FIITJEE (JEE-Advanced)

PHYSICS, CHEMISTRY & MATHEMATICS

QP Code:

Common Test – 1

Time Allotted: 3 Hours **Maximum Marks: 198**

- 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. Each **Section** is further divided into **Two Parts**: **Part-A & B** in the 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 HB pencil 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 (01-06) –** Contains Six (06) 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 (07-12) –** Contains Six (06) multiple choice questions which have **One or More** 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.

(ii) **Part-B (01-06)** contains Six (06) Numerical based questions, the answer of which maybe positive or negative numbers or decimals to **Two decimal places** (e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) and each question carries **+4 marks** for correct answer and **there will be no negative marking.**

Name of the Candidate :_____

Batch :_____ **Date of Examination :**_____

Enrolment Number :_____

SECTION-1 : PHYSICS
PART – A
(Single Correct Choice Type)
This section contains **6 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. The angle made by vector $\hat{i} + 2\hat{j} - 2\hat{k}$ with the y axis is

    (A) $\cos^{-1}\dfrac{1}{3}$　　　　(B) $\cos^{-1}\left(-\dfrac{2}{3}\right)$　　　　(C) $\cos^{-1}\left(\dfrac{2}{3}\right)$　　　　(D) $\sin^{-1}\left(\dfrac{1}{3}\right)$

2. Of the following quantities, which one has dimensions different form the remaining three
    (A) Energy per unit volume
    (B) Force per unit area
    (C) Product of voltage and charge per unit volume
    (D) Angular momentum per unit mass

3. The resultant of $\bar{A} + \bar{B}$ is $\bar{R}_1$. On reversing the vector $\bar{B}$, the resultant becomes $\bar{R}_2$, what is the value of $R_1^2 + R_2^2$
    (A) $A^2 + B^2$　　　(B) $A^2 - B^2$　　　(C) $2(A^2 + B^2)$　　　(D) $2(A^2 - B^2)$

4. Given the $\bar{A} + \bar{B} = \bar{C}$ and that $\bar{C}$ is $\perp$ to $\bar{A}$. Further if $|\bar{A}| = |\bar{C}|$, then what is the angle between $\bar{A}$ and $\bar{B}$

    (A) $\dfrac{\pi}{4}$ radian　　　(B) $\dfrac{\pi}{2}$ radian　　　(C) $\dfrac{3\pi}{4}$ radian　　　(D) π radian

5. The frequency of vibration f of a malls m suspended from a spring of spring constant K is given by a relation of this type, $f = Cm^x K^y$, where C is a dimensionless quantity. The value of x and y are

    (A) $x = \dfrac{1}{2}, y = \dfrac{1}{2}$　　　　　　　　(B) $x = -\dfrac{1}{2}, y = -\dfrac{1}{2}$

    (C) $x = \dfrac{1}{2}, y = -\dfrac{1}{2}$　　　　　　　　(D) $x = -\dfrac{1}{2}, y = \dfrac{1}{2}$

6. If $\vec{A} = \hat{i} + 2\hat{j} + 2\hat{k}$ and $\vec{B} = 3\hat{i} + 6\hat{j} + 2\hat{k}$, then the vector in the direction of $\vec{A}$ and having same magnitude as $|\vec{B}|$, is

    (A) $\dfrac{7}{3}\left(\hat{i} + \hat{j} + 2\hat{k}\right)$　　　　　　　　(B) $7\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$

    (C) $\dfrac{3}{7}\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$　　　　　　　　(D) $\dfrac{7}{3}\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$

Space For Rough Work

(Multi Correct Choice Type)

This section contains 6 **multiple choice questions.** Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

7. If $\vec{A} = 2\hat{i} + 3\hat{j}$ and $\vec{B} = 2\hat{i} - 3\hat{j} + \hat{k}$ then
   (A) $\vec{A}.\vec{B} = -5$ (B) $\vec{A}.\vec{B} = 5$
   (C) $\left|\vec{A} \times \vec{B}\right| = \sqrt{157}$ (D) $\left|\vec{A} \times \vec{B}\right| = -\sqrt{157}$

8. Choose from following the correct statement(s).
   (A) The no. of significant figures in 0.0145m is 3.
   (B) When 2.251 is rounded off to one decimal place the answer is 2.3
   (C) When 2.251 is rounded off to one decimal place the answer is 2.2
   (D) The least count of weighing machine is 100 Kg. The measured value wing this machine is written as 2000 Kg. The no. of significant figure in this is one.

