

**JEE MAINS PAPER 1 2025**

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Subject	B. Tech

Section : **Mathematics Section A**

**Q.1** Let the point A divide the line segment joining the points  $P(-1, -1, 2)$  and  $Q(5, 5, 10)$  internally in the ratio  $r : 1$  ( $r > 0$ ). If O is the origin and  $(\overrightarrow{OQ} \cdot \overrightarrow{OA}) - \frac{1}{5} |\overrightarrow{OP} \times \overrightarrow{OA}|^2 = 10$ , then the value of r is :

Options

1. 3
2. 7
3. 14
4.  $\sqrt{7}$

Question Type : **MCQ**Question ID : **656445395**Option 1 ID : **6564451352**Option 2 ID : **6564451354**Option 3 ID : **6564451355**Option 4 ID : **6564451353**Status : **Not Answered**

Chosen Option : --

**Q.2** The system of equations

$$x + y + z = 6,$$

$$x + 2y + 5z = 9,$$

$$x + 5y + \lambda z = \mu,$$

has no solution if

Options

1.  $\lambda = 17, \mu \neq 18$
2.  $\lambda = 17, \mu = 18$
3.  $\lambda = 15, \mu \neq 17$
4.  $\lambda \neq 17, \mu \neq 18$

Question Type : **MCQ**Question ID : **656445379**Option 1 ID : **6564451288**Option 2 ID : **6564451291**Option 3 ID : **6564451289**Option 4 ID : **6564451290**Status : **Answered**Chosen Option : **2**

**Q.3** If in the expansion of  $(1+x)^p(1-x)^q$ , the coefficients of  $x$  and  $x^2$  are 1 and  $-2$ , respectively, then  $p^2+q^2$  is equal to :

Options

1. 8
2. 20
3. 18
4. 13

Question Type : MCQ

Question ID : 656445381

Option 1 ID : 6564451296

Option 2 ID : 6564451299

Option 3 ID : 6564451298

Option 4 ID : 6564451297

Status : Not Answered

Chosen Option : --

**Q.4** Let  $X = \mathbb{R} \times \mathbb{R}$ . Define a relation  $R$  on  $X$  as :

$$(a_1, b_1) R (a_2, b_2) \Leftrightarrow b_1 = b_2.$$

**Statement I :**  $R$  is an equivalence relation.

**Statement II :** For some  $(a, b) \in X$ , the set  $S = \{(x, y) \in X : (x, y) R (a, b)\}$  represents a line parallel to  $y = x$ .

In the light of the above statements, choose the correct answer from the options given below :

Options

1. Statement I is true but Statement II is false
2. Statement I is false but Statement II is true
3. Both Statement I and Statement II are true
4. Both Statement I and Statement II are false

Question Type : MCQ

Question ID : 656445377

Option 1 ID : 6564451282

Option 2 ID : 6564451283

Option 3 ID : 6564451280

Option 4 ID : 6564451281

Status : Not Answered

Chosen Option : --

**Q.5**

The distance of the line  $\frac{x-2}{2} = \frac{y-6}{3} = \frac{z-3}{4}$  from the point (1, 4, 0) along the line

$\frac{x}{1} = \frac{y-2}{2} = \frac{z+3}{3}$  is :

**Options**

1.  $\sqrt{17}$

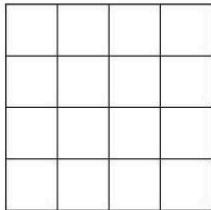
2.  $\sqrt{13}$

3.  $\sqrt{14}$

4.  $\sqrt{15}$

Question Type : **MCQ**Question ID : **656445387**Option 1 ID : **6564451323**Option 2 ID : **6564451322**Option 3 ID : **6564451320**Option 4 ID : **6564451321**Status : **Answered**Chosen Option : **1****Q.6**

A board has 16 squares as shown in the figure :



Out of these 16 squares, two squares are chosen at random. The probability that they have no side in common is :

**Options**

1.  $\frac{4}{5}$

2.  $\frac{3}{5}$

3.  $\frac{7}{10}$

4.  $\frac{23}{30}$

Question Type : **MCQ**Question ID : **656445382**Option 1 ID : **6564451303**Option 2 ID : **6564451301**Option 3 ID : **6564451302**Option 4 ID : **6564451300**Status : **Not Answered**Chosen Option : **--**

**Q.7** A rod of length eight units moves such that its ends A and B always lie on the lines  $x - y + 2 = 0$  and  $y + 2 = 0$ , respectively. If the locus of the point P, that divides the rod AB internally in the ratio  $2 : 1$  is  $9(x^2 + \alpha y^2 + \beta xy + \gamma x + 28 y) - 76 = 0$ , then  $\alpha - \beta - \gamma$  is equal to :

Options

1. 21
2. 24
3. 23
4. 22

Question Type : **MCQ**

Question ID : **656445383**

Option 1 ID : **6564451304**

Option 2 ID : **6564451307**

Option 3 ID : **6564451306**

Option 4 ID : **6564451305**

Status : **Not Answered**

Chosen Option : --

**Q.8** If the area of the region  $\{(x, y) : -1 \leq x \leq 1, 0 \leq y \leq a + e^{|x|} - e^{-x}, a > 0\}$  is  $\frac{e^2 + 8e + 1}{e}$ , then the value of a is :

Options

1. 7
2. 6
3. 5
4. 8

Question Type : **MCQ**

Question ID : **656445391**

Option 1 ID : **6564451338**

Option 2 ID : **6564451337**

Option 3 ID : **6564451336**

Option 4 ID : **6564451339**

Status : **Not Answered**

Chosen Option : --

**Q.9** A spherical chocolate ball has a layer of ice-cream of uniform thickness around it. When the thickness of the ice-cream layer is 1 cm, the ice-cream melts at the rate of  $81 \text{ cm}^3/\text{min}$  and the thickness of the ice-cream layer decreases at the rate of  $\frac{1}{4\pi} \text{ cm/min}$ . The surface area (in  $\text{cm}^2$ ) of the chocolate ball (without the ice-cream layer) is :

Options

1.  $128 \pi$
2.  $196 \pi$
3.  $225 \pi$
4.  $256 \pi$

Question Type : **MCQ**

Question ID : **656445390**

Option 1 ID : **6564451333**

Option 2 ID : **6564451332**

Option 3 ID : **6564451335**

Option 4 ID : **6564451334**

Status : **Not Answered**

Chosen Option : --

**Q.10** Let  $\int x^3 \sin x dx = g(x) + C$ , where C is the constant of integration. If

$$8 \left( g\left(\frac{\pi}{2}\right) + g'\left(\frac{\pi}{2}\right) \right) = \alpha \pi^3 + \beta \pi^2 + \gamma, \alpha, \beta, \gamma \in \mathbb{Z}, \text{ then } \alpha + \beta - \gamma \text{ equals :}$$

