

**PHYSICS, CHEMISTRY & MATHEMATICS****QP CODE: 100883****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.

**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 option(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 (08-11)** – This section contains Four (04) 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 **+3 Marks** for correct answer and **-1 marks** for wrong answer.
- (iii) **Part-B (01-06)** 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. Each question carries **+4 marks** for correct answer. **There is no negative marking.**

Name of the Candidate: \_\_\_\_\_

Batch: \_\_\_\_\_ Date of Examination: \_\_\_\_\_

Enrolment Number: \_\_\_\_\_

**BATCH – NWCMSW425A1\_PT-3**

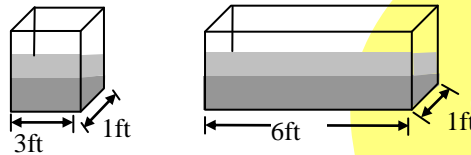
## **SECTION – I: PHYSICS**

### **(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. The period of a particle executing SHM is 8 sec. At  $t = 0$  it is at the mean position. The ratio of the distances covered by the particle in the 1<sup>st</sup> second to the 2<sup>nd</sup> second is:
- (A)  $\frac{1}{\sqrt{2}+1}$       (B)  $\sqrt{2}$       (C)  $\frac{1}{\sqrt{2}}$       (D)  $\sqrt{2}+1$
2. The figure shows two fish tank, each having ends of width 1 foot. Tank A is 3 feet long while tank B is 6 feet long. Both tanks are filled with 1 foot of water.



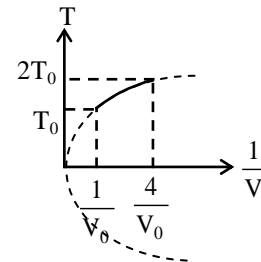
$S_A$  = the magnitude of the force of the water on the end of tank A.

$S_B$  = the magnitude of the force of the water on the end of tank B.

$B_A$  = the magnitude of the force of the water on the bottom of tank A.

$B_B$  = the magnitude of the force of the water on the bottom of tank B Using the notation given above, Which one of the following sets of equations below is correct for this situation ?

- (A)  $S_A = S_B$  and  $B_A = B_B$       (B)  $S_A = 2S_B$  and  $B_A = B_B$   
 (C)  $2S_A = S_B$  and  $2B_A = B_B$       (D)  $S_A = S_B$  and  $2B_A = B_B$
3. Figure shows a parabolic graph between  $T$  and  $\frac{1}{V}$  for a mixture of a gas undergoing an adiabatic process. What is the ratio of  $V_{rms}$  of molecules and speed of sound in mixture? (Given:  $\gamma = \frac{3}{2}$ )
- (A)  $\frac{\sqrt{3}}{2}$       (B)  $\sqrt{2}$   
 (C)  $\frac{\sqrt{2}}{3}$       (D)  $\sqrt{3}$



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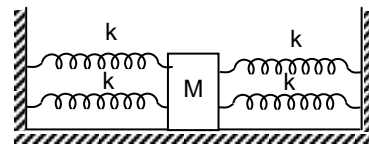
4. Time period of mass  $m$  for small oscillation is

(A)  $2\pi\sqrt{\frac{4k}{m}}$

(B)  $2\pi\sqrt{\frac{m}{k}}$

(C)  $2\pi\sqrt{\frac{m}{4k}}$

(D)  $2\pi\sqrt{\frac{m}{(k/4)}}$



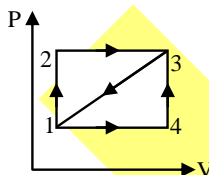
(One or More Than One Options Correct Type)

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. If one of the slits of a standard young's double slit experiment is covered by a thin parallel slit glass so that it transmits only one half the light intensity of the other, then:

- (A) The fringe pattern will get shifted towards the covered slit  
 (B) The fringe pattern will get shifted away from the covered slit  
 (C) The bright fringes will become less bright and the dark ones will become more bright  
 (D) The fringe width will remain unchanged

6. For the PV diagram shown, for path 1-2-3, 100 J of heat is given to the system and 40 J of work is done by the system. For path 1-4-3 the work done by system is 10 J. Then -



- (A)  $U_3 - U_1 = 60$  joule, where  $U_3$  &  $U_1$  are internal energy of gas  
 (B) for path  $3 \rightarrow 1$  the heat is rejected and equal to 85 joule  
 (C) for path  $1 \rightarrow 4$  the work done by system is 10 joule  
 (D) for path  $1 \rightarrow 4$  the heat given to system is 20 joule