9. Given two vectors $\vec{A}$ and $\vec{B}$ at a certain angle (none of them being null vectors) then
   (A) $\left(\vec{A} \times \vec{B}\right) \cdot \vec{A} = 0$ (B) $\left(\vec{A} \times \vec{B}\right) \cdot \vec{B} = 0$
   (C) $\vec{A} \times \vec{B} = -\vec{B} \times \vec{A}$ (D) $\left|\vec{A} \times \vec{B}\right| = \left|\vec{B} \times \vec{A}\right|$

10. Given that $y = A\sin\left[\left(\dfrac{2\pi}{\lambda}(ct - x)\right)\right]$, where y and x are measured in metres. Which of the following statements is/are true?
    (A) The unit of λ is same as that of x and A
    (B) The unit of λ is same as that of x but not of A
    (C) The unit of c is same as that of $\dfrac{2\pi}{\lambda}$
    (D) The unit of (ct – x) is same as that of $\dfrac{2\pi}{\lambda}$

11. If $\vec{A} \times \vec{B} = \vec{C} + \vec{D}$, then select the correct alternative
    (A) Component of $\vec{C}$ along $\vec{B}$ = component of $\vec{D}$ along $\vec{B}$
    (B) Component of $\vec{C}$ along $\vec{B}$ = – component of $\vec{D}$ along $\vec{B}$
    (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 $\vec{A}$

Space For Rough Work

12. An experiment measures quantities *a*, *b*, *c* are *x* is calculated from $x = \dfrac{ab^2}{c^3}$. If the percentage errors in *a*, *b*, *c* are $\pm 1\%, \pm 3\%$ and $\pm 2\%$ respectively.
   (A) The percentage error in *x* can be $\pm 13\%$.
   (B) The percentage error in *x* can be $\pm 7\%$.
   (C) The percentage error in *x* can be $\pm 20\%$.
   (D) The percentage error in *x* can be $\pm 26\%$.

PART – B
(Numerical Type)

1. If $\vec{A} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{B} = -\hat{i} + 3\hat{j} + 4\hat{k}$, then projection of $\vec{A}$ on $\vec{B}$ will be ?

2. Percentage error in the measurement of mass and speed are 2% and 3% respectively. The percentage error in the estimate of kinetic energy obtained by measuring mass and speed will be

3. The resultant of two vectors A and B is perpendicular to the vector A and its magnitude is equal to half the magnitude of vector B. The angle between A and B is $x \dfrac{\pi}{6}$. Then the value of 'x' is

4. The density of a cube is measured by measuring its mass and length of its sides. If the maximum error in the measurement of mass and length are 4% and 3% respectively, the maximum error in the measurement of density in percentage will be:

5. 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 $\left| \vec{C} \right| = \left| \vec{A} \times \vec{B} \right|$.

6. If voltage V = (100 ± 5) V and current I = (10 ± 0.2) A, the percentage error in resistance R is:

Space For Rough Work

SECTION-2 : CHEMISTRY
PART – A
(Single Correct Choice Type)

This section contains **6 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. 0.1 mole of a substance weighs 5.6 g. What is the molecular mass of the substance in g mol^{-1} unit?
    (A) 5.6
    (B) 56
    (C) 560
    (D) 5600

2. The oxidation number of nitrogen in NH_2OH is
    (A) -2
    (B) +1
    (C) -1
    (D) +2

3. 400 mL of a solution contains 0.1 mole of solute. How much water is to be added to the solution so that it's concentration will be 0.1 M?
    (A) 100 mL
    (B) 600 mL
    (C) 400 mL
    (D) 200 mL

