FIITJEE INTERNAL Phase Test

PHYSICS, CHEMISTRY & MATHEMATICS

QP CODE: 100773 | **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.

Forthcoming Exam – FTRE on 15th Sept. 2024.

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.

*** In multiple choice questions the options are given as F,T,R & E which correspond to the options A,B,C & D respectively in the 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 (08-11) –** 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 – NWCMPA425C1– PT – 1

*** In multiple choice questions the options are given as F,T,R & E which correspond to the options A,B,C & D respectively in the OMR sheet.**

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.**

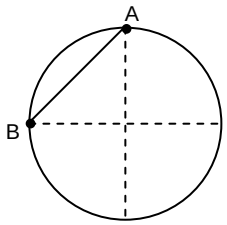
1. Twelve persons are initially at the twelve corners of a regular polygon of twelve sides of side a. Each person now moves with uniform speed V in such a manner that 1 is always directed towards 2, 2 towards 3, 3 towards 4 and so on. The distance travelled by each person before they meet is

(F) $\frac{2a}{2+\sqrt{3}}$ (T) $\frac{2a}{2-\sqrt{3}}$ (R) $\frac{2a}{\sqrt{3}}$ (E) $\frac{a}{2+\sqrt{3}}$

2. A small ball thrown at an initial velocity *u* directed at an angle θ = 37° above the horizontal collides inelastically (*e* = 1/4) with a vertical massive wall moving with a uniform horizontal velocity *u*/5 towards ball. After collision with the wall, the ball returns to the point from where it was thrown. Neglect friction between ball and wall. The time *t* from beginning of motion of the ball till the moment of its impact with the wall is (tan37° = 3/4)

(F) $\frac{3u}{5g}$ (T) $\frac{18u}{25g}$ (R) $\frac{54u}{125g}$ (E) $\frac{54u}{25g}$

3. Two beads A and B of equal mass 'm' are connected by a light inextensible cord. They are constrained to move on a frictionless ring in vertical plane. The beads are released from rest as shown in figure. The tension in the cord just after the release is



(F) $\frac{mg}{4}$ (T) $\sqrt{2}\,mg$

(R) $\frac{mg}{2}$ (E) $\frac{mg}{\sqrt{2}}$

4. The vector $\vec{B} = 5\hat{i} + 2\hat{j} - x\hat{k}$ is perpendicular to the vector $\vec{A} = 3\hat{i} + \hat{j} + 2\hat{k}$ for x equals to

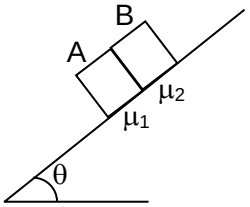
(F) 1 (T) 4.7
(R) 6.3 (E) 8.5

Space For Rough Work

(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. Two block A & B of equal mass are initially in contact, when released from rest on the inclined plane. The co-efficient of friction between the inclined plane and A & B are μ_1 & μ_2 respectively



(F) If $\mu_1 > \mu_2$, the blocks will always remain in contact.

(T) If $\mu_1 < \mu_2$, the blocks will slide down with different acceleration.

(R) If $\mu_1 > \mu_2$, the blocks will have common acceleration $\frac{1}{2}(\mu_1 + \mu_2)$ g sin θ

(E) If $\mu_1 < \mu_2$, the blocks will have a common acceleration $\frac{\mu_1\mu_2}{\mu_1 + \mu_2}$ g sin θ.

6. The potential energy of a particle of mass 0.1 kg, moving along the x-axis, is given by U = 5x (x–4)J, where x is in meters. It can be concluded that

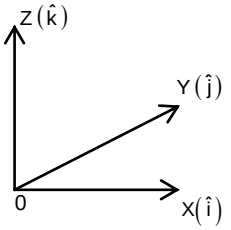
(F) The particle is acted upon by a variable force.

(T) The minimum potential energy during motion is –20 J

(R) The speed of the particle is maximum at x = 2m.

(E) The motion of the particle is periodic.

7. A particle is projected from origin with velocity $\vec{u} = \left(\hat{j} + \sqrt{2}\hat{k}\right)$ m/s. Horizontal surface lies in X – Y plane, then (take g = 10 m/sec^2)



(F) Time of flight = $\frac{\sqrt{2}}{5}$ sec

(T) horizontal range = $\frac{2}{5}$ m

(R) Maximum height $\frac{1}{10}$ m

(E) Maximum height = $\frac{1}{5}$ 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. A particle is moving according to the displacement time relation $x = 3t^2 - \frac{t^3}{2}$ (where x is in meters and t is in seconds). Match the condition of the List-I with the time interval and instant in List-II.

