

JEE MAINS QFT- 4 2025

CIPHER

Love you daddy, no diddy tho.

By: C I P H E R

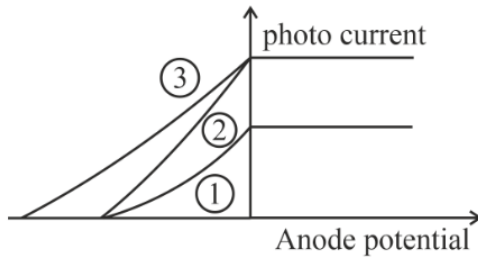


Physics Single Correct (Maximum Marks: 80)

Question No. 1

Only One Option Correct Type

The following graph represents the variation of photo current with anode potential for a metal surface. Here I_1 , I_2 and I_3 represents intensities and γ_1 , γ_2 , γ_3 represents frequency for curves 1, 2 and 3 respectively, then



- $\gamma_1 = \gamma_2$ and $I_1 = I_2$
- $\gamma_2 = \gamma_3$ and $I_1 = I_3$
- $\gamma_1 = \gamma_2$ and $I_1 \neq I_2$
- $\gamma_1 = \gamma_3$ and $I_1 = I_3$

Question No. 2

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

A particle is released freely from a height H . At a certain height, its kinetic energy is two times of its potential energy. Then, the height and the speed of the particle at that instant are respectively

(g = acceleration due to gravity)

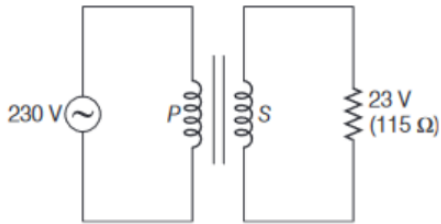
- $\frac{H}{3}, \sqrt{\frac{2gH}{3}}$
- $\frac{H}{3}, 2\sqrt{\frac{gH}{3}}$
- $\frac{2H}{3}, \sqrt{\frac{2gH}{3}}$
- $\frac{H}{3}, \sqrt{2gH}$

Question No. 3

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

Find the current through the primary coil (P) of the transformer shown below.



- 0.08 A
- 0.04 A
- 0.02 A
- 0.01 A

Question No. 4

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

The pass-axes of two polarisers were kept such that the incident unpolarised beam of intensity I_0 , gets completely blocked. Another polariser was introduced in between these two polarisers with its pass-axis 60° with respect to the pass-axis of the first one. The output intensity would then become:

- 0
- $\frac{3}{32} I_0$
- $\frac{3}{16} I_0$
- $\frac{3}{8} I_0$

Question No. 5

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

If speed (V), acceleration (A) and force (F) are considered as fundamental units, the dimension of Young's modulus will be:

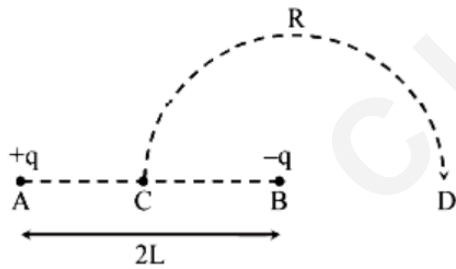
- $[V^{-2} A^2 F^2]$
- $[V^{-2} A^2 F^{-2}]$
- $[V^{-4} A^{-2} F]$
- $[V^{-4} A^2 F]$

Question No. 6

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

Charges $+q$ and $-q$ are placed at A and B respectively which are at a distance $2L$ apart. If C is the midpoint between A and B then work done in moving Q from C to D (through semicircular path CRD) and from C to ∞ are respectively -

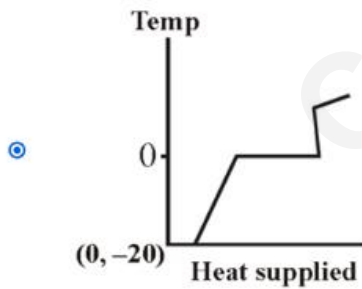
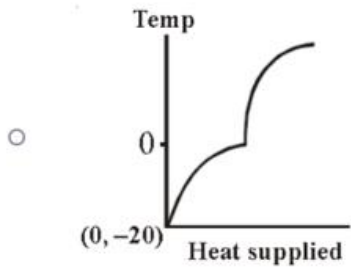
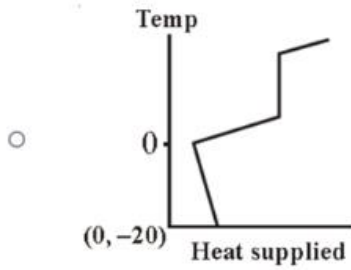
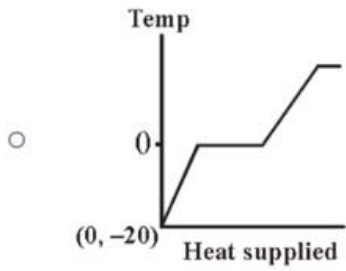


- $\frac{qQ}{2\pi\epsilon_0 L}$ and infinity
- $\frac{qQ}{6\pi\epsilon_0 L}$ and zero
- zero, zero
- $\frac{-qQ}{6\pi\epsilon_0 L}$ and zero

Question No. 7

Only One Option Correct Type

A block of ice at temperature -20°C is slowly heated and converted to steam at 100°C . Which of the following diagram is most appropriate?