Options

1. 55
2. 48
3. 62
4. 47

Question Type : **MCQ**

Question ID : **656445392**

Option 1 ID : **6564451340**

Option 2 ID : **6564451341**

Option 3 ID : **6564451343**

Option 4 ID : **6564451342**

Status : **Not Answered**

Chosen Option : --

Q.11

$$\lim_{x \rightarrow \infty} \frac{(2x^2 - 3x + 5)(3x - 1)^{\frac{x}{2}}}{(3x^2 + 5x + 4)\sqrt{(3x + 2)^x}} \text{ is equal to :}$$

Options

1.  $\frac{2e}{\sqrt{3}}$
2.  $\frac{2e}{3}$
3.  $\frac{2}{\sqrt{3}e}$
4.  $\frac{2}{3\sqrt{e}}$

Question Type : **MCQ**Question ID : **656445389**Option 1 ID : **6564451331**Option 2 ID : **6564451328**Option 3 ID : **6564451330**Option 4 ID : **6564451329**Status : **Not Answered**

Chosen Option : --

Q.12

Let  $A = \{(x, y) \in \mathbf{R} \times \mathbf{R} : |x + y| \geq 3\}$  and  $B = \{(x, y) \in \mathbf{R} \times \mathbf{R} : |x| + |y| \leq 3\}$ .

If  $C = \{(x, y) \in A \cap B : x = 0 \text{ or } y = 0\}$ , then  $\sum_{(x, y) \in C} |x + y|$  is :

Options

1. 24
2. 15
3. 18
4. 12

Question Type : **MCQ**Question ID : **656445376**Option 1 ID : **6564451276**Option 2 ID : **6564451278**Option 3 ID : **6564451277**Option 4 ID : **6564451279**Status : **Not Answered**

Chosen Option : --

**Q.13**

Let  $x = x(y)$  be the solution of the differential equation  $y = \left(x - y \frac{dx}{dy}\right) \sin\left(\frac{x}{y}\right)$ ,  $y > 0$  and  $x(1) = \frac{\pi}{2}$ .

Then  $\cos(x(2))$  is equal to :

**Options**

1.  $2(\log_e 2)^2 - 1$
2.  $2(\log_e 2) - 1$
3.  $1 - 2(\log_e 2)$
4.  $1 - 2(\log_e 2)^2$

Question Type : **MCQ**Question ID : **656445394**Option 1 ID : **6564451349**Option 2 ID : **6564451350**Option 3 ID : **6564451351**Option 4 ID : **6564451348**Status : **Not Answered**

Chosen Option : --

**Q.14**

If the square of the shortest distance between the lines  $\frac{x-2}{1} = \frac{y-1}{2} = \frac{z+3}{-3}$  and

$\frac{x+1}{2} = \frac{y+3}{4} = \frac{z+5}{-5}$  is  $\frac{m}{n}$ , where m, n are coprime numbers, then m+n is equal to :

**Options**

1. **9**
2. **6**
3. **21**
4. **14**

Question Type : **MCQ**Question ID : **656445388**Option 1 ID : **6564451325**Option 2 ID : **6564451324**Option 3 ID : **6564451327**Option 4 ID : **6564451326**Status : **Not Answered**

Chosen Option : --

**Q.15**

Let  $A = [a_{ij}]$  be a  $3 \times 3$  matrix such that  $A \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$ ,  $A \begin{bmatrix} 4 \\ 1 \\ 3 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$  and  $A \begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ , then  $a_{23}$  equals :

**Options**

1. 1
2. 2
3. -1
4. 0

Question Type : **MCQ**Question ID : **656445380**Option 1 ID : **6564451293**Option 2 ID : **6564451295**Option 3 ID : **6564451294**Option 4 ID : **6564451292**Status : **Not Answered**

Chosen Option : --

**Q.16**

The number of complex numbers  $z$ , satisfying  $|z|=1$  and  $\left| \frac{z}{\bar{z}} + \frac{\bar{z}}{z} \right| = 1$ , is :

**Options**

1. 4
2. 8
3. 6
4. 10

Question Type : **MCQ**Question ID : **656445378**Option 1 ID : **6564451284**Option 2 ID : **6564451286**Option 3 ID : **6564451285**Option 4 ID : **6564451287**Status : **Not Answered**

Chosen Option : --



**Q.17** Let the shortest distance from  $(a, 0)$ ,  $a > 0$ , to the parabola  $y^2 = 4x$  be 4. Then the equation of the circle passing through the point  $(a, 0)$  and the focus of the parabola, and having its centre on the axis of the parabola is :

**Options**

1.  $x^2 + y^2 - 8x + 7 = 0$
2.  $x^2 + y^2 - 10x + 9 = 0$
3.  $x^2 + y^2 - 6x + 5 = 0$
4.  $x^2 + y^2 - 4x + 3 = 0$

Question Type : **MCQ**

Question ID : **656445385**

Option 1 ID : **6564451312**

Option 2 ID : **6564451313**

Option 3 ID : **6564451314**

Option 4 ID : **6564451315**

Status : **Not Answered**

Chosen Option : --

**Q.18** The length of the chord of the ellipse  $\frac{x^2}{4} + \frac{y^2}{2} = 1$ , whose mid-point is  $\left(1, \frac{1}{2}\right)$ , is :

**Options**

1.  $\frac{5}{3}\sqrt{15}$
2.  $\frac{2}{3}\sqrt{15}$
3.  $\sqrt{15}$
4.  $\frac{1}{3}\sqrt{15}$

Question Type : **MCQ**

Question ID : **656445384**

Option 1 ID : **6564451310**

Option 2 ID : **6564451311**

Option 3 ID : **6564451308**

Option 4 ID : **6564451309**

Status : **Not Answered**

Chosen Option : --

Q.19

If  $I = \int_0^{\frac{\pi}{2}} \frac{\sin^{\frac{3}{2}} x}{\sin^{\frac{3}{2}} x + \cos^{\frac{3}{2}} x} dx$ , then  $\int_0^{2I} \frac{x \sin x \cos x}{\sin^4 x + \cos^4 x} dx$  equals :

Options

1.  $\frac{\pi^2}{8}$

2.  $\frac{\pi^2}{12}$

3.  $\frac{\pi^2}{16}$

4.  $\frac{\pi^2}{4}$

Question Type : MCQ

Question ID : 656445393

Option 1 ID : 6564451345

Option 2 ID : 6564451346

Option 3 ID : 6564451347

Option 4 ID : 6564451344

Status : Not Answered

Chosen Option : --

Q.20

Let the range of the function  $f(x) = 6 + 16 \cos x \cdot \cos\left(\frac{\pi}{3} - x\right) \cdot \cos\left(\frac{\pi}{3} + x\right) \cdot \sin 3x \cdot \cos 6x$ ,  $x \in \mathbf{R}$  be  $[\alpha, \beta]$ . Then the distance of the point  $(\alpha, \beta)$  from the line  $3x + 4y + 12 = 0$  is :

Options

1. 9

2. 10

3. 8

4. 11

Question Type : MCQ

Question ID : 656445386

Option 1 ID : 6564451317

Option 2 ID : 6564451318

Option 3 ID : 6564451316

Option 4 ID : 6564451319

Status : Not Answered

Chosen Option : --

Section : Mathematics Section B

**Q.21** The focus of the parabola  $y^2 = 4x + 16$  is the centre of the circle C of radius 5. If the values of  $\lambda$ , for which C passes through the point of intersection of the lines  $3x - y = 0$  and  $x + \lambda y = 4$ , are  $\lambda_1$  and  $\lambda_2$ ,  $\lambda_1 < \lambda_2$ , then  $12\lambda_1 + 29\lambda_2$  is equal to \_\_\_\_\_.

