

FIITJEE INTERNAL TEST

Batches: All 1921 batches
RANK IMPROVEMENT TEST – I
IIT- JEE 2021
QP CODE:

Time: 3 hours

Maximum Marks: 210

- Please read the instructions carefully. You are allotted 5 minutes specially for this purpose.
- You are not allowed to leave the examination hall before end of the test.
- Use Blue/Black Ball Point Pen only for writing particulars on Side-1 and Side-2 of the Answer Sheet. Use to Pencil is strictly prohibited.

Instructions

Note:

1. The question paper contains 3 sections (Sec-1, Chemistry, Sec-II, Physics & Sec-III, Mathematics.)
2. Each section is divided into three parts, **PART-A, PART-B and PART-C.**
3. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
4. Blank Papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.

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.

Marking Scheme For All Three Parts.

1. **PART – A (01 – 05)** contains 5 Multiple Choice Questions which have **Only One Correct answer**. Each question carries **+3 marks** for correct answer and **-1 mark** for wrong answer.
2. **PART – A (06 – 13)** contains 8 Multiple Choice Questions which have **One or More Correct** answer.

For each question in the group **Q. 6 – 13** of **PART – A** you will be awarded

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.

3. **PART – B** contains 2 Matrix Match Type Questions which have statements given in 2 columns. Statements in the first column have to be matched with statements in the second column. There may be **One or More Than One Correct** choices. Each question carries **+4 marks** for all correct answer however for each correct row **+1 marks** will be awarded. No negative marks will be awarded in this section.
4. **PART-C (01 – 05)** contains 5 Numerical Based questions the answer of which maybe positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -30, 30.27, -127.30) and each question carries **+3 marks** for correct answer. **There is no negative marking.**

Name of the Candidate :

Enrolment Number :

Section – I (Chemistry)

PART – A

(Single Correct Choice Type)

This section contains 5 **multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which only **ONE** option is be correct.

1. In the discharge tube experiment, very low pressure is maintained in order to
 (A) increase the formation of electrons from the electrodes.
 (B) reduce the scattering of electrons by the gas molecules
 (C) increase the velocity of electrons
 (D) reduce the number of electrons
1. B
2. In which molecule the central atom uses d- orbital for bond formation?
 (A) SO₂ (B) H₂S (C) SCl₂ (D) S₈
2. A
3. Group – 1 metals $\xrightarrow[\text{Heating}]{\text{Air}}$ Products
 Which product is not formed in the above reaction?
 (A) Li₃N (B) NaO (C) KO₂ (D) RbO₂
3. B
4. λ_1 and λ_2 are two wavelengths of the visible radiations of hydrogen spectrum. They are emitted by two adjacent electronic transition in hydrogen atom. If λ_1 is greater than of λ_2 , what is the ratio of λ_1 to λ_2 ?
 (A) 17 : 10 (B) 10 : 17 (C) 27 : 20 (D) 20 : 27
4. C
5. Which of the following is a polymeric hydride?
 (A) KH (B) BeH₂ (C) YbH_{2.25} (D) ZnH₂
5. B

(Multiple Correct Choice Type)

This section contains 8 **multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

6. The radial wave function of an atomic orbital is represented by $R_{n,l}$. The wave function of an orbital is given below [$a_0 = 0.529 \text{ \AA}$].

$$R_{2,1} = \frac{1}{2\sqrt{6}} \left(\frac{Z}{a_0} \right)^{3/2} \left(\frac{Zr}{a_0} \right) e^{-\frac{Zr}{2a_0}}$$
 Choose correct statement(s) about the orbital.
 (A) It is one of 2p orbitals.
 (B) The radial probability versus radial distance curve of this orbital has a maxima at around 2 \AA .
 (C) It has no radial node.
 (D) The orbital has two nodal planes.
6. ABC
7. The correct statement(s) regarding PH₃ and PF₃ is/are:
 (A) Bond angle : PF₃ > PH₃
 (B) Dipole moment : PH₃ > PF₃
 (C) % s-orbital character in covalent bonds : PF₃ > PH₃
 (D) Basic strength : PH₃ > PF₃
7. ABCD