Question No. 8

Only One Option Correct Type

Maximum height reached by a rocket fired with a speed equal to 50% of the escape velocity from earth's surface is :

- $R/2$
- $16R/9$
- $R/3$
- $R/8$

Question No. 9

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

In the following a statement of Assertion is followed by a statement of Reason.

Assertion: The mass defect involved in a chemical reaction is almost a million times smaller than that in a nuclear reaction.

Reason: The mass energy interconversion does not take place in a chemical reaction.

- Both Assertion & Reason are true and the Reason is the correct explanation of the Assertion.
- Both Assertion & Reason are true but the Reason is not the correct explanation of the Assertion.
- Assertion is true statement but Reason is false.
- Both Assertion and Reason are false statements.

Question No. 10

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

The minimum force required to move a body up an inclined plane is three times the minimum force required to prevent it from sliding down the plane. If the coefficient of friction between the body and the inclined plane is $\frac{1}{2\sqrt{3}}$, then the angle of the inclined plane is _____

- 60°
- 45°
- 30°
- 15°

Question No. 11

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

The electric potential between a proton and an electron is given by $V = V_0 \ln\left(\frac{r}{r_0}\right)$ where V_0 and r_0 are constants and r is the radius of the electron orbit around the proton. Assuming Bohr's model to be applicable, it is found that r is proportional to n^x , where n is the principal quantum number. Find the value of x .

- 2
- 3
- 1
- $\frac{3}{2}$

Question No. 12

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

The correct match between the entries in column I and column II are :

I Radiation	II Wavelength
a Microwave	i 100 m
b Gamma rays	ii 10^{-15} m
c A.M. radio	iii 10^{-10} m
d X-rays	iv 10^{-3} m

- (a)–(ii), (b) – (i), (c) – (iv), (d) – (iii)
- (a)–(i), (b) – (iii), (c) – (iv), (d) – (ii)
- (a)–(iii), (b) – (ii), (c) – (i), (d) – (iv)
- (a)–(iv), (b) – (ii), (c) – (i), (d) – (iii)

Question No. 13

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

Each atom of mass m of a monoatomic gas has got three degrees of freedom. The rms velocity of these atoms is v at temperature T . For a diatomic molecule of mass m and temperature T , which has got five degrees of freedom, rms velocity of molecule is,

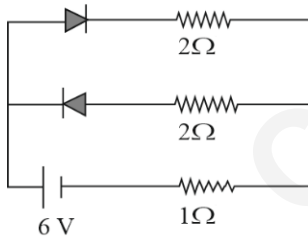
- $\sqrt{\frac{5}{3}} v$
- $\sqrt{\frac{3}{5}} v$
- v
- $\sqrt{\frac{2}{5}} v$

Question No. 14

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

Find the current through $1\ \Omega$ resistance. (Assume diode to be ideal)



- 2
- 3.5
- 3
- 2.5

Question No. 15

Only One Option Correct Type

A particle is projected from ground at some angle with horizontal (Assuming point of projection to be origin and the horizontal and vertical directions to be the x and y – axis) the particle passes through the points (3 m, 4 m) and (4 m, 3 m) during its motion then the range of the particle would be: ($g = 10 \text{ m s}^{-2}$)

- 36 m
- $\frac{37}{7}$ m
- 4 m
- 16 m

Question No. 16

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

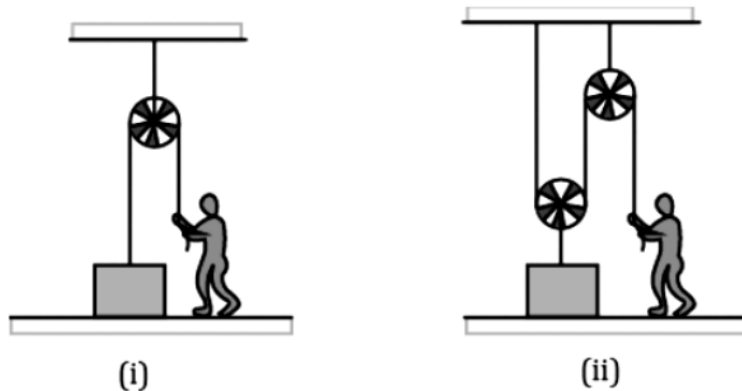
A galvanometer of resistance 40Ω gives a deflection of 10 divisions per mA. There are 50 divisions on the scale. Maximum current that can pass through it when a shunt resistance of 2Ω is connected is-

- 105 mA
- 155 mA
- 210 mA
- 75 mA

Question No. 17

Only One Option Correct Type

In the figure shown, a person wants to raise a block lying on the ground to a height h . In both the cases if time required is same then in which case he has to exert more force. Assume pulleys and strings light.



