PHYSICS, CHEMISTRY & MATHEMATICS

QP CODE: 101103 **Paper-1**

Time Allotted: 3 Hours **Maximum Marks: 180**

- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.
- You are not allowed to leave the Examination Hall before the end of the test.

BATCHES – Two Year CRP426(R & W) _PT-5

INSTRUCTIONS

Caution: Question Paper CODE as given above MUST be correctly marked in the answer OMR sheet before attempting the paper. Wrong CODE or no CODE will give wrong results.

A. General Instructions

1. Attempt ALL the questions. Answers have to be marked on the OMR sheets.
2. This question paper contains **Three Sections.**
3. **Section-I** is Physics, **Section-II** is Chemistry and **Section-III** is Mathematics.
4. All the section can be filled in **PART-A & B** of OMR.
5. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
6. Blank Papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.

B. Filling of OMR Sheet

1. Ensure matching of OMR sheet with the Question paper before you start marking your answers on OMR sheet.
2. On the OMR sheet, darken the appropriate bubble with **_Blue/Black Ball Point Pen_** for each character of your Enrolment No. and write in ink your Name, Test Centre and other details at the designated places.
3. OMR sheet contains alphabets, numerals & special characters for marking answers.

C. Marking Scheme For All Two Parts.

(i) **Part-A (01-04) –** Contains Four (04) multiple choice questions which have ONLY ONE CORRECT answer Each question carries **+3 marks** for correct answer and **-1 marks** for wrong answer.

(ii) **PART–A** (**05–07**) contains (**3**) Multiple Choice Questions which have **One or More Than One Correct** answer.
Full Marks: **+4** If only the bubble(s) corresponding to all the correct options(s) is (are) darkened.
Partial Marks: **+1** For darkening a bubble corresponding **to each correct option,** provided NO incorrect option is darkened.
Zero Marks: **0** If none of the bubbles is darkened.
Negative Marks: **–1 In all other cases.**
For example, if **(A), (C) and (D)** are all the correct options for a question, darkening all these three will result in **+4 marks**; darkening only **(A) and (D)** will result in **+2 marks**; and darkening **(A) and (B)** will result in **–1** marks, as a wrong option is also darkened.

(iii) **Part-A (08-10) –** This section contains Three (03) Matching List Sets. Each set has **ONE** Multiple Choice Question. Each set has **TWO** lists: List-I and List-II. **List-I** has **Four** entries (P), (Q), (R) and (S) and **List-II** has **Five** entries (1), (2), (3), (4) and (5). **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question. Each question carries **+4 Marks** for correct answer and **-1 marks** for wrong answer.

(iii) **Part-B –** This section contains **SIX (06)** questions numerical based questions. The answer to each question is a **NUMERICAL VALUE**. If the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places. Each question carries **+4 marks** for correct answer. **There is no negative marking.**

Name of the Candidate: _____

Batch: _____ Date of Examination: _____

Enrolment Number: _____

SECTION – I: PHYSICS
(PART – A)
(Single Correct Answer Type)

This section contains **4 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. A flat mirror M is arranged parallel to a wall and light from a point source S on the wall is reflected back to the wall. With what velocity will be spot move along the wall if the mirror is brought up to the wall with a velocity v?
    (A) Zero   (B) 2v
    (C) v/2   (D) v
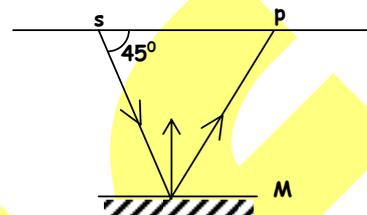
2. In the given diagram a wavefront AB moving in air is incident on a plane glass surface xy. Its position CD after refraction through the glass slab is shown also along with normals drawn at A and D. The refractive index of glass will not be equal to :

    (A) (BD/AC)   (B) (AB/CD)   (C) $(\sin\phi / \sin\phi')$ (D) $(\cos\theta / \cos\theta')$
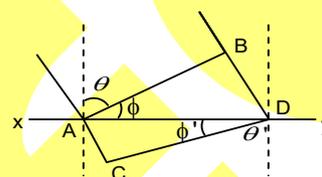
3. From a newly formed radioactive substance (Half life 2 hours), the intensity of radiation is 64 times the permissible safe level. The minimum time after which work can be done
    (A) 6 hours   (B) 12 hours   (C) 24 hours   (D) 128 hours