8. Which of the following reaction(s) evolve O_2 gas?
 (A) $KO_2 + H_2O \rightarrow$ (B) $NaNO_3 \xrightarrow{\text{Heating}}$
 (C) $LiOH \xrightarrow{\text{Heating}}$ (D) $MgO + H_2O \longrightarrow$
8. **AB**
9. Choose correct statement(s) for the compound BaO_2 .
 (A) It is obtained in the following reaction
 $2BaO + O_2 \rightarrow 2BaO_2$
 (B) It is an ionic peroxide and contains O_2^{2-} ions in solution state
 (C) It's hydrate, $BaO_2 \cdot 8H_2O$ contains O_2^{2-} ions to which H_2O molecules are hydrogen bonded like
 $-----O_2^{2-}----- (H_2O)_8 -----O_2^{2-}----- (H_2O)_8 -----$
 (D) It reacts with dilute acids to form H_2O_2 and its salt.
9. **ABCD**
10. Which of the following quantum number(s) is/are correct for the unpaired electron of aluminium atom ($Z = 13$) in ground state?
 (A) $n = 3$ (B) $\ell = 1$ (C) $m = -2$ (D) $s = \pm \frac{1}{2}$
10. **ABD**
11. The correct statement(s) regarding the O_2 molecule and O atom is/are:
 (A) Oxidizing agent : $O > O_2$ (B) Spin-only magnetic moments : $O = O_2$
(Paramagnetism)
 (C) Ionization enthalpy : $O_2 > O$ (D) Number of electrons : $O_2 > O$
11. **ABD**
12. Which of the following aqueous solutions form a thin solid layer on their surface(s) when they are kept under air?
 (A) NaOH (B) $Ca(OH)_2$ (C) $Ba(OH)_2$ (D) KOH
12. **BC**
13. Which of the following statement(s) is / are correct for iron atom and its ions? ($Z = 26$)
 (A) The spin multiplicity of Fe^{3+} ion is greater than that of Fe^{2+} ion.
 (B) Fe^{3+} contains more electrons with $\ell = 2$ than that of Fe^{2+} .
 (C) The orbital of Fe atom which wave function is $\psi_{3, 2, 0}$ contains no nodal planes.
 (D) 'Fe' atom contains eight electrons in spherical orbitals.
13. **ACD**

PART – B
(Matrix Match Type)

1. Match the molecules mentioned in Column-I with their properties mentioned in Column-II.

Column-I		Column-II	
(A)	BF_3	(P)	Dipole moment is zero.
(B)	CO_2	(Q)	Bond order is greater than one
(C)	SO_3	(R)	Contains sigma as well as pi-bonds
(D)	NH_3	(S)	Contains lone pair on central atom
		(T)	Contains $p\pi-p\pi$ back bond.

1. **A → PQT B → PQR C → PQR D → S**

2. Match the compounds mentioned in Column-I with their properties mentioned in Column-II.

Column-I		Column-II	
(A)	$\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$	(P)	Undergoes complete dehydration on heating.
(B)	$\text{Mg}(\text{OH})_2$	(Q)	Undergoes partial dehydration on heating
(C)	$\text{Ca}(\text{OH})_2$	(R)	Added to NaCl to decrease its melting point during preparation of Na through electrolysis
(D)	CaCl_2	(S)	Forms mixed salt when treated with Cl_2
		(T)	Precipitated from sea water by adding lime water

2. A → Q B → PT C → PS D → R

PART – C

This section contains 5 Numerical Based questions. The answer to each question is a single digit integer, ranging from 0 to 9 (both inclusive)

- The threshold wavelength for the photoelectron emission of molybdenum is 2300 \AA . Radiation with wavelength 1682 \AA is used to release photoelectrons. The maximum kinetic energy in joule is $x \times 10^{-19} \text{ C}$. The value of x is
1. **3.2**
- The wave function describing the resonating structures of hydrogen molecule is given by $\psi_{\text{H}_2} = (1 - \lambda)\psi_{\text{covalent}} + \lambda\psi_{\text{ionic}}$
Hence, λ is called the mixing coefficient which measures the extent of contribution of the ionic forms to the resonating structures.
What is the value of λ for pure covalent forms of $\text{H}_2(\text{H} - \text{H})$?
2. **Zero**
- An alkaline earth metal which hydroxide is used as an antacid, reacts with carbon to form carbide (P) at 500°C and carbide (Q) at 700°C . (P) contains two carbon atoms and (Q) has three carbon atoms per molecule. The total negative charge on carbon on both P and Q is
3. **-6**
- | | | |
|----|---|---|
| ↑↓ | ↑ | ↑ |
|----|---|---|