7. A SHM is given by  $y = (\sin \omega t + \cos \omega t)$ . Which of the following statement are true?

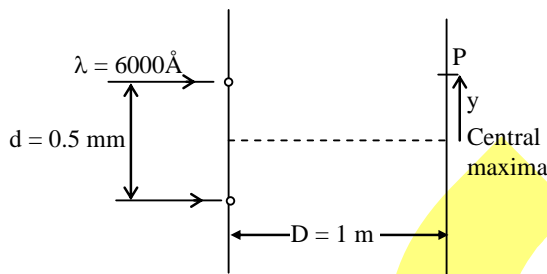
- (A) The amplitude is 1 m.  
 (B) The amplitude is  $\sqrt{2}$  m.  
 (C) When  $t = 0$ , the amplitude is 0 m.  
 (D) When  $t = 0$ , the amplitude is 1 m.

Space For Rough Work

**(Matching List Sets)**

This section contains **FOUR (04)** 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. In YDSE light of wavelength  $\lambda = 6000\text{\AA}$  is used screen distance  $D = 1\text{ m}$  and slit separation  $d = 0.5\text{ mm}$ . Intensity of light on screen emerging from slits are individually  $I_0$  and  $4I_0$ . List-I indicates distance of certain point P on screen from central maxima. Match the entries of columns.



List-I		List-II	
(P)	$y = 2\text{ mm}$	(1)	Intensity = $7I_0$ at P
(Q)	$y = 2.2\text{ mm}$	(2)	Intensity = $3I_0$ at P
(R)	$y = 2.6\text{ mm}$	(3)	P lies between 2 <sup>nd</sup> minima and 3 <sup>rd</sup> maxima
(S)	$y = 2.8\text{ mm}$	(4)	P lies between 3 <sup>rd</sup> minima and 2 <sup>nd</sup> maxima

The correct option is:

- (A) P  $\rightarrow$  2,3 ; Q  $\rightarrow$  1,2 ; R  $\rightarrow$  1,2,4 ; S  $\rightarrow$  2,3  
 (B) P  $\rightarrow$  2,3 ; Q  $\rightarrow$  1,3 ; R  $\rightarrow$  1,3,4 ; S  $\rightarrow$  2,3,4  
 (C) P  $\rightarrow$  2,4 ; Q  $\rightarrow$  3 ; R  $\rightarrow$  1,2,4 ; S  $\rightarrow$  1,3,4  
 (D) P  $\rightarrow$  1,2 ; Q  $\rightarrow$  4 ; R  $\rightarrow$  1,4 ; S  $\rightarrow$  2,3
9. List-I contains different arrangements and List-II contains capillary rise of water in those arrangements. Surface tension of water is  $S$  and density is ' $\rho$ '. Match the following:

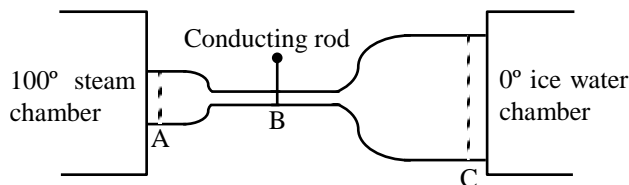
List-I		List-II	
(P)	Silver tube of radius R immersed in water	(1)	$\frac{2S}{R\rho g}$
(Q)	Glass tube of radius R immersed in water	(2)	$\frac{4S}{R\rho g}$
(R)	Hollow co-axial cylinder made of glass, having inner and outer radius R and 2R respectively immersed in water	(3)	$\frac{3S}{R\rho g}$
(S)	Two parallel glass plate separated by distance 'R' immersed in water.	(4)	Zero

The correct option is:

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

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10. A copper rod (initially at room temperature  $20^{\circ}\text{C}$ ) of non-uniform cross section is placed between a steam chamber at  $100^{\circ}\text{C}$  and ice-water chamber at  $0^{\circ}\text{C}$ .



List-I		List-II	
(P)	Initially rate of heat flow $\left[\frac{dQ}{dt}\right]$ will be	(1)	maximum at section A
(Q)	At steady state rate of heat flow $\left[\frac{dQ}{dt}\right]$ will be	(2)	maximum at section B
(R)	At steady state temperature gradient $\left \frac{dT}{dx}\right $ will be	(3)	minimum at section C
(S)	At steady state rate of change of temperature $\left[\frac{dT}{dx}\right]$ at a certain point will be	(4)	same for all section

The correct option is:

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

11. The displacement equation of a standing wave in air is given by

$$y = A \cos kx \cos \omega t$$

Match the physical quantities in the List-I, to the correct plots in the List-II.