4. $MnO_4^- + FeC_2O_4 + H^+ \longrightarrow Mn^{2+} + Fe^{3+} + CO_2 + H_2O$
    What is the equivalent mass of FeC_2O_4(Molar mass = M)?
    (A) $\dfrac{M}{2}$
    (B) $\dfrac{M}{3}$
    (C) $\dfrac{M}{4}$
    (D) $\dfrac{M}{6}$

5. $S + 6NO_3^- + 4H^+ \longrightarrow SO_4^{2-} + 6NO_2 + 2H_2O$
    Choose correct statement.
    (A) Number of electrons lost or gained in above reaction is eight.
    (B) NO_3^- is the oxidizing agent
    (C) H^+ is reduced in the reaction
    (D) The oxidation number of oxygen changes from -1 to -2 in the reaction

6. 200 mL of 0.4 M solution of NaOH was neutralized by 400 mL of HCl solution. What is the morality of the HCl solution?
    (A) 0.1 M
    (B) 0.2 M
    (C) 0.8 M
    (D) 1.2 M

Space For Rough Work

(Multi Correct Choice Type)

This section contains 6 **multiple choice questions.** Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

7. Which of the following half-reaction(s) is/are oxidation reaction(s)?

(A) $NO_2^- \longrightarrow NO_3^-$ (B) AsO_3^{3-} and AsO_4^{3-}

(C) $CO_2 \longrightarrow CO_3^{2-}$ (D) $N_2H_4 \longrightarrow NH_3$

8. $MnO_4^- + M^{m+} + H^+ \longrightarrow Mn^{2+} + M^{n+} + H_2O$

Choose the correct statement(s)

(A) m < n

(B) if one mole of MnO_4 oxidizes 5 mole of M^{m+}, then$(m - n) = -1$

(C) the equivalent mass and atomic mass of the metal ion M^{m+} are identical

(D) The oxidation number of Mn in MnO_4^- is +5

9. $CaCO_3 + 2HCl \longrightarrow CaCl_2 + CO_2 + H_2O$

0.1 mole of $CaCO_3$ and 0.1 mole of HCl undergo complete reaction to produce.

(A) 0.05 mole of $CaCl_2$ (B) 0.9 g of H_2O

(C) 0.1 mole CO_2 (D) 0.1 mole $CaCl_2$

10. In which compound(s) sulphur shows positive oxidation states?

(A) S_8 (B) H_2SO_4

(C) SF_4 (D) H_2S

11. Which of the following contain(s) one mole atoms?

(A) 15 g NO (B) 14 g CO

(C) 4 g CH_4 (D) 6 gram H_2O

12. $Mg + 2HCl \longrightarrow MgCl_2 + H_2$

In above reaction

(A) Mg is oxidized (B) Cl^- is reduced

(C) it is an intermolecular redox reaction (D) it is a disproportionation reaction

Space For Rough Work

PART – B
(Numerical Type)

1. If the mass%(w/w) of oxygen present in magnesium oxide(MgO) is X, what is the value of $\dfrac{X}{16}$?

2. A gaseous mixture contains 128 gram of O_2 and 6 moles of CH_4. What is the molecular mass of the mixture(M_{mix}) in g mol^{-1} unit?
    [Molecular mass of O_2 = 32 and CH_4 = 16]

3. One mole of a compound contains 72 gram of carbon, 12 moles of hydrogen atoms and three moles of dioxygen(O_2) molecules. If the empirical mass of the compound is X g mol^{-1}, what is the value of $\dfrac{X}{8}$?

4. 50 mL of a solution containing NaOH and Na_2CO_3 requires 800 mL of 0.75 M HCl solution for titration in presence of phenolphthalein indicator. If the molarity of NaOH in the original solution(50 mL) is 8 M, how many gram of Na_2CO_3 is present in the original solution?

5. What is the equivalent mass of NaCl in the following reaction in g equ^{-1} unit?
    $$NaCl + AgNO_3 \longrightarrow AgCl + NaNO_3$$

6. An unknown quantity of $MgCO_3$ was added to a container which contains 500 mL of 0.5 M HCl solution. After complete reaction, the excess acid(HCl) required 100 mL of 0.5 M NaOH solution for neutralization. How much $MgCO_3$ in gram taken initially?

