 & 2 & x-1 \end{vmatrix} = (x-2)(px^2 + qx + r) + 8$, then $3p - 2q + r = ?$
- (A) 0 (B) 3 (C) 5 (D) 1

Correct Option: B

Solution:

118. If the direction cosines of two lines satisfy the relations $\ell + m - n = 0$, $3\ell^2 + m^2 + 6n\ell = 0$, then those lines are

(A) parallel lines (B) perpendicular lines
(C) skew lines (D) intersecting lines

Correct Option: A

Solution:

119. Let $\vec{a}, \vec{b}, \vec{c}$ be three unit vectors satisfying $|\vec{a} - \vec{b}|^2 + |\vec{a} - \vec{c}|^2 = 10$. Then
Statement (I): $|\vec{a} + 2\vec{b}|^2 + |2\vec{a} + \vec{c}|^2 = 2$.
Statement (II): $|2\vec{a} + 3\vec{b}|^2 + |3\vec{a} + 2\vec{c}|^2 = 10$.
Which of the above statements is (are) true?
- (A) Statement I is true, but Statement II is false
(B) Statement II is true but Statement I is false
(C) Both Statement I and Statement II are true

(D) Both Statement I and Statement II are false

Correct Option: D

Solution:

120. If the points with position vectors $x\hat{i} + 2\hat{j} + y\hat{k}$, $\hat{i} - 2\hat{j} - 2x\hat{k}$ and $2\hat{i} + 3\hat{j} - \hat{k}$ are collinear, then $10x - 25y =$
- (A) -7 (B) 20 (C) 0 (D) 1

Correct Option: B

Solution:

121. If $A = \begin{bmatrix} 3 & x & 2 \\ 2x & 3 & -1 \\ 1 & 2 & 3x \end{bmatrix}$ is a singular matrix and $x > 0$, then $\sqrt{3}x =$
- (A) $\sqrt{21}$ (B) $\sqrt{11}$ (C) $\sqrt{13}$ (D) $\sqrt{17}$

Correct Option: D

Solution:

Given $|A| = 0$

$$\Rightarrow 3(9x + 2) - x(6x^2 + 1) + 2(4x - 3) = 0$$

$$\Rightarrow -6x^3 + 34x = 0 \Rightarrow 3x^2 = 17 \text{ [Since } x > 0]$$

$$\sqrt{3}x = \sqrt{17}$$

122. If $A = \begin{bmatrix} 2 & 3 & 1 \\ 3 & 1 & 2 \\ 1 & 2 & 3 \end{bmatrix}$, then Trace of $(A^{-1}) =$
- (A) $\frac{1}{3}$ (B) $-\frac{1}{3}$
(C) $\frac{1}{6}$ (D) $-\frac{1}{6}$

Correct Option: C

Solution:

$$|A| = 2(3 - 4) - 3(9 - 2) + 6 - 1$$

$$= -2 - 21 + 6 - 1 = -18$$

$$\text{Cofactor matrix of } A = \begin{vmatrix} -1 & -7 & 5 \\ -7 & 5 & -1 \\ 5 & -1 & -7 \end{vmatrix}$$

$$\text{Adj}(A) = \begin{bmatrix} -1 & -7 & 5 \\ -7 & 5 & -1 \\ 5 & -1 & -7 \end{bmatrix}$$

$$A^{-1} = \frac{-1}{18} \begin{bmatrix} -1 & -7 & 5 \\ -7 & 5 & -1 \\ 5 & -1 & -7 \end{bmatrix}$$

$$\text{Trace of } A^{-1} = \frac{1}{18} - \frac{5}{18} + \frac{7}{18} = \frac{3}{18} = \frac{1}{6}$$

123. A particle moves along the curve $6y = x^3 + 2$. The point 'P' on the curve at which the y -coordinate is changing 8 times as fast as the x -coordinate are $(4, 11)$ and $(-4, -\frac{31}{3})$.