List-I		List-II	
(P)	Velocity and acceleration will be in same direction	(1)	At t = 0 and t = 6 sec
(Q)	particle will be at origin	(2)	0 < t < 2 sec and t > 4sec
(R)	particle will retard	(3)	At t = 0 and t = 4 sec
(S)	velocity is zero	(4)	2 < t < 4
		(5)	At t = 1 and t = 4 sec

The correct option is:

(F) P $\rightarrow$ 3 ; Q $\rightarrow$ 1 ; R $\rightarrow$ 4 ; S $\rightarrow$ 3 (T) P $\rightarrow$ 2 ; Q $\rightarrow$ 1 ; R $\rightarrow$ 3 ; S $\rightarrow$ 4

(R) P $\rightarrow$ 2 ; Q $\rightarrow$ 1 ; R $\rightarrow$ 4 ; S $\rightarrow$ 3 (E) P $\rightarrow$ 4 ; Q $\rightarrow$ 3 ; R $\rightarrow$ 2 ; S $\rightarrow$ 1

9. In a conservative force field we can define he radial component of force from the potential energy function by using $F = -\frac{du}{dr}$. Here, a positive force means repulsion and a negative force means attraction. For the given potential energy function U(r) we can find the equilibrium position where force is zero. We can also find the ionization energy which is the work done to move the particle point at a distance 'r' from he centre of the force. The potential energy of the particle is $U = \frac{A}{r^2} - \frac{B}{r}$, where 'r' is the distance from the centre of the force and A and B are +ve constants. Answer the following questions:

List-I		List-II	
(P)	The equilibrium distance is given by	(1)	$\left[\frac{2A}{r^3} - \frac{B}{r^2}\right]$
(Q)	The equilibrium is	(2)	Stable
(R)	At the state of stable equilibrium, the potential energy is:	(3)	$\left[\frac{-2A}{r^3} + \frac{B}{r^2}\right]$
(S)	Force acting	(4)	Minimum
		(5)	$\frac{2A}{B}$

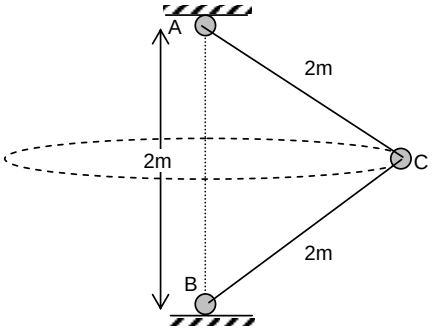
The correct option is:

(F) P $\rightarrow$ 5 ; Q $\rightarrow$ 2 ; R $\rightarrow$ 1 ; S $\rightarrow$ 3 (T) P $\rightarrow$ 5 ; Q $\rightarrow$ 2 ; R $\rightarrow$ 4 ; S $\rightarrow$ 1

(R) P $\rightarrow$ 4 ; Q $\rightarrow$ 3 ; R $\rightarrow$ 2 ; S $\rightarrow$ 1 (E) P $\rightarrow$ 4 ; Q $\rightarrow$ 5 ; R $\rightarrow$ 1 ; S $\rightarrow$ 3

Space For Rough Work

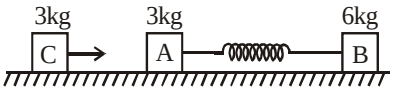
10. Particle of mass m is attached with two string AC and BC. When particle rotates in horizontal plane with $\omega = \sqrt{10}\,\text{rad/s}$, tension in strings AC and BC are T_1 , and T_2 respectively. Then match the tension in List-I so values in List-II ($g = 10\ m/s^2$)



List-I		List-II	
(P)	$T_1 + T_2$	(1)	Zero
(Q)	$T_1 – T_2$	(2)	(10 m) Newton
(R)	T_1	(3)	(20 m) Newton
(S)	T_2	(4)	(20 m) Newton
		(5)	(40 m) Newton

The correct option is:
(F) $P \to 3$; $Q \to 3$; $R \to 3$; $S \to 1$ (T) $P \to 3$; $Q \to 2$; $R \to 4$; $S \to 5$
(R) $P \to 3$; $Q \to 1$; $R \to 2$; $S \to 5$ (E) $P \to 2$; $Q \to 3$; $R \to 4$; $S \to 1$

11. Initially spring connecting A and B are elongated by a distance of 3 cm and placed on smooth horizontal surface. When spring is in its natural length (block A moving right and block B is moving left) block C moving towards A with speed 0.4 m/s (towards right) collides and get stuck with it.



