

Test Date	04/04/2024
Test Time	3:00 PM - 6:00 PM
Subject	B. Tech

Section : Mathematics Section A

Q.1 Let P be the point of intersection of the lines $\frac{x-2}{1} = \frac{y-4}{5} = \frac{z-2}{1}$ and $\frac{x-3}{2} = \frac{y-2}{3} = \frac{z-3}{2}$. Then, the shortest distance of P from the line $4x = 2y = z$ is

- Options
1. $\frac{\sqrt{14}}{7}$
 2. $\frac{5\sqrt{14}}{7}$
 3. $\frac{3\sqrt{14}}{7}$
 4. $\frac{6\sqrt{14}}{7}$

Question Type : MCQ

Question ID : 68019113809

Option 1 ID : 68019154432

Option 2 ID : 68019154433

Option 3 ID : 68019154431

Option 4 ID : 68019154434

Q.2 Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} + 4\hat{j} - 5\hat{k}$ and $\vec{c} = x\hat{i} + 2\hat{j} + 3\hat{k}$, $x \in \mathbb{R}$.

If \vec{d} is the unit vector in the direction of $\vec{b} + \vec{c}$ such that $\vec{a} \cdot \vec{d} = 1$, then $(\vec{a} \times \vec{b}) \cdot \vec{c}$ is equal to

- Options
1. 9
 2. 6
 3. 3
 4. 11

Question Type : MCQ

Question ID : 68019113810

Option 1 ID : 68019154437

Option 2 ID : 68019154436

Option 3 ID : 68019154435

Option 4 ID : 68019154438

Q.3 Given that the inverse trigonometric function assumes principal values only. Let x, y be any two real numbers in $[-1, 1]$ such that $\cos^{-1} x - \sin^{-1} y = \alpha, \frac{-\pi}{2} \leq \alpha \leq \pi$.

Then, the minimum value of $x^2 + y^2 + 2xy \sin \alpha$ is

- Options**
1. $\frac{-1}{2}$
 2. -1
 3. $\frac{1}{2}$
 4. 0

Question Type : MCQ

Question ID : 68019113813

Option 1 ID : 68019154448

Option 2 ID : 68019154447

Option 3 ID : 68019154450

Option 4 ID : 68019154449

Q.4 Let $f(x) = 3\sqrt{x-2} + \sqrt{4-x}$ be a real valued function. If α and β are respectively the minimum and the maximum values of f , then $\alpha^2 + 2\beta^2$ is equal to

- Options**
1. 24
 2. 38
 3. 42
 4. 44

Question Type : MCQ

Question ID : 68019113800

Option 1 ID : 68019154395

Option 2 ID : 68019154396

Option 3 ID : 68019154398

Option 4 ID : 68019154397

Q.5 If the value of the integral $\int_{-1}^1 \frac{\cos \alpha x}{1+3^x} dx$ is $\frac{2}{\pi}$. Then, a value of α is

- Options**
1. $\frac{\pi}{6}$
 2. $\frac{\pi}{2}$
 3. $\frac{\pi}{4}$
 4. $\frac{\pi}{3}$

Question Type : MCQ

Question ID : 68019113803

Option 1 ID : 68019154410

Option 2 ID : 68019154409

Option 3 ID : 68019154407

Option 4 ID : 68019154408

Q.6 The value of $\frac{1 \times 2^2 + 2 \times 3^2 + \dots + 100 \times (101)^2}{1^2 \times 2 + 2^2 \times 3 + \dots + 100^2 \times 101}$ is

- Options
1. $\frac{32}{31}$
 2. $\frac{31}{30}$
 3. $\frac{306}{305}$
 4. $\frac{305}{301}$

Question Type : MCQ

Question ID : 68019113798

Option 1 ID : 68019154389

Option 2 ID : 68019154387

Option 3 ID : 68019154390

Option 4 ID : 68019154388

Q.7 If the function

$$f(x) = \begin{cases} \frac{72^x - 9^x - 8^x + 1}{\sqrt{2} - \sqrt{1 + \cos x}} & , x \neq 0 \\ a \log_e 2 \log_e 3 & , x = 0 \end{cases}$$

is continuous at $x = 0$, then the value of a^2 is equal to

- Options
1. 746
 2. 1152
 3. 968
 4. 1250

Question Type : MCQ

Question ID : 68019113801

Option 1 ID : 68019154399

Option 2 ID : 68019154401

Option 3 ID : 68019154400

Option 4 ID : 68019154402

Q.8 Let $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = I + \text{adj}(A) + (\text{adj } A)^2 + \dots + (\text{adj } A)^{10}$.

Then, the sum of all the elements of the matrix B is:

- Options
1. -124
 2. 22
 3. -88
 4. -110

Question Type : MCQ

Question ID : 68019113796

Option 1 ID : 68019154381

Option 2 ID : 68019154379

Option 3 ID : 68019154382

Option 4 ID : 68019154380

Q.9 Let a relation R on $N \times N$ be defined as:
 $(x_1, y_1) R (x_2, y_2)$ if and only if $x_1 \leq x_2$ or $y_1 \leq y_2$.

Consider the two statements:

(I) R is reflexive but not symmetric.

(II) R is transitive

Then which one of the following is true?

- Options
1. Only (I) is correct.
 2. Neither (I) nor (II) is correct.
 3. Both (I) and (II) are correct.
 4. Only (II) is correct.

Question Type : MCQ

Question ID : 68019113794

Option 1 ID : 68019154371

Option 2 ID : 68019154374

Option 3 ID : 68019154373

Option 4 ID : 68019154372

Q.10 The area (in sq. units) of the region
 $S = \{z \in \mathbb{C} : |z-1| \leq 2; (z+\bar{z}) + i(z-\bar{z}) \leq 2, \text{Im}(z) \geq 0\}$ is

- Options
1. $\frac{17\pi}{8}$
 2. $\frac{3\pi}{2}$
 3. $\frac{7\pi}{4}$
 4. $\frac{7\pi}{3}$

Question Type : MCQ

Question ID : 68019113795

Option 1 ID : 68019154378

Option 2 ID : 68019154375

Option 3 ID : 68019154377

Option 4 ID : 68019154376

Q.11 Consider a hyperbola H having centre at the origin and foci on the x -axis. Let C_1 be the circle touching the hyperbola H and having the centre at the origin. Let C_2 be the circle touching the hyperbola H at its vertex and having the centre at one of its foci. If areas (in sq units) of C_1 and C_2 are 36π and 4π , respectively, then the length (in units) of latus rectum of H is