List-I		List-II	
(P)	Displacement $y$ of the particles at $t = T/2$	(1)	
(Q)	Velocity of the particles at $t = T/4$	(2)	
(R)	Change in pressure of the medium at $t = 0$	(3)	
(S)	Density of the medium at $t = T/2$	(4)	

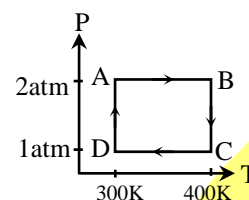
The correct option is:

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

Space For Rough Work

**(PART – B)****(Non – Negative Integer)**

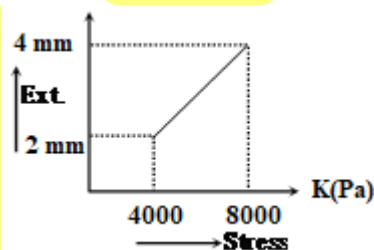
1. Two moles of helium gas undergoes a cyclic process as shown. Assuming the gas to be ideal then the net work done by the gas is  $XR\ln 2$ . Find the value of 'X'.



2. A glass capillary sealed at the upper end is of length 0.11 m and internal diameter  $2 \times 10^{-5}$  m. This tube is immersed vertically into a liquid of surface tension  $5.06 \times 10^{-2}$  N/m. When the length  $x \times 10^{-2}$  m of the tube is immersed in liquid then the liquid level inside and outside the capillary tube becomes the same, then the value of x is: (Assume atmospheric pressure is  $1.01 \times 10^5 \frac{\text{N}}{\text{m}^2}$ )

3. A string of length  $\ell$  is fixed at both ends and is vibrating in second harmonic. The amplitude at antinodes is 2 mm and the amplitude of a particle at a distance  $\frac{\ell}{8}$  from fixed end is  $\frac{a}{\sqrt{2}}$  mm then the value of a is \_\_\_\_\_ mm.

4. In determination of young modulus of elasticity of wire, a force is applied and extension is recorded. Initial length of wire is '1m'. The curve between extension and stress is depicted then young modulus of wire will be  $K \times 10^9$  N/m<sup>2</sup>, where K is:



5. An observer is moving towards a source with speed 15 m/s. The source is moving with speed 5 m/s in the same direction. Air is blowing with speed 10 m/s from observer to source. If frequency of sound emitted is 325 Hz then frequency (in Hz) of sound heard by observer (velocity of sound in air = 330 m/s) minus 330 Hz will be equal to—
6. A particle moving with SHM in a straight line has a speed of 6 m/s when 4 m from the centre of oscillations and a speed of 8 m/s when 3 m from the centre. Find the amplitude in meter of oscillation.

*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**.

- Aqueous solution of which of the following complex has maximum conductivity?  
 (A)  $[\text{Fe}(\text{H}_2\text{O})_4\text{Cl}_2]\text{Cl}$  (B)  $[\text{Fe}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2$   
 (C)  $[\text{Fe}(\text{H}_2\text{O})_6]\text{Cl}_3$  (D)  $[\text{Fe}(\text{H}_2\text{O})_3\text{Cl}_3]$
- Which of the following is NOT an ionic compound?  
 (A) CaO (B)  $\text{SiO}_2$   
 (C) BaO (D)  $\text{Na}_2\text{O}$
- Which of the following complex has the largest co-ordination number?  
 (A)  $[\text{Zn}(\text{OH})_4]^{2-}$  (B)  $[\text{Ni}(\text{NH}_3)_4][\text{PtCl}_4]$   
 (C)  $[\text{Cr}(\text{en})_3]^{2+}$  (D)  $[\text{Fe}(\text{CO})_5]$
- Which of the following is a colourless complex?  
 (A)  $[\text{Fe}(\text{CN})_6]^{3-}$  (B)  $[\text{Fe}(\text{CN})_6]^{4-}$   
 (C)  $[\text{FeF}_6]^{3-}$  (D)  $[\text{FeF}_6]^{4-}$