- (A) x -coordinates at the point P are ± 4
 (B) y -coordinates at the point P are 11 and $-\frac{31}{3}$
 (C) Both (a) and (b)
 (D) None of the above

Correct Option: C

Solution:

Given, $6y = x^3 + 2$

On differentiating w.r.t. t , we get

$$6 \frac{dy}{dt} = 3x^2 \frac{dx}{dt} \Rightarrow 6 \times 8 \frac{dx}{dt} = 3x^2 \frac{dx}{dt} \Rightarrow 3x^2 = 48 \Rightarrow x^2 = 16 \Rightarrow x = \pm 4$$

When $x = 4$, then $6y = (4)^3 + 2$

$$\Rightarrow 6y = 64 + 2 \Rightarrow y = \frac{66}{6} = 11$$

When $x = -4$, then $6y = (-4)^3 + 2$

$$\Rightarrow 6y = -64 + 2 \Rightarrow y = \frac{-62}{6} = -\frac{31}{3}$$

Hence, the required points on the curve are

$$(4, 11) \text{ and } (-4, -\frac{31}{3})$$

124. The function $f(x) = xe^{x(1-x)}$, $x \in \mathbb{R}$, is:

- (A) increasing in $(-\frac{1}{2}, 1)$
 (B) decreasing in $(\frac{1}{2}, 2)$
 (C) increasing in $(-1, -\frac{1}{2})$
 (D) decreasing in $(-\frac{1}{2}, \frac{1}{2})$

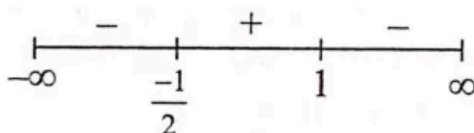
Correct Option: A

Solution:

$$f(x) = xe^{x(1-x)}$$

$$f'(x) = -e^{x(1-x)}(2x+1)(x-1) = 0$$

$$x = 1, -\frac{1}{2}$$



$\therefore f(x)$ is increasing in $(-\frac{1}{2}, 1)$

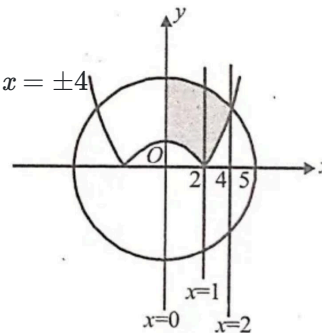
125. The area bounded by the curves $x^2 + y^2 = 25$, $4y = |4 - x^2|$, and $x = 0$, above the x -axis is

- (A) $2 + \frac{25}{2} \sin^{-1} \frac{4}{5}$
 (B) $2 + \frac{25}{4} \sin^{-1} \frac{4}{5}$
 (C) $2 + \frac{25}{2} \sin^{-1} \frac{1}{5}$
 (D) None of these

Correct Option: A

Solution:

The required area



$$\begin{aligned} &= \int_0^4 \sqrt{25 - x^2} dx - \int_0^2 \frac{4 - x^2}{4} dx - \int_2^4 \frac{x^2 - 4}{4} dx \\ &= \left[\frac{x}{2} \sqrt{25 - x^2} + \frac{25}{2} \sin^{-1} \frac{x}{5} \right]_0^4 \\ &\quad - \frac{1}{4} \left[4x - \frac{x^3}{3} \right]_0^2 - \frac{1}{4} \left[\frac{x^3}{3} - 4x \right]_2^4 \\ &= 2 + \frac{25}{2} \sin^{-1} \frac{4}{5} \end{aligned}$$

126. If a and b are arbitrary constants, then the differential equation corresponding to the family of curves given by $y = ax^2 - 2abx + ab^2$ is

- (A) $2x \frac{d^2 y}{dx^2} = \left(\frac{dy}{dx} \right)^2$
 (B) $2y \frac{d^2 y}{dx^2} = \left(\frac{dy}{dx} \right)^2$
 (C) $2x \left(\frac{dy}{dx} \right)^2 = \frac{d^2 y}{dx^2}$
 (D) $2y \left(\frac{dy}{dx} \right)^2 = \frac{d^2 y}{dx^2}$

Correct Option: B

Solution:

127. The general solution of the differential equation $x^3 dx - xy^2 dy + y^3 dx = 0$ is

- (A) $y^3 = 3x^4 + cx$

(B) $y^3 = x^3 \log |x| + c$

(C) $e^{(y^3/x^3)} = cx^3$

(D) $y^3 = \log(cx)^3$

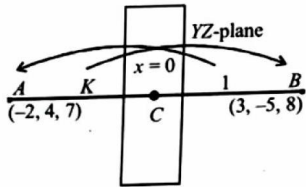
Correct Option: C**Solution:**

128. The ratio in which the YZ-plane divide the line segment formed by joining the points $(-2, 4, 7)$ and $(3, -5, 8)$ is $2 : m$. The value of m is

- (A) 2 (B) 3 (C) 4 (D) 1

Correct Option: B**Solution:**

Let the points be $A(-2, 4, 7)$ and $B(3, -5, 8)$ on YZ-plane, x -coordinate = 0.