4. An object O is placed in front of a small plane mirror M_1 and a large convex mirror M_2 of focal length f. The distance between O and M_1 is x, and the distance between M_1 and M_2 is y. The images of O formed by M_1 and M_2 coincide. The magnitude of f is

    (A) $\dfrac{x^2 - y^2}{2y}$ (B) $\dfrac{x^2 + y^2}{2y}$ (C) $x - y$ (D) $\dfrac{x^2 + y^2}{x - y}$
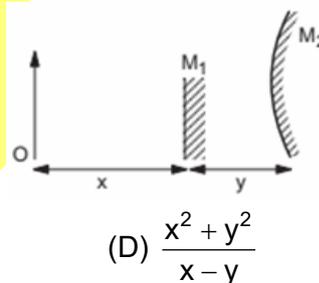
(One or More Than One Options Correct Type)

This section contains **3 multiple choice questions.** Each question has 4 choices (A), (B), (C) and (D), out of which **ONE** or **MORE THAN ONE** is correct.

5. An emf is produced in a coil, which is not connected to an external voltage source. This can be due to:
    (A) the coil being in a time-varying magnetic field.
    (B) the coil moving in a time-varying magnetic field.
    (C) the coil is moving in constant magnetic field.
    (D) the coil is stationary in external spatially varying magnetic field, which does not change with time.

Space For Rough Work

6.   AB and CD are smooth parallel rails, separated by a distance ℓ, and inclined to the horizontal at an angle θ. A uniform magnetic field of magnitude B, directed vertically upwards, exists in the region. EF is a conductor of mass m, carrying a current i. For EF to be in equilibrium,

(A) i must flow from E to F   (B) $Bi\ell = mg\tan\theta$

(C) $Bi\ell = mg\sin\theta$ (D) $Bi\ell = mg$
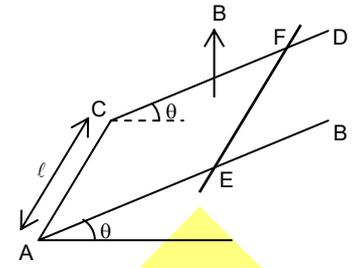
7.   An object of length 1 cm is placed on the principle axis of biconvex lens of radius 5 cm. Distance between the lens and object is 20 cm. Space between the lens and object is filled with medium of two different refractive index 2 and 1 as shown in the figure. Refractive index is 1 on the left of the object and on the right side of the lens. Boundary of both medium is mid-way between the object and lens as shown in figure. Choose from following the correct option(s).
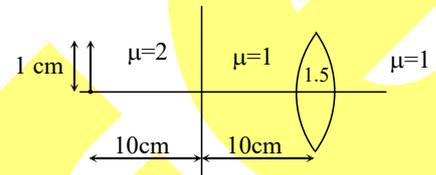
(A) The image will be formed at distance of 7.5 cm from the optical centre.
(B) The image will be formed at distance of 10 cm from the optical centre.
(C) The size of the image is 0.5 cm.
(D) The size of the image is 0.4 cm.

(Matching List Sets)

This section contains **Three (03)** Matching List Sets. Each set has **ONE** Multiple Choice Question. Each set has **TWO** lists: **List-I** and **List-II**. List-I has **Four** entries (P), (Q), (R) and (S) and **List-II** has **Five** entries (1), (2), (3), (4) and (5). **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.

8.

	List – I		List– II
(P)		(1)	1 and 2 attract each other
(Q)		(2)	1 and 2 repel each other
(R)		(3)	1 and 2 do not exert any force on each other
(S)		(4)	Magnetic field at point P due to wires 1 and 2 are perpendicular to each other.
		(5)	Magnetic field at point P due to wires 1 and 2 are in same direction.

(A) P → 3,4 ; Q → 3,4 ; R → 2,3 ; S → 2,5
(B) P → 3,4 ; Q → 3,4 ; R → 3,4 ; S → 3,5
(C) P → 3,4 ; Q → 1,4 ; R → 2,4 ; S → 3,5
(D) P → 2,4 ; Q → 1,5 ; R → 3,4 ; S → 1,5

9.   An optical instrument is made using four different mirror or lens but radius of curvature of each is R and refractive index of material of lens (μ) is 1.5. List-I gives the four different optical instruement (mirror / lens) and list-II of some quantity.