Spring constant $K = 200\frac{N}{m}$

List-I		List-II (in proper unit)	
(P)	Velocity of B before collision (m/s)	(1)	0.1
(Q)	Velocity of center of mass of whole system after colliding (m/s)	(2)	0.2
(R)	Amplitude of oscillation of combined body (m) (rounded off to one significant figure)	(3)	0.03
(S)	Loss of energy during collision (J)	(4)	0.05
		(5)	0.8

The correct option is:
(F) $P \to 1$; $Q \to 1$; $R \to 4$; $S \to 3$ (T) $P \to 1$; $Q \to 5$; $R \to 4$; $S \to 2$
(R) $P \to 2$; $Q \to 1$; $R \to 5$; $S \to 3$ (E) $P \to 1$; $Q \to 1$; $R \to 3$; $S \to 2$

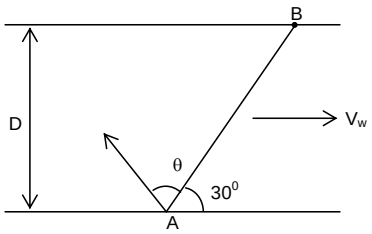
Space For Rough Work

(PART – B)

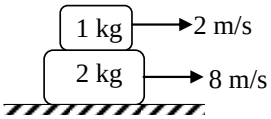
(Non – Negative Integer)

1. Power supplied to a particle of mass 2 kg varies with time as $P = \frac{3t^2}{2}$ W. Here t in second. If velocity of particle at t = 0 is v=0. Find the velocity (in m/sec) of the particle at time t = 2 Sec.

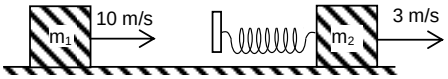
2. Two ports A and B are separated by a river of width D. Water in the river flows with speed V_W. A boat crosses the river form port A to port B. The speed of the boat relative to water is V_B. Given $V_W = \sqrt{3}\, V_B$. if at angle $\theta = \frac{\pi}{n}$ (in radian) with AB in which the boat should start relative to water so that it moves along A, then find the value of n



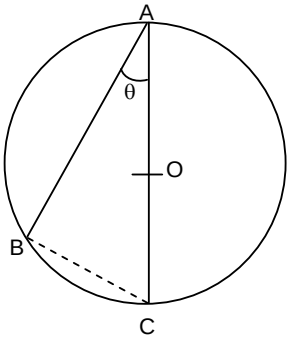
3. Coefficient of friction between two blocks shown in figure is $\mu = 0.4$. Floor is smooth. The blocks are given velocities of 2 m/s and 8 m/s in the directions shown in figure at t = 0. The time when relative motion between them will stop is (in sec.)



4. Two blocks of masses m_1 = 2kg and m_2 = 5kg are moving in the same direction along a frictionless surface with speeds 10 m/s and 3 m/s respectively, m_2 being ahead of m_1. An ideal spring with k = 1120 N/m is attached to the back side of m_2. if the maximum compression of the spring when the blocks collide, is $\frac{1}{n}$ metres, then n =



5. A bead is free to slide down on a smooth wire tightly stretched between point A and B on a vertical circle of radius 10 m. Find the time taken(in s) by the bead to reach the point B, if the bead slide from rest from the highest point A on the circle. (tame g = 10 m/s^2)



6. If $\vec{A}\cdot\vec{B} = \left|\vec{A}\times\vec{B}\right|$ and $\left|\vec{A}\right|$ & $\left|\vec{B}\right|$ are $2\sqrt{2}$ and 3 respectively, determine $\left|\vec{C}\right| = \left|\vec{A}\times\vec{B}\right|$.