Let the ratio be $K : 1$.

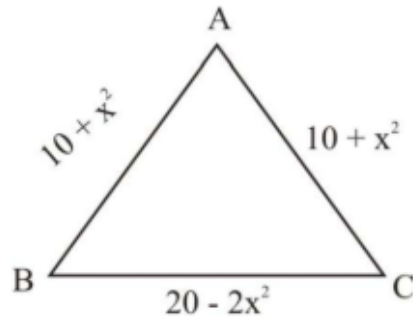
The coordinates of C are $(\frac{3K-2}{K+1}, \frac{-5K+4}{K+1}, \frac{8K+7}{K+1})$

Clearly $\frac{3K-2}{K+1} = 0 \Rightarrow 3K = 2 \Rightarrow K = \frac{2}{3}$

Hence required ratio is $2 : 3$.

129. The lengths of the sides of a triangle are $10 + x^2$, $10 + x^2$, and $20 - 2x^2$. If for $x = k$, the area of the triangle is maximum, then $3k^2$ is equal to:

- (A) 5 (B) 8 (C) 10 (D) 12

JM 2022**Correct Option: C****Solution:**

$$a = 20 - 2x^2, \quad b = 10 + x^2, \quad c = 10 + x^2$$

$$s = \frac{a + b + c}{2} = 20$$

$$\Delta = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{20 \times (2x^2) \times (10 - x^2) \times (10 - x^2)}$$

$$= 2\sqrt{10} \sqrt{x^2(10 - x^2)^2}$$

$$= 2\sqrt{10} |x(10 - x^2)|$$

$$= 2\sqrt{10} |10x - x^3|$$

$$S = 10x - x^3$$

$$\frac{dS}{dx} = 10 - 3x^2$$

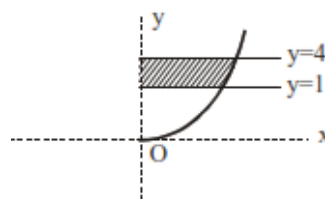
$$\frac{dS}{dx} = 0 \Rightarrow x^2 = \frac{10}{3}$$

$$3x^2 = 10$$

130. The area of the region (in sq. units), in the first quadrant bounded by the parabola $y = 9x^2$ and the lines $x = 0$, $y = 1$ and $y = 4$, is :-

[JEE-Main (On line)-2013]

- (A)
- $7/9$
- (B)
- $14/3$
- (C)
- $14/9$
- (D)
- $7/3$

Correct Option: C**Solution:**

$$\text{Area} = \int_1^4 \frac{\sqrt{y}}{3} dy = \frac{14}{9}$$

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	A	A	A	D	C	B	A	B	B	C
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	D	A	C	D	D	D	C	A	A	B
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	B	D	B	D	A	A	B	C	C	A
Que.	31	32	33	34	35	36	37	38	39	40
Ans.	C	B	A	C	D	D	C	D	A	B
Que.	41	42	43	44	45	46	47	48	49	50
Ans.	A	A	A	A	C	D	B	B	D	B
Que.	51	52	53	54	55	56	57	58	59	60
Ans.	B	B	B	D	B	C	B	A	B	A
Que.	61	62	63	64	65	66	67	68	69	70
Ans.	B	D	A	A	B	C	D	B	B	A
Que.	71	72	73	74	75	76	77	78	79	80
Ans.	D	A	B	D	B	C	A	B	D	B
Que.	81	82	83	84	85	86	87	88	89	90
Ans.	C	D	C	A	A	D	B	C	C	C
Que.	91	92	93	94	95	96	97	98	99	100
Ans.	A	D	B	B	B	C	B	B	D	C
Que.	101	102	103	104	105	106	107	108	109	110
Ans.	B	C	C	C	A	A	A	A	B	B
Que.	111	112	113	114	115	116	117	118	119	120
Ans.	A	D	D	A	B	D	B	A	D	B
Que.	121	122	123	124	125	126	127	128	129	130
Ans.	D	C	C	A	A	B	C	B	C	C