	List-I		List-II
(P)	Convex mirror	(1)	1
(Q)	Concave mirror	(2)	–1
(R)	Convex lens	(3)	2
(S)	Concave lens	(4)	–2
		(5)	–2/3

If the focal length of convex mirror is R/2 then the correct match for their focal length in terms of R/2.

(A) P → 1 ; Q → 2 ; R → 3 ; S → 4   (B) P → 4 ; Q → 3 ; R → 2 ; S → 1
(C) P → 3 ; Q → 2 ; R → 4 ; S → 1   (D) P → 1 ; Q → 4 ; R → 2 ; S → 3

Space For Rough Work

10. S_1 and S_2 in List-I represent coherent sources S, S_1, S_2 represent a point source
        λ = wavelength of light emitted by the sources.
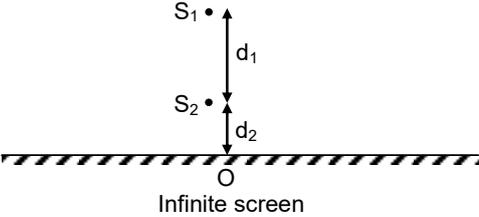
	List-I		List-II
(P)	 S_1 • d_1 S_2 • d_2 O Infinite screen	(1)	Number of maxima and minima is equal.
(Q)	 O d_2 S_1 S_1 d_1 Screen cylindrical	(2)	Number of maxima and minima not equal.
(R)	 S_1 t_1 $\mu = 1.5$ S S_2 t_1 $\mu = 1.5$ O $D >> d_1$ D = 1 meter	(3)	Central maxima above point O.
(S)	 A = 2° d_1 A $\mu = 1.5$ A = 2° $D >> d_1$ D = 1 O d_2	(4)	Central maxima at point O.
		(5)	Central maxima below point O.
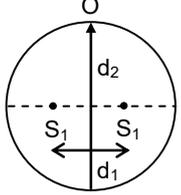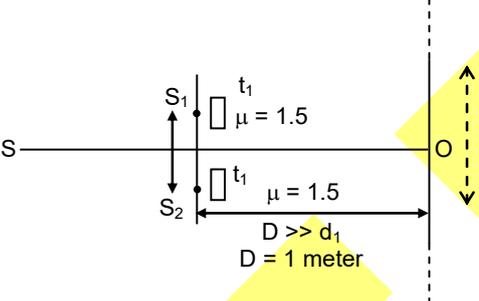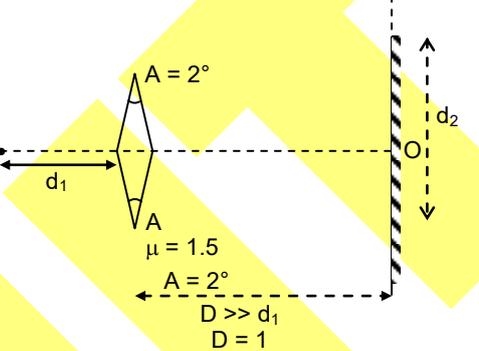
For $d_1 = 20\ \lambda$, $d_2 = 30\ \lambda$ $t_1 = 10^{-6}$ m and t_2 is 2×10^{-6} m, correct match is:

(A) P $\rightarrow$ 1,3 ; Q $\rightarrow$ 2 ; R $\rightarrow$ 4 ; S $\rightarrow$ 5   (B) P $\rightarrow$ 1 ; Q $\rightarrow$ 2,3 ; R $\rightarrow$ 3 ; S $\rightarrow$ 4
(C) P $\rightarrow$ 5 ; Q $\rightarrow$ 2, 3 ; R $\rightarrow$ 1 ; S $\rightarrow$ 2, 3   (D) P $\rightarrow$ 2 ; Q $\rightarrow$ 1 ; R $\rightarrow$ 5 ; S $\rightarrow$ 4, 2

Space For Rough Work

(PART – B)

This section contains **SIX (06)** numerical based questions. The answer to each question is a NUMERICAL VALUE. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.