Give --  
n  
Ans  
wer :

Question Type : SA  
Question ID : 656445400  
Status : Not Answered

**Q.22** The variance of the numbers 8, 21, 34, 47, . . . , 320 is \_\_\_\_\_.

Give --  
n  
Ans  
wer :

Question Type : SA  
Question ID : 656445399  
Status : Not Answered

**Q.23** Let  $\alpha, \beta$  be the roots of the equation  $x^2 - ax - b = 0$  with  $\text{Im}(\alpha) < \text{Im}(\beta)$ . Let  $P_n = \alpha^n - \beta^n$ . If  $P_3 = -5\sqrt{7}i$ ,  $P_4 = -3\sqrt{7}i$ ,  $P_5 = 11\sqrt{7}i$  and  $P_6 = 45\sqrt{7}i$ , then  $|\alpha^4 + \beta^4|$  is equal to \_\_\_\_\_.

Give --  
n  
Ans  
wer :

Question Type : SA  
Question ID : 656445397  
Status : Not Answered

**Q.24** The roots of the quadratic equation  $3x^2 - px + q = 0$  are  $10^{\text{th}}$  and  $11^{\text{th}}$  terms of an arithmetic progression with common difference  $\frac{3}{2}$ . If the sum of the first 11 terms of this arithmetic progression is 88, then  $q - 2p$  is equal to \_\_\_\_\_.

Give 309  
n  
Ans  
wer :

Question Type : SA  
Question ID : 656445396  
Status : Answered

**Q.25** The number of ways, 5 boys and 4 girls can sit in a row so that either all the boys sit together or no two boys sit together, is \_\_\_\_\_.

Give --  
n  
Ans  
wer :

Question Type : SA  
Question ID : 656445398  
Status : Not Answered

Section : Physics Section A

**Q.26** Water of mass  $m$  gram is slowly heated to increase the temperature from  $T_1$  to  $T_2$ . The change in entropy of the water, given specific heat of water is  $1 \text{ J kg}^{-1} \text{ K}^{-1}$ , is :

Options

1.  $m \ln \left( \frac{T_1}{T_2} \right)$
2. zero
3.  $m(T_2 - T_1)$
4.  $m \ln \left( \frac{T_2}{T_1} \right)$

Question Type : **MCQ**

Question ID : **656445409**

Option 1 ID : **6564451394**

Option 2 ID : **6564451396**

Option 3 ID : **6564451395**

Option 4 ID : **6564451393**

Status : **Answered**

Chosen Option : **4**

**Q.27** A circular disk of radius  $R$  meter and mass  $M$  kg is rotating around the axis perpendicular to the disk. An external torque is applied to the disk such that  $\theta(t) = 5t^2 - 8t$ , where  $\theta(t)$  is the angular position of the rotating disc as a function of time  $t$ .  
How much power is delivered by the applied torque, when  $t = 2 \text{ s}$  ?

Options

1.  $60 MR^2$
2.  $108 MR^2$
3.  $8 MR^2$
4.  $72 MR^2$

Question Type : **MCQ**

Question ID : **656445404**

Option 1 ID : **6564451374**

Option 2 ID : **6564451376**

Option 3 ID : **6564451373**

Option 4 ID : **6564451375**

Status : **Answered**

Chosen Option : **4**

**Q.28** A ball having kinetic energy KE, is projected at an angle of  $60^\circ$  from the horizontal. What will be the kinetic energy of ball at the highest point of its flight ?

Options

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

2.  $\frac{(KE)}{16}$

3.  $\frac{(KE)}{8}$

4.  $\frac{(KE)}{4}$

Question Type : **MCQ**

Question ID : **656445403**

Option 1 ID : **6564451369**

Option 2 ID : **6564451371**

Option 3 ID : **6564451370**

Option 4 ID : **6564451372**

Status : **Answered**

Chosen Option : **4**

**Q.29** A plane electromagnetic wave of frequency 20 MHz travels in free space along the  $+x$  direction. At a particular point in space and time, the electric field vector of the wave is  $E_y = 9.3 \text{ Vm}^{-1}$ . Then, the magnetic field vector of the wave at that point is

Options

1.  $B_z = 9.3 \times 10^{-8} \text{ T}$

2.  $B_z = 3.1 \times 10^{-8} \text{ T}$

3.  $B_z = 6.2 \times 10^{-8} \text{ T}$

4.  $B_z = 1.55 \times 10^{-8} \text{ T}$

Question Type : **MCQ**

Question ID : **656445414**

Option 1 ID : **6564451414**

Option 2 ID : **6564451415**

Option 3 ID : **6564451413**

Option 4 ID : **6564451416**

Status : **Answered**

Chosen Option : **2**

Q.30

Match List - I with List - II.

List - I	List - II
(A) Permeability of free space	(I) $[M L^2 T^{-2}]$
(B) Magnetic field	(II) $[M T^{-2} A^{-1}]$
(C) Magnetic moment	(III) $[M L T^{-2} A^{-2}]$
(D) Torsional constant	(IV) $[L^2 A]$

Choose the **correct** answer from the options given below :

Options

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

Question Type : **MCQ**Question ID : **656445401**Option 1 ID : **6564451364**Option 2 ID : **6564451363**Option 3 ID : **6564451362**Option 4 ID : **6564451361**Status : **Answered**Chosen Option : **4**

Q.31

In photoelectric effect an em-wave is incident on a metal surface and electrons are ejected from the surface. If the work function of the metal is 2.14 eV and stopping potential is 2V, what is the wavelength of the em-wave ?

(Given  $hc = 1242 \text{ eVnm}$  where  $h$  is the Planck's constant and  $c$  is the speed of light in vacuum.)

