

JEE ADVANCED TEST 04 (PAPER - 2) (#1377)

Total Marks: 180

Total Duration: 180 minutes

Instructions

In this test there are 3 subjects namely Mathematics, Physics and Chemistry.

Each subject has 4 sections.

Section wise mark and the rules are given below. They stand the same for each subject.

SECTION 1 (Maximum Marks: 12)

This section contains **FOUR (04)** questions.

Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.

For each question, choose the option corresponding to the correct answer.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +3 If **ONLY** the correct option is chosen;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -1 In all other cases.

SECTION 2 (Maximum Marks: 12)

This section contains **THREE (03)** questions.

Each question has b options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).

For each question, choose the option(s) corresponding to (all) the correct answer(s).

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 **ONLY** if (all) the correct option(s) is(are) chosen;

Partial Marks : +3 If all the four options are correct but **ONLY** three options are chosen;

Partial Marks : +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct;

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option;

Zero Marks : 0 If unanswered;

Negative Marks : -2 In all other cases.

For example, in a question, if (A), (B) and (D) are the **ONLY** three options corresponding to correct answers, then choosing **ONLY** (A), (B) and (D) will get +4 marks;

choosing **ONLY** (A) and (B) will get +2 marks;

choosing **ONLY** (A) and (D) will get +2marks;

choosing **ONLY** (B) and (D) will get +2 marks;

choosing **ONLY** (A) will get +1 mark;

choosing **ONLY** (B) will get +1 mark;

choosing **ONLY** (D) will get +1 mark;

choosing no option(s) (i.e. the question is unanswered) will get 0 marks and choosing any other option(s) will get -2 marks.

SECTION 3 (Maximum Marks: 24)

This section contains **SIX (06)** questions.

The answer to each question is a **NON-NEGATIVE INTEGER**.

For each question, enter the correct integer corresponding to the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If **ONLY** the correct integer is entered;

Zero Marks : 0 In all other cases.

SECTION 4 (Maximum Marks: 12)

This section contains **TWO (02)** paragraphs.

Based on each paragraph, there are TWO (02) questions.

The answer to each question is a **NUMERICAL VALUE**.

For each question, enter the correct numerical value of the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.

If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +3 If **ONLY** the correct numerical value is entered in the designated place;

Zero Marks : 0 In all other cases.

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Section: Mathematics - SECTION 1**Marks per question: 3****4 of 4 question(s) in this section will be shown to examinee****Examinee should answer all 4 question(s) in this section****This section has negative marking for incorrect answer(s). 33% marks will be deducted for every incorrect answer.****Q1 Difficulty Level: Easy****Knowledge Level: K1**

An ellipse has eccentricity $1/2$ and one focus at point $P(1/2, 1)$. Its one directrix nearer to point P is the common tangent, to the circle $x^2 + y^2 = 1$ and the hyperbola $x^2 - y^2 = 1$. The equation of the ellipse is

- $3x^2 + 4y^2 - 2x - 8y + 4 = 0$
- $3x^2 + 4y^2 + 2x + 8y - 4 = 0$
- $3x^2 + 4y^2 - 2x + 8y - 4 = 0$
- None of these

Q2 Difficulty Level: Easy

Knowledge Level: K1

The value of $\cos \frac{\pi}{65} \cos \frac{2\pi}{65} \cos \frac{4\pi}{65} \dots \cos \frac{32\pi}{65}$ is

- $\frac{1}{32}$
- $\frac{1}{64}$
- $-\frac{1}{32}$
- $-\frac{1}{64}$

Q3 Difficulty Level: Easy

Knowledge Level: K1

If the points $(-2, 0)$, $\left(-1, \frac{1}{\sqrt{3}}\right)$ and $(\cos \theta, \sin \theta)$ are collinear, then the number of values of $\theta \in [0, 2\pi]$ is

- 0
- 1
- 2
- infinite

Q4 Difficulty Level: Easy

Knowledge Level: K1

Let $S = \{z \in \mathbb{C} : |z-1|=1 \text{ and } (\sqrt{2}-1)(z+\bar{z})-i(z-\bar{z})=2\sqrt{2}\}$. Let $z_1, z_2 \in S$ be such that $|z_1| = \max_{z \in S} |z|$ and $|z_2| = \min_{z \in S} |z|$. Then $|\sqrt{2}z_1 - z_2|^2$ equals :

- 1
- 4
- 3
- 2

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Section: Mathematics - SECTION 2

Marks per question: 4

3 of 3 question(s) in this section will be shown to examinee

Examinee should answer all 3 question(s) in this section

This section has negative marking for incorrect answer(s). 50% marks will be deducted for every incorrect answer.