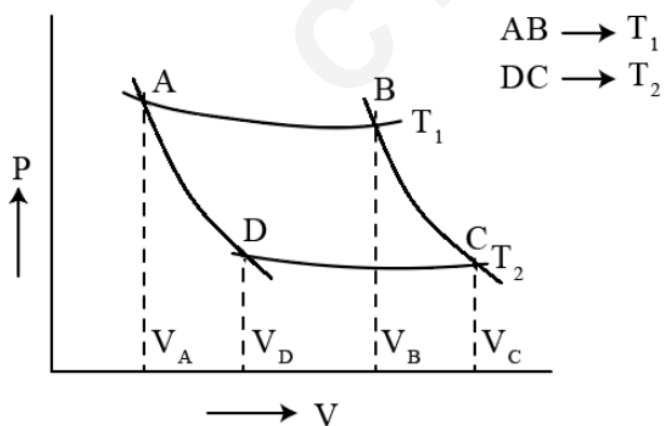
- (i)
- (ii)
- same in both
- Cannot be determined

Question No. 18

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

In the following $P - V$ diagram of an ideal gas, AB and CD are isothermal whereas BC and DA are adiabatic process. The value of V_B/V_C is

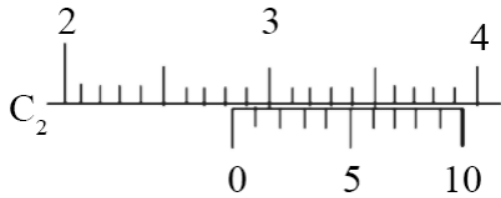
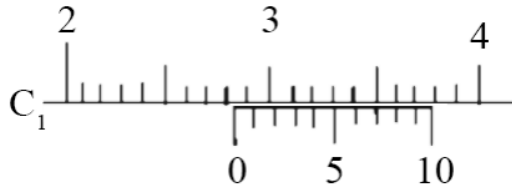


- $= V_A/V_D$
- $< V_A/V_D$
- $> V_A/V_D$
- cannot say

Question No. 19

Only One Option Correct Type

There are two vernier calipers both of which have 1 cm divided into 10 equal divisions on the main scale. The Vernier scale of one of the calipers (C_1) has 10 equal divisions that correspond to 9 main scale divisions. The Vernier scale of the other caliper (C_2) has 10 equal divisions that correspond to 11 main scale divisions. The readings of the two calipers are shown in the figure. The measured values (in cm) by calipers C_1 and C_2 respectively, are (in both cases 7th Vernier Scale Division coincides with Main Scale Division)



- 2.87 and 2.86
- 2.83 and 2.87
- 2.87 and 2.83
- 2.85 and 2.82

Question No. 20

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

The circumference of the second orbit of an atom or ion having single electron, is 4×10^{-9} m. The de Broglie wavelength of electron revolving in this orbit should be:

- 2×10^{-9} m
- 4×10^{-9} m
- 8×10^{-9} m
- 1×10^{-9} m

Physics Numerical (Maximum Marks: 20)

Question No. 1

Numerical Type

Two soap bubbles A and B are kept in a closed chamber, where the air is maintained at pressure of 8 N/m^2 . The radii of bubbles A and B are 2 cm and 4 cm respectively. Surface tension of the soap water used to make bubbles is 0.04 N/m . Find the ratio $\frac{n_B}{n_A}$, where n_A and n_B are the number of moles of air in bubbles A and B respectively at same temperature. Neglect effect of gravity.

Question No. 2

Numerical Type

A disc of mass 4 kg and radius 0.4 m is rotating with angular velocity 30 rad s^{-1} . When two point-masses, each 0.25 kg are attached on the periphery of the disc, at diametrically opposite points, its angular velocity becomes (in rad/s)....

Question No. 3

Numerical Type

Two strings A and B of lengths, $L_A = 80 \text{ cm}$ and $L_B = x \text{ cm}$ respectively are used separately in a sonometer. The ratio of their densities is 0.81. the diameter of B is one-half that of A. if the strings have the same tension and fundamental frequency the value of x is:

Question No. 4

Numerical Type

Two parallel wires in the plane of a paper are at a distance X_0 apart. A point charge is moving with a speed u between the wires in the same plane at a distance X_1 from one of the wires. When the wires carry current of magnitude I in the same direction, the radius of curvature of the path of the point charge is R_1 . In contrast, if the currents of magnitude I in the two wires have directions opposite to each other, the curvature of the path is R_2 . If $\frac{X_0}{X_1} = 3$, the value of $\frac{R_1}{R_2}$ is----

Question No. 5

Numerical Type

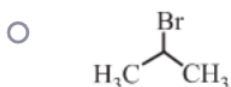
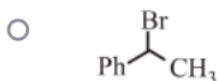
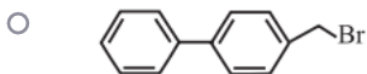
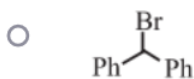
Optic axis of a thin equiconvex lens is the x -axis. The co-ordinates of a point object and its image are $(-40 \text{ cm}, 1 \text{ cm})$ and $(50 \text{ cm}, -2 \text{ cm})$ respectively. Lens is located at (x, y) coordinates. The magnitude of x in cm is?