Options

- 200 nm
- 400 nm
- 300 nm
- 600 nm

Question Type : **MCQ**Question ID : **656445418**Option 1 ID : **6564451429**Option 2 ID : **6564451431**Option 3 ID : **6564451430**Option 4 ID : **6564451432**Status : **Answered**Chosen Option : **3**

**Q.32** A concave mirror of focal length  $f$  in air is dipped in a liquid of refractive index  $\mu$ . Its focal length in the liquid will be :

Options

1.  $\mu f$
2.  $\frac{f}{(\mu - 1)}$
3.  $\frac{f}{\mu}$
4.  $f$

Question Type : **MCQ**

Question ID : **656445417**

Option 1 ID : **6564451426**

Option 2 ID : **6564451428**

Option 3 ID : **6564451425**

Option 4 ID : **6564451427**

Status : **Answered**

Chosen Option : **4**

**Q.33** A galvanometer having a coil of resistance  $30\ \Omega$  need  $20\ \text{mA}$  of current for full-scale deflection. If a maximum current of  $3\ \text{A}$  is to be measured using this galvanometer, the resistance of the shunt to be added to the galvanometer should be  $\frac{30}{X}\ \Omega$ , where  $X$  is

Options

1. **447**
2. **149**
3. **298**
4. **596**

Question Type : **MCQ**

Question ID : **656445412**

Option 1 ID : **6564451407**

Option 2 ID : **6564451405**

Option 3 ID : **6564451406**

Option 4 ID : **6564451408**

Status : **Answered**

Chosen Option : **2**

**Q.34** If a satellite orbiting the Earth is 9 times closer to the Earth than the Moon, what is the time period of rotation of the satellite? Given rotational time period of Moon = 27 days and gravitational attraction between the satellite and the moon is neglected.

Options

1. 1 day
2. 3 days
3. 81 days
4. 27 days

Question Type : **MCQ**

Question ID : **656445405**

Option 1 ID : **6564451380**

Option 2 ID : **6564451378**

Option 3 ID : **6564451379**

Option 4 ID : **6564451377**

Status : **Answered**

Chosen Option : 1

**Q.35** The width of one of the two slits in Young's double slit experiment is  $d$  while that of the other slit is  $xd$ . If the ratio of the maximum to the minimum intensity in the interference pattern on the screen is 9 : 4 then what is the value of  $x$  ?  
(Assume that the field strength varies according to the slit width.)

Options

1. 4
2. 5
3. 3
4. 2

Question Type : **MCQ**

Question ID : **656445416**

Option 1 ID : **6564451421**

Option 2 ID : **6564451422**

Option 3 ID : **6564451423**

Option 4 ID : **6564451424**

Status : **Answered**

Chosen Option : 2



**Q.36** Two point charges  $-4 \mu\text{C}$  and  $4 \mu\text{C}$ , constituting an electric dipole, are placed at  $(-9, 0, 0)$  cm and  $(9, 0, 0)$  cm in a uniform electric field of strength  $10^4 \text{ N C}^{-1}$ . The work done on the dipole in rotating it from the equilibrium through  $180^\circ$  is :

Options

1. 12.4 mJ
2. 14.4 mJ
3. 18.4 mJ
4. 16.4 mJ

Question Type : MCQ

Question ID : 656445411

Option 1 ID : 6564451401

Option 2 ID : 6564451402

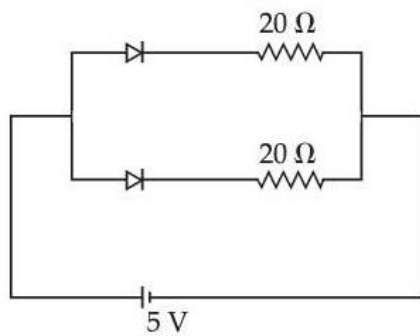
Option 3 ID : 6564451404

Option 4 ID : 6564451403

Status : Answered

Chosen Option : 2

**Q.37** What is the current through the battery in the circuit shown below ?



Options

1. 0.5 A
2. 1.0 A
3. 0.25 A
4. 1.5 A

Question Type : MCQ

Question ID : 656445420

Option 1 ID : 6564451438

Option 2 ID : 6564451439

Option 3 ID : 6564451437

Option 4 ID : 6564451440

Status : Answered

Chosen Option : 3

**Q.38** The energy of a system is given as  $E(t) = \alpha^3 e^{-\beta t}$ , where  $t$  is the time and  $\beta = 0.3 \text{ s}^{-1}$ . The errors in the measurement of  $\alpha$  and  $t$  are 1.2% and 1.6%, respectively. At  $t = 5 \text{ s}$ , maximum percentage error in the energy is :

Options

1. 6 %
2. 4 %
3. 8.4 %
4. 11.6 %

Question Type : **MCQ**

Question ID : **656445402**

Option 1 ID : **6564451365**

Option 2 ID : **6564451366**

Option 3 ID : **6564451368**

Option 4 ID : **6564451367**

Status : **Answered**

Chosen Option : **4**

**Q.39** A massless spring gets elongated by amount  $x_1$  under a tension of 5 N. Its elongation is  $x_2$  under the tension of 7 N. For the elongation of  $(5x_1 - 2x_2)$ , the tension in the spring will be,

Options

1. 11 N
2. 15 N
3. 20 N
4. 39 N

Question Type : **MCQ**

Question ID : **656445406**

Option 1 ID : **6564451382**

Option 2 ID : **6564451383**

Option 3 ID : **6564451384**

Option 4 ID : **6564451381**

Status : **Not Answered**

Chosen Option : **--**

**Q.40** The equation of a transverse wave travelling along a string is  
 $y(x, t) = 4.0 \sin[20 \times 10^{-3} x + 600t]$  mm, where  $x$  is in mm and  $t$  is in second. The velocity of the wave is :

Options

1.  $+30 \text{ m/s}$
2.  $-30 \text{ m/s}$
3.  $+60 \text{ m/s}$
4.  $-60 \text{ m/s}$

Question Type : **MCQ**

Question ID : **656445410**

Option 1 ID : **6564451397**

Option 2 ID : **6564451398**

Option 3 ID : **6564451399**

Option 4 ID : **6564451400**

Status : **Answered**

Chosen Option : **1**

**Q.41** Water flows in a horizontal pipe whose one end is closed with a valve. The reading of the pressure gauge attached to the pipe is  $P_1$ . The reading of the pressure gauge falls to  $P_2$  when the valve is opened. The speed of water flowing in the pipe is proportional to

Options

1.  $(P_1 - P_2)^2$
2.  $P_1 - P_2$
3.  $\sqrt{P_1 - P_2}$
4.  $(P_1 - P_2)^4$

Question Type : **MCQ**

Question ID : **656445407**

Option 1 ID : **6564451387**

Option 2 ID : **6564451385**

Option 3 ID : **6564451386**

Option 4 ID : **6564451388**

Status : **Not Answered**

Chosen Option : **--**

**Q.42** The refractive index of the material of a glass prism is  $\sqrt{3}$ . The angle of minimum deviation is equal to the angle of the prism. What is the angle of the prism ?

Options

1.  $48^\circ$
2.  $50^\circ$
3.  $60^\circ$
4.  $58^\circ$

Question Type : **MCQ**

Question ID : **656445415**

Option 1 ID : **6564451420**

Option 2 ID : **6564451417**

Option 3 ID : **6564451419**

Option 4 ID : **6564451418**

Status : **Answered**

Chosen Option : **3**

**Q.43** Two charges  $7 \mu\text{C}$  and  $-4 \mu\text{C}$  are placed at  $(-7 \text{ cm}, 0, 0)$  and  $(7 \text{ cm}, 0, 0)$  respectively. Given,  $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$ , the electrostatic potential energy of the charge configuration is :

Options

1.  $-1.2 \text{ J}$
2.  $-1.5 \text{ J}$
3.  $-2.0 \text{ J}$
4.  $-1.8 \text{ J}$

Question Type : **MCQ**

Question ID : **656445413**

Option 1 ID : **6564451409**

Option 2 ID : **6564451410**

Option 3 ID : **6564451412**

Option 4 ID : **6564451411**

Status : **Answered**

Chosen Option : **4**

**Q.44** Given below are two statements. One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A) :** The binding energy per nucleon is found to be practically independent of the atomic number  $A$ , for nuclei with mass numbers between 30 and 170.