- Options
1. $\frac{10}{3}$
 2. $\frac{14}{3}$
 3. $\frac{28}{3}$
 4. $\frac{11}{3}$

Question Type : MCQ

Question ID : 68019113807

Option 1 ID : 68019154425

Option 2 ID : 68019154424

Option 3 ID : 68019154423

Option 4 ID : 68019154426

Q.12 Let three real numbers a, b, c be in arithmetic progression and $a + 1, b, c + 3$ be in geometric progression. If $a > 10$ and the arithmetic mean of a, b and c is 8, then the cube of the geometric mean of a, b and c is

- Options
1. 120
 2. 316
 3. 128
 4. 312

Question Type : MCQ

Question ID : 68019113799

Option 1 ID : 68019154393

Option 2 ID : 68019154394

Option 3 ID : 68019154391

Option 4 ID : 68019154392

Q.13

Let $f(x) = \int_0^x (t + \sin(1 - e^t)) dt, x \in \mathbb{R}$. Then, $\lim_{x \rightarrow 0} \frac{f(x)}{x^3}$ is equal to

- Options
1. $\frac{1}{6}$
 2. $-\frac{1}{6}$
 3. $\frac{2}{3}$
 4. $-\frac{2}{3}$

Question Type : MCQ

Question ID : 68019113802

Option 1 ID : 68019154405

Option 2 ID : 68019154406

Option 3 ID : 68019154403

Option 4 ID : 68019154404

Q.14 Let PQ be a chord of the parabola $y^2 = 12x$ and the midpoint of PQ be at (4, 1). Then, which of the following point lies on the line passing through the points P and Q?

- Options
1. $\left(\frac{3}{2}, -16\right)$
 2. (2, -9)
 3. (3, -3)
 4. $\left(\frac{1}{2}, -20\right)$

Question Type : MCQ

Question ID : 68019113808

Option 1 ID : 68019154429

Option 2 ID : 68019154428

Option 3 ID : 68019154427

Option 4 ID : 68019154430

Q.15 The area (in sq. units) of the region described by $\{(x, y) : y^2 \leq 2x, \text{ and } y \geq 4x - 1\}$ is

- Options
1. $\frac{11}{32}$
 2. $\frac{9}{32}$
 3. $\frac{8}{9}$
 4. $\frac{11}{12}$

Question Type : MCQ

Question ID : 68019113804

Option 1 ID : 68019154413

Option 2 ID : 68019154411

Option 3 ID : 68019154412

Option 4 ID : 68019154414

Q.16 Let C be a circle with radius $\sqrt{10}$ units and centre at the origin. Let the line $x + y = 2$ intersect the circle C at the points P and Q . Let MN be a chord of C of length 2 unit and slope -1 . Then, a distance (in units) between the chord PQ and the chord MN is

- Options
1. $2 - \sqrt{3}$
 2. $\sqrt{2} + 1$
 3. $3 - \sqrt{2}$
 4. $\sqrt{2} - 1$

Question Type : MCQ

Question ID : 68019113806

Option 1 ID : 68019154422

Option 2 ID : 68019154421

Option 3 ID : 68019154420

Option 4 ID : 68019154419

Q.17 Let $y = y(x)$ be the solution of the differential equation $(x^2 + 4)^2 dy + (2x^3y + 8xy - 2)dx = 0$. If $y(0) = 0$, then $y(2)$ is equal to

- Options
1. $\frac{\pi}{16}$
 2. 2π
 3. $\frac{\pi}{32}$
 4. $\frac{\pi}{8}$

Question Type : MCQ

Question ID : 68019113805

Option 1 ID : 68019154416

Option 2 ID : 68019154418

Option 3 ID : 68019154415

Option 4 ID : 68019154417

Q.18 For $\lambda > 0$, let θ be the angle between the vectors $\vec{a} = \hat{i} + \lambda\hat{j} - 3\hat{k}$ and $\vec{b} = 3\hat{i} - \hat{j} + 2\hat{k}$. If the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are mutually perpendicular, then the value of $(14 \cos \theta)^2$ is equal to

- Options
1. 25
 2. 40
 3. 20
 4. 50

Question Type : MCQ

Question ID : 68019113811

Option 1 ID : 68019154439

Option 2 ID : 68019154442

Option 3 ID : 68019154440

Option 4 ID : 68019154441

Q.19 If the coefficients of x^4 , x^5 and x^6 in the expansion of $(1+x)^n$ are in the arithmetic progression, then the maximum value of n is:

- Options
1. 7
 2. 14
 3. 21
 4. 28

Question Type : MCQ

Question ID : 68019113797

Option 1 ID : 68019154383

Option 2 ID : 68019154384

Option 3 ID : 68019154385

Option 4 ID : 68019154386

Q.20 If the mean of the following probability distribution of a random variable X :

X	0	2	4	6	8
P(X)	a	$2a$	$a+b$	$2b$	$3b$

is $\frac{46}{9}$, then the variance of the distribution is

- Options
1. $\frac{151}{27}$
 2. $\frac{581}{81}$
 3. $\frac{173}{27}$
 4. $\frac{566}{81}$

Question Type : MCQ

Question ID : 68019113812

Option 1 ID : 68019154443

Option 2 ID : 68019154445

Option 3 ID : 68019154446

Option 4 ID : 68019154444

- Q.21** Consider a triangle ABC having the vertices $A(1, 2)$, $B(\alpha, \beta)$ and $C(\gamma, \delta)$ and angles $\angle ABC = \frac{\pi}{6}$ and $\angle BAC = \frac{2\pi}{3}$. If the points B and C lie on the line $y = x + 4$, then $\alpha^2 + \gamma^2$ is equal to _____.

Question Type : SA
Question ID : 68019113821

- Q.22** In a tournament, a team plays 10 matches with probabilities of winning and losing each match as $\frac{1}{3}$ and $\frac{2}{3}$ respectively. Let x be the number of matches that the team wins, and y be the number of matches that team loses. If the probability $P(|x - y| \leq 2)$ is p , then $3^9 p$ equals _____.

Question Type : SA
Question ID : 68019113823

- Q.23** Let $S = \{\sin^2 2\theta : (\sin^4 \theta + \cos^4 \theta)x^2 + (\sin 2\theta)x + (\sin^6 \theta + \cos^6 \theta) = 0 \text{ has real roots}\}$. If α and β be the smallest and largest elements of the set S , respectively, then $3((\alpha - 2)^2 + (\beta - 1)^2)$ equals _____.