Chemistry Single Correct (Maximum Marks: 80)

Question No. 1

Only One Option Correct Type

The rate S_N1 reaction will be faster for which of the following bromides?



Question No. 2

Only One Option Correct Type

Identify correct statements about NO molecule:

(i) When NO is ionized to NO^+ , the electron is removed from the $\pi^* 2p$ orbital.

(ii) Bond order of NO is 2.5 and bond order of NO^+ is 3.

(iii) Bond length of NO^+ is greater than that of NO.

(iv) It is similar to N_2^- in all respect.

(i) and (ii)

(i) and (iii)

(i) and (iv)

All are correct

Question No. 3

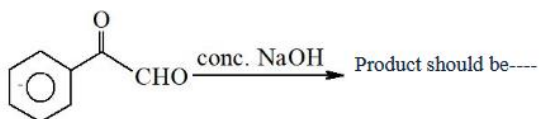
Only One Option Correct Type

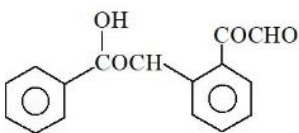
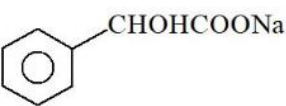

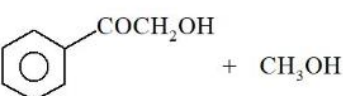
x grams of water is mixed in 69 g of ethanol. Mole fraction of ethanol in the resultant solution is 0.6 . What is the value of x in grams?

- 54
- 36
- 180
- 18

Question No. 4

Only One Option Correct Type



- 
- 
- 
- 

Question No. 5

Choose the correct statements about the properties of group 15 hydrides:

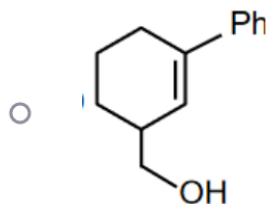
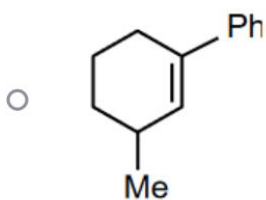
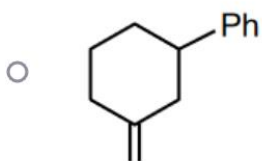
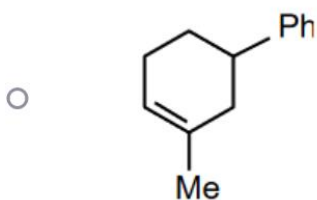
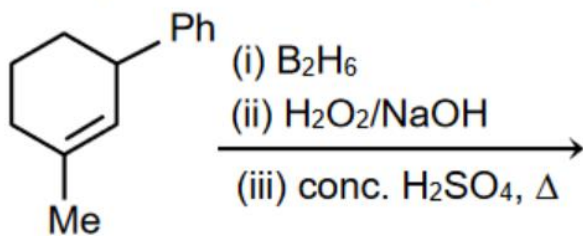
- (A) The bond angle in NH_3 is greater than in PH_3 due to stronger lone pair-lone pair repulsion.
- (B) BiH_3 has the lowest basicity among the group 15 hydrides.
- (C) The bond dissociation energy increases in the order $\text{NH}_3 < \text{PH}_3 < \text{AsH}_3 < \text{SbH}_3 < \text{BiH}_3$.
- (D) The covalent radius of the central atom in the hydrides increases in the order $\text{NH}_3 < \text{PH}_3 < \text{AsH}_3 < \text{SbH}_3 < \text{BiH}_3$.

- A and B only
- A, C, and D only
- B and D only
- A, B, and D only

Question No. 6

Only One Option Correct Type

The major product of the following reaction sequence is



Question No. 7

Only One Option Correct Type

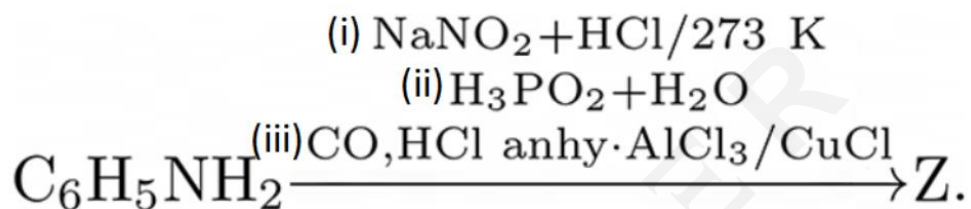
The total number of cyclic structural as well as stereo isomers possible for a compound with the molecular formula C_5H_{10} is....

- 5
- 6
- 8
- 7

Question No. 8

Only One Option Correct Type

What is Z in the following reaction sequence?



- $C_6H_5CO_2H$
- C_6H_5OH
- C_6H_5CHO
- C_6H_6

Question No. 9

Only One Option Correct Type

Assertion : First ionization energy for nitrogen is lower than oxygen.