Q1 Difficulty Level: Easy

Knowledge Level: K1

The tangent at any point P on a standard ellipse with foci as S & S' meets the tangents at the vertices A & A' in the points V & V', then

- $l(AV) \cdot l(A'V') = b^2$
- $l(AV) \cdot l(A'V') = a^2$
- $\angle V'SV = 90^\circ$
- VS'VS is a cyclic quadrilateral

Q2 Difficulty Level: Easy

Knowledge Level: K1

The equation $x^{\left[(\log_3 x)^2 - \frac{9}{2} \log_3 x + 5 \right]} = 3\sqrt{3}$ has

- exactly three real solution
- at least one real solution
- exactly one irrational solution
- complex roots

Q3 Difficulty Level: Easy**Knowledge Level: K1**

Let a, b, x and y be real numbers such that $a - b = 1$ and $y \neq 0$. If the complex number $z = x + iy$ satisfies $\operatorname{Im}\left(\frac{az+b}{z+1}\right) = y$, then which of the following is(are) possible value(s) of x ?

- $-1 - \sqrt{1 - y^2}$
- $1 + \sqrt{1 + y^2}$
- $1 - \sqrt{1 + y^2}$
- $-1 + \sqrt{1 - y^2}$

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Section: Mathematics - SECTION 3

Marks per question: 4

6 of 6 question(s) in this section will be shown to examinee

Examinee should answer all 6 question(s) in this section

Q1 Difficulty Level: Easy

Knowledge Level: K1

If the constant term, in binomial expansion of $\left(2x^r + \frac{1}{x^2}\right)^{10}$ is 180, then r is equal to

SNo	Blank
1	Integers

Q2 Difficulty Level: Easy

Knowledge Level: K1

If the line $y + x = 0$ bisects two chords drawn from a point $\left(\frac{1+a\sqrt{2}}{2}, \frac{1-a\sqrt{2}}{2}\right)$ to the circle

$2x^2 + 2y^2 - (1+a\sqrt{2})x - (1-a\sqrt{2})y = 0$, then a lies in the interval $(-\infty, -\lambda) \cup (\lambda, \infty)$, the numerical quantity λ should be equal to

SNo	Blank
1	Integers

Q3 Difficulty Level: Easy

Knowledge Level: K1

If $0 \leq x \leq 2\pi$, then the number of real values of a satisfying the equation $81^{\sin^2 x} + 81^{\cos^2 x} = 30$ is

SNo	Blank
1	Integers

Q4 Difficulty Level: Easy

Knowledge Level: K1

Let the positive numbers a_1, a_2, a_3, a_4 and a_5 be in a G.P. Let their mean and variance be $31/10$ and m/n respectively, where m and n are co-prime. If the mean of their reciprocals is $31/40$ and $a_3 + a_4 + a_5 = 14$, then $m + n$ is equal to

SNo	Blank
1	Integers

Q5 Difficulty Level: Easy

Knowledge Level: K1

All the letters of the word "GTWENTY" are written in all possible ways with or without meaning and these words are written as in a dictionary. The serial number of the word "GTWENTY" IS

SNo	Blank
1	Integers

Q6 Difficulty Level: Easy

Knowledge Level: K1

From the point $(-1, 2)$ tangent lines are drawn to the parabola $y^2 = 4x$. If area of triangle formed by the chord of contact and the tangents is $\sqrt{2} N$. then $N =$

SNo	Blank
1	Integers

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Section: Mathematics - SECTION 4

Marks per question: 3

4 of 4 question(s) in this section will be shown to examinee

Examinee should answer all 4 question(s) in this section

Q1 Difficulty Level: Easy

Knowledge Level: K1

Consider a binary string which consist only of digits 0 and 1. Let a_n be the number of binary strings of length 'n' that do not contain the sequence 11 and b_n be the number of binary strings of length 'n' that do not contain the string 111. Then (For example 0001001010 is a binary string of length 10) a_n is equal to (where $n \geq 5$) (Give the numerical value of the options)

- (1) $a_{n-1} + 2a_{n-2}$ (2) $a_{n-1} + a_{n-3}$ (3) $2a_{n-1} + a_{n-2}$ (4) $a_{n-1} + a_{n-2}$

SNo	Blank
1	Integers

Q2 Difficulty Level: Easy

Knowledge Level: K1

Consider a binary string which consist only of digits 0 and 1. Let a_n be the number of binary strings of length 'n' that do not contain the sequence 11 and b_n be the number of binary strings of length 'n' that do not contain the string 111. Then (For example 0001001010 is a binary string of length 10) b_n is equal to (where $n \geq 5$) (Give the numerical value of the options)

- (1) $b_{n-1} + 2b_{n-2} + 3b_{n-3}$ (2) $b_{n-3} + b_{n-2} + b_{n-1}$ (3) $4b_{n-1} + b_{n-2} + b_{n-3}$ (4) $b_{n-1} + b_{n-2}$

