

Test Date	05/04/2024
Test Time	9:00 AM - 12:00 PM
Subject	B. Tech

Section : Mathematics Section A

Q.1 Suppose $\theta \in \left[0, \frac{\pi}{4}\right]$ is a solution of $4 \cos \theta - 3 \sin \theta = 1$. Then $\cos \theta$ is equal to :

Options

1. $\frac{6 - \sqrt{6}}{(3\sqrt{6} - 2)}$

2. $\frac{4}{(3\sqrt{6} - 2)}$

3. $\frac{6 + \sqrt{6}}{(3\sqrt{6} + 2)}$

4. $\frac{4}{(3\sqrt{6} + 2)}$

Question Type : MCQ

Question ID : 87827055627

Option 1 ID : 878270218857

Option 2 ID : 878270218858

Option 3 ID : 878270218860

Option 4 ID : 878270218859

Q.2 If the function $f(x) = \frac{\sin 3x + \alpha \sin x - \beta \cos 3x}{x^3}$, $x \in \mathbf{R}$, is continuous at $x=0$, then $f(0)$ is equal to :

Options

1. -4

2. 2

3. 4

4. -2

Question Type : MCQ

Question ID : 87827055614

Option 1 ID : 878270218808

Option 2 ID : 878270218805

Option 3 ID : 878270218807

Option 4 ID : 878270218806

Q.3 Let d be the distance of the point of intersection of the lines $\frac{x+6}{3} = \frac{y}{2} = \frac{z+1}{1}$ and

$\frac{x-7}{4} = \frac{y-9}{3} = \frac{z-4}{2}$ from the point (7, 8, 9). Then d^2+6 is equal to :

Options

1. 72
2. 78
3. 75
4. 69

Question Type : MCQ

Question ID : 87827055624

Option 1 ID : 878270218846

Option 2 ID : 878270218848

Option 3 ID : 878270218847

Option 4 ID : 878270218845

Q.4

For the function

$$f(x) = \sin x + 3x - \frac{2}{\pi}(x^2 + x), \text{ where } x \in \left[0, \frac{\pi}{2}\right],$$

consider the following two statements :

(I) f is increasing in $\left(0, \frac{\pi}{2}\right)$.

(II) f' is decreasing in $\left(0, \frac{\pi}{2}\right)$.

Between the above two statements,

Options

1. only (I) is true.
2. neither (I) nor (II) is true.
3. both (I) and (II) are true.
4. only (II) is true.

Question Type : MCQ

Question ID : 87827055612

Option 1 ID : 878270218797

Option 2 ID : 878270218799

Option 3 ID : 878270218800

Option 4 ID : 878270218798

Q.5

If the system of equations

$$11x + y + \lambda z = -5$$

$$2x + 3y + 5z = 3$$

$$8x - 19y - 39z = \mu$$

has infinitely many solutions, then $\lambda^4 - \mu$ is equal to :

Options

1. 51
2. 45
3. 47
4. 49

Question Type : MCQ

Question ID : 87827055611

Option 1 ID : 878270218796

Option 2 ID : 878270218793

Option 3 ID : 878270218794

Option 4 ID : 878270218795

Q.6 Let $f(x) = x^5 + 2x^3 + 3x + 1$, $x \in \mathbf{R}$, and $g(x)$ be a function such that $g(f(x)) = x$ for all $x \in \mathbf{R}$. Then

$\frac{g(7)}{g'(7)}$ is equal to :

Options

1. 42
2. 1
3. 7
4. 14

Question Type : MCQ

Question ID : 87827055615

Option 1 ID : 878270218812

Option 2 ID : 878270218809

Option 3 ID : 878270218810

Option 4 ID : 878270218811

Q.7

If the line $\frac{2-x}{3} = \frac{3y-2}{4\lambda+1} = 4-z$ makes a right angle with the line $\frac{x+3}{3\mu} = \frac{1-2y}{6} = \frac{5-z}{7}$, then $4\lambda+9\mu$ is equal to :

Options

1. 4
2. 5
3. 13
4. 6

Question Type : **MCQ**

Question ID : **87827055623**

Option 1 ID : **878270218841**

Option 2 ID : **878270218842**

Option 3 ID : **878270218844**

Option 4 ID : **878270218843**

Q.8 If A(1, -1, 2), B(5, 7, -6), C(3, 4, -10) and D(-1, -4, -2) are the vertices of a quadrilateral ABCD, then its area is :

Options

1. $24\sqrt{7}$
2. $24\sqrt{29}$
3. $12\sqrt{29}$
4. $48\sqrt{7}$

Question Type : **MCQ**

Question ID : **87827055625**

Option 1 ID : **878270218852**

Option 2 ID : **878270218850**

Option 3 ID : **878270218849**

Option 4 ID : **878270218851**

Q.9 Let $A = \{1, 3, 7, 9, 11\}$ and $B = \{2, 4, 5, 7, 8, 10, 12\}$. Then the total number of one-one maps $f: A \rightarrow B$, such that $f(1) + f(3) = 14$, is :

- Options**
1. 120
 2. 480
 3. 180
 4. 240

Question Type : MCQ

Question ID : 87827055608

Option 1 ID : 878270218781

Option 2 ID : 878270218784

Option 3 ID : 878270218782

Option 4 ID : 878270218783

Q.10 Let two straight lines drawn from the origin O intersect the line $3x + 4y = 12$ at the points P and Q such that $\triangle OPQ$ is an isosceles triangle and $\angle POQ = 90^\circ$. If $l = OP^2 + PQ^2 + QO^2$, then the greatest integer less than or equal to l is :

- Options**
1. 42
 2. 48
 3. 46
 4. 44

Question Type : MCQ

Question ID : 87827055621

Option 1 ID : 878270218834

Option 2 ID : 878270218833

Option 3 ID : 878270218836

Option 4 ID : 878270218835

Q.11 Let the line $2x + 3y - k = 0$, $k > 0$, intersect the x -axis and y -axis at the points A and B, respectively. If the equation of the circle having the line segment AB as a diameter is $x^2 + y^2 - 3x - 2y = 0$ and the length of the latus rectum of the ellipse $x^2 + 9y^2 = k^2$ is $\frac{m}{n}$, where m and n are coprime, then $2m + n$ is equal to

Options

1. 12
2. 13
3. 11
4. 10

Question Type : MCQ

Question ID : 87827055622

Option 1 ID : 878270218839

Option 2 ID : 878270218840

Option 3 ID : 878270218838

Option 4 ID : 878270218837

Q.12 Let a circle C of radius 1 and closer to the origin be such that the lines passing through the point (3, 2) and parallel to the coordinate axes touch it. Then the shortest distance of the circle C from the point (5, 5) is :