1.   A point source of power 4W is placed 1m below the free surface of liquid whose refractive index is '$\dfrac{2}{\sqrt{3}}$'. Find the rate of transfer of energy (in watt) from the liquid surface to air. Ignore any absorption or scattering of light energy.

2.   An object is placed at a distance 3 meter from a symmetrical convex lens. Its image is formed at 2 m from the lens as shown in the figure.
     The position of image if lens is cut into two symmetrical plano convex lens and one of the plano convex lens is removed is $\dfrac{24}{x}$, then x will be
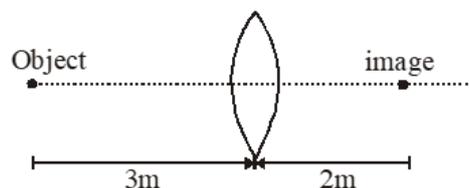
3.   A wire of fixed length is wound on a tube of length ℓ and radius r its self inductance is found to be L. Now, if same wire of fixed length is wound on a tube of length $\ell/2$ and radius r/2 its self inductance is found to be n L. Find the value of 'n'

4.   A light ray traveling in air is incident vertically on one face of a right angled prism with a refractive index $\mu = \sqrt{3}$ as shown in the figure. If $\theta = 60^0$ and the base of the prism is horizontal and silvered then the angle ϕ made by emergent ray with the normal to the right face of the prism in degree will be
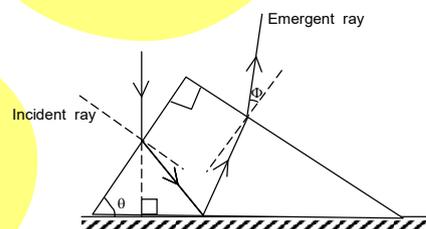
5.   In an AC circuit the phase difference between emf and current is $\pi/3$ then the power factor of the circuit is (1/n). Where 'n' is

6.   A thin prism is made of a material having refractive indices 1.61 and 1.65 for red and violet light. The dispersive power of the material is 0.07. It is found that a beam of yellow light passing through the prism suffers a minimum deviation of 4° in favorable conditions. Then the angle of prism will be

Space For Rough Work

SECTION – II: CHEMISTRY

(PART – A)

(Single Correct Answer Type)

This section contains **4 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. For the cell reaction, $X(s) + Y^{2+}(1M) \rightleftharpoons X^{2+}(1M) + Y(s)$, the emf is 1.6 V. E° of the cell is :

    (A) −1.6 V   (B) 1.6 V   (C) Zero volt   (D) 0.16 V

2. Which of the following thermodynamic quantity remains zero in forming an ideal solution?
    (A) $(\Delta H_{mix} - T\Delta S_{mix})$ (B) $(\Delta G_{mix} + T\Delta S_{mix})$ (C) $(\Delta H_{mix} + T\Delta S_{mix})$ (D) $(\Delta G_{mix} - T\Delta S_{mix})$

3. $NCl_3 + H_2O \longrightarrow NH_3 + (X)$

    $PCl_3 + H_2O \longrightarrow H_3PO_3 + (Y)$

    Which reaction produces both (X) and (Y) as the products?
    (A) $Cl_2 + NaOH \longrightarrow$ (B) $Cl_2 + H_2O \longrightarrow$

    (C) $Cl_2 + H_2 \longrightarrow$ (D) $Cl_2 + Na_2O_2 \longrightarrow$

4. The order of oxidizing agents is given correctly in
    (A) $MnO_4^{2-} > MnO_4^{-} > MnO_2$ (B) $HClO > F_2 > O_2$
    (C) $HNO_2 > NO_2 > HNO_3$ (D) $F_2 > O_3 > O_2$

(One or More Than One Options Correct Type)

This section contains **3 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE** or **MORE THAN ONE is correct.**