Space For Rough Work

SECTION-3 : MATHEMATICS
PART – A
(Single Correct Choice Type)
This section contains **6 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. Find the value of $n\left(P\left(P\left(P\left(\phi\right)\right)\right)\right) = ?$

   (Where $P\left(A\right)$ denotes the power set of 'A' and $n\left(A\right)$ represents number of elements in set 'A')
   (A) 1   (B) 0
   (C) 2   (D) 4

2. The sum of all real roots of the equation $\left|x - 2\right|^2 + \left|x - 2\right| - 2 = 0$ is
   (A) 1   (B) 2
   (C) 3   (D) 4

3. A college awarded 38 medals in Football, 15 in basketball and 20 in cricket. If these medals went to a total of 58 players and only three players got medals in all three sports; then how many players received medals in exactly two of the three sports?
   (A) 18   (B) 38
   (C) 9   (D) 20

4. The solution of the inequality $\left|x\right| + 2 > \left|x - 2\right|$ is
   (A) $\left(-\infty, \infty\right)$ (B) $\left(0, \infty\right)$
   (C) $\left[0, \infty\right)$ (D) $\left[-\infty, 0\right]$

5. Domain of definition of the function $f\left(x\right) = \dfrac{3}{4 - x^2} + \log_{10}\left(x^3 - x\right)$ is
   (A) $(1, 2)$ (B) $(1, 0) \cup (1, 2)$
   (C) $(1, 2) \cup (2, \infty)$ (D) $(-1, 0) \cup (1, 2) \cup (2, \infty)$

6. Domain of $f\left(x\right) = \sqrt{\dfrac{\sqrt{x - 2}}{\left(x - 3\right)}}$
   (A) $x \in \left[2, 3\right)$ (B) $x \in \left[3, \infty\right)$
   (C) $x \in \left(3, \infty\right)$ (D) $x \in \left\{2\right\} \cup \left(3, \infty\right)$

Space For Rough Work

(Multi Correct Choice Type)

This section contains 6 **multiple choice questions.** Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

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7. If $|x+1| - |x| + |2x-1| = \lambda$ have exactly two solutions then 'λ' can be
   (A) 1
   (B) 2
   (C) $\dfrac{3}{2}$
   (D) 4

8. The points at which $z = x + 2y$ attains its minimum value subject to the following constraints
   (i) $2x + 4y \geq 200$
   (ii) $2x - y \leq 0$
   (iii) $2x + y \leq 200$
   (iv) $x \geq 0$
   (v) $y \geq 0$
   are
   (A) (0, 50)
   (B) (10, 45)
   (C) (20, 40)
   (D) (8, 46)

9. If $n(A \cup B) = 90, n(A - B) = 15, n(A \cap B) = 30,$ then which of the following statements are true?
   (A) $n(B) = 70$
   (B) $n(A) = 45$
   (C) $n((A \times B) \cap (B \times A)) = 900$
   (D) $n((B \times A) \times A) = 151875$

10. Let $A = \{a, b, c, d\}, B = \{1, 2, 3, 4, 5\}$ Then which of the following mappings from set A to set B can be considered as function $f: A \to B$??

    (A)

    (B)

    (C)