Options

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

Question Type : MCQ

Question ID : 87827055620

Option 1 ID : 878270218830

Option 2 ID : 878270218832

Option 3 ID : 878270218831

Option 4 ID : 878270218829

Q.13

If $y=y(x)$ is the solution of the differential equation $\frac{dy}{dx} + 2y = \sin(2x)$, $y(0) = \frac{3}{4}$, then $y\left(\frac{\pi}{8}\right)$ is equal to :

Options

1. $e^{\pi/8}$
2. $e^{\pi/4}$
3. $e^{-\pi/4}$
4. $e^{-\pi/8}$

Question Type : **MCQ**

Question ID : **87827055619**

Option 1 ID : **878270218827**

Option 2 ID : **878270218826**

Option 3 ID : **878270218825**

Option 4 ID : **878270218828**

Q.14

Consider the following two statements :

Statement I : For any two non-zero complex numbers z_1, z_2 ,

$$(|z_1| + |z_2|) \left| \frac{z_1}{|z_1|} + \frac{z_2}{|z_2|} \right| \leq 2(|z_1| + |z_2|), \text{ and}$$

Statement II : If x, y, z are three distinct complex numbers and a, b, c are three positive real

numbers such that $\frac{a}{|y-z|} = \frac{b}{|z-x|} = \frac{c}{|x-y|}$, then

$$\frac{a^2}{y-z} + \frac{b^2}{z-x} + \frac{c^2}{x-y} = 1.$$

Between the above two statements,

Options

1. both **Statement I** and **Statement II** are incorrect.
2. **Statement I** is incorrect but **Statement II** is correct.
3. both **Statement I** and **Statement II** are correct.
4. **Statement I** is correct but **Statement II** is incorrect.

Question Type : **MCQ**

Question ID : **87827055609**

Option 1 ID : **878270218786**

Option 2 ID : **878270218788**

Option 3 ID : **878270218785**

Option 4 ID : **878270218787**

Q.15

If $\frac{1}{\sqrt{1} + \sqrt{2}} + \frac{1}{\sqrt{2} + \sqrt{3}} + \dots + \frac{1}{\sqrt{99} + \sqrt{100}} = m$ and $\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \dots + \frac{1}{99 \cdot 100} = n$, then the point (m, n) lies on the line

Options

1. $11(x - 1) - 100y = 0$
2. $11x - 100y = 0$
3. $11(x - 1) - 100(y - 2) = 0$
4. $11(x - 2) - 100(y - 1) = 0$

Question Type : **MCQ**

Question ID : **87827055613**

Option 1 ID : **878270218802**

Option 2 ID : **878270218801**

Option 3 ID : **878270218804**

Option 4 ID : **878270218803**

Q.16

The coefficients a, b, c in the quadratic equation $ax^2 + bx + c = 0$ are chosen from the set $\{1, 2, 3, 4, 5, 6, 7, 8\}$. The probability of this equation having repeated roots is :

Options

1. $\frac{1}{128}$
2. $\frac{1}{64}$
3. $\frac{3}{128}$
4. $\frac{3}{256}$

Question Type : **MCQ**

Question ID : **87827055626**

Option 1 ID : **878270218854**

Option 2 ID : **878270218856**

Option 3 ID : **878270218855**

Option 4 ID : **878270218853**

Q.17 Let A and B be two square matrices of order 3 such that $|A| = 3$ and $|B| = 2$. Then $|A^T A (\text{adj}(2A))^{-1} (\text{adj}(4B)) (\text{adj}(AB))^{-1} AA^T|$ is equal to :

Options

1. 32
2. 108
3. 81
4. 64

Question Type : **MCQ**

Question ID : **87827055610**

Option 1 ID : **878270218789**

Option 2 ID : **878270218792**

Option 3 ID : **878270218791**

Option 4 ID : **878270218790**

Q.18

The value of $\int_{-\pi}^{\pi} \frac{2y(1 + \sin y)}{1 + \cos^2 y} dy$ is :

Options

1. $\frac{\pi^2}{2}$
2. $\frac{\pi}{2}$
3. π^2
4. $2\pi^2$

Question Type : **MCQ**

Question ID : **87827055617**

Option 1 ID : **878270218818**

Option 2 ID : **878270218820**

Option 3 ID : **878270218817**

Option 4 ID : **878270218819**

Q.19

The integral $\int_0^{\pi/4} \frac{136 \sin x}{3 \sin x + 5 \cos x} dx$ is equal to :

Options

1. $3\pi - 10 \log_e(2\sqrt{2}) + 10 \log_e 5$
2. $3\pi - 50 \log_e 2 + 20 \log_e 5$
3. $3\pi - 25 \log_e 2 + 10 \log_e 5$
4. $3\pi - 30 \log_e 2 + 20 \log_e 5$

Question Type : MCQ

Question ID : 87827055618

Option 1 ID : 878270218821

Option 2 ID : 878270218824

Option 3 ID : 878270218823

Option 4 ID : 878270218822

Q.20

Let a rectangle ABCD of sides 2 and 4 be inscribed in another rectangle PQRS such that the vertices of the rectangle ABCD lie on the sides of the rectangle PQRS. Let a and b be the sides of the rectangle PQRS when its area is maximum. Then $(a+b)^2$ is equal to :

Options

1. 60
2. 72
3. 80
4. 64

Question Type : MCQ

Question ID : 87827055616

Option 1 ID : 878270218816

Option 2 ID : 878270218813

Option 3 ID : 878270218815

Option 4 ID : 878270218814

Section : Mathematics Section B

Q.21 The number of ways of getting a sum 16 on throwing a dice four times is _____.

Question Type : SA

Question ID : 87827055630

Q.22 Suppose AB is a focal chord of the parabola $y^2 = 12x$ of length l and slope $m < \sqrt{3}$. If the distance of the chord AB from the origin is d , then ld^2 is equal to _____.

Question Type : SA

Question ID : 87827055635

Q.23 Let $\vec{a} = \hat{i} - 3\hat{j} + 7\hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} + \hat{k}$ and \vec{c} be a vector such that $(\vec{a} + 2\vec{b}) \times \vec{c} = 3(\vec{c} \times \vec{a})$.

If $\vec{a} \cdot \vec{c} = 130$, then $\vec{b} \cdot \vec{c}$ is equal to _____.