2p
If the maximum number of exchange pair(s) is x and sum of spin quantum numbers of all electrons is y(positive), then (y - x) is
4. **-2**
- A s-block metal(P) forms a mixture (Q) when it is heated in air. Reaction of (P) with HCl forms salt(R) and gas(S). The same treatment of mixture(Q) produces salt(R), gas(T) and water. Reaction of (Q) with water produces lime water and gas (T). If the number of atoms present in gas(S) and gas(T) are respectively X and Y, what is (Y - X)?
5. **-2**

Section – II (Physics)

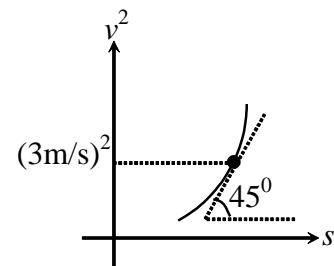
PART – A

(Single Correct Choice Type)

This section contains 5 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which only **ONE** option is be correct.

1. The hour hand of a clock is 6 cm long. The magnitude of the displacement of the tip of hour hand between 1:00 pm to 5:00 pm is
 (A) 6 cm (B) $6\sqrt{3}$ cm
 (C) 12 cm (D) $3\sqrt{3}$ cm
1. **B**
2. Let $\vec{A} + \vec{B} = \vec{C}$ and $\vec{A} - \vec{B} = \vec{D}$. If \vec{C} and \vec{D} are equal in magnitude and perpendicular to each other then
 (A) $\vec{A} = \vec{B}$ (B) $A \neq B$
 (C) \vec{A} is perpendicular to \vec{B} (D) \vec{A} is parallel to \vec{B}
2. **C**
3. The velocity function of an object moving along a straight line is given by $v(t) = At^2 + Bt$. If at $t = 2$ s, the velocity is 3 m/s and acceleration is 2 m/s^2 , find the value of the constant A.
 (A) 0.25 m/s^3 (B) -0.5 m/s^2
 (C) 0.5 m/s^3 (D) -1.5 m/s^2
3. **A**

4. A particle is moving in a straight line and graph between (velocity)² (v^2) and displacement (s) are related as shown. Find the acceleration of particle when its velocity is 3 m/s.
 (A) 1 m/s^2 (B) $\frac{1}{2} \text{ m/s}^2$
 (C) 2 m/s^2 (D) $\frac{3}{2} \text{ m/s}^2$



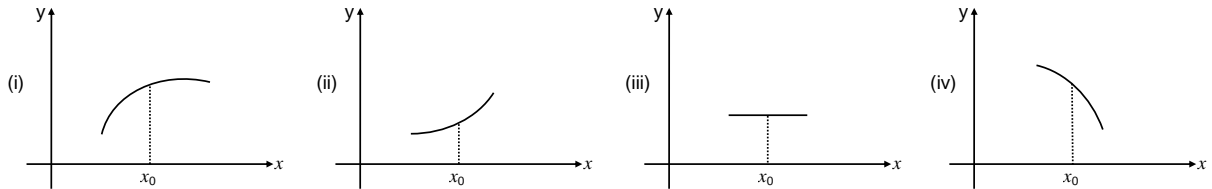
4. **B**
5. If $\vec{A} \times \vec{B} = \vec{C} + \vec{D}$, then select the correct alternative
 (A) \vec{B} is parallel to $\vec{C} + \vec{D}$
 (B) \vec{A} is perpendicular to \vec{C}
 (C) Component of \vec{C} along $\vec{A} =$ component of \vec{D} along \vec{A}
 (D) Component of \vec{C} along $\vec{A} = -$ component of \vec{D} along \vec{A}
5. **D**

(Multiple Correct Choice Type)

This section contains 8 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

6. Two vectors \vec{A} and \vec{B} are drawn from a common point and $\vec{C} = \vec{A} + \vec{B}$
 (A) If $C^2 = A^2 + B^2$, the angle between vectors \vec{A} and \vec{B} is 90°
 (B) If $C^2 < A^2 + B^2$, the angle between \vec{A} and \vec{B} is greater than 90°
 (C) If $C^2 > A^2 + B^2$ then angle between the vectors \vec{A} and \vec{B} is between 0° and 90°
 (D) If $C = A - B$, angle between \vec{A} and \vec{B} is 180°
6. **ABCD**