5.
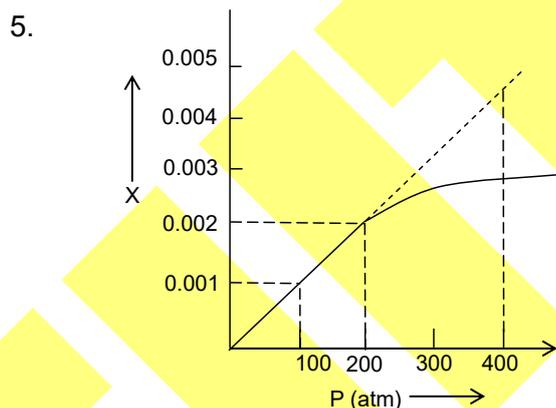
The solubility of a gas in water in terms of mole fraction(X) has been plotted versus partial pressure(P) of the gas above solution.
Choose the correct statements
(A) The Henry's law constant is 10^{-5} atm^{-1}
(B) The gas follows Henry's law upto 200 atm
(C) The gas cannot be HCl
(D) Solubility is directly proportional to Henry's law constant

Space For Rough Work

6. 18 g of glucose($C_6H_{12}O_6$) was dissolved in one Kg water. The resulting solution was cooled to -0.2°C. [K_f of H_2O = 1.86 K Kg mol^{-1}]. Choose correct statements from the following.
    (A) 70 g of ice is formed in the cooling process
    (B) if the solution is cooled to -0.4°C, 140 g of ice is formed
    (C) if more glucose is added to the solution, the freezing point of water will increase
    (D) K_f of H_2O does not change by adding solute or removing solvent

7. $Zn(s) \mid Zn^{2+}(0.01 \text{ M}) \mid\mid Ag^+(C \text{ M}) \mid Ag(s)$
    $E^o_{Zn^{2+}/Zn} = -0.76\,V, E^o_{Ag^+/Ag} = 1.8\,V$

    Choose correct statement(s) from the following?
    (A) E_{cell} will be 2.56 V if the concentration of Ag^+ becomes 0.1 M.
    (B) NH_4Cl solution can't be used as salt bridge for this electrochemical cell
    (C) ΔG will be equal to ΔG^o when the system attains equilibrium
    (D) E_{cell} will decrease if the cathode compartment is diluted

(Matching List Sets)
This section contains **Three (03)** Matching List Sets. Each set has **ONE** Multiple Choice Question. Each set has **TWO** lists: **List-I** and **List-II**. **List-I** has **Four** entries (P), (Q), (R) and (S) and **List-II** has **Five** entries (1), (2), (3), (4) and (5). **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.

8. Match the ions mentioned in List-I with information about their structures mentioned in List-II.

List-I		List-II	
(P)	$S_2O_4^{2-}$	(1)	Contains S – S bond
(Q)	$S_2O_6^{2-}$	(2)	Contains S – O – S bond
(R)	$S_2O_7^{2-}$	(3)	Contains O – O bond
(S)	$S_2O_8^{2-}$	(4)	Contains lone pairs on sulphur atom
		(5)	Contains S = S bond

The correct option is:

(A) (P) → (3, 4), (Q) → (1), (R) → (5), (S) → (4)
(B) (P) → (1, 4), (Q) → (1), (R) → (2), (S) → (3)
(C) (P) → (2, 3), (Q) → (5), (R) → (2), (S) → (1)
(D) (P) → (4, 5), (Q) → (2), (R) → (3), (S) → (5)

9. Match the compounds mentioned in List-I with their changing reagents mentioned in List-II.

List-I		List-II	
(P)	$Cr(OH)_3$ (solid)	(1)	Changes from black to white by H_2O_2
(Q)	$FeCl_3$(solution)	(2)	Changes from white to blue by H_2O
(R)	PbS(solid)	(3)	Changes from light brown to red solution by NaSCN
(S)	$CuSO_4$(solid)	(4)	Changes from green to yellow by Na_2O_2
		(5)	Changes from light brown to green by H_2S

The correct option is:

(A) (P) → (1), (Q) → (2), (R) → (3), (S) → (4)
(B) (P) → (2), (Q) → (1), (R) → (5), (S) → (4)
(C) (P) → (4), (Q) → (5), (R) → (1), (S) → (2)
(D) (P) → (5), (Q) → (3), (R) → (2), (S) → (1)

Space For Rough Work

10.   Match the lists

List - I		List - II	
(P)	[Ni(CO)$_4$]	(1)	Shows geometrical isomerism
(Q)	[Cu(CN)$_4$]$^{3-}$	(2)	The oxidation state of metal is +1
(R)	Fe(CO)$_5$	(3)	d-orbital participates in hybridization
(S)	[Cr(NH$_3$)$_4$Cl$_2$]Br	(4)	Metal atoms undergoes sp^3 hybridization
		(5)	Trigonal bipyramidal shape