Question Type : SA

Question ID : 87827055636

Q.24 If $S = \{a \in \mathbb{R} : |2a - 1| = 3[a] + 2\{a\}\}$, where $[t]$ denotes the greatest integer less than or equal to t and $\{t\}$ represents the fractional part of t , then $72 \sum_{a \in S} a$ is equal to _____.

Question Type : SA

Question ID : 87827055628

Q.25 Let a_1, a_2, a_3, \dots be in an arithmetic progression of positive terms.

Let $A_k = a_1^2 - a_2^2 + a_3^2 - a_4^2 + \dots + a_{2k-1}^2 - a_{2k}^2$.

If $A_3 = -153$, $A_5 = -435$ and $a_1^2 + a_2^2 + a_3^2 = 66$, then $a_{17} - A_7$ is equal to _____.

Question Type : SA

Question ID : 87827055632

Q.26 Let f be a differentiable function in the interval $(0, \infty)$ such that $f(1) = 1$ and $\lim_{t \rightarrow x} \frac{t^2 f(x) - x^2 f(t)}{t - x} = 1$ for each $x > 0$. Then $2f(2) + 3f(3)$ is equal to _____.

Question Type : SA

Question ID : 87827055633

Q.27 If the constant term in the expansion of $(1 + 2x - 3x^3) \left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^9$ is p , then $108p$ is equal to _____.

Question Type : SA

Question ID : 87827055631

Q.28 The number of distinct real roots of the equation $|x| |x+2| - 5|x+1| - 1 = 0$ is _____.

Question Type : SA

Question ID : 87827055629

- Q.29** From a lot of 10 items, which include 3 defective items, a sample of 5 items is drawn at random. Let the random variable X denote the number of defective items in the sample. If the variance of X is σ^2 , then $96\sigma^2$ is equal to _____.

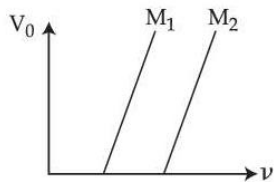
Question Type : SA
Question ID : 87827055637

- Q.30** The area of the region enclosed by the parabolas $y = x^2 - 5x$ and $y = 7x - x^2$ is _____.

Question Type : SA
Question ID : 87827055634

Section : Physics Section A

- Q.31** Given below are two statements :



Statement I : Figure shows the variation of stopping potential with frequency (ν) for the two photosensitive materials M_1 and M_2 . The slope gives value of $\frac{h}{e}$, where h is Planck's constant, e is the charge of electron.

Statement II : M_2 will emit photoelectrons of greater kinetic energy for the incident radiation having same frequency.

In the light of the above statements, choose the **most appropriate** answer from the options given below.

Options 1.

Statement I is correct and Statement II is incorrect

2. **Both Statement I and Statement II are incorrect**

3. **Statement I is incorrect but Statement II is correct**

4. **Both Statement I and Statement II are correct**

Question Type : MCQ
Question ID : 87827055654
Option 1 ID : 878270218937
Option 2 ID : 878270218936
Option 3 ID : 878270218938
Option 4 ID : 878270218935

Q.32 A wooden block of mass 5 kg rests on a soft horizontal floor. When an iron cylinder of mass 25 kg is placed on the top of the block, the floor yields and the block and the cylinder together go down with an acceleration of 0.1 ms^{-2} . The action force of the system on the floor is equal to :

Options

1. 196 N
2. 291 N
3. 294 N
4. 297 N

Question Type : MCQ

Question ID : 87827055640

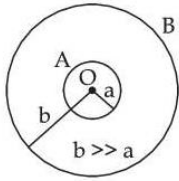
Option 1 ID : 878270218882

Option 2 ID : 878270218881

Option 3 ID : 878270218880

Option 4 ID : 878270218879

Q.33 Two conducting circular loops A and B are placed in the same plane with their centres coinciding as shown in figure. The mutual inductance between them is :



Options

1. $\frac{\mu_0}{2\pi} \cdot \frac{b^2}{a}$
2. $\frac{\mu_0 \pi b^2}{2a}$
3. $\frac{\mu_0 \pi a^2}{2b}$
4. $\frac{\mu_0}{2\pi} \cdot \frac{a^2}{b}$

Question Type : MCQ

Question ID : 87827055651

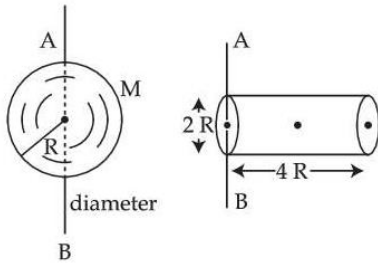
Option 1 ID : 878270218923

Option 2 ID : 878270218925

Option 3 ID : 878270218926

Option 4 ID : 878270218924

Q.34 Ratio of radius of gyration of a hollow sphere to that of a solid cylinder of equal mass, for moment of Inertia about their diameter axis AB as shown in figure is $\sqrt{\frac{8}{x}}$. The value of x is :



- Options**
1. 51
 2. 17
 3. 34
 4. 67

Question Type : MCQ

Question ID : 87827055642

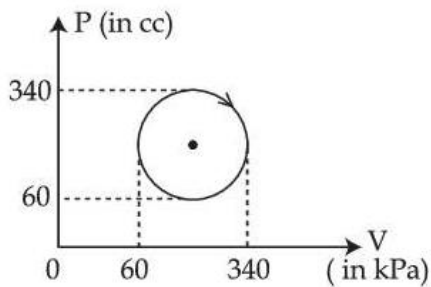
Option 1 ID : 878270218889

Option 2 ID : 878270218887

Option 3 ID : 878270218890

Option 4 ID : 878270218888

Q.35 The heat absorbed by a system in going through the given cyclic process is :



- Options**
1. 431.2 J
 2. 61.6 J
 3. 616 J
 4. 19.6 J

Question Type : MCQ

Question ID : 87827055645

Option 1 ID : 878270218899

Option 2 ID : 878270218901

Option 3 ID : 878270218900

Option 4 ID : 878270218902

Q.36 Light emerges out of a convex lens when a source of light kept at its focus. The shape of wavefront of the light is :

Options

1. cylindrical
2. both spherical and cylindrical
3. plane
4. spherical

Question Type : **MCQ**

Question ID : **87827055653**

Option 1 ID : **878270218932**

Option 2 ID : **878270218933**

Option 3 ID : **878270218934**

Option 4 ID : **878270218931**

Q.37 An alternating voltage of amplitude 40 V and frequency 4 kHz is applied directly across the capacitor of $12 \mu\text{F}$. The maximum displacement current between the plates of the capacitor is nearly :