Question Type : SA
Question ID : 68019113815

- Q.24** Consider a line L passing through the points $P(1, 2, 1)$ and $Q(2, 1, -1)$. If the mirror image of the point $A(2, 2, 2)$ in the line L is (α, β, γ) , then $\alpha + \beta + 6\gamma$ is equal to _____.

Question Type : SA
Question ID : 68019113822

- Q.25** If $\int \operatorname{cosec}^5 x \, dx = \alpha \cot x \operatorname{cosec} x \left(\operatorname{cosec}^2 x + \frac{3}{2} \right) + \beta \log_e \left| \tan \frac{x}{2} \right| + C$

where $\alpha, \beta \in \mathbb{R}$ and C is the constant of integration, then the value of $8(\alpha + \beta)$ equals _____.

Question Type : SA
Question ID : 68019113819

- Q.26** Let A be a 2×2 symmetric matrix such that $A \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 3 \\ 7 \end{bmatrix}$ and the determinant of A be 1. If $A^{-1} = \alpha A + \beta I$, where I is an identity matrix of order 2×2 , then $\alpha + \beta$ equals _____.

Question Type : SA
Question ID : 68019113816

Q.27 Let $y = y(x)$ be the solution of the differential equation $(x + y + 2)^2 dx = dy$, $y(0) = -2$. Let the maximum and minimum values of the function $y = y(x)$ in $\left[0, \frac{\pi}{3}\right]$ be α and β , respectively. If $(3\alpha + \pi)^2 + \beta^2 = \gamma + \delta\sqrt{3}$, $\gamma, \delta \in \mathbb{Z}$, then $\gamma + \delta$ equals _____

Question Type : SA

Question ID : 68019113820

Q.28 There are 4 men and 5 women in Group A, and 5 men and 4 women in Group B. If 4 persons are selected from each group, then the number of ways of selecting 4 men and 4 women is _____

Question Type : SA

Question ID : 68019113817

Q.29 Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a thrice differentiable function such that $f(0) = 0, f(1) = 1, f(2) = -1, f(3) = 2$ and $f(4) = -2$. Then, the minimum number of zeros of $(3f'f'' + ff''')(x)$ is _____

Question Type : SA

Question ID : 68019113818

Q.30 Consider the function $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = \frac{2x}{\sqrt{1+9x^2}}$. If the composition of f , $\underbrace{(f \circ f \circ f \circ \dots \circ f)}_{10 \text{ times}}(x) = \frac{2^{10}x}{\sqrt{1+9\alpha x^2}}$, then the value of $\sqrt{3\alpha+1}$ is equal to _____

Question Type : SA

Question ID : 68019113814

Section : Physics Section A

Q.31 A 90 kg body placed at $2R$ distance from surface of earth experiences gravitational pull of :

(R = Radius of earth, $g = 10 \text{ m s}^{-2}$)

- Options
1. 225 N
 2. 300 N
 3. 120 N
 4. 100 N

Question Type : MCQ

Question ID : 68019113828

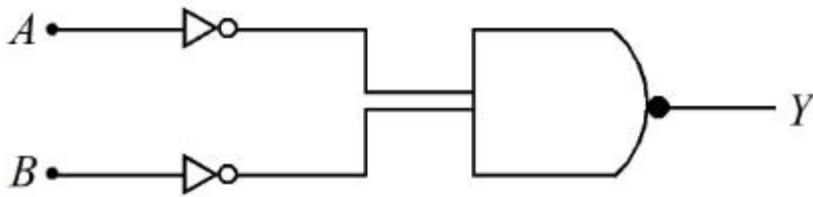
Option 1 ID : 68019154478

Option 2 ID : 68019154477

Option 3 ID : 68019154479

Option 4 ID : 68019154480

Q.32 Identify the logic gate given in the circuit:



- Options
1. OR- gate
 2. AND gate
 3. NOR gate
 4. NAND- gate

Question Type : MCQ

Question ID : 68019113842

Option 1 ID : 68019154533

Option 2 ID : 68019154535

Option 3 ID : 68019154536

Option 4 ID : 68019154534

Q.33 A 2 kg brick begins to slide over a surface which is inclined at an angle of 45° with respect to horizontal axis. The co-efficient of static friction between their surfaces is:

- Options
1. 1.7
 2. 1
 3. 0.5
 4. $\frac{1}{\sqrt{3}}$

Question Type : MCQ

Question ID : 68019113827

Option 1 ID : 68019154475

Option 2 ID : 68019154473

Option 3 ID : 68019154476

Option 4 ID : 68019154474

Q.34 Arrange the following in the ascending order of wavelength:

- A. Gamma rays (λ_1)
- B. x - rays (λ_2)
- C. Infrared waves (λ_3)
- D. Microwaves (λ_4)

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

- Options
1. $\lambda_1 < \lambda_2 < \lambda_3 < \lambda_4$
 2. $\lambda_4 < \lambda_3 < \lambda_1 < \lambda_2$
 3. $\lambda_4 < \lambda_3 < \lambda_2 < \lambda_1$
 4. $\lambda_2 < \lambda_1 < \lambda_4 < \lambda_3$

Question Type : MCQ

Question ID : 68019113838

Option 1 ID : 68019154520

Option 2 ID : 68019154518

Option 3 ID : 68019154517

Option 4 ID : 68019154519

Q.35 Correct formula for height of a satellite from earth's surface is:

- Options
1. $\left(\frac{T^2 R^2 g}{4\pi^2}\right)^{1/3} - R$
 2. $\left(\frac{T^2 R^2 g}{4\pi}\right)^{1/2} - R$
 3. $\left(\frac{T^2 R^2 g}{4\pi^2}\right)^{-1/3} + R$
 4. $\left(\frac{T^2 R^2}{4\pi^2 g}\right)^{1/3} - R$

Question Type : MCQ

Question ID : 68019113830

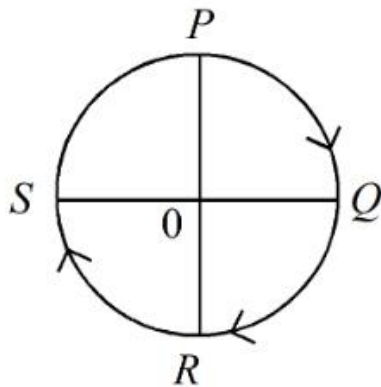
Option 1 ID : 68019154488

Option 2 ID : 68019154486

Option 3 ID : 68019154487

Option 4 ID : 68019154485

Q.36 A cyclist starts from the point P of a circular ground of radius 2 km and travels along its circumference to the point S . The displacement of a cyclist is:



- Options
1. 6 km
 2. 8 km
 3. 4 km
 4. $\sqrt{8}$ km

Question Type : MCQ

Question ID : 68019113826

Option 1 ID : 68019154472

Option 2 ID : 68019154469

Option 3 ID : 68019154470

Option 4 ID : 68019154471

Q.37 A charge q is placed at the center of one of the surface of a cube. The flux linked with the cube is:

- Options
1. $\frac{q}{2\epsilon_0}$
 2. $\frac{q}{4\epsilon_0}$
 3. $\frac{q}{8\epsilon_0}$
 4. Zero

Question Type : MCQ

Question ID : 68019113834

Option 1 ID : 68019154501

Option 2 ID : 68019154502

Option 3 ID : 68019154503

Option 4 ID : 68019154504

Q.38 An electric bulb rated 50 W - 200 V is connected across a 100 V supply. The power dissipation of the bulb is:

- Options
1. 12.5 W
 2. 25 W
 3. 100 W
 4. 50 W

Question Type : MCQ

Question ID : 68019113835

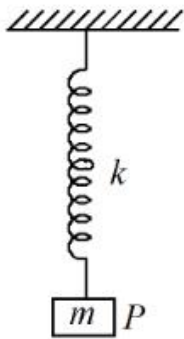
Option 1 ID : 68019154505

Option 2 ID : 68019154508

Option 3 ID : 68019154507

Option 4 ID : 68019154506

Q.39 In simple harmonic motion, the total mechanical energy of given system is E . If mass of oscillating particle P is doubled then the new energy of the system for same amplitude is:



- Options
1. $E/\sqrt{2}$
 2. $E\sqrt{2}$
 3. $2E$
 4. E

Question Type : MCQ

Question ID : 68019113843

Option 1 ID : 68019154538

Option 2 ID : 68019154537

Option 3 ID : 68019154539

Option 4 ID : 68019154540

Q.40 According to Bohr's theory, the moment of momentum of an electron revolving in 4th orbit of hydrogen atom is:

- Options
1. $\frac{h}{2\pi}$
 2. $8\frac{h}{\pi}$
 3. $2\frac{h}{\pi}$
 4. $\frac{h}{\pi}$

Question Type : MCQ

Question ID : 68019113841

Option 1 ID : 68019154532

Option 2 ID : 68019154531

Option 3 ID : 68019154529

Option 4 ID : 68019154530

Q.41 The width of one of the two slits in a Young's double slit experiment is 4 times that of the other slit. The ratio of the maximum of the minimum intensity in the interference pattern is:

- Options
1. 9:1
 2. 4:1
 3. 16:1
 4. 1:1

Question Type : MCQ

Question ID : 68019113839

Option 1 ID : 68019154521

Option 2 ID : 68019154523

Option 3 ID : 68019154522

Option 4 ID : 68019154524

Q.42 Applying the principle of homogeneity of dimensions, determine which one is correct,

where T is time period, G is gravitational constant, M is mass, r is radius of orbit.

- Options
1. $T^2 = 4\pi^2 r^3$
 2. $T^2 = \frac{4\pi^2 r}{GM^2}$
 3. $T^2 = \frac{4\pi^2 r^2}{GM}$
 4. $T^2 = \frac{4\pi^2 r^3}{GM}$

Question Type : MCQ

Question ID : 68019113825

Option 1 ID : 68019154467

Option 2 ID : 68019154468

Option 3 ID : 68019154466

Option 4 ID : 68019154465

Q.43 Given below are two statements :

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

Statement II : The rise of a liquid in a capillary tube does not depend on the inner radius of the tube.

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

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

Question Type : **MCQ**

Question ID : **68019113831**

Option 1 ID : **68019154492**

Option 2 ID : **68019154491**

Option 3 ID : **68019154490**

Option 4 ID : **68019154489**

Q.44 The magnetic moment of a bar magnet is 0.5 Am^2 . It is suspended in a uniform magnetic field of $8 \times 10^{-2} \text{ T}$. The work done in rotating it from its most stable to most unstable position is:

- Options**
1. Zero
 2. $16 \times 10^{-2} \text{ J}$
 3. $8 \times 10^{-2} \text{ J}$
 4. $4 \times 10^{-2} \text{ J}$

Question Type : **MCQ**

Question ID : **68019113836**

Option 1 ID : **68019154509**

Option 2 ID : **68019154512**

Option 3 ID : **68019154511**

Option 4 ID : **68019154510**

Q.45 Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A: Number of photons increases with increase in frequency of light.

Reason R: Maximum kinetic energy of emitted electrons increases with the frequency of incident radiation.

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

- Options
1. **A** is not correct but **R** is correct.
 2. **A** is correct but **R** is not correct.
 3. Both **A** and **R** are correct and **R** is the correct explanation of **A**.
 4. Both **A** and **R** are correct and **R** is **NOT** the correct explanation of **A**.

Question Type : **MCQ**

Question ID : **68019113840**

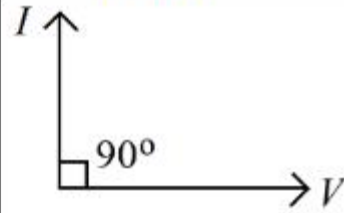
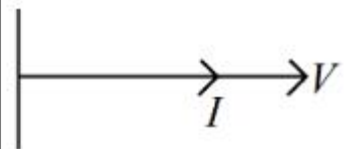
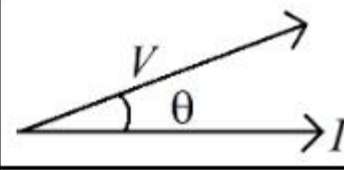
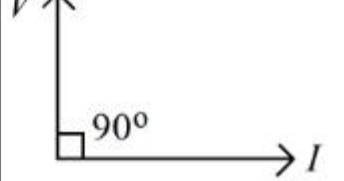
Option 1 ID : **68019154528**

Option 2 ID : **68019154527**

Option 3 ID : **68019154525**

Option 4 ID : **68019154526**

Q.46 Match List I with List II

LIST I		LIST II	
A.	Purely capacitive circuit	I.	
B.	Purely inductive circuit	II.	
C.	LCR series at resonance	III.	
D.	LCR series circuit	IV.	