SNo	Blank
1	Integers

Q3 Difficulty Level: Easy**Knowledge Level: K1**

Let $f(x) = x^3 + ax^2 + bx + c$ and $g(x) = x^3 + bx^2 + cx + a$, where a, b, c are integers with $c \neq 0$

Let $f(1) = 0$ and the roots of $g(x)$ are squares of the roots of $f(x)$ Then

$a^3 + b^2 + c =$ (Give the numerical value of the options)

- (1) -1 (2) 1 (3) -3 (4) 3

SNo	Blank
1	Integers

Q4 Difficulty Level: Easy**Knowledge Level: K1**

Let $f(x) = x^3 + ax^2 + bx + c$ and $g(x) = x^3 + bx^2 + cx + a$, where a, b, c are integers with $c \neq 0$

Let $f(1) = 0$ and the roots of $g(x)$ are squares of the roots of $f(x)$ Then

$ab + bc + ca =$ (Give the numerical value of the options)

- (1) -1 (2) 3 (3) 1 (4) -3

SNo	Blank
1	Integers

Section: Physics - SECTION 1

Marks per question: 3

4 of 4 question(s) in this section will be shown to examinee

Examinee should answer all 4 question(s) in this section

This section has negative marking for incorrect answer(s). 33% marks will be deducted for every incorrect answer.

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Q2 Difficulty Level: Easy

Knowledge Level: K1

Two satellites S_1 and S_2 revolve round a planet in coplanar circular orbits in the same sense. Their periods of revolution are 1 h and 8 h respectively. The radius of the orbit of S_1 is 10 km. When S_2 is closest to S_1 , the angular speed of S_2 as observed by an astronaut in S_1 will be

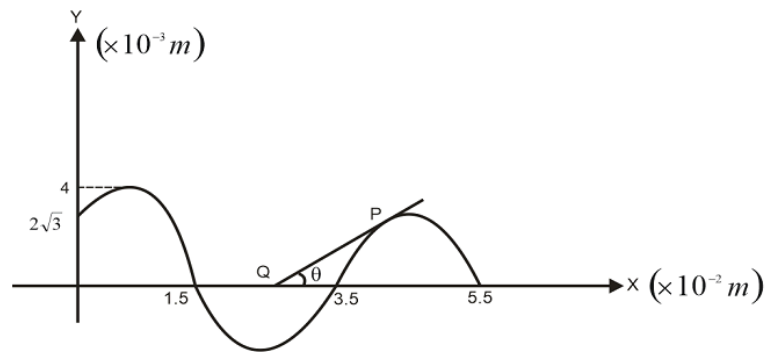
- $\frac{\pi}{6} \text{ rad h}^{-1}$
- $\frac{\pi}{3} \text{ rad h}^{-1}$
- $\frac{\pi}{4} \text{ rad h}^{-1}$
- $\frac{2\pi}{3} \text{ rad h}^{-1}$

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Q3 Difficulty Level: Easy

Knowledge Level: K1

A transverse sinusoidal wave is moving along a string in negative x direction with velocity $10\sqrt{3}$ m/s. A particle P is observed to be moving up with velocity 10 m/s. A line drawn from the point P intersects the x-axis at point Q. Calculate the angle subtended by line PQ with x-axis. Given that amplitude of wave is 4 mm, wavelength λ is 0.035 mm



- $\frac{\pi}{3}$
- $\frac{\pi}{6}$
- $\frac{\pi}{4}$
- 0

Q4 Difficulty Level: Easy

Knowledge Level: K1

A train approaching a railway crossing at a speed of 120 km h^{-1} sounds a short whistle at frequency 640 Hz when it is 300 m away from the crossing. The speed of sound in air is 340 m/s . A person moving on a road with speed 72 Km/h perpendicular to the track through the crossing at a distance of 400 m at the instant when whistle is blown by the train. What will be the frequency heard by the person at that vary instant

- 680 Hz**
- 648 Hz**
- 712 Hz**
- 650 Hz**

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Section: Physics - SECTION 2

Marks per question: 4

3 of 3 question(s) in this section will be shown to examinee

Examinee should answer all 3 question(s) in this section

This section has negative marking for incorrect answer(s). 50% marks will be deducted for every incorrect answer.

Q1 Difficulty Level: Easy

Knowledge Level: K1

The molar heat capacity for an ideal gas

- cannot be negative
- must be equal to either C_V or C_P
- must lie in the range $C_V \leq C \leq C_P$
- may have any value between $-\infty$ and $+\infty$

Q2 Difficulty Level: Easy

Knowledge Level: K1

The stationary waves set up on a string have the equation $y = (2 \text{ mm})\sin[(6.28 \text{ m}^{-1})x] \cos(\omega t)$. The stationary wave is created by two identical waves, of amplitude A each, moving in opposite directions along the string.