Space For Rough Work

*** In multiple choice questions the options are given as F,T,R & E which correspond to the options A,B,C & D respectively in the OMR sheet.**

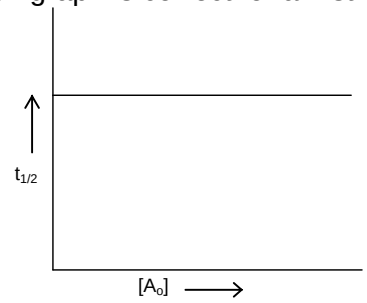
SECTION – II: CHEMISTRY

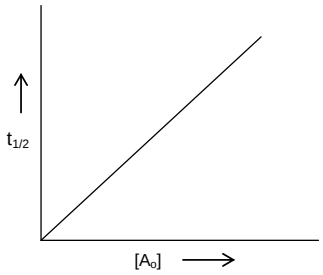
(PART – A)

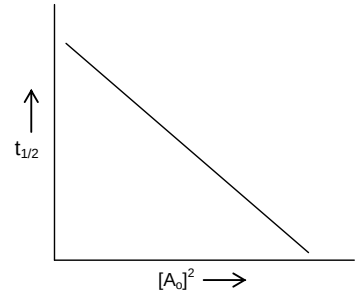
(Single Correct Answer Type)

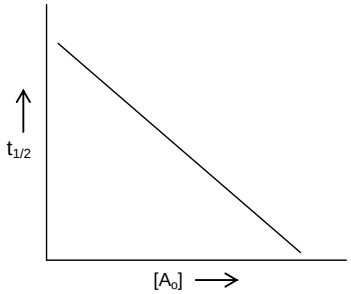
This section contains **4 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. Which graph is correct for a first order reaction?

(F) 

(T) 

(R) 

(E) 

2. K_{sp} of a base MOH is 1×10^{-4}. What is the pH of its saturated solution?
   (F) 2 (T) 12
   (R) 4 (E) 10

3. Which of the following two compounds cannot be distinguished by the action of heat?
   (F) Na_2CO_3 and Li_2CO_3 (T) $NaNO_3$ and $LiNO_3$
   (R) $MgCO_3$ and $CaCO_3$ (E) $Mg(NO_3)_2$ and $MgCO_3$

4. Redox reaction take place between NaOH and
   (F) H_2SO_4 (T) Cl_2
   (R) HCl (E) CO_2

Space For Rough Work

(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. Which of the following quantum number(s) is/are used to express the wave function of an atomic orbital?
(F) Principal quantum number (T) Azimuthal quantum number
(R) Magnetic quantum number (E) Spin quantum number

6. In which of the following the electronegativity of phosphorus is higher than that in PCl_3?
(F) PCl_5 (T) PH_3
(R) $POCl_3$ (E) PF_5

7. Which of the following compound(s) is/are more covalent than $BeCl_2$?
(F) $MgCl_2$ (T) BCl_3
(R) $BeBr_2$ (E) BI_3

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 lists.

List – I (Molecular orbitals)		List – II (Characteristics)	
(P)	N_2	(1)	The lowest unoccupied molecular orbital (LUMO) is a sigma bonding molecular orbital
(Q)	O_2	(2)	Addition of electron takes place into the antibonding molecular orbital and removal of electrons takes place from bonding molecular orbital
(R)	C_2	(3)	The diatomic molecule as well as its mono atom contain same number of unpaired electrons
(S)	F_2	(4)	Both HOMO and LUMO are antibonding molecular orbitals(HOMO is highest occupied molecular orbitals)
		(5)	Addition of electron reduces it's bond order to less than one

The correct option is:
(F) (P) $\rightarrow$ (3), (Q) $\rightarrow$ (2), (R) $\rightarrow$ (1), (S) $\rightarrow$ (4)
(T) (P) $\rightarrow$ (3), (Q) $\rightarrow$ (1), (R) $\rightarrow$ (2), (S) $\rightarrow$ (4)
(R) (P) $\rightarrow$ (2), (Q) $\rightarrow$ (4), (R) $\rightarrow$ (1), (S) $\rightarrow$ (3)
(E) (P) $\rightarrow$ (2), (Q) $\rightarrow$ (3), (R) $\rightarrow$ (1), (S) $\rightarrow$ (5)

Space For Rough Work

9. Match the lists.

List – I (Orbitals)		List – II (Characteristics)	
(P)	$4d_{xy}$	(1)	Has four radial nodes
(Q)	$6p_y$	(2)	Has two angular nodes
(R)	$5f_{xyz}$	(3)	Has one radial and three angular nodes
(S)	3s	(4)	The wave function of this orbital does not contain any angular part
		(5)	Oriented along y-axis of the coordinate system