Choose the correct answer from the options given below:

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

Question Type : MCQ

Question ID : 68019113837

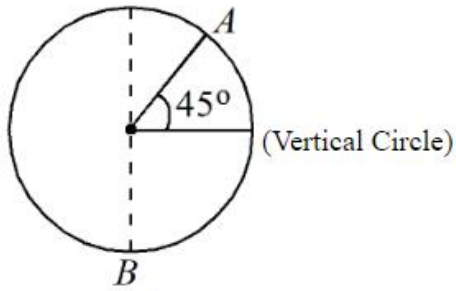
Option 1 ID : 68019154513

Option 2 ID : 68019154515

Option 3 ID : 68019154514

Option 4 ID : 68019154516

Q.47 A body of m kg slides from rest along the curve of vertical circle from point A to B in friction less path. The velocity of the body at B is:



(given, $R = 14$ m, $g = 10$ m/s² and $\sqrt{2} = 1.4$)

- Options**
1. 21.9 m/s
 2. 16.7 m/s
 3. 10.6 m/s
 4. 19.8 m/s

Question Type : **MCQ**

Question ID : **68019113829**

Option 1 ID : **68019154481**

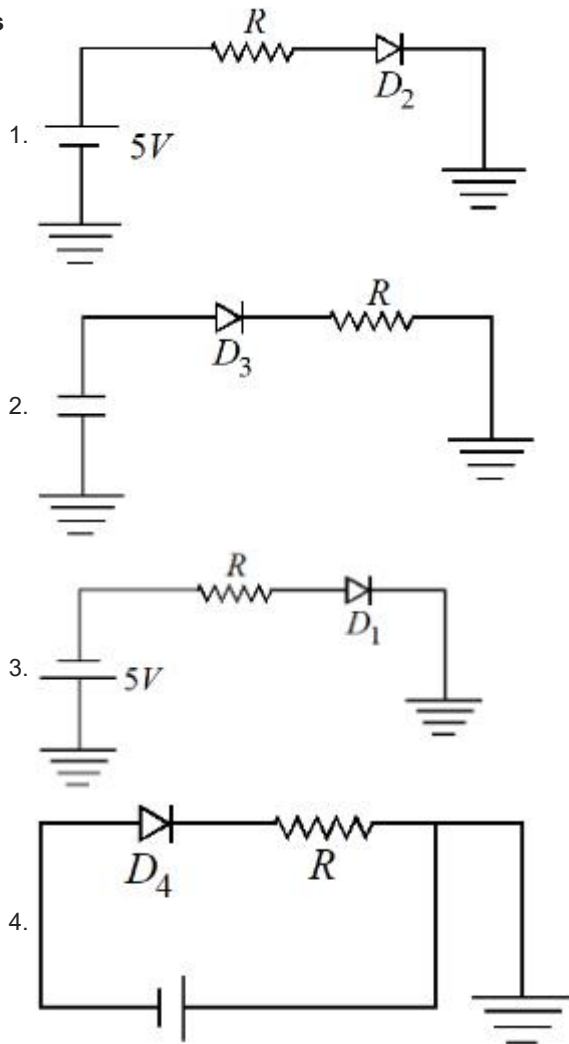
Option 2 ID : **68019154482**

Option 3 ID : **68019154484**

Option 4 ID : **68019154483**

Q.48 Which of the diode circuit shows correct biasing used for the measurement of dynamic resistance of p-n junction diode :

Options



Question Type : MCQ

Question ID : 68019113824

Option 1 ID : 68019154462

Option 2 ID : 68019154463

Option 3 ID : 68019154461

Option 4 ID : 68019154464

Q.49 The translational degrees of freedom (f_t) and rotational degrees of freedom (f_r) of CH_4 molecule are:

- Options
1. $f_t = 2$ and $f_r = 2$
 2. $f_t = 3$ and $f_r = 3$
 3. $f_t = 2$ and $f_r = 3$
 4. $f_t = 3$ and $f_r = 2$

Question Type : MCQ

Question ID : 68019113833

Option 1 ID : 68019154500

Option 2 ID : 68019154499

Option 3 ID : 68019154498

Option 4 ID : 68019154497

Q.50 A sample of gas at temperature T is adiabatically expanded to double its volume. Adiabatic constant for the gas is $\gamma = 3/2$. The work done by the gas in the process is:

($\mu = 1$ mole)

- Options
1. $RT[1 - 2\sqrt{2}]$
 2. $RT[2\sqrt{2} - 1]$
 3. $RT[\sqrt{2} - 2]$
 4. $RT[2 - \sqrt{2}]$

Question Type : MCQ

Question ID : 68019113832

Option 1 ID : 68019154496

Option 2 ID : 68019154495

Option 3 ID : 68019154494

Option 4 ID : 68019154493

Section : Physics Section B

Q.51 Two wires A and B are made up of the same material and have the same mass. Wire A has radius of 2.0 mm and wire B has radius of 4.0 mm. The resistance of wire B is 2Ω . The resistance of wire A is _____ Ω .

Question Type : SA

Question ID : 68019113848

Q.52 A rod of length 60 cm rotates with a uniform angular velocity 20 rad s^{-1} about its perpendicular bisector, in a uniform magnetic field $0.5T$. The direction of magnetic field is parallel to the axis of rotation. The potential difference between the two ends of the rod is _____ V.

Question Type : SA

Question ID : 68019113846

Q.53 A bus moving along a straight highway with speed of 72 km/h is brought to halt within 4 s after applying the brakes. The distance travelled by the bus during this time (Assume the retardation is uniform) is _____ m.

Question Type : SA

Question ID : 68019113852

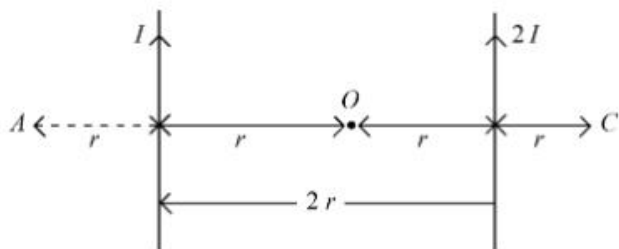
Q.54 Mercury is filled in a tube of radius 2 cm up to a height of 30 cm. The force exerted by mercury on the bottom of the tube is _____ N.