- $A = 2 \text{ mm}$
- $A = 1 \text{ mm}$
- The smallest length of the string is 50 cm.
- The smallest length of the string is 2 m.

Q3 Difficulty Level: Easy

Knowledge Level: K1

A solid sphere of radius R and density ρ is attached to one end of a mass-less spring of force constant k . The other end of the spring is connected to another solid sphere of radius R and density 3ρ . The complete arrangement is placed in a liquid of density 2ρ and is allowed to reach equilibrium. The correct statement(s) is (are)

- the net elongation of the spring is $\frac{4\pi R^3 \rho g}{3k}$
- the net elongation of the spring is $\frac{8\pi R^3 \rho g}{3k}$
- the light sphere is partially submerged.
- the light sphere is completely submerged.

Section: Physics - SECTION 3

Marks per question: 4

6 of 6 question(s) in this section will be shown to examinee

Examinee should answer all 6 question(s) in this section

Q1 Difficulty Level: Easy

Knowledge Level: K1

A bob of mass m , suspended by a string of length l_1 is given a minimum velocity required to complete full circle in the vertical plane. At the highest point, it collides elastically with another bob of mass m suspended by a string of length l_2 , which is initially at rest. Both the strings are mass-less and inextensible. If the second bob, after collision acquires the minimum speed required to complete a full circle in the vertical plane, the ratio l_1/l_2 is _____.

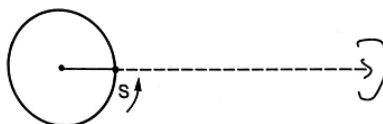
SNo	Blank
1	Integers

Q2 Difficulty Level: Easy

Knowledge Level: K1

A small source of sound S of frequency 480 Hz is attached to the end of a light string and is whirled in a vertical circle of radius 2 m. The string just remains tight when the source is at the highest point. An observer is located in the same vertical plane at a large distance and at the same height as the centre of the circle as shown. The speed of sound in air = 330 m s^{-1} and $g = 10 \text{ ms}^{-2}$. The difference between maximum and minimum frequency heard by the observer will be _____ Hz (to the nearest integer).

Take $\sqrt{5} = 2.23$

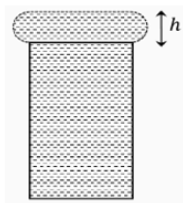


SNo	Blank
1	Integers

Q3 Difficulty Level: Easy

Knowledge Level: K1

When water is filled carefully in a glass, one can fill it to a height h above the rim of the glass due to the surface tension of water. To calculate h just before water starts flowing, model the shape of the water at the rim as a disc of thickness h having semicircular edges, as shown schematically in the figure. When the pressure of water at the bottom of this disc exceeds what can be withstood due to the surface tension, water surface breaks near the rim and water starts flowing from there. If the density of water, its surface tension and the acceleration due to gravity are 10^3 kg m^{-3} , 0.07 Nm^{-1} and 10 ms^{-2} , respectively, the value of h (in mm) is to the nearest integer _____.



SNo	Blank
1	Decimals Precision: 0.01%

Q4 Difficulty Level: Easy

Knowledge Level: K1

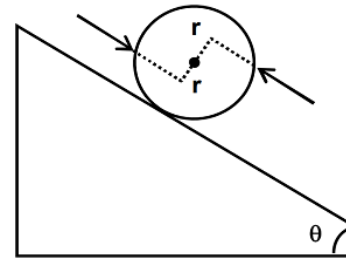
A piece of ice (heat capacity) $2100 \text{ J kg}^{-1} \text{ }^\circ\text{C}^{-1}$ and latent heat $= 3.36 \times 10^5 \text{ J kg}^{-1}$ of mass m grams is at 0°C at atmospheric pressure. It is given 420 J of heat so that the ice starts melting. Finally when the ice-water mixture is in equilibrium, it is found that 1 gm of ice has melted. Assuming there is no other heat exchange during the process, the value of m is _____.

SNo	Blank
1	Integers

Q5 Difficulty Level: Easy

Knowledge Level: K1

A solid sphere of mass 1 kg and radius 1 m rolls without slipping on a fixed inclined plane with an angle of inclination $\theta = 30^\circ$ from the horizontal. Two forces of magnitude 1N each, parallel to the incline, act on the sphere, both at distance $r = 0.5$ m from the center of the sphere, as shown in the figure. If a be the acceleration of the sphere down the plane then $14 \times a = \underline{\hspace{2cm}}$ ms^{-2} . (Take $g = 10 \text{ ms}^{-2}$.)