    (D)
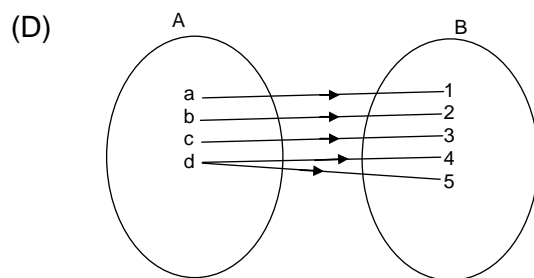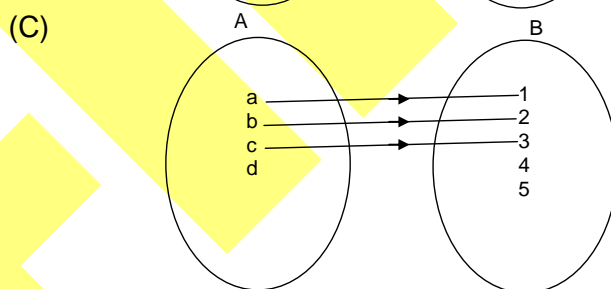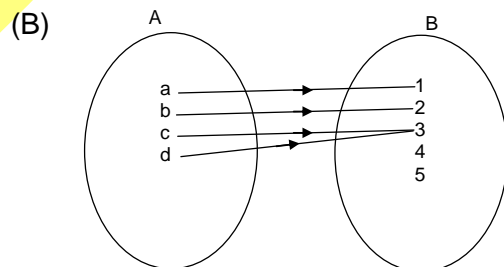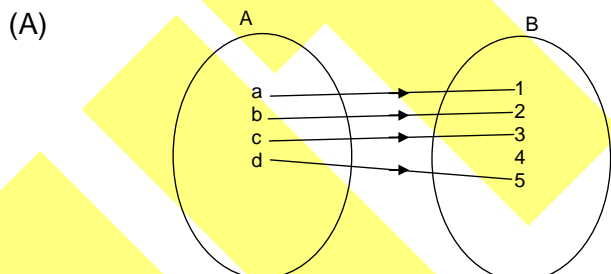
Space For Rough Work

11. The solution set of $\dfrac{|x|-1}{|x|-2} \geq 0$ includes the set

(A) $(-\infty, -2)$ (B) $[-2, -1]$

(C) $[-1, 1]$ (D) $[2, \infty)$

12. If $n(A) = 8$ and $n(B) = 13,$ then possible value of $n(A \cup B)$ is

(A) 8   (B) 13

(C) 15   (D) 21

PART – B
(Numerical Type)

1. Number of integral values of 'x' satisfying the given inequality is/are _____

$$\frac{\left(x^2 - 3\right)\left(x^4 + x^2 + 1\right)\left(2^x - 1\right)}{\left(3x + 1\right)^7 \left(x + 5\right)^2} \leq 0$$

2. A manufacturing company makes two types of television sets, one is black & white and other is color. The company has resources to make at most 300 sets a weak. It takes Rs. 1800 to make a black & white set and Rs. 2700 to make a colored set. The company can spend not more than Rs. 648000 a week to make television sets, If it makes a profit of Rs. 510 per black & white set and Rs. 675 per colored set, how many colored sets should be produced so that the company has a maximum profit?

3. If $n(A) = 7, n(B) = 8$ and $n(A \cap B) = 4,$ then $n\big((A \times B) \cup (B \times A)\big) = ?$

4. If $y = |x - 1| + |x - 3| + |x - 7|,$ then minimum value of 'y' is _____

5. Sum of all possible values of 'x' satisfying the equation $|x| + |2x - 3| = 4$ is _____

6. Number of integral values of 'x' satisfying $|x - 1| + |x - 3| < 6$ is/are _____

Space For Rough Work

QP Code:

ANSWERS

SECTION-1 : PHYSICS

PART – A

1.	C	2.	D	3.	C	4.	C
5.	D	6.	D	7.	AC	8.	ABD
9.	ABCD	10.	A	11.	BD	12.	AB

PART – B

1.	0.59 (Range: 0.58 to 0.60)	2.	8	3.	5
4.	13	5.	6	6.	7

SECTION – 2 : CHEMISTRY

PART – A

1.	B	2.	C	3.	B	4.	B
5.	B	6.	B	7.	AB	8.	ABC
9.	AB	10.	BC	11.	ABD	12.	AC

PART – B

1.	2.5	2.	22.4	3.	3.75	4.	21.2
5.	58.5	6.	8.4				

SECTION – 3 : MATHEMATICS

PART – A

1.	D	2.	D	3.	C	4.	B
5.	D	6.	D	7.	CD	8.	ABCD
9.	BCD	10.	AB	11.	AC	12.	BCD

PART – B

1.	3	2.	120	3.	96	4.	7
5.	2	6.	5				