Options

1. 10 A
2. 12 A
3. 8 A
4. 13 A

Question Type : **MCQ**

Question ID : **87827055652**

Option 1 ID : **878270218927**

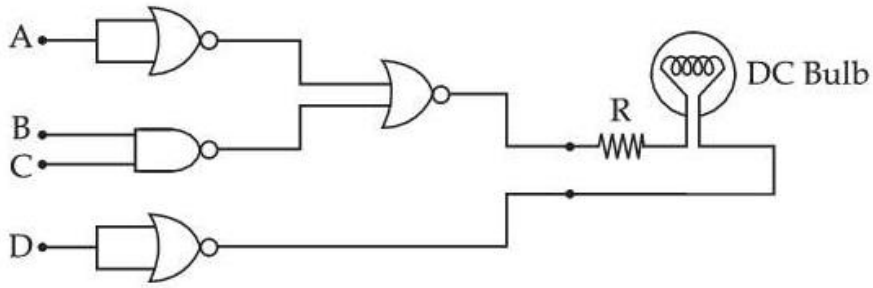
Option 2 ID : **878270218928**

Option 3 ID : **878270218930**

Option 4 ID : **878270218929**

Q.38

Following gates section is connected in a complete suitable circuit.



For which of the following combination, bulb will glow (ON) :

Options

1. $A = 0, B = 0, C = 0, D = 1$
2. $A = 1, B = 0, C = 0, D = 0$
3. $A = 0, B = 1, C = 1, D = 1$
4. $A = 1, B = 1, C = 1, D = 0$

Question Type : MCQ

Question ID : 87827055656

Option 1 ID : 878270218946

Option 2 ID : 878270218945

Option 3 ID : 878270218944

Option 4 ID : 878270218943

Q.39 Match List I with List II :

List I

- (A) Kinetic energy of planet
- (B) Gravitation Potential energy of sun-planet system
- (C) Total mechanical energy of planet
- (D) Escape energy at the surface of planet for unit mass object

List II

- (I) $-GMm/a$
- (II) $GMm/2a$
- (III) $\frac{Gm}{r}$
- (IV) $-GMm/2a$

(Where a = radius of planet orbit, r = radius of planet, M = mass of Sun, m = mass of planet)

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

Options

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

Question Type : **MCQ**

Question ID : **87827055643**

Option 1 ID : **878270218893**

Option 2 ID : **878270218894**

Option 3 ID : **878270218891**

Option 4 ID : **878270218892**

Q.40

The angle between vector \vec{Q} and the resultant of $(2\vec{Q} + 2\vec{P})$ and $(2\vec{Q} - 2\vec{P})$ is :

Options

1. $\tan^{-1} \frac{(2\vec{Q} - 2\vec{P})}{2\vec{Q} + 2\vec{P}}$
2. $\tan^{-1} (P/Q)$
3. 0°
4. $\tan^{-1} (2Q/P)$

Question Type : **MCQ**

Question ID : **87827055639**

Option 1 ID : **878270218877**

Option 2 ID : **878270218876**

Option 3 ID : **878270218878**

Option 4 ID : **878270218875**

Q.41 In a co-axial straight cable, the central conductor and the outer conductor carry equal currents in opposite directions. The magnetic field is zero :

- Options**
1. inside the outer conductor
 2. inside the inner conductor
 3. outside the cable
 4. in between the two conductors

Question Type : **MCQ**

Question ID : **87827055650**

Option 1 ID : **878270218921**

Option 2 ID : **878270218920**

Option 3 ID : **878270218919**

Option 4 ID : **878270218922**

Q.42 An electron rotates in a circle around a nucleus having positive charge Ze . Correct relation between total energy (E) of electron to its potential energy (U) is :

- Options**
1. $2E = 3U$
 2. $E = U$
 3. $2E = U$
 4. $E = 2U$

Question Type : **MCQ**

Question ID : **87827055655**

Option 1 ID : **878270218942**

Option 2 ID : **878270218940**

Option 3 ID : **878270218941**

Option 4 ID : **878270218939**

Q.43 Given below are two statements :

Statement I : When a capillary tube is dipped into a liquid, the liquid neither rises nor falls in the capillary. The contact angle may be 0° .

Statement II : The contact angle between a solid and a liquid is a property of the material of the solid and liquid as well.

In the light of the above statement, 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 and **Statement II** is false
4. **Statement I** is false but **Statement II** is true

Question Type : **MCQ**

Question ID : **87827055644**

Option 1 ID : **878270218895**

Option 2 ID : **878270218896**

Option 3 ID : **878270218897**

Option 4 ID : **878270218898**

Q.44 If the collision frequency of hydrogen molecules in a closed chamber at 27°C is Z , then the collision frequency of the same system at 127°C is :

Options

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

Question Type : **MCQ**

Question ID : **87827055646**

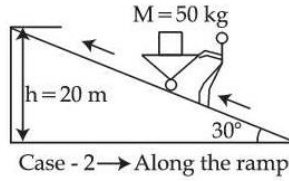
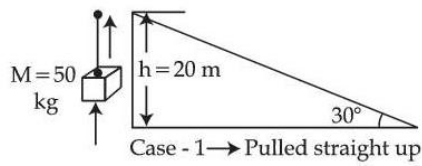
Option 1 ID : **878270218903**

Option 2 ID : **878270218905**

Option 3 ID : **878270218904**

Option 4 ID : **878270218906**

Q.45 A body of mass 50 kg is lifted to a height of 20 m from the ground in the two different ways as shown in the figures. The ratio of work done against the gravity in both the respective cases, will be :



Options

1. 2 : 1
2. 1 : 2
3. $\sqrt{3} : 2$
4. 1 : 1

Question Type : MCQ

Question ID : 87827055641

Option 1 ID : 878270218884

Option 2 ID : 878270218883

Option 3 ID : 878270218885

Option 4 ID : 878270218886

Q.46 If G be the gravitational constant and u be the energy density then which of the following quantity have the dimensions as that of the \sqrt{uG} :

Options

1. Force per unit mass
2. Energy per unit mass
3. pressure gradient per unit mass
4. Gravitational potential

Question Type : MCQ

Question ID : 87827055638

Option 1 ID : 878270218871

Option 2 ID : 878270218873

Option 3 ID : 878270218874

Option 4 ID : 878270218872

Q.47 Time periods of oscillation of the same simple pendulum measured using four different measuring clocks were recorded as 4.62 s, 4.632 s, 4.6 s and 4.64 s. The arithmetic mean of these readings in correct significant figure is :