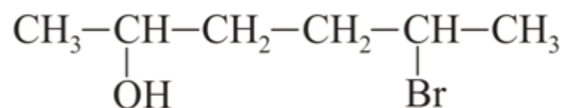
Reason : Across a period effective nuclear charge decreases.

- If both assertion and reason are true and reason is the correct explanation of assertion
- If both assertion and reason are true but reason is not the correct explanation of assertion
- If assertion is true but reason is false
- If both assertion and reason are false.

Question No. 10

Only One Option Correct Type

A mixture of all stereoisomers possible from the structure is subjected to fractional distillation. How many fractions will be obtained from the following?



- 2
- 4
- 6
- 7

Question No. 11

Only One Option Correct Type

Identify, from the following, the diamagnetic, tetrahedral complex.

- $[\text{Ni}(\text{Cl})_4]^{2-}$
- $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$
- $[\text{Ni}(\text{CN})_4]^{2-}$
- $[\text{Ni}(\text{CO})_4]$

Question No. 12

Only One Option Correct Type

The standard molar enthalpies of formation of cyclohexane (l) and benzene (l) at 25 °C are -156 and +49 KJ mol⁻¹ respectively. The standard enthalpy of hydrogenation of cyclohexene (l) at 25 °C is -116 KJ mol⁻¹. Use these data to estimate the magnitude of the resonance energy of benzene. Mark answer in KJ per mol

- 72.5 KJ/mol
- 286 KJ/mol
- 143 KJ/mol
- 215.5 KJ/mol

Question No. 13

Only One Option Correct Type

Each question has multiple options out of which ONLY ONE is correct.

We have taken two electrode, with potential values: $E_{\text{Mg}^{2+}/\text{Mg}}^{\circ} = -2.37 \text{ V}$ and $E_{\text{Fe}^{3+}/\text{Fe}}^{\circ} = -0.04 \text{ V}$. Which of the following will act as the best reducing agent:

- Mg^{2+}
- Fe^{3+}
- Mg
- Fe

Question No. 14

Only One Option Correct Type

In acidic medium KMnO_4 is decolourise by :-

(a) $\text{H}_2\text{C}_2\text{O}_4$

(b) HNO_3

(c) $\text{Na}_2\text{S}_2\text{O}_3$

(d) HNO_2

- a,b,c,d
- a & c only
- a & d only
- c & d only

Question No. 15

Only One Option Correct Type

Consider two reactions having same Arrhenius factor A, but different energy of activation.

(i) $\text{A} \rightarrow \text{B}; E_{a1} = 20 \text{ kJ}$

(ii) $\text{C} \rightarrow \text{D}; E_{a2} = 30 \text{ kJ}$

Both are at temperature 25°C If temperature in both reaction is increased slightly in such a way that change in temperature in both case is same than choose the correct options.

- The second reaction is faster
- The second reaction is more sensitive towards temperature variation
- If temperature increases, rate of first reaction increase more sharply
- All the above are correct

Question No. 16

Only One Option Correct Type

A tetrapeptide has $-\text{COOH}$ group on alanine. The produces glycine (Gly), valine (Val), phenyl alanine (Phe) and alanine (Ala), on complete hydrolysis. For this tetrapeptide, the number of possible sequences (primary structures) with $-\text{NH}_2$ group attached to a chiral centre is-

- 4
- 5
- 3
- 2

Question No. 17

Only One Option Correct Type

Match the following

List - I (Molecules)	List - II (Dipole moment μ , D)
A. H_2O	I. 0
B. BF_3	II. 0.23
C. NH_3	III. 1.47
D. NF_3	IV. 1.85

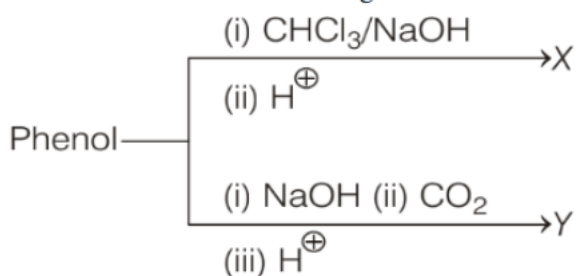
The correct answer is

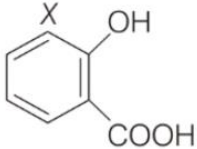
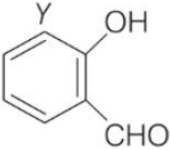
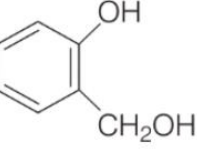
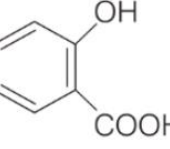
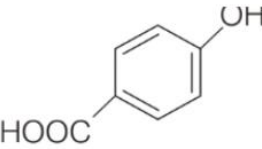
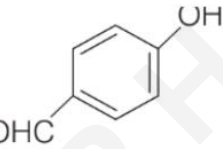
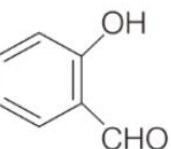
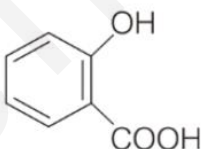
- A – IV, B – I, C – II, D – III
- A - IV, B - I, C - III, D - II
- A - IV, B - III, C - I, D - II
- A - III, B -IV, C - II, D - I

Question No. 18

Only One Option Correct Type

What are X and Y in the following reactions?