SNo	Blank
1	Integers

Q6 Difficulty Level: Easy

Knowledge Level: K1

A train with cross-sectional area S_t is moving with speed v_t inside a long tunnel of cross-sectional area S_0 ($S_0 = 4S_t$). Assume that almost all the air (density ρ) in front of the train flows back between its sides and the walls of the tunnel. Also, the air flow with respect to the train is steady and laminar. Take the ambient pressure and that inside the train to be p_0 . If the pressure in the region between the sides of

train and the tunnel walls is p , then $p_0 - p = \frac{7}{2N} \rho v_t^2$. The value of N is $\underline{\hspace{2cm}}$.

SNo	Blank
1	Integers

Section: Physics - SECTION 4

Marks per question: 3

4 of 4 question(s) in this section will be shown to examinee

Examinee should answer all 4 question(s) in this section

Q1 Difficulty Level: Easy

Knowledge Level: K1

When liquid medicine of density $\rho = 10^3 \text{ kg/m}^3$ is to be put in the eye, it is done with the help of a dropper. As the bulb on the top of the dropper is pressed, a drop forms at the opening of the dropper. We wish to estimate the size of the drop. We first assume that the drop formed at the opening is spherical because that requires a minimum increase in its surface energy. To determine the size, we calculate the net vertical force due to the surface tension $T = 0.1 \text{ N/m}$ when the radius of the drop is $R = 5 \times 10^{-3} \text{ m}$. When this force becomes smaller than the weight of the drop, the drop gets detached from the dropper.

If the radius of the opening of the dropper is $r = 5 \times 10^{-4} \text{ m}$ the vertical force due to the surface tension on the drop = ____ μN . (Take $\pi = 3.14$)

SNo	Blank
1	Decimals Precision: 0.01%

Q2 Difficulty Level: Easy

Knowledge Level: K1

When liquid medicine of density $\rho = 10^3 \text{ kg/m}^3$ is to be put in the eye, it is done with the help of a dropper. As the bulb on the top of the dropper is pressed, a drop forms at the opening of the dropper. We wish to estimate the size of the drop. We first assume that the drop formed at the opening is spherical because that requires a minimum increase in its surface energy. To determine the size, we calculate the net vertical force due to the surface tension $T = 0.1 \text{ N/m}$ when the radius of the drop is $R = 5 \times 10^{-3} \text{ m}$. When this force becomes smaller than the weight of the drop, the drop gets detached from the dropper.

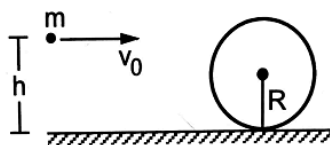
After the drop detaches, its surface energy is _____ μJ .

SNo	Blank
1	Decimals Precision: 0.01%

Q3 Difficulty Level: Easy

Knowledge Level: K1

The sphere of mass $M = 15 \text{ kg}$ and radius $R = 2 \text{ m}$ shown in figure lies on a rough plane when a particle of mass $m = 0.015 \text{ kg}$ travelling at a speed $v_0 = 4 \text{ m/s}$ collides and sticks with it. If the line of motion of the particle is at a distance $h = 3.2 \text{ m}$ above the plane,



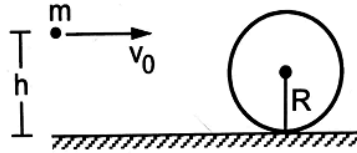
The angular speed of the system just after the collision = _____

SNo	Blank
1	Decimals Precision: 0.01%

Q4 Difficulty Level: Easy

Knowledge Level: K1

The sphere of mass $M = 15 \text{ kg}$ and radius $R = 2 \text{ m}$ shown in figure lies on a rough plane with a particle of mass $m = 0.015 \text{ kg}$ travelling at a speed $v_0 = 4 \text{ m/s}$ collides and sticks with it. The line of motion of the particle is at a distance h above the plane,



The value of h for which the sphere starts pure rolling on the plane = _____.

SNo	Blank
1	Decimals Precision: 0.01%

Section: Chemistry - SECTION 1

Marks per question: 3

4 of 4 question(s) in this section will be shown to examinee

Examinee should answer all 4 question(s) in this section

This section has negative marking for incorrect answer(s). 33% marks will be deducted for every incorrect answer.