Options

1. 5 s
2. 4.62 s
3. 4.6 s
4. 4.623 s

Question Type : **MCQ**

Question ID : **87827055657**

Option 1 ID : **878270218950**

Option 2 ID : **878270218948**

Option 3 ID : **878270218949**

Option 4 ID : **878270218947**

Q.48 A simple pendulum doing small oscillations at a place R height above earth surface has time period of $T_1 = 4$ s. T_2 would be its time period if it is brought to a point which is at a height $2R$ from earth surface. Choose the correct relation [R = radius of earth] :

Options

1. $3T_1 = 2T_2$
2. $2T_1 = 3T_2$
3. $T_1 = T_2$
4. $2T_1 = T_2$

Question Type : **MCQ**

Question ID : **87827055647**

Option 1 ID : **878270218909**

Option 2 ID : **878270218910**

Option 3 ID : **878270218907**

Option 4 ID : **878270218908**

Q.49 In hydrogen like system the ratio of coulombian force and gravitational force between an electron and a proton is in the order of :

- Options**
1. 10^{29}
 2. 10^{36}
 3. 10^{39}
 4. 10^{19}

Question Type : **MCQ**

Question ID : **87827055648**

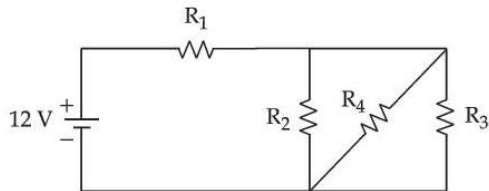
Option 1 ID : **878270218913**

Option 2 ID : **878270218911**

Option 3 ID : **878270218912**

Option 4 ID : **878270218914**

Q.50 In the given figure $R_1 = 10\Omega$, $R_2 = 8\Omega$, $R_3 = 4\Omega$ and $R_4 = 8\Omega$. Battery is ideal with emf 12V. Equivalent resistant of the circuit and current supplied by battery are respectively :



- Options**
1. $12\ \Omega$ and $1\ \text{A}$
 2. $12\ \Omega$ and $11.4\ \text{A}$
 3. $10.5\ \Omega$ and $1.14\ \text{A}$
 4. $10.5\ \Omega$ and $1\ \text{A}$

Question Type : **MCQ**

Question ID : **87827055649**

Option 1 ID : **878270218917**

Option 2 ID : **878270218916**

Option 3 ID : **878270218915**

Option 4 ID : **878270218918**

Section : Physics Section B

Q.51 In Young's double slit experiment, carried out with light of wavelength $5000\ \text{\AA}$, the distance between the slits is $0.3\ \text{mm}$ and the screen is at $200\ \text{cm}$ from the slits. The central maximum is at $x = 0\ \text{cm}$. The value of x for third maxima is _____ mm.

Question Type : **SA**

Question ID : **87827055665**

- Q.52** The density and breaking stress of a wire are $6 \times 10^4 \text{ kg/m}^3$ and $1.2 \times 10^8 \text{ N/m}^2$ respectively. The wire is suspended from a rigid support on a planet where acceleration due to gravity is $\frac{1}{3}$ of the value on the surface of earth. The maximum length of the wire with breaking is _____ m (take, $g = 10 \text{ m/s}^2$).

Question Type : SA

Question ID : 87827055660

- Q.53** If three helium nuclei combine to form a carbon nucleus then the energy released in this reaction is _____ $\times 10^{-2} \text{ MeV}$. (Given $1 \text{ u} = 931 \text{ MeV}/c^2$, atomic mass of helium = 4.002603 u)

Question Type : SA

Question ID : 87827055666

- Q.54** A 2A current carrying straight metal wire of resistance 1Ω , resistivity $2 \times 10^{-6} \Omega \text{ m}$, area of cross-section 10 mm^2 and mass 500 g is suspended horizontally in mid air by applying a uniform magnetic field \vec{B} . The magnitude of B is _____ $\times 10^{-1} \text{ T}$ (given, $g = 10 \text{ m/s}^2$).

Question Type : SA

Question ID : 87827055663

- Q.55** Three capacitors of capacitances $25 \mu\text{F}$, $30 \mu\text{F}$ and $45 \mu\text{F}$ are connected in parallel to a supply of 100 V. Energy stored in the above combination is E. When these capacitors are connected in series to the same supply, the stored energy is $\frac{9}{x} E$. The value of x is _____.

Question Type : SA

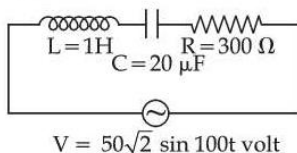
Question ID : 87827055661

- Q.56** A body moves on a frictionless plane starting from rest. If S_n is distance moved between $t = n - 1$ and $t = n$ and S_{n-1} is distance moved between $t = n - 2$ and $t = n - 1$, then the ratio $\frac{S_{n-1}}{S_n}$ is $\left(1 - \frac{2}{x}\right)$ for $n = 10$. The value of x is _____.

Question Type : SA

Question ID : 87827055658

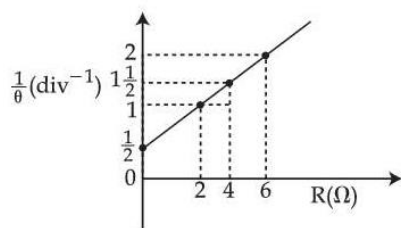
- Q.57** An ac source is connected in given series LCR circuit. The rms potential difference across the capacitor of $20 \mu\text{F}$ is _____ V.



Question Type : SA

Question ID : 87827055664

- Q.58** In the experiment to determine the galvanometer resistance by half-deflection method, the plot of $\frac{1}{\theta}$ vs the resistance (R) of the resistance box is shown in the figure. The figure of merit of the galvanometer is _____ $\times 10^{-1}$ A/division. [The source has emf 2V]

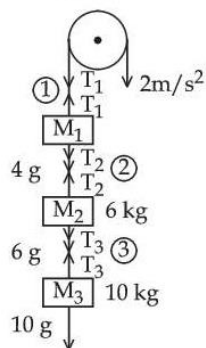


Question Type : SA
Question ID : 87827055667

- Q.59** The electric field between the two parallel plates of a capacitor of $1.5 \mu\text{F}$ capacitance drops to one third of its initial value in $6.6 \mu\text{s}$ when the plates are connected by a thin wire. The resistance of this wire is _____ Ω . (Given, $\log 3 = 1.1$)

Question Type : SA
Question ID : 87827055662

- Q.60** Three blocks M_1 , M_2 , M_3 having masses 4 kg, 6 kg and 10 kg respectively are hanging from a smooth pulley using rope 1, 2 and 3 as shown in figure. The tension in the rope 1, T_1 when they are moving upward with acceleration of 2ms^{-2} is _____ N (if $g = 10 \text{ m/s}^2$).