7. Which of the following statements are true, based on graphs of y -versus x as shown below



- (A) Slope at x_0 is positive and non-zero in graph (i) and (ii)
 (B) Slope is constant in (iii)
 (C) Slope at x_0 is negative in (iv) at x_0
 (D) Slope at x_0 is negative in (ii)

7. **ABC**

8. The magnitude of component of a vector may be

- (A) greater than the magnitude of that vector.
 (B) equal to the magnitude of that vector.
 (C) smaller than the magnitude of that vector.
 (D) zero.

8. **ABCD**

9. Which of the following statement(s) is/are true about a vector quantity:

- (A) A vector quantity always obeys law of vector addition.
 (B) Two vectors quantities are equal if they have same direction and magnitude even if they represent two different physical quantities.
 (C) The result of scalar product of two vectors is scalar quantity, not another vectors quantity.
 (D) Similar to scalar subtraction the order of the terms in vector difference affects the results.

9. **ACD**

10. If $(\vec{A} + \vec{B})$ is perpendicular to $\vec{A} - \vec{B}$ then \vec{A} and \vec{B} must represent adjacent sides of

- (A) rhombus (B) square
 (C) rectangle (D) none

10. **A**

11. Let a_r and a_t represent radial and tangential accelerations. The motion of a particle may be circular if:

- (A) $a_r = a_t = 0$ (B) $a_r = 0$ and $a_t \neq 0$ (C) $a_r \neq 0$ and $a_t = 0$ (D) $a_r \neq 0$ and $a_t \neq 0$

11. **CD**

12. A particle moves along positive branch of the curve, $y = \frac{x}{2}$, where $x = \frac{t^3}{3}$, x and y are measured in metres and t in seconds, then

- (A) The velocity of particle at $t = 1s$ is $\hat{i} + \frac{1}{2}\hat{j}$
 (B) The velocity of particle at $t = 1s$ is $\frac{1}{2}\hat{i} + \hat{j}$
 (C) The acceleration of particle at $t = 1s$ is $\hat{i} + 2\hat{j}$
 (D) The acceleration of particle at $t = 2s$ is $2\hat{i} + 4\hat{j}$

12. **ACD**

13. If $\vec{A} = 2\hat{i} + 3\hat{j}$ and $\vec{B} = 2\hat{i} - 3\hat{j} + \hat{k}$ then

- (A) $\vec{A} \cdot \vec{B} = -5$ (B) $\vec{A} \cdot \vec{B} = 5$
 (C) $|\vec{A} \times \vec{B}| = \sqrt{157}$ (D) $|\vec{A} \times \vec{B}| = -\sqrt{157}$

13. **AC**

PART – B
(Matrix Match Type)

14.

Column I		Column II	
(A)	In one dimensional motion of a particle	(P)	Acceleration may be along the motion
(B)	In projectile motion of a particle (except angle of projection with horizontal is 90°)	(Q)	Acceleration will never be along the motion
(C)	In uniform circular motion of a particle	(R)	Acceleration may be perpendicular to motion
(D)	In non-uniform circular motion of a particle	(S)	Acceleration may be opposite to the displacement
		(T)	Acceleration must be perpendicular to the motion

14. **A → PS B → QR C → QRT D → Q**

15. If a particle is projected with speed $5\sqrt{2} \text{ m/s}$ along the angle of elevation of 45° with horizontal from top of a tower of height 30 m, then match the following ($g = 10 \text{ m/s}^2$)

Column I		Column II	
(A)	Time taken to reach the ground	(P)	1.366 sec
(B)	Time taken to reach to the maximum height	(Q)	1 sec
(C)	Time taken by the body when its velocity makes an angle 45° with vertical again	(R)	3 sec
(D)	Time taken by the body when its velocity makes an angle 60° with horizontal during its downward motion	(S)	0.5 sec
		(T)	2 sec

15. **A → R B → S C → Q D → P**

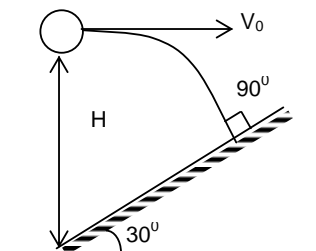
PART – C

This section contains 5 Numerical Based questions. The answer to each question is a single digit integer, ranging from 0 to 9 (both inclusive)

16. A passenger is standing 20m behind from a bus. The bus begins to move with constant acceleration 0.9m/s^2 . To catch the bus, the passenger runs at a constant speed v towards the bus. What must be the minimum speed (in m/s) of the passenger so that he may catch the bus?

