

**FIITJEE COMMON TEST – 1****PHYSICS, CHEMISTRY & MATHEMATICS****CODE:****Time Allotted: 3 Hours****Maximum Marks: 186**

- 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. Wrog 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 Section.
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 & Part-C**
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 Three Parts.**

- (i) **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.

**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.

- (iii) **Part-B (01-05)** contains five (05) 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 and **there will be no negative marking**.

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

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

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

BATCHES – NWCM82201S, NWCM2022X1R, NWCM2022Y1R, NWCM2022A1R, NWCM2022A2R, NWCM2022A1W, NWCM2022A2W, NWCM2022A3W, NWCM2022A4W, NWCM2022X1W, NWCM2022Y1W, NWCM2022Z1W, NWCM2022A1W, NWCM2022XA1W, NWCM2022XA2W, PANINI2022-XI 1,

## PART – I: PHYSICS

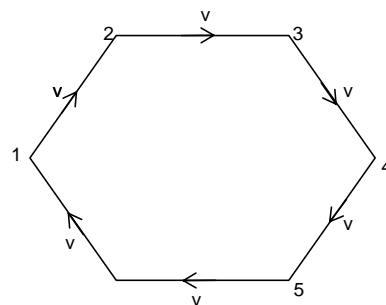
### SECTION – A

#### (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** is correct.

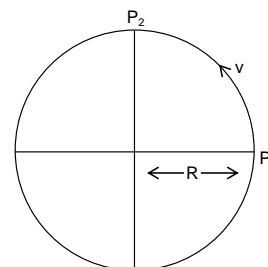
1. The relation between time  $t$  and distance  $x$  moved by a particle is  $t = \alpha x^2 + \beta x$  where  $\alpha$  and  $\beta$  are constants. The retardation is (if  $v$  represents velocity)
- (A)  $2\alpha V^3$                       (B)  $2\beta V^3$                       (C)  $2\alpha\beta V^3$                       (D)  $2\beta^2 V^3$

2. Six particles move in a cyclic manner along the sides of a regular hexagon of side  $\ell$  as shown in the figure, when the speed of each particle is  $v$  the particles lie always at the vertices of a hexagon. When will the side of the hexagon be halved?  $\ell = 1\text{m}$ ,  $v = 1\text{ m/sec}$
- (A) 0.5 seconds                      (B) 1 second  
(C) 1.5 seconds                      (D) 2 seconds



3. Given the  $\vec{A} + \vec{B} = \vec{C}$  and that  $\vec{C}$  is  $\perp$  to  $\vec{A}$ . Further if  $|\vec{A}| = |\vec{C}|$ , then what is the angle between  $\vec{A}$  and  $\vec{B}$
- (A)  $\frac{\pi}{4}$  radian                      (B)  $\frac{\pi}{2}$  radian  
(C)  $\frac{3\pi}{4}$  radian                      (D)  $\pi$  radian

4. Figure below shows a body of mass  $M$  moving with the uniform speed on a circular path of radius  $R$ . What is the change in acceleration in going from  $P_1$  to  $P_2$
- (A) Zero                      (B)  $v^2 / 2R$   
(C)  $2v^2 / R$                       (D)  $\frac{v^2}{R} \times \sqrt{2}$

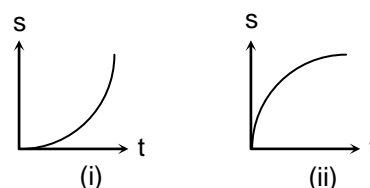


5. A particle has an initial velocity of  $3\hat{i} + 4\hat{j}$  and an acceleration of  $0.4\hat{i} + 0.3\hat{j}$ . Its Speed after 10 sec is
- (A) 10 m/s                      (B) 7 m/s                      (C)  $7\sqrt{2}$  m/s                      (D) 8.5 m/s

#### (Multi 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. Displacement ( $s$ ) versus time ( $t$ ) graphs of two particles moving in a straight line along  $x$ -axis are shown below. It can be stated that
- (A) particle (i) has accelerated motion  
(B) particle (i) has uniform motion  
(C) particle (ii) has uniform motion  
(D) particle (ii) has a retarded motion





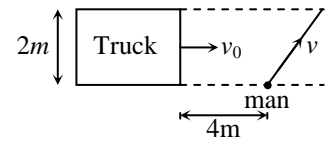
**SECTION – C**  
**(Numerica Type)**

This section contains **5 questions** 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).