Q1 Difficulty Level: Easy

Knowledge Level: K1

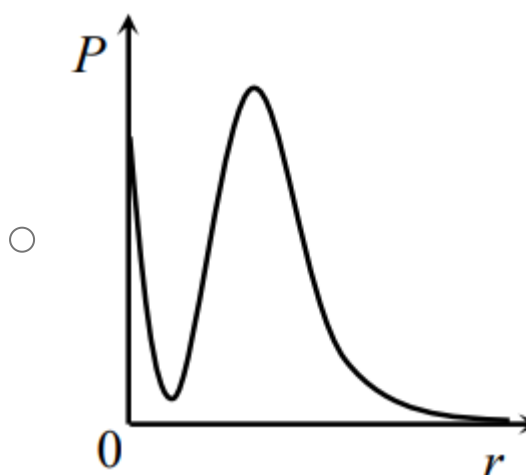
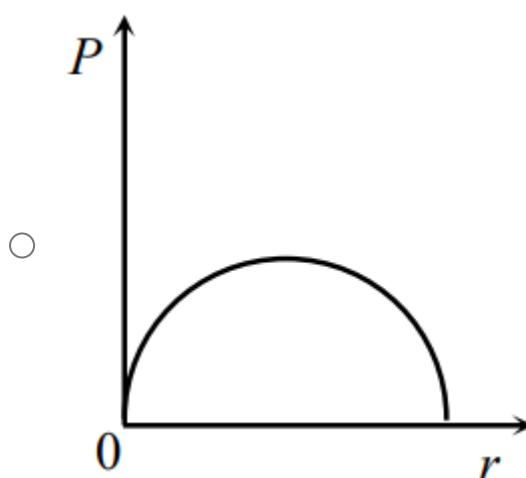
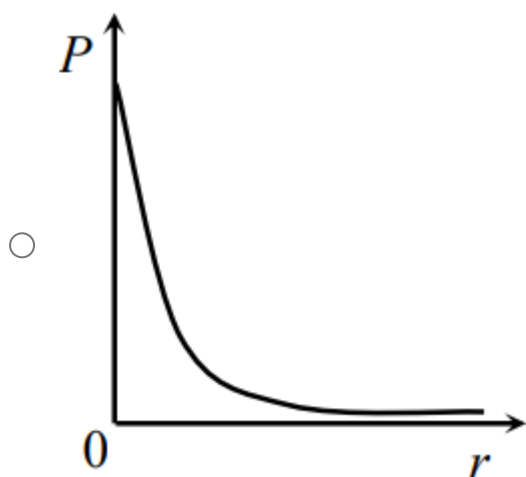
Which of the following correct order of solubility order of group-I sulphate

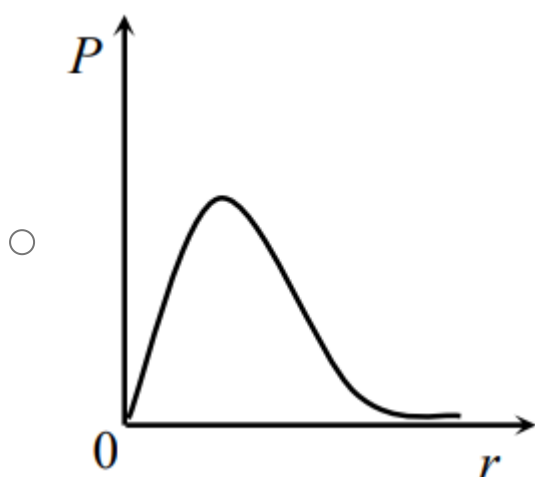
- $\text{Li}_2\text{SO}_4 > \text{Na}_2\text{SO}_4 > \text{K}_2\text{SO}_4 > \text{Rb}_2\text{SO}_4 > \text{Cs}_2\text{SO}_4$
- $\text{Li}_2\text{SO}_4 < \text{Na}_2\text{SO}_4 > \text{K}_2\text{SO}_4 < \text{Rb}_2\text{SO}_4 < \text{Cs}_2\text{SO}_4$
- $\text{Li}_2\text{SO}_4 < \text{Na}_2\text{SO}_4 < \text{K}_2\text{SO}_4 < \text{Rb}_2\text{SO}_4 < \text{Cs}_2\text{SO}_4$
- $\text{Li}_2\text{SO}_4 < \text{Na}_2\text{SO}_4 < \text{K}_2\text{SO}_4 > \text{Rb}_2\text{SO}_4 > \text{Cs}_2\text{SO}_4$

Q2 Difficulty Level: Easy

Knowledge Level: K1

P is the probability of finding the $1s$ electron of hydrogen atom in a spherical shell of infinitesimal thickness, dr , at a distance r from the nucleus. The volume of this shell is $4\pi r^2 dr$. The qualitative sketch of the dependence of P on r is





Q3 Difficulty Level: Easy

Knowledge Level: K1

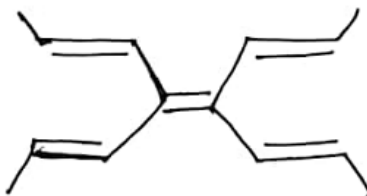
The increasing order of atomic radii of the following Group 13 elements is