Question Type : SA
Question ID : 87827055659

Q.61 The reaction at cathode in the cells commonly used in clocks involves.

- Options**
1. oxidation of Mn from +3 to +4
 2. reduction of Mn from +4 to +3
 3. reduction of Mn from +7 to +2
 4. oxidation of Mn from +2 to +7

Question Type : **MCQ**

Question ID : **87827055671**

Option 1 ID : **878270218975**

Option 2 ID : **878270218974**

Option 3 ID : **878270218973**

Option 4 ID : **878270218976**

Q.62 The metal that shows highest and maximum number of oxidation state is :

- Options**
1. Mn
 2. Fe
 3. Co
 4. Ti

Question Type : **MCQ**

Question ID : **87827055676**

Option 1 ID : **878270218995**

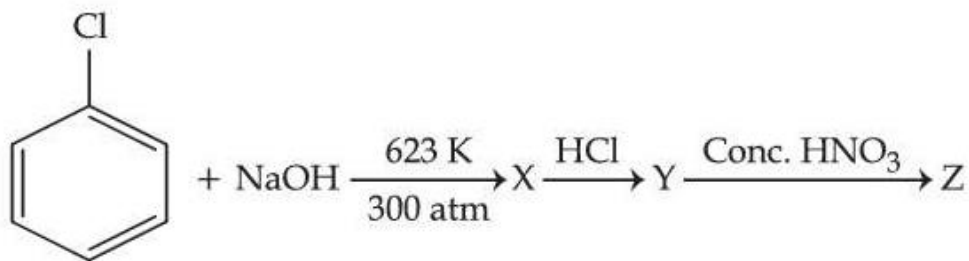
Option 2 ID : **878270218993**

Option 3 ID : **878270218996**

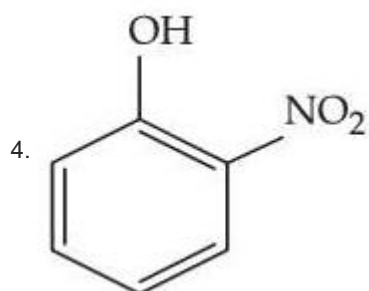
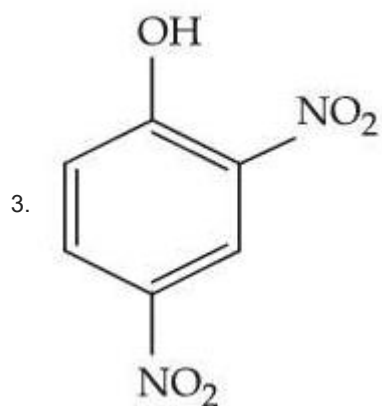
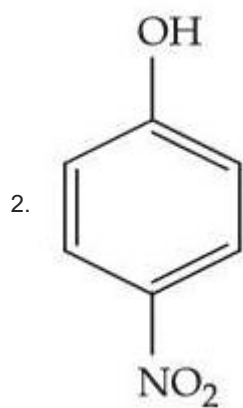
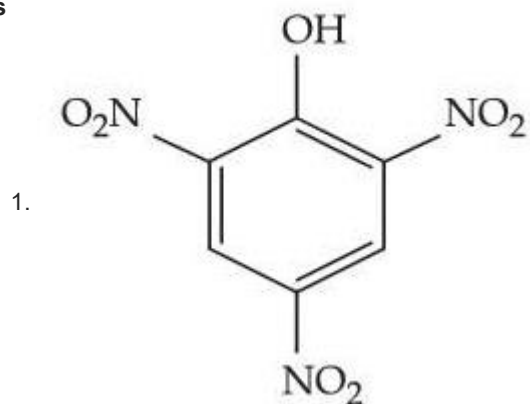
Option 4 ID : **878270218994**

Q.63

Identify compound (Z) in the following reaction sequence.



Options



Question ID : 87827055685
Option 1 ID : 878270219032
Option 2 ID : 878270219031
Option 3 ID : 878270219029
Option 4 ID : 878270219030

- Q.64** Given below are two statement :
- Statements I :** Bromination of phenol in solvent with low polarity such as CHCl_3 or CS_2 requires Lewis acid catalyst.
- Statements II :** The Lewis acid catalyst polarises the bromine to generate Br^+ .
- 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**

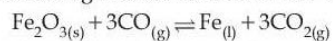
Question Type : **MCQ**
Question ID : 87827055684
Option 1 ID : 878270219027
Option 2 ID : 878270219026
Option 3 ID : 878270219025
Option 4 ID : 878270219028

- Q.65** The number of neutrons present in the more abundant isotope of boron is 'x'. Amorphous boron upon heating with air forms a product, in which the oxidation state of boron is 'y'. The value of $x+y$ is _____.

- Options**
1. **4**
 2. **3**
 3. **6**
 4. **9**

Question Type : **MCQ**
Question ID : 87827055675
Option 1 ID : 878270218992
Option 2 ID : 878270218990
Option 3 ID : 878270218989
Option 4 ID : 878270218991

Q.66 The following reaction occurs in the Blast furnace where iron ore is reduced to iron metal



Using the Le-chatelier's principle, predict which one of the following will not disturb the equilibrium.

Options

1. Removal of CO
2. Addition of CO₂
3. Addition of Fe₂O₃
4. Removal of CO₂

Question Type : **MCQ**

Question ID : **87827055670**

Option 1 ID : **878270218969**

Option 2 ID : **878270218971**

Option 3 ID : **878270218972**

Option 4 ID : **878270218970**

Q.67 Number of σ and π bonds present in ethylene molecule is respectively :

Options

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

Question Type : **MCQ**

Question ID : **87827055669**

Option 1 ID : **878270218965**

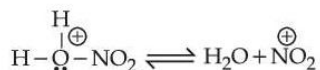
Option 2 ID : **878270218968**

Option 3 ID : **878270218967**

Option 4 ID : **878270218966**

Q.68 Given below are two statements :

Statement I : Nitration of benzene involves the following step -



Statement II : Use of Lewis base promotes the electrophilic substitution of benzene.