-  
-  
-  
-  

Question No. 19

Only One Option Correct Type

What is the correct sequence of the increasing order of freezing points at one atmosphere of the following 1.0M aqueous solution?

1. Urea, 2. Sodium chloride, 3. Sodium sulphate, 4. Sodium phosphate.
Select the correct answer using the codes given below

- 4, 3, 1, 2
- 3, 4, 2, 1
- 3, 4, 1, 2
- 4, 3, 2, 1

Question No. 20

Only One Option Correct Type

Which of the following compounds is expected to be coloured?

- ZnSO₄
- MgCl₂
- CuCl₂
- AgCl

Chemistry Numerical (Maximum Marks: 20)

Question No. 1

Numerical Type

K_a for HCN is 5×10^{-10} at 25°C. For maintaining a constant pH of 9, the volume in ml of 5M KCN solution required to be added to 10ml of 2M HCN solution is (Mark answer in ml)

Question No. 2

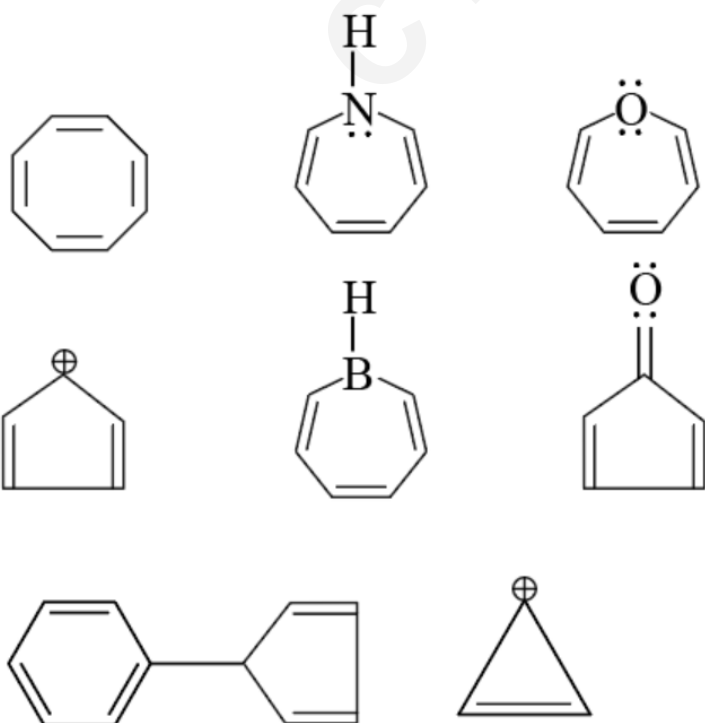
Numerical Type

In alkaline medium ClO₂ oxidises H₂O₂ in O₂ and reduced itself as Cl⁻ then moles of H₂O₂ will be oxidised by two mole of ClO₂.

Question No. 3

Numerical Type

How many of the following compounds are antiaromatic.



Question No. 4

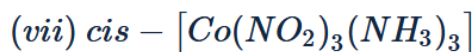
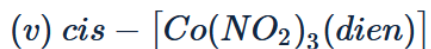
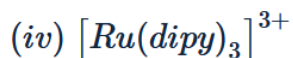
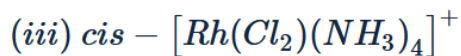
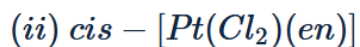
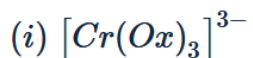
Numerical Type

If each hydrogen atom in the ground state, 1.0 mol of H atoms are excited by absorbing photons of energy 8.4 eV, 12.09 eV, and 15.0 eV of energy, then the number of spectral lines emitted is equal to.

Question No. 5

Numerical Type

Total number of complexes among the following which are optically active?



Mathematics Single Correct (Maximum Marks: 80)

Question No. 1

Only One Option Correct Type

The mean and the standard deviation of a data of 8 items are 25 and 5 respectively. If two items 15 and 25 are added to this data, then the variance of the new data is

- 29
- 24
- 26
- $\sqrt{29}$

Question No. 2

Only One Option Correct Type

Consider three vectors \vec{a} , \vec{b} , \vec{c} such that $|\vec{a}| = 2$, $|\vec{b}| = 1$, $|\vec{c}| = 4$ angle

between \vec{a} & \vec{b} is 120° and \vec{c} lies along the bisector of \vec{a} & \vec{b} . Which of the following is true?

- $2\vec{a} - \vec{c} + 4\vec{b} = 0$
- $\vec{a} - 3\vec{c} - 4\vec{b} = 0$
- $3\vec{a} - \vec{c} - 4\vec{b} = 0$
- $\vec{a} + \vec{b} + \vec{c} = 0$

Question No. 3

Only One Option Correct Type

Find the sum of all possible integral value(s) of 'a' for which

$F(x) = \frac{x^3}{3} + (a - 3)x^2 + x - 13$ has negative point of local minimum in the interval $[1, 100]$.