**Reason (R) :** Nuclear force is long range.

In the light of the above statements, choose the **correct** answer from the options given below :

**Options 1.**

Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**

2. **(A)** is true but **(R)** is false

3. **(A)** is false but **(R)** is true

4.

Both **(A)** and **(R)** are true but **(R)** is **NOT** the correct explanation of **(A)**

Question Type : **MCQ**

Question ID : **656445419**

Option 1 ID : **6564451433**

Option 2 ID : **6564451435**

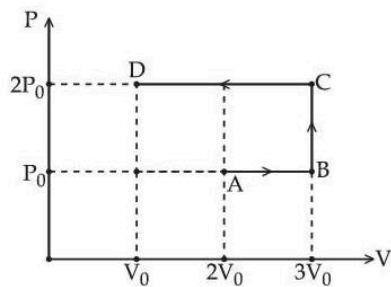
Option 3 ID : **6564451436**

Option 4 ID : **6564451434**

Status : **Answered**

Chosen Option : **2**

**Q.45**



Using the given P-V diagram, the work done by an ideal gas along the path ABCD is :

**Options**

1.  $3 P_0 V_0$

2.  $-3 P_0 V_0$

3.  $-4 P_0 V_0$

4.  $4 P_0 V_0$

Question Type : **MCQ**

Question ID : **656445408**

Option 1 ID : **6564451391**

Option 2 ID : **6564451392**

Option 3 ID : **6564451390**

Option 4 ID : **6564451389**

Status : **Answered**

Chosen Option : **2**

**Q.46**

A satellite of mass  $\frac{M}{2}$  is revolving around earth in a circular orbit at a height of  $\frac{R}{3}$  from earth surface. The angular momentum of the satellite is  $M\sqrt{\frac{GMR}{x}}$ . The value of  $x$  is \_\_\_\_\_, where  $M$  and  $R$  are the mass and radius of earth, respectively. ( $G$  is the gravitational constant)

Give 2

n

Ans

wer :

Question Type : SA

Question ID : 656445421

Status : Answered

**Q.47**

An air bubble of radius 1.0 mm is observed at a depth of 20 cm below the free surface of a liquid having surface tension  $0.095 \text{ J/m}^2$  and density  $10^3 \text{ kg/m}^3$ . The difference between pressure inside the bubble and atmospheric pressure is \_\_\_\_\_  $\text{N/m}^2$ . (Take  $g = 10 \text{ m/s}^2$ )

Give --

n

Ans

wer :

Question Type : SA

Question ID : 656445422

Status : Not Answered

**Q.48**

A time varying potential difference is applied between the plates of a parallel plate capacitor of capacitance  $2.5 \mu\text{F}$ . The dielectric constant of the medium between the capacitor plates is 1. It produces an instantaneous displacement current of  $0.25 \text{ mA}$  in the intervening space between the capacitor plates, the magnitude of the rate of change of the potential difference will be \_\_\_\_\_  $\text{Vs}^{-1}$ .

Give --

n

Ans

wer :

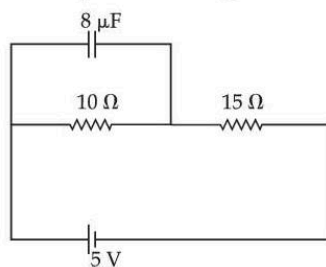
Question Type : SA

Question ID : 656445423

Status : Not Answered

**Q.49**

At steady state the charge on the capacitor, as shown in the circuit below, is \_\_\_\_\_  $\mu\text{C}$ .



Give --

n

Ans

wer :

Question Type : SA

Question ID : 656445425

Status : Not Answered

**Q.50** In a series LCR circuit, a resistor of  $300\ \Omega$ , a capacitor of  $25\ \text{nF}$  and an inductor of  $100\ \text{mH}$  are used. For maximum current in the circuit, the angular frequency of the ac source is  $\text{_____} \times 10^4\ \text{radians s}^{-1}$ .

Give 2

n

Ans

wer :

Question Type : SA

Question ID : 656445424

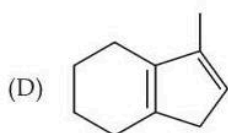
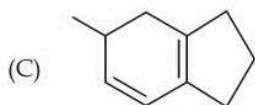
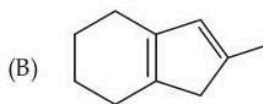
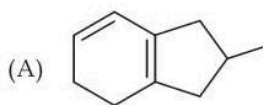
Status : Answered

Section : Chemistry Section A

**Q.51** Match List - I with List - II.

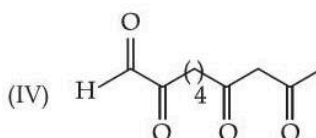
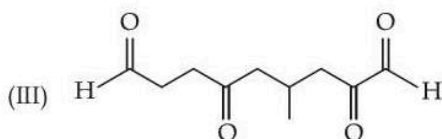
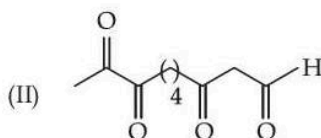
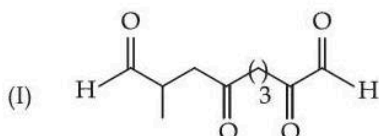
List - I

(Isomers of  $\text{C}_{10}\text{H}_{14}$ )



List - II

(Ozonolysis product)



Choose the **correct** answer from the options given below :

Options

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

Question Type : MCQ

Question ID : 656445441

Option 1 ID : 6564451506

Option 2 ID : 6564451508

Option 3 ID : 6564451507

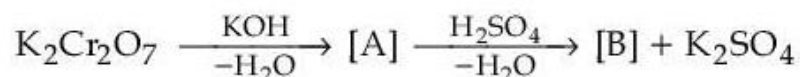
Option 4 ID : 6564451509

Status : Answered

Chosen Option : 3

Q.52

Consider the following reactions



The products [A] and [B], respectively are :

Options

1.  $\text{K}_2\text{CrO}_4$  and  $\text{K}_2\text{Cr}_2\text{O}_7$
2.  $\text{K}_2\text{Cr}(\text{OH})_6$  and  $\text{Cr}_2\text{O}_3$
3.  $\text{K}_2\text{CrO}_4$  and  $\text{CrO}$
4.  $\text{K}_2\text{CrO}_4$  and  $\text{Cr}_2\text{O}_3$

Question Type : MCQ

Question ID : 656445436

Option 1 ID : 6564451488

Option 2 ID : 6564451489

Option 3 ID : 6564451487

Option 4 ID : 6564451486

Status : Answered

Chosen Option : 4

Q.53

Match List - I with List - II.