(Given, atmospheric pressure = 10^5 Nm^{-2} , density of mercury = 1.36×10^4 $kg m^{-3}$, $g = 10$ $m s^{-2}$, $\pi = \frac{22}{7}$)

Question Type : SA

Question ID : 68019113850

- Q.55** Two parallel long current carrying wire separated by a distance $2r$ are shown in the figure. The ratio of magnetic field at A to the magnetic field produced at C is $\frac{x}{7}$. The value of x is _____.



Question Type : SA
Question ID : 68019113847

- Q.56** The disintegration energy Q for the nuclear fission of $^{235}\text{U} \rightarrow ^{140}\text{Ce} + ^{94}\text{Zr} + n$ is _____ MeV.

Given atomic masses of ^{235}U : $235.0439u$; ^{140}Ce : $139.9054u$,

^{94}Zr : $93.9063u$; n : $1.0086u$,

Value of $c^2 = 931 \text{ MeV}/u$.

Question Type : SA
Question ID : 68019113844

- Q.57** A parallel plate capacitor of capacitance 12.5 pF is charged by a battery connected between its plates to potential difference of 12.0 V . The battery is now disconnected and a dielectric slab ($\epsilon_r = 6$) is inserted between the plates. The change in its potential energy after inserting the dielectric slab is _____ $\times 10^{-12} \text{ J}$.

Question Type : SA
Question ID : 68019113853

- Q.58** The displacement of a particle executing SHM is given by $x = 10 \sin\left(\omega t + \frac{\pi}{3}\right) \text{ m}$. The time period of motion is 3.14 s . The velocity of the particle at $t = 0$ is _____ m/s .

Question Type : SA
Question ID : 68019113849

- Q.59** A light ray is incident on a glass slab of thickness $4\sqrt{3} \text{ cm}$ and refractive index $\sqrt{2}$. The angle of incidence is equal to the critical angle for the glass slab with air. The lateral displacement of ray after passing through glass slab is _____ cm .

(Given $\sin 15^\circ = 0.25$)

Question Type : SA
Question ID : 68019113845

Q.60 In a system two particles of masses $m_1 = 3 \text{ kg}$ and $m_2 = 2 \text{ kg}$ are placed at certain distance from each other. The particle of mass m_1 is moved towards the center of mass of the system through a distance 2 cm . In order to keep the center of mass of the system at the original position, the particle of mass m_2 should move towards the center of mass by the distance _____ cm .

Question Type : SA

Question ID : 68019113851

Section : Chemistry Section A

Q.61 The correct statement/s about Hydrogen bonding is/are

- A. Hydrogen bonding exists when H is covalently bonded to the highly electro negative atom.
- B. Intermolecular H bonding is present in *o*-nitro phenol
- C. Intramolecular H bonding is present in HF.
- D. The magnitude of H bonding depends on the physical state of the compound.
- E. H-bonding has powerful effect on the structure and properties of compounds

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

- Options
1. A, B, D only
 2. A only
 3. A, D, E only
 4. A, B, C only

Question Type : MCQ

Question ID : 68019113855

Option 1 ID : 68019154556

Option 2 ID : 68019154555

Option 3 ID : 68019154558

Option 4 ID : 68019154557

Q.62 Fuel cell, using hydrogen and oxygen as fuels,

- A. has been used in spaceship
- B. has an efficiency of 40% to produce electricity
- C. uses aluminum as catalysts
- D. is eco-friendly
- E. is actually a type of Galvanic cell only

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

- Options
1. A, B, D, E only
 2. A, B, D only
 3. A, B, C only
 4. A, D, E only

Question Type : MCQ

Question ID : 68019113857

Option 1 ID : 68019154566

Option 2 ID : 68019154564

Option 3 ID : 68019154563

Option 4 ID : 68019154565

Q.63 The number of unpaired d-electrons in $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$ is _____.

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

Question Type : MCQ

Question ID : 68019113863

Option 1 ID : 68019154587

Option 2 ID : 68019154590

Option 3 ID : 68019154588

Option 4 ID : 68019154589

Q.64 The correct order of the first ionization enthalpy is

- Options
1. $\text{Tl} > \text{Ga} > \text{Al}$
 2. $\text{Al} > \text{Ga} > \text{Tl}$
 3. $\text{B} > \text{Al} > \text{Ga}$
 4. $\text{Ga} > \text{Al} > \text{B}$

Question Type : MCQ

Question ID : 68019113860

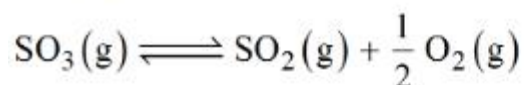
Option 1 ID : 68019154577

Option 2 ID : 68019154578

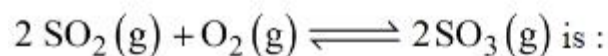
Option 3 ID : 68019154576

Option 4 ID : 68019154575

Q.65 The equilibrium constant for the reaction



is $K_c = 4.9 \times 10^{-2}$. The value of K_c for the reaction given below is



- Options
1. 416
 2. 41.6
 3. 49
 4. 4.9

Question Type : MCQ

Question ID : 68019113856

Option 1 ID : 68019154560

Option 2 ID : 68019154561

Option 3 ID : 68019154562

Option 4 ID : 68019154559

Q.66 The adsorbent used in adsorption chromatography is/are -

- A. silica gel
- B. alumina
- C. quick lime
- D. magnesia

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

- Options
1. B only
 2. C and D only
 3. A and B only
 4. A only

Question Type : MCQ

Question ID : 68019113866

Option 1 ID : 68019154600

Option 2 ID : 68019154602

Option 3 ID : 68019154601

Option 4 ID : 68019154599

Q.67 Choose the **Incorrect** Statement about Dalton's Atomic Theory

- Options
1. chemical reactions involve reorganization of atoms
 2. All the atoms of a given element have identical properties including identical mass.
 3. Matter consists of indivisible atoms.
 4. Compounds are formed when atoms of different elements combine in any ratio.