- 5040
- 5050
- 4990
- 4950

Question No. 4

Only One Option Correct Type

If some three consecutive coefficients in the binomial expansion of $(x + 1)^n$ in powers of x are in the ratio $2 : 15 : 70$, then the average of these three coefficients is:

- 227
- 964
- 625
- 232

Question No. 5

Only One Option Correct Type

Let P and Q be any two points on the lines represented by $2x - 3y = 0$ and $2x + 3y = 0$, respectively. If the area of $\triangle OPQ$ (where O is the origin) is 5 sq. units, then which of the following equations do not represent parts of the locus of the midpoint of PQ ?

- $4x^2 - 9y^2 + 30 = 0$
- $4x^2 - 9y^2 - 30 = 0$
- $9x^2 - 4y^2 - 30 = 0$
- None of these

Question No. 6

Only One Option Correct Type

If $A = \begin{bmatrix} 2 & 1 & -1 \\ 3 & 5 & 2 \\ 1 & 6 & 1 \end{bmatrix}$, then $\text{tr}(A \text{adj}(\text{adj } A))$ is equal to (where, $\text{tr}(P)$ denotes the trace of the matrix P i.e. the sum of all the diagonal elements of the matrix P and $\text{adj}(P)$ denotes the adjoint of matrix P)

- 7
- 18
- 58
- 1624

Question No. 7

Only One Option Correct Type

Let $\vec{a} = \vec{i} + \vec{j}$, $\vec{b} = 2\vec{i} - \vec{k}$. Then the vector \vec{r} satisfying the equations $\vec{r} \times \vec{a} = \vec{b} \times \vec{a}$ and $\vec{r} \times \vec{b} = \vec{a} \times \vec{b}$ is

- $\vec{i} - \vec{j} + \vec{k}$
- $3\vec{i} - \vec{j} + \vec{k}$
- $3\vec{i} + \vec{j} - \vec{k}$
- $\vec{i} - \vec{j} - \vec{k}$

Question No. 8

Only One Option Correct Type

Consider a real valued continuous function f such that

$$f(x) = \sin x + \int_{-\pi/2}^{\pi/2} (\sin x + tf(t)) dt$$

If M and m are maximum and minimum value of the function f , then

- $\frac{M}{m} = 4$
- $M - m = 2\pi + 1$
- $M + m = 4(\pi + 1)$
- $Mm = 2(\pi^2 + 1)$

Question No. 9

Only One Option Correct Type

The co-ordinates of the perpendicular drawn from the point $2\hat{i} - \hat{j} + 5\hat{k}$ to the line $\vec{r} = (11\hat{i} - 2\hat{j} - 8\hat{k}) + \lambda(10\hat{i} - 4\hat{j} - 11\hat{k})$ are

- $(1, -2, 3)$
- $(1, 2, -3)$
- $(-1, 2, 3)$
- $(1, 2, 3)$

Question No. 10

Only One Option Correct Type

For each positive integer n , consider the point P with abscissa n on the curve $y^2 - x^2 = 1$. If d_n represents the shortest distance from the point P to the line $y = x$. Then, $\lim_{n \rightarrow \infty} (n \cdot d_n)$ has the value equal to

- $\frac{1}{2\sqrt{2}}$
- $\frac{1}{2}$
- $\frac{1}{\sqrt{2}}$
- 0

Question No. 11

Only One Option Correct Type

A person has to catch a train. To catch train, from his home he can take a taxi or take rickshaw or walk by foot with respective probabilities $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{6}$. Probability of him catching train when he takes rickshaw from his home is half that of when he takes the taxi and probability of catching the train when he walked by foot is $\frac{1}{4}$ th that of when he takes rickshaw. He finally reached the train, the probability he walked by his foot to catch the train, is

- $\frac{1}{33}$
- $\frac{2}{33}$
- $\frac{7}{33}$
- $\frac{13}{33}$

Question No. 12

Only One Option Correct Type

The number of values of x such that x , $[x]$ and $\{x\}$ are in arithmetic progression is equal to (where, $[\cdot]$ denotes the greatest integer function and $\{ \cdot \}$ denotes the fractional part function)

- 0
- 1
- 2
- 4

Question No. 13**Only One Option Correct Type**

If the function $f(x) = Pe^{2x} + Qe^x + Rx$ satisfies the conditions $f(0) = -1$, $f'(\log 2) = 31$ and $\int_0^{\log 4} (f(x) - Rx)dx = \frac{39}{2}$, then

- $P = 5, Q = -6, R = 3$
- $P = 5, Q = 2, R = 5$
- $P = -5, Q = 6, R = 3$
- $P = 3, Q = 2, R = 3$

Question No. 14**Only One Option Correct Type**

Let $f(x) = \begin{cases} \max\{|x|, x^2\}, & |x| \leq 3 \\ 12 - |x|, & 3 < |x| \leq 12 \end{cases}$. If S is the set of points in the interval $(-12, 12)$ at which f is not differentiable, then S is