#### **(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**.

- Which of the following statement(s) is/are correct for  $\text{Ni}(\text{CO})_4$ ?  
 (A) Nickel undergoes  $sp^3$  hybridization  
 (B) It is a paramagnetic substance  
 (C) Both sigma donation and pi acceptance takes place  
 (D) On heating it produces  $\text{NiCO}_3 + \text{CO} + \text{CO}_2$
- $sp^3$ -hybridization is found in  
 (A)  $[\text{ZnCl}_4]^{2-}$  (B)  $[\text{Cu}(\text{NH}_3)_4]^{2+}$   
 (C)  $[\text{CuCl}_4]^{2-}$  (D)  $[\text{Ni}(\text{CO})_4]$
- Which is/are the correct statements?  
 (A) CFSE of  $[\text{Co}(\text{NH}_3)_6]^{3+} < [\text{Rh}(\text{NH}_3)_6]^{3+} < [\text{Ir}(\text{NH}_3)_6]^{3+}$   
 (B) CFSE of  $[\text{Co}(\text{NH}_3)_6]^{3+} < [\text{Co}(\text{en})_3]^{3+}$   
 (C)  $\Delta_0 < P$  low spin state is more stable  
 (D) CFSE of  $[\text{Cr}(\text{H}_2\text{O})_6]^+$  and  $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$  are zero

*Space For Rough Work*

**(Matching List Sets)**

This section contains **FOUR (04)** 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 complexes mentioned in list – I with the isomerism which they show, mentioned in list – II

	List – I		List– II
(P)	$[\text{Cr}(\text{NH}_3)_4\text{BrCl}]\text{I}$	(1)	Ionization isomerism
(Q)	$[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$	(2)	Linkage isomerism
(R)	$[\text{Fe}(\text{gly})_3]$	(3)	Coordination isomerism
(S)	Cis – $[\text{Cr}(\text{en})_2\text{Cl}(\text{CN})]\text{Br}$	(4)	Geometrical isomerism
		(5)	Optical isomerism

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

9. Match the lists.

	List – I (Compounds)		List– II (Properties)
(P)	$\text{NH}_3$	(1)	Bond angle is greater than that of $\text{CH}_4$
(Q)	$\text{NF}_3$	(2)	Back bond does not take place due to very less difference in electronegativity
(R)	$\text{NCl}_3$	(3)	More basic than $\text{NF}_3$
(S)	$\text{NO}_2^+$	(4)	Lone pair moment and bond pair moment act in opposite direction
		(5)	Central atom undergoes sp-hybridization

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

10. Match the lists.

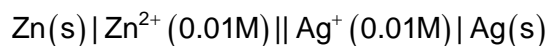
	List – I (Periodic properties)		List– II (Order of elements)
(P)	First ionization energy	(1)	S > O
(Q)	Second ionization energy	(2)	F > Cl
(R)	Electron affinity	(3)	N > O
(S)	Electronegativity	(4)	B > Be
		(5)	Cl > F

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

Space For Rough Work



11. Match the characteristics of the following electrochemical cell mentioned in list-I with their numerical values mentioned in list-II.



$$E_{\text{Zn}^{2+}/\text{Zn}}^0 = -0.76\text{V}, E_{\text{Ag}^+/\text{Ag}}^0 = +0.8\text{V}$$

$$\left[ \text{Assume: } \frac{2.303RT}{F} = 0.06 \right]$$

	List – I		List– II
(P)	$E_{\text{Cell}}^0$ in volt unit	(1)	100
(Q)	$E_{\text{Cell}}$ in volt unit	(2)	1.56
(R)	$\Delta G$ in kJ unit	(3)	-289.5
(S)	Reaction quotient	(4)	1.5
		(5)	-194.5

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

### (PART – B)

(Non – Negative Integer)

- How many 3d-transition series metal(s) contain(s) full-filled 3d-subshell configuration in uncombined state?
- How many hybrid orbital(s) is/are present around Xe in  $\text{XeO}_4$ ?
- $\text{FeCl}_3 + \text{K}_4[\text{Fe}(\text{CN})_6] \longrightarrow \text{Fe}_x[\text{Fe}(\text{CN})_6]_y$   
In above reaction, the sum of x and y is
- If the ratio of molar conductance to equivalent conductance  $\left(\frac{\Lambda_m}{\Lambda_e}\right)$  of Mohr's salt,  $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$  is x : y, what is the value of (x + y)?
- How many moles of AgCl are formed if one mole of the complex hexamminechromium (III) chloride is treated with excess of  $\text{AgNO}_3$  solution?
- How many Faraday of electricity is needed to obtain 22.4 L of  $\text{O}_2$  gas at NTP from water by electrolysis?