The correct option is:
(F) (P) $\rightarrow$ (3), (Q) $\rightarrow$ (2), (R) $\rightarrow$ (1), (S) $\rightarrow$ (4)
(T) (P) $\rightarrow$ (3), (Q) $\rightarrow$ (4), (R) $\rightarrow$ (2), (S) $\rightarrow$ (1)
(R) (P) $\rightarrow$ (2), (Q) $\rightarrow$ (1), (R) $\rightarrow$ (3), (S) $\rightarrow$ (4)
(E) (P) $\rightarrow$ (2), (Q) $\rightarrow$ (3), (R) $\rightarrow$ (1), (S) $\rightarrow$ (5)

10. Match the lists.

List – I (Titration of H_3PO_4 with NaOH) (Dissociation constants of H_3PO_4 are K_{a_1}, K_{a_2} and K_{a_3})		List – II (pH at the following points)	
(P)	pH at the mid-point before the first equivalence point	(1)	$pH = \frac{1}{2}\left(p^{K_{a_2}} + p^{K_{a_3}}\right)$
(Q)	pH at the first equivalence point	(2)	$pH = p^{K_{a_1}}$
(R)	pH as the mid-point between first and second equivalence point	(3)	$pH = p^{K_{a_2}}$
(S)	pH at the second equivalence point	(4)	$pH = \frac{1}{2}\left(p^{K_{a_1}} + p^{K_{a_2}}\right)$
		(5)	$pH = \frac{1}{2}\left(p^{K_{a_1}} + p^{K_{a_3}}\right)$

The correct option is:
(F) (P) $\rightarrow$ (3), (Q) $\rightarrow$ (5), (R) $\rightarrow$ (2), (S) $\rightarrow$ (4)
(T) (P) $\rightarrow$ (2), (Q) $\rightarrow$ (4), (R) $\rightarrow$ (3), (S) $\rightarrow$ (1)
(R) (P) $\rightarrow$ (2), (Q) $\rightarrow$ (3), (R) $\rightarrow$ (4), (S) $\rightarrow$ (1)
(E) (P) $\rightarrow$ (3), (Q) $\rightarrow$ (4), (R) $\rightarrow$ (2), (S) $\rightarrow$ (5)

Space For Rough Work

11. Match the lists.

List – I (Rate equations)		List – II (Number of time the rate of reaction increases by doubling the conc. of all species)	
(P)	$\text{Rate} = k\frac{[A][B]^2}{[C]}$	(1)	$4\sqrt{2}$ times
(Q)	$\text{Rate} = k\frac{[A]^{1/2}[B]^3}{[C]}$	(2)	8 times
(R)	$\text{Rate} = k\frac{[A]^2[B]^0}{[C]}$	(3)	4 times
(S)	$\text{Rate} = k\frac{[A][B]^2}{[C]^0}$	(4)	2 times
		(5)	16 times

The correct option is:
(F) (P) $\rightarrow$ (2), (Q) $\rightarrow$ (1), (R) $\rightarrow$ (3), (S) $\rightarrow$ (4)
(T) (P) $\rightarrow$ (2), (Q) $\rightarrow$ (3), (R) $\rightarrow$ (1), (S) $\rightarrow$ (4)
(R) (P) $\rightarrow$ (3), (Q) $\rightarrow$ (1), (R) $\rightarrow$ (4), (S) $\rightarrow$ (2)
(E) (P) $\rightarrow$ (3), (Q) $\rightarrow$ (2), (R) $\rightarrow$ (1), (S) $\rightarrow$ (4)

(**PART – B)**

(Non – Negative Integer)

1. How many minimum number of electrons of iron(Z = 26) will have n + ℓ = 4?

2. $NH_4Cl(s) \rightleftharpoons NH_3(g) + HCl(g)$

Above reaction attains equilibrium at 6 atm and T K. The equilibrium constant K_P of the reaction in atm^2 unit is:

Space For Rough Work

3. $P(g) + 2Q(g) \rightleftharpoons 2R(g) + 4S(g)$

One mole each of P and Q gases are taken in a one litre vessel. If the equilibrium concentrations of Q and R are same and K_C is given in the simplest ratio x : y, i.e. $K_C = \frac{x}{y}$, the value of (x + y) is:

4. The half-life period of a chemical reaction is expressed as:

$t_{½} = K\ C_o^{-2}$

Where K is a constant other than the rate constant and C_o is the initial concentration of the reactant. What is the order of the reaction?