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

Options

1. **Statement I** is correct but **Statement II** is incorrect
2. Both **Statement I** and **Statement II** are incorrect
3. Both **Statement I** and **Statement II** are correct
4. **Statement I** is incorrect but **Statement II** is correct

Question Type : **MCQ**

Question ID : **87827055681**

Option 1 ID : **878270219015**

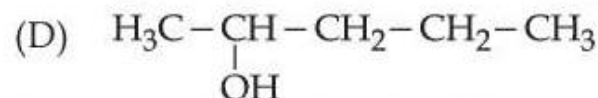
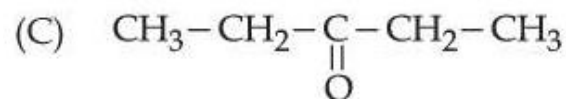
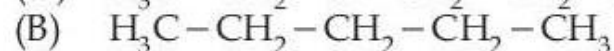
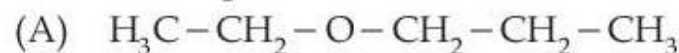
Option 2 ID : **878270219014**

Option 3 ID : **878270219013**

Option 4 ID : **878270219016**

Q.69

For the Compounds :



The increasing order of boiling point is :

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

Options

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

Question Type : **MCQ**

Question ID : **87827055682**

Option 1 ID : **878270219017**

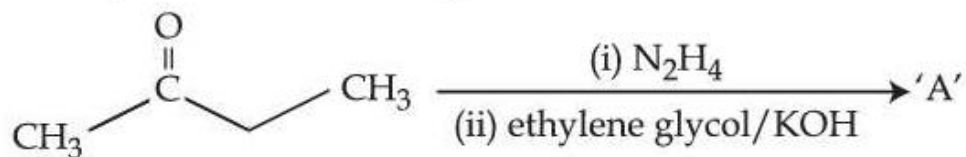
Option 2 ID : **878270219020**

Option 3 ID : **878270219019**

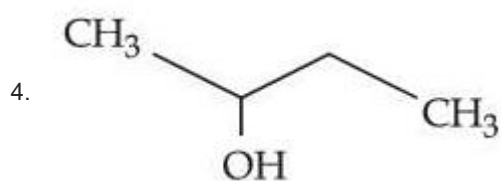
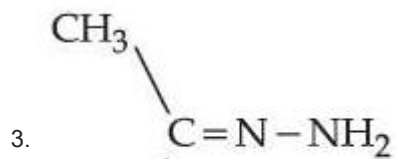
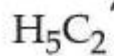
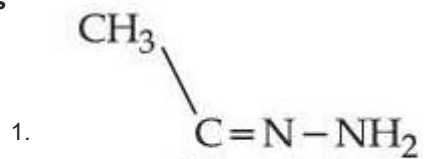
Option 4 ID : **878270219018**

Q.70

Identify 'A' in the following reaction :



Options



Question Type : MCQ

Question ID : 87827055686

Option 1 ID : 878270219035

Option 2 ID : 878270219034

Option 3 ID : 878270219033

Option 4 ID : 878270219036

Q.71 Which of the following gives a positive test with ninhydrin ?

Options

1. Polyvinyl chloride
2. Cellulose
3. Starch
4. Egg albumin

Question Type : MCQ

Question ID : 87827055687

Option 1 ID : 878270219037

Option 2 ID : 878270219039

Option 3 ID : 878270219038

Option 4 ID : 878270219040

Q.72 Given below are two statements : One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**

Assertion (A) : Enthalpy of neutralisation of strong monobasic acid with strong monoacidic base is always -57 kJ mol^{-1}

Reason (R) : Enthalpy of neutralisation is the amount of heat liberated when one mole of H^+ ions furnished by acid combine with one mole of OH^- ions furnished by base to form one mole of water.

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

Options

1. **(A)** is true but **(R)** is false
2. Both **(A)** and **(R)** are true but **(R)** is **not** the correct explanation of **(A)**
3. Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**
4. **(A)** is false but **(R)** is true

Question Type : MCQ

Question ID : 87827055679

Option 1 ID : 878270219007

Option 2 ID : 878270219006

Option 3 ID : 878270219005

Option 4 ID : 878270219008

Q.73 Given below are two statements :

Statement I : In group 13, the stability of +1 oxidation state increases down the group.

Statement II : The atomic size of gallium is greater than that of aluminium.

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

Options

1. Both **Statement I** and **Statement II** are correct
2. **Statement I** is correct but **Statement II** is incorrect
3. Both **Statement I** and **Statement II** are incorrect
4. **Statement I** is incorrect but **Statement II** is correct

Question Type : **MCQ**

Question ID : **87827055674**

Option 1 ID : **878270218985**

Option 2 ID : **878270218987**

Option 3 ID : **878270218986**

Option 4 ID : **878270218988**

Q.74 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 :

Options

1. $C_{12}H_{20}O_{12}$
2. $C_{12}H_{22}O_{11}$
3. $C_{14}H_{20}O_{10}$
4. $C_{11}H_{18}O_{12}$

Question Type : **MCQ**

Question ID : **87827055680**

Option 1 ID : **878270219012**

Option 2 ID : **878270219009**

Option 3 ID : **878270219011**

Option 4 ID : **878270219010**

Q.75 Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : Cis form of alkene is found to be more polar than the trans form.

Reason (R) : Dipole moment of trans isomer of 2-butene is zero.

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 false but **(R)** is true

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

4.

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

Question Type : **MCQ**

Question ID : **87827055683**

Option 1 ID : **878270219021**

Option 2 ID : **878270219024**

Option 3 ID : **878270219023**

Option 4 ID : **878270219022**

Q.76 The statement(s) that are **correct** about the species O^{2-} , F^- , Na^+ and Mg^{2+} .

(A) All are isoelectronic

(B) All have the same nuclear charge

(C) O^{2-} has the largest ionic radii

(D) Mg^{2+} has the smallest ionic radii

Choose the **most appropriate** answer from the options given below :

Options

1. **(B)**, **(C)** and **(D)** only

2. **(C)** and **(D)** only

3. **(A)**, **(B)**, **(C)** and **(D)**

4. **(A)**, **(C)** and **(D)** only

Question Type : **MCQ**

Question ID : **87827055673**

Option 1 ID : **878270218984**

Option 2 ID : **878270218983**

Option 3 ID : **878270218981**

Option 4 ID : **878270218982**

Q.77 The correct order of ligands arranged in increasing field strength.