The correct option is:

(A) (P) → (4), (Q) → (2), (R) → (3, 5), (S) → (1, 3)
(B) (P) → (3), (Q) → (3), (R) → (1, 4), (S) → (1, 5)
(C) (P) → (2), (Q) → (1), (R) → (2, 3), (S) → (2, 4)
(D) (P) → (1), (Q) → (4), (R) → (4, 5), (S) → (2, 3)

(PART – B)

This section contains **SIX (06)** numerical based questions. The answer to each question is a NUMERICAL VALUE. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.

1.   What is the sum of the number of 3d orbitals of the metal/metal ion(s), used in hybridization, in the following complexes?
Fe(CO)$_5$, Ni(CO)$_4$, [Cu(CN)$_4$]$^{2-}$, [Cr(NH$_3$)$_6$]$^{3+}$, [Co(H$_2$O)$_6$]$^{3+}$, K$_4$[Fe(CN)$_6$], [FeF$_6$]$^{3-}$

2.   The conductivity of 0.1 M solution of an electrolyte MX$_2$ is 21.4×10^{-4} ohm^{-1} cm^{-1}. The molar conductivity of the ions at infinite dilution is given as

$\lambda^0_{M^{2+}} = 25.3$ ohm^{-1} cm^2 mol^{-1}

$\lambda^0_{X^-} = 14.1$ ohm^{-1} cm^2 mol^{-1}

What is the degree of dissociation of the electrolyte?

3.
1.8 M C$_6$H$_{12}$O$_6$ solution	0.1 M KCl solution

        T = 280 K   T = 320 K

The degree of dissociation of KCl is 0.8. If the ratio of osmotic pressures of the two solutions is expressed by the simple ratio x : y, what is (x + y)?

4.   M(s) | M^{2+}(1M) || N^{2+}(1 M) | N(s)
$E^0_{N^{2+}/N} = 0.62\,V, E^0_{M^{2+}/M} = 0.14\,V$

If the value of ΔG° of the above electrochemical cell in kJ mol^{-1} unit is –x , what is the value of x?

5.   The formula of ferric ferro cyanide is
Fe$_4$[Fe(CN)$_6$]$_3$
Let x = Co-ordination number of iron
      y = Number of Fe^{2+} - CN bonds
What is the value of (x + y)?

6.   The vapour pressure of the mixture of liquid A and B is expressed as
V.P = 400 – 80 X$_A$
If the ratio of p^0_A to p^0_B is expressed as x : y, then value of (x + y) is

Space For Rough Work

SECTION – III: MATHEMATICS

(PART – A)

(Single Correct Answer Type)

This section contains **4 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. The solution of differential equation $(x \cot y + \ln \cos x) dy + (\ln \sin y - y \tan x) dx = 0$ is

    (A) $(\sin x)^y (\cos y)^x = c$ (B) $(\sin y)^x (\cos x)^y = c$

    (C) $(\sin x)^y (\sin y)^x = c$ (D) $(\cot x)^y (\cot y)^x = c$

2. Let $f(x) = \begin{vmatrix} \sin x & \sin(x+h) & \sin(x+2h) \\ \sin(x+2h) & \sin x & \sin(x+h) \\ \sin(x+h) & \sin(x+2h) & \sin x \end{vmatrix}$.

    If $\underset{h \to 0}{Lim} \dfrac{f(x)}{h^2}$ has the value equal to $k(\sin 3x + \sin^3 x)$ then $k(\in N)$ is equal to

    (A) 2   (B) 3   (C) 4   (D) 5

3. The area bounded by the curve $|x| = \cos^{-1} y$ and the line $|x| = 1$ and the x-axis is

    (A) cos 1   (B) sin 1   (C) 2 cos 1   (D) 2 sin 1

4. The point of intersection of the plane $\vec{r} \cdot (3i - 5j + 2k) = 6$ with line passing through the origin and perpendicular to the plane $2x - y - z = 4$ is (x_0, y_0, z_0) then value of $2x_0 - 3y_0 + z_0$ is