5. The rate of an elementary reaction $2X(g) + Y(g) \longrightarrow X_2Y(g)$ is 8×10^{-3} mol $L^{-1}s^{-1}$ if the reaction starts with 0.1 M of X and 0.2 M of Y. What is the rate constant (k) of the reaction in $mol^{-2}\ L^2s^{-1}$ unit?

6. The equilibrium constant of a reversible reaction is given as $\ell nK_p = -5$. What is the standard free energy change(ΔG^o) of the reaction at 400 K in KJ unit? [Assume that R = 8 $JK^{-1}\ mol^{-1}$]

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*** In multiple choice questions the options are given as F,T,R & E which correspond to the options A,B,C & D respectively in the OMR sheet.**

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. If $f(x) = x^3 + bx^2 + cx + d$ and $0 < b^2 < c$, then in $(-\infty, \infty) f(x)$

   (F) is increasing (T) has local maxima
   (R) is decreasing (E) is bounded

2. If $0 < a < b$, then $\lim_{n\to\infty} \left(b^n + a^n\right)^{1/n}$ is equal to

   (F) e (T) a
   (R) b (E) none of these

3. If the function $f(x) = \begin{cases} \left(1 + |\sin x|^{\frac{a}{|\sin x|}}\right), & -\frac{\pi}{6} < x < 0 \\ b, & x = 0 \\ e^{\frac{\tan 2x}{\tan 3x}}, & 0 < x < \frac{\pi}{6} \end{cases}$ is continuous at x = 0, then

   (F) $a = \log_e b, a = \frac{2}{3}$ (T) $b = \log_e a, a = \frac{2}{3}$
   (R) $a = \log_e b, b = 2$ (E) none of these

4. If $f(x) = \frac{\sin([x]\pi)}{x^2 + x + 1}$, where [.] denotes the greatest integer function, then

   (F) f is one – one (T) f is not one – one and non – constant
   (R) f is constant function (E) None of these

Space For Rough Work

(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. Let $h(x)=f(x)-(f(x))^2+(f(x))^3$ for every real number x, then
   (F) h is increasing when even f is increasing
   (T) h is increasing when ever f is decreasing
   (R) h is decreasing whenever f is decreasing
   (E) nothing can be said general

6. Which of the following functions is (are) injective (one-one)
   (F) $f(x)=|x+1|, x\in[-1,\infty)$ (T) $f(x)=x+\frac{1}{x}, x\in(0,\infty)$
   (R) $f(x)=x^2+4x-5, x\in(0,\infty)$ (E) $f(x)=e^{-x}, x\in[0,\infty)$

7. If $f(x)=\begin{cases}-x-\frac{\pi}{2}, & x\le-\frac{\pi}{2}\\ -\cos x, & -\frac{\pi}{2}<x\le 0\\ x-1, & 0<x\le 1\\ \ln x, & x>1\end{cases}$, then
   (F) $f(x)$ is continuous at $x=\frac{-\pi}{2}$ (T) $f(x)$ is not differentiable at x = 0
   (R) $f(x)$ is differentiable at x = 1 (E) $f(x)$ is differentiable at $x=\frac{-3}{2}$

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 following

List - I		List – II	
(P)	If $x^2+y^2=1$, then minimum value of $x+y$ is	(1)	–3
(Q)	If maximum value of $y=a\cos x-\frac{1}{3}\cos 3x$ occurs at $x=\frac{\pi}{6}$, then value of 'a' is	(2)	$-\sqrt{2}$
(R)	If $f(x)=x-2\sin x, 0\le x\le 2\pi$ is increasing in the interval $(a\pi, b\pi)$ then $a+b$ is	(3)	3
(S)	If equation of tangent to the curve $y=-e^{-x/2}$ where it crosses the y – axis is $\frac{x}{p}+\frac{y}{q}=1$, then $p-q$ is	(4)	2
		(5)	–2

(F) P $\to$ 4, Q $\to$2, R $\to$5, S $\to$5 (T) P $\to$ 1, Q $\to$3, R $\to$3, S $\to$1
(R) P $\to$ 2, Q $\to$1, R $\to$3, S $\to$5 (E) P $\to$ 2, Q $\to$4, R $\to$4, S $\to$3

9. Consider the sets $A=\{1,2,3,4,5\}$ and $B=\{11, 12, 13, 14, 15, 16, 17, 18\}$. A function f : A $\to$B is formed

	List – I		List – II
(P)	Number of One – One function are	(1)	56
(Q)	Number of Strictly increasing function are	(2)	840
(R)	Number of one – one functions such that $f(1)=2$	(3)	6720
(S)	Number of non – increasing functions are	(4)	7620
		(5)	792