16. **6**

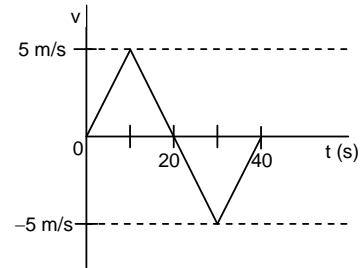
17. In the given figure, the angle of inclination of the inclined plane is 30° . Find the horizontal velocity V_0 (in m/s) so that the particle hits the inclined plane perpendicularly. Given, $H = 4\text{m}$, $g = 10 \text{ m/s}^2$



17. **4**

18. Velocity of a particle at any instant is given by the equation $\vec{V} = (3\hat{i} + 2t^2\hat{j})\text{m/s}$. Tangential acceleration of the particle at $t = 2\text{s}$ is 4 K m/s^2 . Find the value of K .
18. **1.87**
19. Given two vectors $\vec{A} = 2\hat{i} + 3\hat{j}$ and $\vec{B} = \hat{i} + \hat{j}$. The component of vector \vec{A} along vector \vec{B} is x . Find the value of ' x '.
19. **3.53**

20. From the velocity-time plot shown in figure. The average velocity during this period is $(N \times 6)$.



20. **0**

space for rough work

Section – III (Mathematics)

PART – A

(Single Correct Choice Type)

This section contains 5 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which only **ONE** option is be correct.

1. If $f(x) = \cos^{-1}(x - x^2) + \sqrt{\left(1 - \frac{1}{|x|}\right) + \frac{1}{x^2 - 1}}$, then domain of $f(x)$ is (where $[.]$ is the greatest integer)
- (A) $\left[\frac{1-\sqrt{5}}{2}, \sqrt{2}\right]$ (B) $\left(-\sqrt{2}, \frac{1-\sqrt{5}}{2}\right)$ (C) $\left[\sqrt{2}, \frac{1+\sqrt{5}}{2}\right]$ (D) $\left[\frac{1-\sqrt{5}}{2}, \frac{1+\sqrt{5}}{2}\right]$

1. **C**

2. For $\alpha \in \mathbb{R}$, the range of the function $f(\alpha) = \int_{\tan^{-1}\alpha}^{\cot^{-1}\alpha} \left(\frac{\tan x}{\tan x + \cot x}\right) dx$ is equal to
- (A) $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$ (B) $(0, \pi)$ (C) $\left(\frac{-\pi}{4}, \frac{3\pi}{4}\right)$ (D) $\left(0, \frac{\pi}{2}\right)$

2. **C**

3. Which of the following function is surjective but not injective
- (A) $f: \mathbb{R} \rightarrow \mathbb{R}$ $f(x) = x^4 + 2x^3 - x^2 + 1$ (B) $f: \mathbb{R} \rightarrow \mathbb{R}$ $f(x) = x^3 + x + 1$
 (C) $f: \mathbb{R} \rightarrow \mathbb{R}^+$ $f(x) = \sqrt{1+x^2}$ (D) $f: \mathbb{R} \rightarrow \mathbb{R}$ $f(x) = x^3 + 2x^2 - x + 1$

3. **D**

4. Let $f_1(x) = \frac{2}{3} - \frac{3}{3x+1}$ and for $n \geq 2$, define $f_n(x) = f_1(f_{n-1}(x))$ then incorrect statement is
- (A) $f_2(x) = \frac{-3x-7}{9x-6}$ (B) $f_{1001}(x) = f_2(x)$
 (C) $f_3(x) = x$ (D) None of these

4. **D**

5. Let $f(x) = x^3 + x^2$ and $g(x)$ be the inverse of $f(x)$, then the value of $g'(2) =$
- (A) $\frac{1}{3}$ (B) $\frac{1}{4}$
 (C) $\frac{1}{5}$ (D) $\frac{1}{6}$

5. **C**

(Multiple Correct Choice Type)

This section contains 8 **multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

6. Let $f : \left[0, \frac{5}{2}\right] \rightarrow \left(\frac{1}{2}, 3\right]$ such that $f(x) = \frac{[x]+1}{\{x\}+1}$ where $[.]$ represents the greatest integer function

and $\{.\}$ represents the fractional part of x , then which of the following is / are true.