    (A) 0   (B) 2   (C) 3   (D) 4

(One or More Than One Options Correct Type)

This section contains **3 multiple choice questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE** or **MORE THAN ONE is correct.**

5. $\vec{a}, \vec{b}$ and $\vec{c}$ are three coplanar unit vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$. If three vectors $\vec{p}, \vec{q}$ and $\vec{r}$ are parallel to $\vec{a}, \vec{b}$ and $\vec{c}$, respectively, and have integral but different magnitudes, then among the following options, $|\vec{p} + \vec{q} + \vec{r}|$ can take a value equal to

    (A) 1   (B) 0   (C) $\sqrt{3}$ (D) 2

6. If $f(x) + g(x) + h(x) = 2 \, \forall x \in R$ then the value of expression $\int\limits_0^{3/4} (f^2(x) + g^2(x) + h^2(x)) dx$ can be

    (A) $\dfrac{1}{2}$ (B) 1   (C) $\dfrac{3}{2}$ (D) 4

Space For Rough Work

7.   The vector $\frac{1}{3}\left(2\hat{i}-2\hat{j}+\hat{k}\right)$ is:

(A) a unit vector

(B) makes an angle $\frac{\pi}{3}$ with the vector $2\hat{i}-4\hat{j}+3\hat{k}$

(C) parallel to the vector $-\hat{i}+\hat{j}-\frac{1}{2}\hat{k}$

(D) perpendicular to the vector $3\hat{i}+2\hat{j}-2\hat{k}$

(Matching List Sets)

This section contains **Three (03)** Matching List Sets. Each set has **ONE** Multiple Choice Question. Each set has **TWO** lists: List-I and List-II. List-I has **Four** entries (P), (Q), (R) and (S) and **List-II** has **Five** entries (1), (2), (3), (4) and (5). **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.

8.   Match the expression in List – I with the appropriate value in List – II

List – I		List – II	
(P)	$f(x)=\begin{vmatrix} \sin(x+\alpha) & \sin(x+\beta) & \sin(x+\gamma) \\ \cos(x+\alpha) & \cos(x+\beta) & \cos(x+\gamma) \\ \sin(\beta+\gamma) & \sin(\gamma+\alpha) & \sin(\alpha+\beta) \end{vmatrix}$ and $f(0)=0$, then $\displaystyle\sum_{j=-5}^{5} f(j)$ equals	(1)	-1
(Q)	If $\sin 2x=1$, then $f(x)=\begin{vmatrix} 0 & \cos x & -\sin x \\ \sin x & 0 & \cos x \\ \cos x & \sin x & 0 \end{vmatrix}^{2}$ equals	(2)	0
(R)	If $f(x)=\begin{vmatrix} \sin x & \sec x & x^2-1 \\ \cos ec\, x & x\sin x & \cos x \\ \tan x & x\tan x & x^2+1 \end{vmatrix}$ then $\displaystyle\int_{-\pi/3}^{\pi/3} f(x)dx$ equals	(3)	2
(S)	Maximum value of the determinant $\begin{vmatrix} 1+\sin^2 x & \cos^2 x & \sin 2x \\ \sin^2 x & 1+\cos^2 x & \sin 2x \\ \sin^2 x & \cos^2 x & 1+\sin 2x \end{vmatrix}$	(4)	3
		(5)	1

(A) P → 2, Q →2, R →4, S →1   (B) P → 2, Q →2, R →2, S →4
(C) P → 2, Q →1, R →2, S →5   (D) P → 5, Q →2, R →2, S →1

Space For Rough Work

9.   Consider a system of linear equations $3x + y - z = 0$; $x - \dfrac{py}{4} + z = 2$ and $2x - y + 2z = q$

where $p, q \in I$ and $p, q \in [1, 10]$ then identify correct statement

	List – I		List – II
(P)	Number of ordered pairs (p, q) for which system of equation has unique solution	(1)	1
(Q)	Number of ordered pairs (p, q) for which system of equation has no solution	(2)	9
(R)	Number of ordered pairs (p, q) for which system of equation has infinite solution	(3)	10
(S)	Number of ordered pairs (p, q) for which system of equation has at least one solution	(4)	90
		(5)	91