- Al < Ga < In < Tl
- Ga < Al < In < Tl
- Al < In < Ga < Tl
- Al < Ga < Tl < In

Q4 Difficulty Level: Easy

Knowledge Level: K1

How many possible geometrical isomers are present of the following compound



- 4
- 6
- 7
- 5

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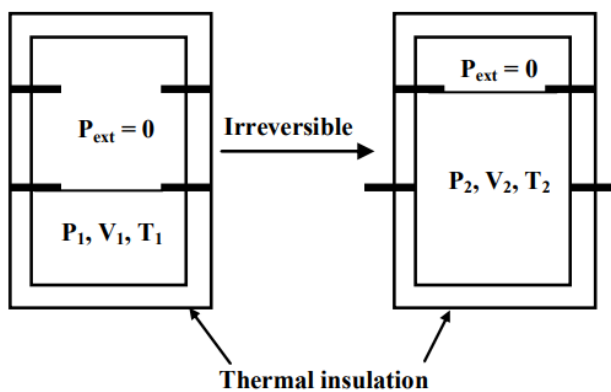
Section: Chemistry - SECTION 2**Marks per question: 4****3 of 3 question(s) in this section will be shown to examinee****Examinee should answer all 3 question(s) in this section****This section has negative marking for incorrect answer(s). 50% marks will be deducted for every incorrect answer.****Q1 Difficulty Level: Easy****Knowledge Level: K1****According to Molecular Orbital Theory**

- C_2^{2-} is expected to be diamagnetic
- O_2^{2+} expected to have a longer bond length than O_2
- N_2^+ and N_2^- have the same bond order
- He_2^+ has the same energy as two isolated He atoms

Q2 Difficulty Level: Easy

Knowledge Level: K1

An ideal gas in a thermally insulated vessel at internal pressure = P_1 , volume = V_1 and temperature = T_1 expands irreversibly against zero external pressure, as shown in the diagram. The internal pressure, volume and absolute temperature of the gas are P_2 , V_2 and T_2 , respectively. expansion,



- $q = 0$
- $T_2 = T_1$
- $P_2 V_2 = P_1 V_1$
- $P_2 V_2^\gamma = P_1 V_1^\gamma$

Q3 Difficulty Level: Easy

Knowledge Level: K1

Hydrogen bonding plays a central role in the following phenom

- Ice floats in water.
- Higher Lewis basicity of primary amines than tertiary amines in aqueous s
- Formic acid is more acidic than acetic acid.
- Dimerisation of acetic acid in benzene.

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Section: Chemistry - SECTION 3**Marks per question: 4****6 of 6 question(s) in this section will be shown to examinee****Examinee should answer all 6 question(s) in this section****Q1 Difficulty Level: Easy****Knowledge Level: K1**

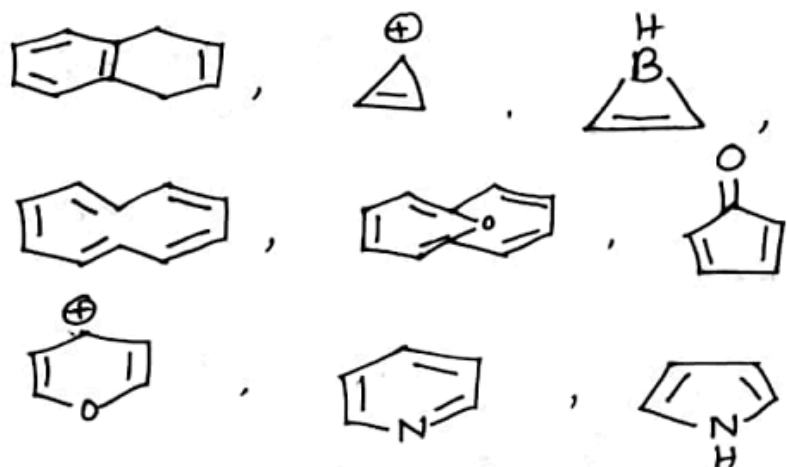
It has been considered that during the formation of earth H₂ gas was available at the earth. But excessive heat on the earth this has been escaped. The temperature of earth during H₂ gas formation is A × 10⁶°C. Find the value of A. [Closest integer] [Given : The escaping velocity is 1.1 × 10⁶ m/s]

SNo	Blank
1	Integers

Q2 Difficulty Level: Easy

Knowledge Level: K1

Among the following the number of aromatic compound(s) is _____



SNo	Blank
1	Integers

Q3 Difficulty Level: Easy

Knowledge Level: K1

The solubility of a salt of weak acid (**AB**) at pH 3 is $Y \times 10^{-3} \text{ mol L}^{-1}$. The value of $Y^2 \times 10^{-6}$ is _____. (Given that the value of solubility product of **AB** (K_{sp}) = 2×10^{-10} and the value of ionization constant of **HB** (K_a) = 1×10^{-8})

SNo	Blank
1	Integers

Q4 Difficulty Level: Easy

Knowledge Level: K1

Among B_2H_6 , $B_3N_3H_6$, N_2O , N_2O_4 , $H_2S_2O_3$ and $H_2S_2O_8$, the total number of molecules containing bond between two atoms of the same kind is