(A) $f(x)$ is injective discontinuous function. (B) $f(x)$ is surjective non – differentiable function.

(C) $\min\left(\lim_{x \rightarrow 1^-} f(x), \lim_{x \rightarrow 1^+} f(x)\right) = f(1)$ (D) $\max\left(\lim_{x \rightarrow 2^-} f(x), \lim_{x \rightarrow 2^+} f(x)\right) = f(2)$

6. **ABD**

7. Which of the following function is / are periodic

(A) $\operatorname{sgn}(e^{-x})$

(B) $\sin x + |\sin x|$

(C) $\min(\sin x, |x|)$

(D) $\left[x + \frac{1}{2}\right] + \left[x - \frac{1}{2}\right] + 2[-x]$

($[.]$ denotes greatest integer function)

7. **ABCD**

8. Of the following functions defined from $[-1, 1]$ to $[-1, 1]$, select those which are not bijective

(A) $\sin(\sin^{-1} x)$ (B) $\frac{2}{\pi} \sin^{-1}(\sin x)$ (C) $(\operatorname{Sgn} x) / \ln(e^x)$ (D) $x^3 (\operatorname{Sgn} x)$

8. **BCD**

9. Which of the following functions are even?

(A) $f(x) = x \left(\frac{a^x + 1}{a^x - 1} \right)$

(B) $g(x) = \ln\left(x + \sqrt{x^2 + a^2}\right)$

(C) $h(x) = \sqrt[3]{(1-x)^2} + \sqrt[3]{(1+x)^2}$

(D) $p(x) = \begin{cases} 0, & \text{if } x \text{ is rational} \\ 1, & \text{if } x \text{ is irrational} \end{cases}$

9. **ACD**

10. If x, y and z lie on domain of the equation such that $\ln(x+z) + \ln(x-2y+z) = 2 \ln(x-z)$, then which of the following is / are true

(A) $y = \frac{2xz}{x+z}$

(B) $y^2 = xz$

(C) $2y = x+z$

(D) $\frac{x}{z} = \frac{x-y}{y-z}$

10. **AD**

11. Let $f : \left[\frac{2\pi}{3}, \frac{5\pi}{3}\right] \rightarrow [0, 4]$ be a function defined as $f(x) = \sqrt{3} \sin x - \cos x + 2$, then :

(A) $f^{-1}(1) = \frac{4\pi}{3}$

(B) $f^{-1}(1) = \pi$

(C) $f^{-1}(2) = \frac{5\pi}{6}$

(D) $f^{-1}(2) = \frac{7\pi}{6}$

11. **AD**

12. The function g , defined by $g(x) = \sin \alpha + \cos \alpha - 1$, where $\alpha = \sin^{-1} \sqrt{\{x\}}$, where $\{.\}$ denotes fractional part then which of the following is / are true for the function g

(A) an even function

(B) periodic function

(C) odd function

(D) neither even nor odd

12. **AB**

13. Which of the following function(s) has/have the same range?

(A) $f(x) = \frac{1}{1+x}$ (B) $f(x) = \frac{1}{1+x^2}$ (C) $f(x) = \frac{1}{1+\sqrt{x}}$ (D) $f(x) = \frac{1}{\sqrt{3-x}}$

13. **BC**

PART – B
(Matrix Match Type)

1. Column B represents the number of solutions of equations given in column A now match the following where $\{x\}$ stands for fractional part of x .