(A) P → 4, Q →2, R →1, S →5   (B) P →4, Q →3, R →1, S →4
(C) P → 4, Q →3, R →2, S →5   (D) P →4, Q →2, R →2, S →4

10.   Answer the following by appropriately matching the lists

	List – I		List – II
(P)	The area bounded by $y = 3x$ and $y = x^2$	(1)	$\dfrac{2}{3}$
(Q)	The area bounded by $x = 4 - y^2$ and the y-axis	(2)	$\dfrac{17}{12}$
(R)	The area in square units of the region bounded by the curve $x^2 = 4y$ on the line $x = 2$ and the x-axis is	(3)	$\dfrac{32}{3}$
(S)	The area bounded by $y = x^3$, $y = x^2$ and $x = 1$, $x = 2$	(4)	$\dfrac{32}{9}$
		(5)	$\dfrac{9}{2}$

Which is correct option?

(A) P→ 5, Q→ 3, R→ 1, S→ 2   (B) P→ 2, Q→ 1, R→ 3, S→ 5
(C) P→ 4, Q→ 3, R→ 2, S→ 1   (D) P→ 2, Q→ 3, R→ 5, S→ 2

Space For Rough Work

(PART – B)

This section contains **SIX (06)** numerical based questions. The answer to each question is a NUMERICAL VALUE. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.

1. Let the equation of the plane containing line $x - y - z - 4 = 0 = x + y + 2z - 4$ and parallel to the line of intersection of the planes $2x + 3y + z = 1$ and $x + 3y + 2z = 2$ be $x + Ay + Bz + C = 0$. Then find the value of $|A + B + C - 4|$.

2. Let $a_r = r\left({}^7C_r\right)$, $b_r = (7-r)\left({}^7C_r\right)$ and $A_r = \begin{pmatrix} a_r & 0 \\ 0 & b_r \end{pmatrix}$. If $A = \sum_{r=0}^{7} A_r = \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}$, then the value of

   $\dfrac{(a+b)}{128}$ must be

3. Let 'a' be a positive constant number. Consider two curves $C_1 : y = e^x$, $C_2 : y = e^{a-x}$. Let S be the area of the part surrounded by C_1, C_2 and the y-axis, then $\lim\limits_{a \to 0} \dfrac{4S}{a^2}$ equals:

4. Let matrix $A = \begin{bmatrix} x^3 + 1 & x + 5 & 3x + 2 \\ y + 1 & -6x^2 + 2 & z - 1 \\ 2 & 3 & 9x + 6 \end{bmatrix}$ and $|A| = 3$. If $f(x) = Tr\left(B^{-1}\right)$ and $B = Adj(A)$ then

   global maxima value of $f(x)$ in $x \in [0, 6]$ is equal to

5. A particle moves in a straight line with a velocity given by $\dfrac{dx}{dt} = x + 1$ (x is the distance travelled). If the time taken by a particle to traverse a distance of 99m if λ, then the value of $20\lambda \log_{10} e$ must be

6. If $f(x) = \begin{vmatrix} 1 & 3\cos x & 1 \\ \sin x & 1 & 3\cos x \\ 1 & \sin x & 1 \end{vmatrix}$, the maximum value of $f(x)$ is _____

Space For Rough Work

FIITJEE INTERNAL TEST

BATCHES – Two Year CRP426(R & W)

Phase Test – 5 (Paper-1)
Code: 101103
JEE ADVANCED
ANSWER KEY

ANSWER KEYS

Physics
PART – A

1.	B	2.	B	3.	B	4.	A
5.	ABC	6.	AB	7.	AC	8.	B
9.	A	10.	D				

PART – B

1.	1	2.	2	3.	2	4.	0
5.	2	6.	7				

Chemistry
PART – A

1.	B	2.	B	3.	B	4.	D
5.	ABC	6.	AD	7.	ABD	8.	B
9.	C	10.	A				

PART – B

1.	6	2.	0.4	3.	39	4.	92.64
5.	24	6.	9				

Mathematics
PART – A

1.	B	2.	B	3.	D	4.	D
5.	CD	6.	BCD	7.	ACD	8.	B
9.	A	10.	A				

PART – B

1.	6	2.	7	3.	1	4.	21
5.	40	6.	10				