List - I

List - II

- |                     |                    |
|---------------------|--------------------|
| (A) Bronze          | (I) Cu, Ni         |
| (B) Brass           | (II) Fe, Cr, Ni, C |
| (C) UK silver coin  | (III) Cu, Zn       |
| (D) Stainless steel | (IV) Cu, Sn        |

Choose the **correct** answer from the options given below :

Options

1. (A)-(IV), (B)-(II), (C)-(III), (D)-(I)
2. (A)-(III), (B)-(I), (C)-(IV), (D)-(II)
3. (A)-(IV), (B)-(III), (C)-(I), (D)-(II)
4. (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

Question Type : MCQ

Question ID : 656445437

Option 1 ID : 6564451493

Option 2 ID : 6564451492

Option 3 ID : 6564451491

Option 4 ID : 6564451490

Status : Answered

Chosen Option : 2



- Q.54** Consider a binary solution of two volatile liquid components 1 and 2.  $x_1$  and  $y_1$  are the mole fractions of component 1 in liquid and vapour phase, respectively. The slope and intercept of the linear plot of  $\frac{1}{x_1}$  vs  $\frac{1}{y_1}$  are given respectively as :

Options

1.  $\frac{P_1^0}{P_2^0}, \frac{P_1^0 - P_2^0}{P_2^0}$
2.  $\frac{P_2^0}{P_1^0}, \frac{P_1^0 - P_2^0}{P_2^0}$
3.  $\frac{P_2^0}{P_1^0}, \frac{P_2^0 - P_1^0}{P_2^0}$
4.  $\frac{P_1^0}{P_2^0}, \frac{P_2^0 - P_1^0}{P_2^0}$

Question Type : **MCQ**

Question ID : **656445430**

Option 1 ID : **6564451462**

Option 2 ID : **6564451464**

Option 3 ID : **6564451465**

Option 4 ID : **6564451463**

Status : **Answered**

Chosen Option : **4**

- Q.55** Standard electrode potentials for a few half cells are mentioned below :

$$E_{\text{Cu}^{2+}/\text{Cu}}^\circ = 0.34 \text{ V}, E_{\text{Zn}^{2+}/\text{Zn}}^\circ = -0.76 \text{ V}$$

$$E_{\text{Ag}^+/\text{Ag}}^\circ = 0.80 \text{ V}, E_{\text{Mg}^{2+}/\text{Mg}}^\circ = -2.37 \text{ V}$$

Which one of the following cells gives the most negative value of  $\Delta G^\circ$  ?

Options

1.  $\text{Zn} | \text{Zn}^{2+} (1\text{M}) || \text{Mg}^{2+} (1\text{M}) | \text{Mg}$
2.  $\text{Ag} | \text{Ag}^+ (1\text{M}) || \text{Mg}^{2+} (1\text{M}) | \text{Mg}$
3.  $\text{Zn} | \text{Zn}^{2+} (1\text{M}) || \text{Ag}^+ (1\text{M}) | \text{Ag}$
4.  $\text{Cu} | \text{Cu}^{2+} (1\text{M}) || \text{Ag}^+ (1\text{M}) | \text{Ag}$

Question Type : **MCQ**

Question ID : **656445428**

Option 1 ID : **6564451455**

Option 2 ID : **6564451454**

Option 3 ID : **6564451457**

Option 4 ID : **6564451456**

Status : **Answered**

Chosen Option : **3**

**Q.56**

Given below are two statements :

**Statement (I) :** For a given shell, the total number of allowed orbitals is given by  $n^2$ .

**Statement (II) :** For any subshell, the spatial orientation of the orbitals is given by  $-l$  to  $+l$  values including zero.

In the light of the above statements, choose the **correct** answer from the options given below :

**Options**

1. **Statement I is true but Statement II is false**
2. **Both Statement I and Statement II are false**
3. **Both Statement I and Statement II are true**
4. **Statement I is false but Statement II is true**

Question Type : **MCQ**

Question ID : **656445426**

Option 1 ID : **6564451448**

Option 2 ID : **6564451447**

Option 3 ID : **6564451446**

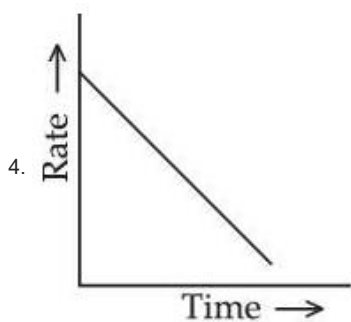
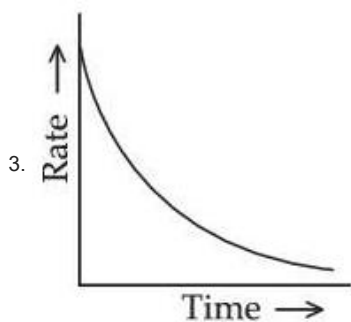
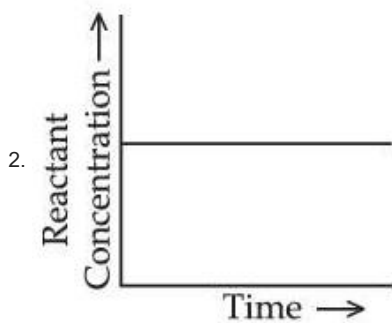
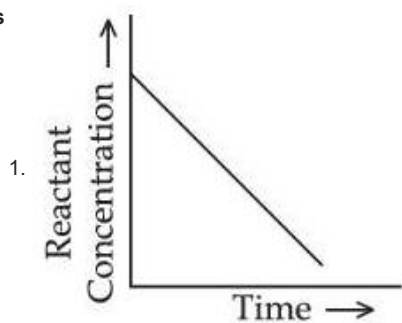
Option 4 ID : **6564451449**

Status : **Answered**

Chosen Option : **3**

**Q.57** Which of the following graphs most appropriately represents a zero order reaction ?

Options



Question Type : **MCQ**

Question ID : **656445432**

Option 1 ID : **6564451473**

Option 2 ID : **6564451471**

Option 3 ID : **6564451472**

Option 4 ID : **6564451470**

Status : **Answered**

Chosen Option : **1**

**Q.58** Given below are two statements about X-ray spectra of elements :

**Statement (I) :** A plot of  $\sqrt{\nu}$  ( $\nu$  = frequency of X-rays emitted) vs atomic mass is a straight line.

**Statement (II) :** A plot of  $\nu$  ( $\nu$  = frequency of X-rays emitted) vs atomic number is a straight line.

In the light of the above statements, choose the **correct** answer from the options given below :

Options

1. Both **Statement I** and **Statement II** are true
2. Both **Statement I** and **Statement II** are false
3. **Statement I** is false but **Statement II** is true
4. **Statement I** is true but **Statement II** is false

Question Type : **MCQ**

Question ID : **656445434**

Option 1 ID : **6564451478**

Option 2 ID : **6564451479**

Option 3 ID : **6564451481**

Option 4 ID : **6564451480**

Status : **Answered**

Chosen Option : **3**

**Q.59** Given below are two statements :

**Statement (I) :** The boiling points of alcohols and phenols increase with increase in the number of C-atoms.

**Statement (II) :** The boiling points of alcohols and phenols are higher in comparison to other class of compounds such as ethers, haloalkanes.