Column A		Column B	
(A)	$15\{x\} = 2x + 3$	(P)	7
(B)	$\{x\} = \ln\left(\frac{x}{3}\right)$	(Q)	5
(C)	$\{ x \} = \sin x \quad x \in (-\pi, \pi)$	(R)	6
(D)	$\{x\} = \{-x\} \quad x \in (-3, 3)$	(S)	11

1 **A → R** **B → Q** **C → Q** **D → S**

2. Match the following

Column-I		Column-II	
(A)	$f(x) = \{x\}$, the fractional part of x	(P)	$f^{-1}(x) = \frac{1}{2}(4^x - 4^{-x})$
(B)	$f(x) = \frac{16^x - 1}{4^x}$	(Q)	f is an even function
(C)	$f(x) = \log_4(x + \sqrt{x^2 + 1})$	(R)	f is a periodic function
(D)	$f(x) = x \frac{3^x - 1}{3^x + 1}$	(S)	f is an odd function

2. **A → R** **B → S** **C → P** **D → Q**

PART – C

This section contains 5 Numerical Based questions the answer of which maybe positive or negative numbers or decimals

1. If $f: \mathbb{R} \rightarrow \mathbb{R}$ is a function such that $f(x) = x^3 + x^2 f'(1) + x f''(2) + f'''(3)$ for all $x \in \mathbb{R}$, then $\frac{f(1) - f(2)}{5}$ is

1. **1.2**

2. If $f(x)$ satisfy $f(x) + 2f\left(\frac{2002}{x}\right) = 3x \quad \forall x > 0$ then $\frac{f(2)}{4000} =$

2. **0.5**

3. Let x and y be real numbers satisfying the equation $x^2 + y^2 - 4x + 3 = 0$. If the maximum and minimum values of $(x^2 + y^2)$ are M and m respectively, then the numerical value of $\frac{M-m}{10}$ is

3. **0.8**

4. If $f(x)$ is a polynomial satisfying $f(x) \cdot f\left(\frac{1}{x}\right) = f(x) + f\left(\frac{1}{x}\right)$, and $f(3) = 28$, then $f(4)$ is given by
K, then $\frac{K}{10}$ equals to

4. **6.5**

5. If $f(x) = \frac{x^2 - 1}{x^2 + 1}$, for every real number, then minimum value of f is m , then $m =$

5. **-1**

space for rough work

FIITJEE INTERNAL TEST

Batches:
RANK IMPROVEMENT TEST – I

IIT- JEE 2021 ANSWERS

QP CODE:

SECTION – I (Chemistry)

Part – A

- | | | | |
|---------|---------|---------|--------|
| 1. B | 2. A | 3. B | 4. C |
| 5. B | 6. ABC | 7. ABCD | 8. AB |
| 9. ABCD | 10. ABD | 11. ABD | 12. BC |
| 13. ACD | | | |

Part – B

- | | | | |
|------------|---------|---------|-------|
| 1. A → PQT | B → PQR | C → PQR | D → S |
| 2. A → Q | B → PT | C → PS | D → R |

Part – C

- | | | | |
|--------|---------|-------|-------|
| 1. 3.2 | 2. Zero | 3. -6 | 4. -2 |
| 5. -2 | | | |

SECTION – II (Physics)

Part – A

- | | | | |
|--------|---------|--------|---------|
| 1. B | 2. C | 3. A | 4. B |
| 5. D | 6. ABCD | 7. ABC | 8. ABCD |
| 9. ACD | 10. A | 11. CD | 12. ACD |
| 13. AC | | | |

Part – B

- | | | | |
|------------|--------|---------|-------|
| 14. A → PS | B → QR | C → QRT | D → Q |
| 15. A → R | B → S | C → Q | D → P |

Part – C

- | | | | |
|-------|-------|----------|----------|
| 16. 6 | 17. 4 | 18. 1.87 | 19. 3.53 |
| 20. 0 | | | |

SECTION – III (Mathematics)

Part – A

- | | | | |
|--------|--------|---------|--------|
| 1. C | 2. C | 3. D | 4. D |
| 5. C | 6. ABD | 7. ABCD | 8. BCD |
| 9. ACD | 10. AD | 11. AD | 12. AB |
| 13. BC | | | |

Part – B

- | | | | |
|----------|-------|-------|-------|
| 1. A → R | B → Q | C → Q | D → S |
| 2. A → R | B → S | C → P | D → Q |

Part – C

- | | | | |
|--------|--------|--------|--------|
| 1. 1.2 | 2. 0.5 | 3. 0.8 | 4. 6.5 |
| 5. -1 | | | |