SNo	Blank
1	Integers

Q5 Difficulty Level: Easy

Knowledge Level: K1

The ground state energy of hydrogen atom is -13.6 eV. Consider an electronic state ψ azimuthal quantum number and magnetic quantum number are -3.4 eV, 2 and 0, respectively. If x is number of angular nodes and y is the number of radial nodes. Calculate $x + y =$ _____

SNo	Blank
1	Integers

Q6 Difficulty Level: Easy

Knowledge Level: K1

Total number of isomers, considering both structural and stereoisomers, of cyclic ethers with the formula C_4H_8O is _____

SNo	Blank
1	Integers

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Section: Chemistry - SECTION 4

Marks per question: 3

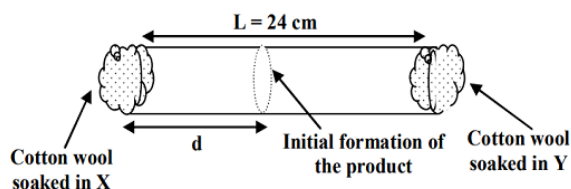
4 of 4 question(s) in this section will be shown to examinee

Examinee should answer all 4 question(s) in this section

Q1 Difficulty Level: Easy

Knowledge Level: K1

X and Y are two volatile liquids with molar weights of 10 g mol^{-1} and 40 g mol^{-1} respectively. Two plugs, one soaked in X and the other soaked in Y, are simultaneously placed at the ends of a tube of length $L = 24 \text{ cm}$, as shown in the figure. The tube is filled with an inert gas at 1 atmosphere pressure and at a temperature of 300 K. Vapours of X and Y react to form a product which is first observed at a distance $d \text{ cm}$ from the plug soaked in X. Take X and Y to have equal molecular diameters and assume ideal gas behaviour for the inert gas and the two vapours.



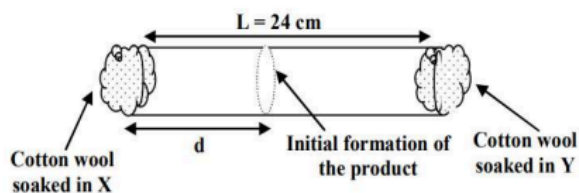
The value of d in cm (shown in the figure), as estimated from Graham's law, is _____.

SNo	Blank
1	Integers

Q2 Difficulty Level: Easy

Knowledge Level: K1

X and Y are two volatile liquids with molar weights of 10 g mol^{-1} and 40 g mol^{-1} respectively. Two plugs, one soaked in X and the other soaked in Y, are simultaneously placed at the ends of a tube of length $L = 24 \text{ cm}$, as shown in the figure. The tube is filled with an inert gas at 1 atmosphere pressure and a temperature of 300 K. Vapours of X and Y react to form a product which is first observed at a distance $d \text{ cm}$ from the plug soaked in X. Take X and Y to have equal molecular diameters and assume ideal gas behaviour for the inert gas and the two vapours.



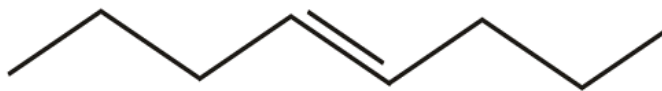
The experimental value of d is found to be smaller than the estimate obtained using Graham's law. This is due to _____ (Put the integral value of the correct statement)

1. larger mean free path for X as compared to that of Y.
2. larger mean free path for Y as compared to that of X.
3. increased collision frequency of Y with the inert gas as compared to that of X with the inert gas.
4. increased collision frequency of X with the inert gas as compared to that of Y with the inert gas.

SNo	Blank
1	Integers

Q3 Difficulty Level: Easy

Knowledge Level: K1



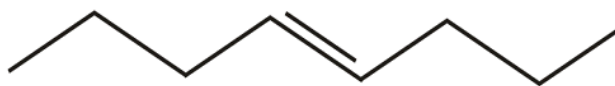
1. $\xrightarrow[\text{b. } H_2O_2]{\text{a. } O_3}$
2. NaOH, electrolysis
3. Cr_2O_3 , $600^\circ C$, 15 atm
4. CH_3CH_2Cl , Anhydrous

The number of $-CH_2-$ (methylene) groups in the product formed from the following reaction sequence is _____

SNo	Blank
1	Integers

Q4 Difficulty Level: Easy

Knowledge Level: K1



1. $\xrightarrow[\text{b. } H_2O_2]{\text{a. } O_3}$
2. NaOH, electrolysis
3. Cr_2O_3 , $600^\circ C$, 15 atm
4. CH_3CH_2Cl , Anhydrous $AlCl_3$

The number of $-CH_2-$ (methylene)

The total number of chiral center formed from one molecule of compound A on Bromination (Br_2/CCl_4) is _____.

SNo	Blank
1	Integers