In the light of the above statements, choose the **correct** answer from the options given below :

Options

1. Both **Statement I** and **Statement II** are false
2. Both **Statement I** and **Statement II** are true
3. **Statement I** is false but **Statement II** is true
4. **Statement I** is true but **Statement II** is false

Question Type : **MCQ**

Question ID : **656445444**

Option 1 ID : **6564451519**

Option 2 ID : **6564451518**

Option 3 ID : **6564451521**

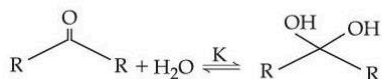
Option 4 ID : **6564451520**

Status : **Answered**

Chosen Option : **2**

Q.60

Given below are two statements :  
Consider the following reaction



**Statement (I) :** In the case of formaldehyde ( $H-\overset{\overset{O}{\parallel}}{C}-H$ ), K is about 2280, due to small substituents, hydration is faster.

**Statement (II) :** In the case of trichloro acetaldehyde ( $H-\overset{\overset{O}{\parallel}}{C}-Cl_3$ ), K is about 2000 due to -I effect of  $-Cl$ .

In the light of the above statements, choose the **correct** answer from the options given below :

Options

1. Both **Statement I** and **Statement II** are true
2. Both **Statement I** and **Statement II** are false
3. **Statement I** is true but **Statement II** is false
4. **Statement I** is false but **Statement II** is true

Question Type : **MCQ**Question ID : **656445440**Option 1 ID : **6564451502**Option 2 ID : **6564451503**Option 3 ID : **6564451504**Option 4 ID : **6564451505**Status : **Answered**Chosen Option : **3**

Q.61

When a non-volatile solute is added to the solvent, the vapour pressure of the solvent decreases by 10 mm of Hg. The mole fraction of the solute in the solution is 0.2. What would be the mole fraction of the solvent if decrease in vapour pressure is 20 mm of Hg ?

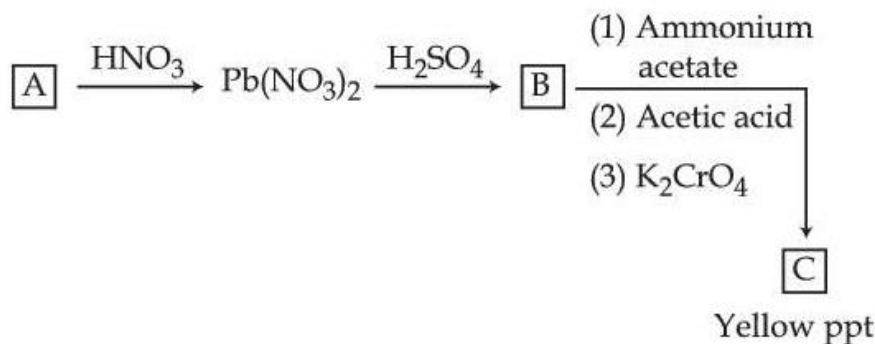
Options

1. **0.6**
2. **0.4**
3. **0.8**
4. **0.2**

Question Type : **MCQ**Question ID : **656445429**Option 1 ID : **6564451459**Option 2 ID : **6564451460**Option 3 ID : **6564451458**Option 4 ID : **6564451461**Status : **Not Answered**Chosen Option : **--**

Q.62

Identify A, B and C in the given below reaction sequence



Options

1. PbS, PbSO<sub>4</sub>, PbCrO<sub>4</sub>
2. PbCl<sub>2</sub>, PbSO<sub>4</sub>, PbCrO<sub>4</sub>
3. PbCl<sub>2</sub>, Pb(SO<sub>4</sub>)<sub>2</sub>, PbCrO<sub>4</sub>
4. PbS, PbSO<sub>4</sub>, Pb(CH<sub>3</sub>COO)<sub>2</sub>

Question Type : MCQ

Question ID : 656445439

Option 1 ID : 6564451501

Option 2 ID : 6564451498

Option 3 ID : 6564451499

Option 4 ID : 6564451500

Status : Answered

Chosen Option : 1

Q.63

The effect of temperature on spontaneity of reactions are represented as :

	$\Delta H$	$\Delta S$	Temperature	Spontaneity
(A)	+	-	any T	Non spontaneous
(B)	+	+	low T	spontaneous
(C)	-	-	low T	Non spontaneous
(D)	-	+	any T	spontaneous

The incorrect combinations are :

Options

1. (A) and (D) only
2. (A) and (C) only
3. (B) and (D) only
4. (B) and (C) only

Question Type : MCQ

Question ID : 656445427

Option 1 ID : 6564451453

Option 2 ID : 6564451451

Option 3 ID : 6564451450

Option 4 ID : 6564451452

Status : Answered

Chosen Option : 1

**Q.64** Given below are the atomic numbers of some group 14 elements. The atomic number of the element with lowest melting point is :

**Options**

1. 50
2. 14
3. 6
4. 82

Question Type : **MCQ**

Question ID : **656445435**

Option 1 ID : **6564451485**

Option 2 ID : **6564451482**

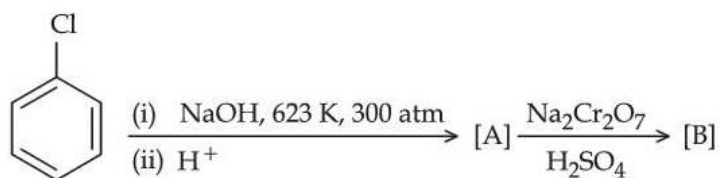
Option 3 ID : **6564451483**

Option 4 ID : **6564451484**

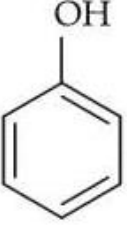
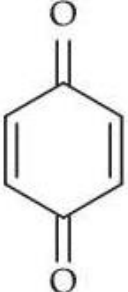

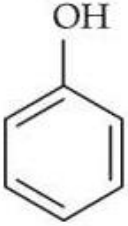

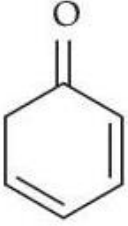
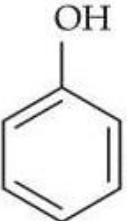
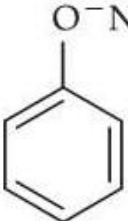
Status : **Answered**

Chosen Option : **3**

**Q.65** Identify the products [A] and [B], respectively in the following reaction :



Options

1. [A] , [B] 
2. [A] , [B] 
3. [A] , [B] 
4. [A] , [B] 