Question Type : **MCQ**

Question ID : **68019113854**

Option 1 ID : **68019154554**

Option 2 ID : **68019154552**

Option 3 ID : **68019154551**

Option 4 ID : **68019154553**

Q.68 Match **List I** with **List II**

LIST I		LIST II	
A.	α - Glucose and α - Galactose	I.	Functional isomers
B.	α - Glucose and β - Glucose	II.	Homologous
C.	α - Glucose and α - Fructose	III.	Anomers
D.	α - Glucose and α - Ribose	IV.	Epimers

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

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

Question Type : **MCQ**

Question ID : **68019113873**

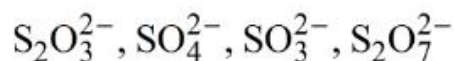
Option 1 ID : **68019154627**

Option 2 ID : **68019154630**

Option 3 ID : **68019154628**

Option 4 ID : **68019154629**

Q.69 The number of species from the following that have pyramidal geometry around the central atom is _____



- Options
1. 1
 2. 2
 3. 3
 4. 4

Question Type : **MCQ**

Question ID : **68019113861**

Option 1 ID : **68019154579**

Option 2 ID : **68019154580**

Option 3 ID : **68019154581**

Option 4 ID : **68019154582**

Q.70 For a strong electrolyte, a plot of molar conductivity against (concentration)^{1/2} is a straight line, with a negative slope, the correct unit for the slope is

- Options
1. $S\text{ cm}^2\text{ mol}^{-3/2}\text{ L}$
 2. $S\text{ cm}^2\text{ mol}^{-3/2}\text{ L}^{1/2}$
 3. $S\text{ cm}^2\text{ mol}^{-3/2}\text{ L}^{-1/2}$
 4. $S\text{ cm}^2\text{ mol}^{-1}\text{ L}^{1/2}$

Question Type : MCQ

Question ID : 68019113858

Option 1 ID : 68019154568

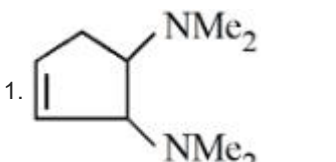
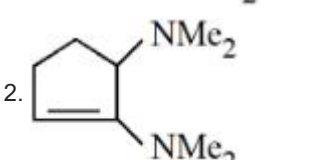
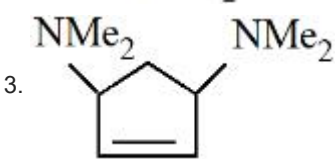
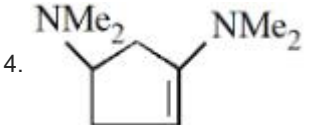
Option 2 ID : 68019154570

Option 3 ID : 68019154569

Option 4 ID : 68019154567

Q.71 Find out the major product formed from the following reaction. [Me : -CH₃]



- Options
1. 
 2. 
 3. 
 4. 

Question Type : MCQ

Question ID : 68019113869

Option 1 ID : 68019154612

Option 2 ID : 68019154614

Option 3 ID : 68019154611

Option 4 ID : 68019154613

Q.72 If an iron (III) complex with the formula $[\text{Fe}(\text{NH}_3)_x (\text{CN})_y]^-$ has no electron in its e_g orbital, then the value of $x + y$ is

- Options
1. 5
 2. 6
 3. 4
 4. 3

Question Type : MCQ

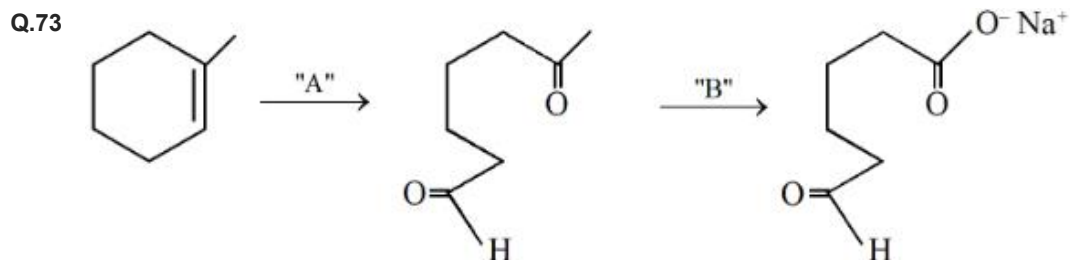
Question ID : 68019113864

Option 1 ID : 68019154593

Option 2 ID : 68019154594

Option 3 ID : 68019154592

Option 4 ID : 68019154591



In the above chemical reaction sequence "A" and "B" respectively are

- Options
1. O_3 , $\text{Zn}/\text{H}_2\text{O}$ and KMnO_4
 2. H_2O , H^+ and $\text{NaOH}_{(\text{alc})}/\text{I}_2$
 3. O_3 , $\text{Zn}/\text{H}_2\text{O}$ and $\text{NaOH}_{(\text{alc})}/\text{I}_2$
 4. H_2O , H^+ and KMnO_4

Question Type : MCQ

Question ID : 68019113868

Option 1 ID : 68019154610

Option 2 ID : 68019154609

Option 3 ID : 68019154608

Option 4 ID : 68019154607

Q.74 Common name of Benzene - 1, 2 - diol is -

- Options
1. catechol
 2. quinol
 3. o-cresol
 4. resorcinol

Question Type : MCQ

Question ID : 68019113871

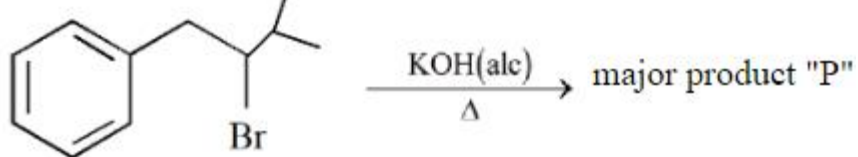
Option 1 ID : 68019154621

Option 2 ID : 68019154620

Option 3 ID : 68019154622

Option 4 ID : 68019154619

Q.75



Product P is

Options

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

Question Type : MCQ

Question ID : 68019113870

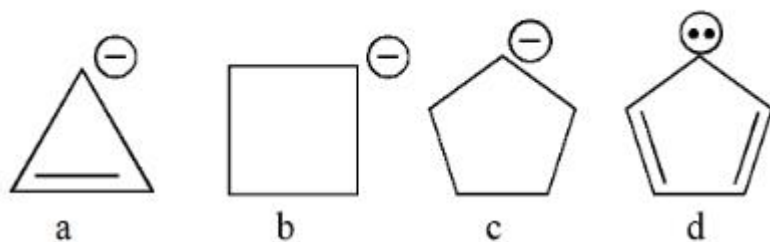
Option 1 ID : 68019154617

Option 2 ID : 68019154615

Option 3 ID : 68019154616

Option 4 ID : 68019154618

Q.76 Correct order of stability of carbanion is -



- Options
1. $d > c > b > a$
 2. $a > b > c > d$
 3. $c > b > d > a$
 4. $d > a > c > b$