- equal to $\{-3, 3\}$
- equal to $\{-3, -1, 1, 3\}$
- an empty set
- equal to $\{-3, -1, 0, 1, 3\}$

Question No. 15**Only One Option Correct Type**

The domain of the real valued function $f(x) = \frac{\sqrt{\log_{10}\left(\frac{x}{x-2}\right)}}{\sqrt{[x]^2 - 5[x] + 6}}$ is (Here $[x]$ denotes the greatest integer function)

- $(-\infty, 0) \cup (2, \infty)$
- $(2, \infty)$
- $(-\infty, 2) \cup (4, \infty)$
- $[4, \infty)$

Question No. 16**Only One Option Correct Type**

The common chord of two intersecting circles C_1 and C_2 can be seen from their centres at the angles of 90° and 60° respectively. If the distance between their centres is equal to $\sqrt{3} + 1$ then the radius of C_1 and C_2 are

- $\sqrt{3}$ and 3
- $\sqrt{2}$ and $2\sqrt{2}$
- $\sqrt{2}$ and 2
- $2\sqrt{2}$ and 4

Question No. 17**Only One Option Correct Type**

If $x^2 - x + 1 = 0$, then $\sum_{r=1}^{2011} \left(x^r + \frac{1}{x^r}\right)^3 =$

- 0
- 1
- 1
- none of these

Question No. 18**Only One Option Correct Type**

Let $f: \mathbb{R} \rightarrow \mathbb{R}$ and $f_n(x) = f(f_{n-1}(x)) \forall n \geq 2, n \in \mathbb{N}$. Then the roots of the equation $f_3(x)f_2(x)f(x) - 25f_2(x)f(x) + 175f(x) = 375$ which also satisfy the equation $f(x) = x$ will be

- 5 only
- 15 only
- 10 only
- 5, 15

Question No. 19**Only One Option Correct Type**

Let L be the least value of the expression $\frac{\cot 2x - \tan 2x}{1 + \sin\left(\frac{5\pi}{2} - 8x\right)}$ if $x \in \left(0, \frac{\pi}{8}\right)$ and M denotes

the value of $\frac{4(\cos^3 10^\circ + \sin^3 20^\circ)}{(\cos 10^\circ + \sin 20^\circ)}$. Find the value of $(L + M)$.

- 1
- 5
- 3
- 2

Question No. 20**Only One Option Correct Type**

Let A be a vertex of the ellipse $S \equiv \frac{x^2}{4} + \frac{y^2}{9} - 1 = 0$ and F be a focus of the ellipse $S' \equiv \frac{x^2}{9} + \frac{y^2}{4} - 1 = 0$. Let P be a point on the major axis of the ellipse $S' = 0$, which divides \overline{OF} in the ratio $2 : 1$ (O is the origin). If the length of the chord of the ellipse $S = 0$ through A and P is $\frac{3\sqrt{101}}{k}$, then $k =$

- 7
- 6
- 12
- 14

Mathematics Numerical (Maximum Marks: 20)

Question No. 1

Only One Option Correct Type

The remainder when $\left(\sum_{k=1}^5 {}^{20}C_{2k-1}\right)^6$ is divided by 11, is :

Question No. 2

Only One Option Correct Type

In the quadratic equation $A(\sqrt{3} - \sqrt{2})x^2 + \frac{B}{\sqrt{3} + \sqrt{2}}x + C = 0$ with α, β as its roots.

If $A = (49 + 20\sqrt{6})^{1/4}$ and $B =$ sum of the infinite G.P as

$8\sqrt{3} + \frac{8\sqrt{6}}{\sqrt{3}} + \frac{16}{\sqrt{3}} + \dots \infty$ and $|\alpha - \beta| = (6\sqrt{6})^k$ where

$k = \log_6 10 - 2\log_6 \sqrt{5} + \log_6 \sqrt{\log_6 18 + \log_6 72}$. Then the value of $\frac{C}{16} =$

Question No. 3

Only One Option Correct Type

The number of 6-digit numbers, such that the digits of each number are all from the set $\{1, 2, 3, 4, 5\}$; and any digit that appears in the number appears at least twice are equal to (Example : 225252 is an admissible number, while 222133 is not)

Question No. 4

Only One Option Correct Type

The highest positive integral value of λ so that the equation $x^2 - 5|x| + 6 - |\lambda - 2| = 0$ has four distinct roots is _____.

Question No. 5

Only One Option Correct Type

Let $f(x)$ and $g(x)$ are differentiable function of x such that

$$x^2(gf(x)) \cdot (f'g(x)) \cdot (g'(x)) = (1 - 2x^2)(g'f(x)) \cdot (f'(x))f(g(x)) \forall x \in R.$$

Moreover $g(x)$ is positive and $f(x)$ is non negative and $\int_0^k f(g(x))dx = 1 - e^{-k^2}$, then the value of $\ln\left(\frac{gf(3)}{gf(2)}\right)$ is P, find 4P.

Mera comeback to ho nhi rha bc, tum hi krlo, ab baswa reddy banunga mai toh 😊 chalo padhne baith jata hu nhi daddy case krdenge 😞 - that wrapthatass guy.