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. Out of 13 applicants for a job, there are 8 men and 5 women. It is desired to select 2 persons for the job. The probability that at least one of the selected persons will be a woman, is  
 (A)  $\frac{5}{13}$  (B)  $\frac{10}{13}$   
 (C)  $\frac{14}{39}$  (D)  $\frac{25}{39}$
2. 4 point out of 8 points in a plane are collinear. Number of different quadrilateral that can be formed by joining them is  
 (A) 56 (B) 53  
 (C) 76 (D) 60
3. The value of  $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ$  is  
 (A)  $\frac{1}{36}$  (B)  $\frac{1}{32}$   
 (C)  $\frac{1}{18}$  (D)  $\frac{1}{16}$
4. If the 6<sup>th</sup> term in the expansion of  $\left(\frac{1}{x^{8/3}} + x^2 \log_{10} x\right)^8$  is 5600, then value of x is  
 (A) 2 (B)  $\sqrt{5}$   
 (C)  $\sqrt{10}$  (D) 10

#### **(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.  $\begin{bmatrix} 2x+1 & 3y \\ 0 & y^3-5y \end{bmatrix} = \begin{bmatrix} x+3 & y^2+2 \\ 0 & -6 \end{bmatrix}$  then  
 (A)  $x = 2$  (B)  $x = 3$   
 (C)  $y = 2$  (D)  $y = 3$

*Space For Rough Work*

6. If in a triangle ABC,  $\angle B = 60^\circ$ , then
- (A)  $(a - b)^2 = c^2 - ab$  (B)  $(b - c)^2 = a^2 - bc$   
 (C)  $(c - a)^2 = b^2 - ac$  (D)  $a^2 + b^2 + c^2 = 2b^2 + ac$
7. If A and B are two independent events such that  $P(A) = \frac{1}{2}$  and  $P(\bar{B}) = \frac{4}{5}$ , then:
- (A)  $P\left(\frac{A}{A \cup B}\right) = \frac{5}{6}$  (B)  $P\left(\frac{A \cap B}{A' \cup B'}\right) = 0$   
 (C)  $P\left(\frac{A}{B}\right) = \frac{1}{2}$  (D)  $P(\bar{A} \cap \bar{B}) = \frac{2}{5}$

**(Matching List Sets)**

This section contains **FOUR (04)** 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 each entry in **List – I** to the correct entry in **List – II**.

	<b>List – I</b>		<b>List – II</b>
(P)	The number of all the matrices $A = [a_{ij}]$ , $1 \leq i, j \leq 4$ such that $a_{ij} = \pm 1$ and $\sum_{i=1}^4 a_{ij} = \sum_{j=1}^4 a_{ij} = 0$ is	(1)	15
(Q)	The number of non – zero diagonal matrices of order 4 satisfying $A^2 = A$ is	(2)	97
(R)	The number of irrational terms in the expansion of $\left(5^{\frac{1}{8}} + 2^{\frac{1}{6}}\right)^{100}$ is	(3)	35
(S)	The number of diagonals that can be drawn by joining the vertices of an octagon is	(4)	90
		(5)	20

The correct option is

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

Space For Rough Work

9. Match each entry in **List – I** to the correct entry in **List – II**.

List – I		List – II	
(P)	If the sides of a triangle are in ratio 3 : 7 : 8, then $\frac{2R}{r}$ is equal to	(1)	0
(Q)	The number of solution(s) of the equation $\cos\theta \cdot \cos 2\theta \cdot \cos 3\theta = \frac{1}{4}$ in $0 < \theta < \pi$ are	(2)	4
(R)	If $f(x) = \begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x+1)x(x-1) \end{vmatrix}$ , then $f(100)$ is equal to	(3)	6
(S)	If $\begin{vmatrix} a & a+b & a+b+c \\ 2a & 3a+2b & 4a+3b+2c \\ 3a & 6a+3b & 10a+6b+3c \end{vmatrix} = 64$ , then 'a' is equal to	(4)	7
		(5)	8