Question Type : MCQ

Question ID : 68019113867

Option 1 ID : 68019154603

Option 2 ID : 68019154604

Option 3 ID : 68019154606

Option 4 ID : 68019154605

Q.77 A first row transition metal in its +2 oxidation state has a spin-only magnetic moment value of 3.86 BM. The atomic number of the metal is

- Options
1. 22
 2. 25
 3. 26
 4. 23

Question Type : MCQ

Question ID : 68019113862

Option 1 ID : 68019154585

Option 2 ID : 68019154583

Option 3 ID : 68019154586

Option 4 ID : 68019154584

Q.78 When MnO_2 and H_2SO_4 is added to a salt (A), the greenish yellow gas liberated as salt (A) is :

- Options
1. KNO_3
 2. CaI_2
 3. NaBr
 4. NH_4Cl

Question Type : MCQ

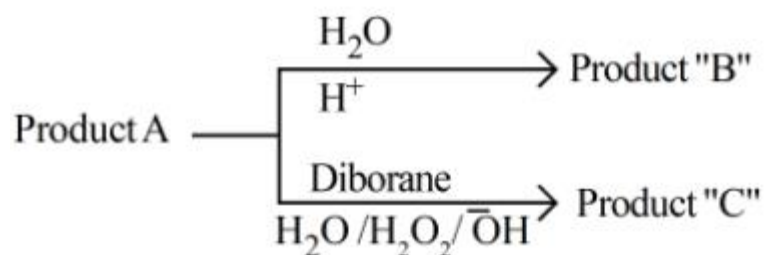
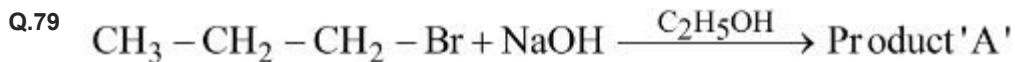
Question ID : 68019113865

Option 1 ID : 68019154598

Option 2 ID : 68019154597

Option 3 ID : 68019154595

Option 4 ID : 68019154596



Consider the above reactions, identify product B and product C.

- Options
1. B = 2-Propanol C = 1-Propanol
 2. B = C = 1-Propanol
 3. B = 1-Propanol C = 2-Propanol
 4. B = C = 2-Propanol

Question Type : MCQ

Question ID : 68019113872

Option 1 ID : 68019154623

Option 2 ID : 68019154626

Option 3 ID : 68019154624

Option 4 ID : 68019154625

Q.80 Given below are two statements :

Statement I : The correct order of first ionization enthalpy values of Li, Na, F and Cl is $\text{Na} < \text{Li} < \text{Cl} < \text{F}$.

Statement II : The correct order of negative electron gain enthalpy values of Li, Na, F and Cl is $\text{Na} < \text{Li} < \text{F} < \text{Cl}$

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

Question Type : MCQ

Question ID : 68019113859

Option 1 ID : 68019154573

Option 2 ID : 68019154571

Option 3 ID : 68019154572

Option 4 ID : 68019154574

Section : Chemistry Section B

Q.81 The maximum number of orbitals which can be identified with $n = 4$ and $m_l = 0$ is _____.

Question Type : SA

Question ID : 68019113874

Q.82 Number of compounds / species from the following with non-zero dipole moment is _____.

$\text{BeCl}_2, \text{BCl}_3, \text{NF}_3, \text{XeF}_4, \text{CCl}_4, \text{H}_2\text{O}, \text{H}_2\text{S}, \text{HBr}, \text{CO}_2, \text{H}_2, \text{HCl}$

Question Type : SA

Question ID : 68019113875

Q.83 2.7 kg of each of water and acetic acid are mixed. The freezing point of the solution will be $-x$ °C. Consider the acetic acid does not dimerise in water, nor dissociates in water. $x =$ _____ (nearest integer)

[Given: Molar mass of water = 18 g mol^{-1} , acetic acid = 60 g mol^{-1}

$K_f \text{H}_2\text{O} : 1.86 \text{ K kg mol}^{-1}$

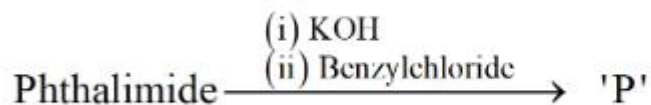
$K_f \text{acetic acid} : 3.90 \text{ K kg mol}^{-1}$

freezing point: $\text{H}_2\text{O} = 273 \text{ K}$, acetic acid = 290 K]

Question Type : SA

Question ID : 68019113877

Q.84 Phthalimide is made to undergo following sequence of reactions.

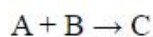


Total number of π bonds present in product 'P' is/are _____.

Question Type : SA

Question ID : 68019113883

Q.85 Consider the following reaction, the rate expression of which is given below



$$\text{rate} = k [\text{A}]^{1/2} [\text{B}]^{1/2}$$

The reaction is initiated by taking 1 M concentration of A and B each. If the rate constant (k) is $4.6 \times 10^{-2} \text{ s}^{-1}$, then the time taken for A to become 0.1 M is _____ sec.

(nearest integer)

Question Type : SA

Question ID : 68019113878

Q.86 From 6.55 g of aniline, the maximum amount of acetanilide that can be prepared will be _____ $\times 10^{-1}$ g.

Question Type : SA

Question ID : 68019113880

Q.87 A first row transition metal with highest enthalpy of atomisation, upon reaction with oxygen at high temperature forms oxides of formula M_2O_n (where $n = 3, 4, 5$). The 'spin-only' magnetic moment value of the amphoteric oxide from the above oxides is _____ BM (near integer)

(Given atomic number : Sc : 21, Ti : 22, V : 23, Cr : 24, Mn : 25, Fe : 26, Co : 27, Ni : 28, Cu : 29, Zn : 30)

Question Type : SA

Question ID : 68019113879

Q.88 The total number of 'sigma' and 'Pi' bonds in 2-oxohex-4-ynoic acid is _____.

Question Type : SA

Question ID : 68019113881

Q.89 Three moles of an ideal gas are compressed isothermally from 60 L to 20 L using constant pressure of 5 atm. Heat exchange Q for the compression is – _____ Lit. atm.

Question Type : SA

Question ID : 68019113876

Q.90 Vanillin compound obtained from vanilla beans, has total sum of oxygen atoms and π electrons is _____.

Question Type : SA

Question ID : 68019113882