Options

1. $\text{Br}^- < \text{F}^- < \text{H}_2\text{O} < \text{NH}_3$
2. $\text{Cl}^- < ^-\text{OH} < \text{Br}^- < \text{CN}^-$
3. $\text{H}_2\text{O} < ^-\text{OH} < \text{CN}^- < \text{NH}_3$
4. $\text{F}^- < \text{Br}^- < \text{I}^- < \text{NH}_3$

Question Type : **MCQ**

Question ID : **87827055677**

Option 1 ID : **878270218997**

Option 2 ID : **878270219000**

Option 3 ID : **878270218999**

Option 4 ID : **878270218998**

Q.78 Molar ionic conductivities of divalent cation and anion are $57 \text{ S cm}^2 \text{ mol}^{-1}$ and $73 \text{ S cm}^2 \text{ mol}^{-1}$ respectively. The molar conductivity of solution of an electrolyte with the above cation and anion will be :

Options

1. $187 \text{ S cm}^2 \text{ mol}^{-1}$
2. $260 \text{ S cm}^2 \text{ mol}^{-1}$
3. $130 \text{ S cm}^2 \text{ mol}^{-1}$
4. $65 \text{ S cm}^2 \text{ mol}^{-1}$

Question Type : **MCQ**

Question ID : **87827055672**

Option 1 ID : **878270218980**

Option 2 ID : **878270218979**

Option 3 ID : **878270218977**

Option 4 ID : **878270218978**

Q.79 Which one of the following complexes will exhibit the least paramagnetic behaviour ?
[Atomic number, Cr = 24, Mn = 25, Fe = 26, Co = 27]

Options

1. $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$
2. $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$
3. $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$
4. $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$

Question Type : **MCQ**

Question ID : **87827055678**

Option 1 ID : **878270219004**

Option 2 ID : **878270219002**

Option 3 ID : **878270219003**

Option 4 ID : **878270219001**

Q.80 The **incorrect** postulates of the Dalton's atomic theory are :

- (A) Atoms of different elements differ in mass.
- (B) Matter consists of divisible atoms.
- (C) Compounds are formed when atoms of different element combine in a fixed ratio.
- (D) All the atoms of given element have different properties including mass.
- (E) Chemical reactions involve reorganisation of atoms.

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

Options

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

Question Type : **MCQ**

Question ID : **87827055668**

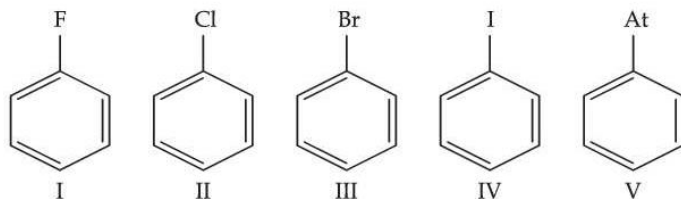
Option 1 ID : **878270218964**

Option 2 ID : **878270218962**

Option 3 ID : **878270218961**

Option 4 ID : **878270218963**

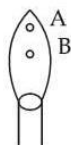
Q.81 The number of halobenzenes from the following that can be prepared by Sandmeyer's reaction is _____.



Question Type : SA

Question ID : 87827055695

Q.82



In a borax bead test under hot condition, a metal salt (one from the given) is heated at point B of the flame, resulted in green colour salt bead. The spin-only magnetic moment value of the salt is _____ BM (Nearest integer)

[Given atomic number of Cu = 29, Ni = 28, Mn = 25, Fe = 26]

Question Type : SA

Question ID : 87827055694

Q.83 The spin-only magnetic moment value of the ion among Ti^{2+} , V^{2+} , Co^{3+} and Cr^{2+} , that acts as strong oxidising agent in aqueous solution is _____ BM (Near integer).

(Given atomic numbers : Ti : 22, V : 23, Cr : 24, Co : 27)

Question Type : SA

Question ID : 87827055693

Q.84 In the lewis dot structure for NO_2^- , total number of valence electrons around nitrogen is _____.

Question Type : SA

Question ID : 87827055689

Q.85 9.3 g of pure aniline is treated with bromine water at room temperature to give a white precipitate of the product 'P'. The mass of product 'P' obtained is 26.4 g. The percentage yield is _____%.

Question Type : SA

Question ID : 87827055697

Q.86 During Kinetic study of reaction $2A + B \rightarrow C + D$, the following results were obtained :

	A [M]	B [M]	initial rate of formation of D
I	0.1	0.1	6.0×10^{-3}
II	0.3	0.2	7.2×10^{-2}
III	0.3	0.4	2.88×10^{-1}
IV	0.4	0.1	2.40×10^{-2}

Based on above data, overall order of the reaction is _____.

Question Type : SA

Question ID : 87827055692

- Q.87** An artificial cell is made by encapsulating 0.2 M glucose solution within a semipermeable membrane. The osmotic pressure developed when the artificial cell is placed within a 0.05 M solution of NaCl at 300 K is _____ $\times 10^{-1}$ bar. (nearest integer).
[Given : $R = 0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$]
Assume complete dissociation of NaCl

Question Type : SA

Question ID : 87827055691

- Q.88** The value of Rydberg constant (R_H) is $2.18 \times 10^{-18} \text{ J}$. The velocity of electron having mass $9.1 \times 10^{-31} \text{ kg}$ in Bohr's first orbit of hydrogen atom = _____ $\times 10^5 \text{ ms}^{-1}$ (nearest integer).

Question Type : SA

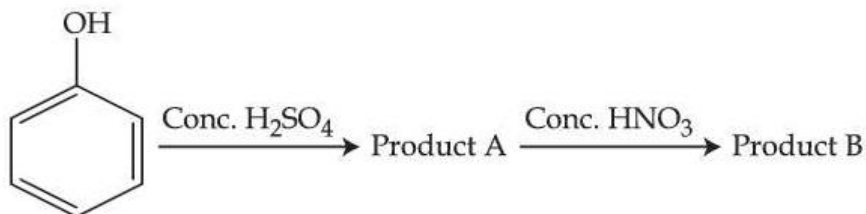
Question ID : 87827055688

- Q.89** The heat of combustion of solid benzoic acid at constant volume is -321.30 kJ at 27°C . The heat of combustion at constant pressure is $(-321.30 - xR) \text{ kJ}$, the value of x is _____.

Question Type : SA

Question ID : 87827055690

- Q.90** Consider the given chemical reaction sequence :



Total sum of oxygen atoms in Product A and Product B are _____.

Question Type : SA

Question ID : 87827055696