The correct option is

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

10. Match each entry in **List – I** to the correct entry in **List – II**.

List – I		List – II	
(P)	The coefficient of $x$ in the expansion of $\begin{vmatrix} (1+x)^{22} & (1+x)^{44} & (1+x)^{66} \\ (1+x)^{33} & (1+x)^{66} & (1+x)^{99} \\ (1+x)^{44} & (1+x)^{88} & (1+x)^{144} \end{vmatrix}$ is	(1)	13
(Q)	In the expansion of $(1+x)^5$ , the sum of the coefficients of the terms is	(2)	0
(R)	A polygon has 65 diagonals. The number of its sides is	(3)	32
(S)	The largest integer $n$ for which $45!$ is divisible by $3^n$ is	(4)	21
		(5)	5

The correct option is

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

Space For Rough Work

11. Match each entry in **List – I** to the correct entry in **List – II**.

	<b>List – I</b>		<b>List – II</b>
(P)	Let $A = \begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$ , if $\det(A^2) = 25$ , then $ \alpha $ is	(1)	$\frac{1}{25}$
(Q)	The value of $k$ do the following homogenous system of equations passes a non-trivial solution is $x + ky + 3z = 0$ , $3x + ky - 2z = 0$ , $2x + 3y - 4z = 0$	(2)	$\frac{21}{5}$
(R)	The probability that a number selected at random from the set of numbers $\{1, 2, 3, 4, \dots, 100\}$ is a cube is	(3)	$\frac{1}{5}$
(S)	If $\begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix} A \begin{bmatrix} -1 & 1 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ 0 & 4 \end{bmatrix}$ , then absolute value of trace of $\frac{A}{5}$ is	(4)	$\frac{33}{2}$
		(5)	$\frac{7}{4}$

The correct option is

- (A) P→(3) Q → (4) R→(1) S→(2)  
 (C) P→(3) Q → (5) R→(4) S→(2)

- (B) P→(2) Q → (4) R→(1) S→(5)  
 (D) P→(1) Q → (5) R→(3) S→(4)

**(PART – B)**

**(Non – Negative Integer)**

1. The remainder left out, when  $8^{2n} - (62)^{2n+1}$  is divided by 9 is:

2. Given that  $\begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)$ , the value of  $\begin{vmatrix} 1 & 1 & 1 \\ 2 & 3 & 4 \\ 8 & 27 & 64 \end{vmatrix}$  is

3.  $\sec^2(\tan^{-1}2) + \operatorname{cosec}^2(\cot^{-1}3)$  is equal to

4. Let  $A$  be the set of 4-digit numbers  $a_1a_2a_3a_4$  where  $a_1 > a_2 > a_3 > a_4$ , then  $n(A)$  is equal to

5. The number of values of  $k$  for which the linear equations  
 $4x + ky + 2z = 0$   
 $kx + 4y + z = 0$   
 $2x + 2y + z = 0$   
 have a non-zero solution is

6. If  $3 \tan^{-1} x + \cot^{-1} x = \pi$ , then  $x$  is equal to:

*Space For Rough Work*

# FIITJEE INTERNAL TEST

BATCH – NWCMSW425A1\_PT-3

Paper – 1

Code: 100883

JEE ADVANCED LEVEL

ANSWER KEY

ANSWER KEYS

## Physics

### PART – A

- |        |        |       |      |
|--------|--------|-------|------|
| 1. D   | 2. D   | 3. B  | 4. C |
| 5. ACD | 6. ABC | 7. BD | 8. B |
| 9. D   | 10. A  | 11. B |      |

### PART – B

- |        |      |      |      |
|--------|------|------|------|
| 1. 200 | 2. 1 | 3. 2 | 4. 2 |
| 5. 5   | 6. 5 |      |      |

## Chemistry

### PART – A

- |       |        |        |      |
|-------|--------|--------|------|
| 1. C  | 2. B   | 3. C   | 4. C |
| 5. AC | 6. ACD | 7. ABD | 8. C |
| 9. C  | 10. D  | 11. B  |      |

### PART – B

- |      |      |      |      |
|------|------|------|------|
| 1. 2 | 2. 4 | 3. 7 | 4. 5 |
| 5. 3 | 6. 4 |      |      |

## Mathematics

### PART – A

- |       |       |         |      |
|-------|-------|---------|------|
| 1. D  | 2. B  | 3. D    | 4. D |
| 5. AC | 6. CD | 7. ABCD | 8. A |
| 9. B  | 10. D | 11. A   |      |

### PART – B

- |      |       |       |        |
|------|-------|-------|--------|
| 1. 2 | 2. 18 | 3. 15 | 4. 210 |
| 5. 2 | 6. 1  |       |        |