Question Type : **MCQ**

Question ID : **656445443**

Option 1 ID : **6564451517**

Option 2 ID : **6564451514**

Option 3 ID : **6564451516**

Option 4 ID : **6564451515**

Status : **Answered**

Chosen Option : **1**



Q.66

pH of water is 7 at 25°C. If water is heated to 80°C., it's pH will :

Options

1. Decrease
2.  $H^+$  concentration increases,  $OH^-$  concentration decreases
3. Increase
4. Remains the same

Question Type : MCQ

Question ID : 656445433

Option 1 ID : 6564451475

Option 2 ID : 6564451477

Option 3 ID : 6564451474

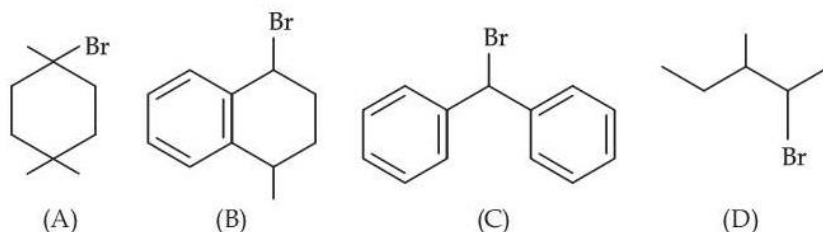
Option 4 ID : 6564451476

Status : Answered

Chosen Option : 1

Q.67

The ascending order of relative rate of solvolysis of following compounds is :



Options

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

Question Type : MCQ

Question ID : 656445442

Option 1 ID : 6564451513

Option 2 ID : 6564451512

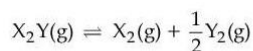
Option 3 ID : 6564451511

Option 4 ID : 6564451510

Status : Answered

Chosen Option : 1

**Q.68** Consider the reaction



The equation representing correct relationship between the degree of dissociation ( $x$ ) of  $X_2Y(g)$  with its equilibrium constant  $K_p$  is \_\_\_\_\_.

Assume  $x$  to be very very small.

**Options**

1.  $x = \sqrt[3]{\frac{2K_p^2}{p}}$

2.  $x = \sqrt[3]{\frac{K_p}{p}}$

3.  $x = \sqrt[3]{\frac{2K_p}{p}}$

4.  $x = \sqrt[3]{\frac{K_p}{2p}}$

Question Type : **MCQ**

Question ID : **656445431**

Option 1 ID : **6564451467**

Option 2 ID : **6564451466**

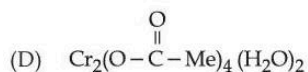
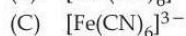
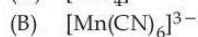
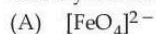
Option 3 ID : **6564451469**

Option 4 ID : **6564451468**

Status : **Answered**

Chosen Option : **3**

**Q.69** Identify the coordination complexes in which the central metal ion has  $d^4$  configuration.



Choose the **correct** answer from the options given below :

**Options**

1. (C) and (E) only

2. (B), (C) and (D) only

3. (A), (B) and (E) only

4. (B) and (D) only

Question Type : **MCQ**

Question ID : **656445438**

Option 1 ID : **6564451496**

Option 2 ID : **6564451497**

Option 3 ID : **6564451495**

Option 4 ID : **6564451494**

Status : **Answered**

Chosen Option : **4**

**Q.70** The  $\alpha$  - Helix and  $\beta$  - Pleated sheet structures of protein are associated with its :

Options

1. secondary structure
2. quaternary structure
3. primary structure
4. tertiary structure

Question Type : **MCQ**

Question ID : **656445445**

Option 1 ID : **6564451523**

Option 2 ID : **6564451525**

Option 3 ID : **6564451522**

Option 4 ID : **6564451524**

Status : **Answered**

Chosen Option : **2**

Section : **Chemistry Section B**

**Q.71** When 81.0 g of aluminium is allowed to react with 128.0 g of oxygen gas, the mass of aluminium oxide produced in grams is \_\_\_\_\_. (Nearest integer)

Given :

Molar mass of Al is  $27.0 \text{ g mol}^{-1}$

Molar mass of O is  $16.0 \text{ g mol}^{-1}$

Give 2

n

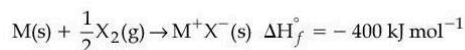
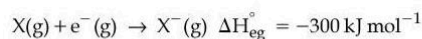
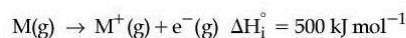
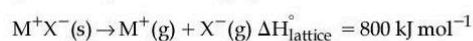
Ans  
wer :

Question Type : **SA**

Question ID : **656445446**

Status : **Answered**

**Q.72** The bond dissociation enthalpy of  $X_2$   $\Delta H_{\text{bond}}^\circ$  calculated from the given data is \_\_\_\_\_  $\text{kJ mol}^{-1}$ . (Nearest integer)



[Given :  $M^+X^-$  is a pure ionic compound and X forms a diatomic molecule  $X_2$  in gaseous state]

Give --

n

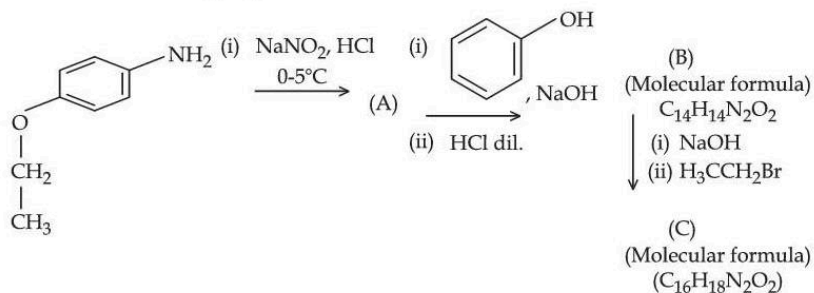
Ans  
wer :

Question Type : **SA**

Question ID : **656445447**

Status : **Not Answered**

**Q.73** Consider the following sequence of reactions.

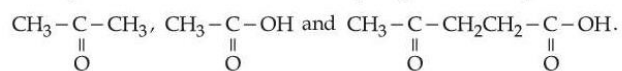


Total number of  $\text{sp}^3$  hybridised carbon atoms in the major product C formed is \_\_\_\_\_.

Give --  
n  
Ans  
wer :

Question Type : **SA**  
Question ID : **656445450**  
Status : **Not Answered**

**Q.74** A compound 'X' absorbs 2 moles of hydrogen and 'X' upon oxidation with  $\text{KMnO}_4/\text{H}^+$  gives



The total number of  $\sigma$  bonds present in the compound 'X' is \_\_\_\_\_.

Give --  
n  
Ans  
wer :

Question Type : **SA**  
Question ID : **656445449**  
Status : **Not Answered**

**Q.75** 0.01 mole of an organic compound (X) containing 10% hydrogen, on complete combustion produced 0.9 g  $\text{H}_2\text{O}$ . Molar mass of (X) is \_\_\_\_\_  $\text{g mol}^{-1}$ .

Give --  
n  
Ans  
wer :

Question Type : **SA**  
Question ID : **656445448**  
Status : **Not Answered**