(F) P $\to$ 3, Q $\to$5, R $\to$2, S $\to$1 (T) P $\to$ 4, Q $\to$1, R $\to$3, S $\to$5
(R) P $\to$ 3, Q $\to$1, R $\to$2, S $\to$5 (E) P $\to$ 4, Q $\to$5, R $\to$1, S $\to$3

10. Match the following

List – I		List – II	
(P)	The number of minima of $f(x)=x^4e^{-x^2}$ is	(1)	0
(Q)	The number of extrema of $f(x)=(x-1)^3(x-2)^4$ is	(2)	1
(R)	The number of minima of $f(x)=\begin{cases}-2x, & x<0\\ 3x+5, & x\ge 0\end{cases}$ is	(3)	2
(S)	The number of maxima of $f(x)=\begin{cases}2x^2+3, & x\ne 0\\ 4, & x=0\end{cases}$ is	(4)	3
		(5)	4

(F) P $\to$ 2, Q $\to$3, R $\to$1, S $\to$2 (T) P $\to$3, Q $\to$5, R $\to$4, S $\to$2
(R) P $\to$ 2, Q $\to$3, R $\to$2, S $\to$4 (E) P $\to$ 2, Q $\to$4, R $\to$1, S $\to$3

11. Match the following

List – I		List – II	
(P)	The value of $f(0)$ so that the function $f(x)=\frac{1}{x}-\frac{1}{\sin x}$ is continuous at $x=0$ is	(1)	6
(Q)	The range of the function $f(x)=x\log x$ is $\left[-\frac{1}{e^{k/3}},\infty\right)$ then k is equal to	(2)	1
(R)	Number of solutions of the equation $\lvert x+1\rvert-\lvert x-1\rvert=0$ is/are	(3)	3
(S)	Let $f(x)=\max\{x^2,x-1,3x\}$, then maximum value of $f(x)$ in $[0,2]$ is	(4)	0
		(5)	2

(F) P $\to$ 4, Q $\to$3, R $\to$2, S $\to$1 (T) P $\to$3, Q $\to$5, R $\to$4, S $\to$2

(R) P $\to$ 5, Q $\to$4, R $\to$2, S $\to$1 (E) P $\to$ 2, Q $\to$4, R $\to$1, S $\to$3

(PART – B)

(Non – Negative Integer)

1. $\lim\limits_{x\to\infty}\left(\frac{2+x}{1+x}\right)^{2x+1}$ is equal to e^k, then k will be

2. If the greatest value of the function $f(x)=x^3\ell nx$ on $[1,e]$ is e^k then k is equal to

3. The number of point of inflection of the function $f(x)=x+x^{5/3}$ is

4. If $\lim\limits_{x\to0}\frac{\int_0^x\sin t^2dt}{x^3}$ is $\frac{k}{3}$ then k = _____

5. If $f(9)=9, f'(9)=4,$ then find value of $\lim\limits_{x\to9}\frac{\sqrt{f(x)}-3}{\sqrt{x}-3}$.

6. If $\int\frac{1}{\tan x+\cot x+\sec x+\operatorname{cosec}x}dx=\frac{1}{k}(\sin x-\cos x-x)+c$ then k is equal to ___

Space For Rough Work

FIITJEE INTERNAL TEST

BATCH – NWCMPA425C1

Phase Test – 1

Paper – 1

Code: 100773

JEE ADVANCED LEVEL

ANSWER KEY

ANSWER KEYS

Physics

PART – A

1.	T	2.	R	3.	E	4.	E
5.	FT	6.	FTRE	7.	FR	8.	R
9.	T	10.	F	11.	F		

PART – B

1.	2	2.	3	3.	1	4.	4
5.	2	6.	6				

Chemistry

PART – A

1.	F	2.	T	3.	R	4.	T
5.	FTR	6.	FRE	7.	TRE	8.	E
9.	R	10.	T	11.	R		

PART – B

1.	8	2.	9	3.	7	4.	3
5.	4	6.	16				

Mathematics

PART – A

1.	R	2.	R	3.	F	4.	R
5.	FR	6.	FRE	7.	FTRE	8.	E
9.	R	10.	F	11.	F		

PART – B

1.	2	2.	3	3.	1	4.	1
5.	4	6.	2				