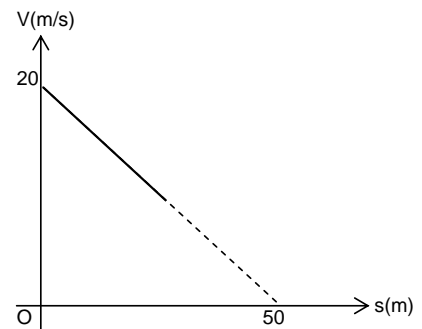
1. A man is going up in an air balloon going up with an acceleration  $2 \text{ m/s}^2$ . When he reaches to a ht.  $100 \text{ m}$  from ground, he drops a ball. The time taken by the ball to reach the ground is  $x(1 + \sqrt{6})$ . Value of  $x$  is

2. If  $\vec{A} \cdot \vec{B} = |\vec{A} \times \vec{B}|$  and  $|\vec{A}|$  &  $|\vec{B}|$  are  $2\sqrt{2}$  and  $3$  respectively, determine  $\frac{|\vec{A} \times \vec{B}|}{4}$ .

3. A  $2\text{m}$  wide truck is moving with a uniform speed  $v_0 = 8 \text{ m/s}$  along a straight horizontal road. A pedestrian starts to cross the road with a uniform speed  $v$  when the truck is  $4 \text{ m}$  away from him. The minimum value of velocity so that he can cross the road safely is  $v$  then the value of  $\frac{\sqrt{5}}{2} v$  is



4. Referring to  $v$ - $s$  diagram, if magnitude of acceleration of the particle when its velocity becomes half of the initial velocity is  $a$ , then find the value of  $a/5$ .



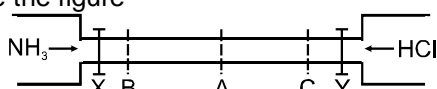
5. Two seconds after the projection, a projectile is moving in a direction at  $30^\circ$  to the horizontal. After one more second, it is moving horizontally. The magnitude of the initial velocity is  $\left(\frac{8\sqrt{3}}{5} y\right)$ . Find the value of 'y'.

*Space for rough work*

**PART – II: CHEMISTRY****SECTION – 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** is correct.

- At 273 K temp and 9 atm pressure the compressibility for a gas is 0.9. The volume of 1 millimoles of gas at this temperature & pressure is  
(A) 2.24 L (B) 0.020 ml (C) 2.24 ml (D) 2.48 ml
- Incorrect postulate of kinetic theory of gases  
(A) gas particles moves in random motion  
(B) forces between gas molecules are negligible  
(C) gas molecules will higher molar mass have more kinetic energy  
(D) collision between gas molecules are elastic
- 20 L of SO<sub>2</sub> diffuses through a porous partition in 60 seconds. Volume of O<sub>2</sub> diffuse under similar conditions in 30 seconds will be:  
(A) 12.14 L (B) 14.14 L (C) 18.14 L (D) 28.14 L
- The correct order of normal boiling points of O<sub>2</sub>, N<sub>2</sub>, NH<sub>3</sub> and CH<sub>4</sub>, for whom the values of vander Waal's constant 'a' are 1.360, 1.390, 4.170 and 2.253 L<sup>2</sup>. atm. Mol<sup>-2</sup> respectively, is  
(A) O<sub>2</sub> < N<sub>2</sub> < NH<sub>3</sub> < CH<sub>4</sub> (B) O<sub>2</sub> < N<sub>2</sub> < CH<sub>4</sub> < NH<sub>3</sub>  
(C) NH<sub>3</sub> < CH<sub>4</sub> < N<sub>2</sub> < O<sub>2</sub> (D) NH<sub>3</sub> < CH<sub>4</sub> < O<sub>2</sub> < N<sub>2</sub>
- See the figure



The valves of X and Y are opened simultaneously. The white fumes of NH<sub>4</sub>Cl will first form at:

- (A) A (B) B  
(C) C (D) A, B and C simultaneously

**(Multi 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.

- The 'A' gas is liquefied more easily than gas 'B'. Hence  
(A) Vander wall's constant a and b of 'A' > that of 'B'  
(B) a and b of 'A' < that of 'B'.  
(C) a(A) > a(B) but b(A) < b(B)  
(D) The intermolecular force of attraction between the 'A' molecules > that between the 'B' molecules
- 11.2 litre of a gas at 1 atm pressure and 273 K weighs 14 gm. The gas/gases would be  
(A) CO (B) N<sub>2</sub> (C) C<sub>2</sub>H<sub>4</sub> (D) N<sub>2</sub>O
- The van der Waal's equation for one mole of a real gas is given below:  

$$\left(P + \frac{a}{V^2}\right)(V - b) = RT$$
 What change(s) is/are observed in the equation if the pressure is increased?  
 (A) The equation reduces to P(V - b) = RT  
 (B) 'a' is neglected and is assumed to be zero  
 (C) PV becomes less than RT  
 (D) 'b' is taken to be zero
- An aqueous solution of glucose (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>) contains 1 mole of glucose in 1.8 L solution . Thus,  
 (A) It is 10% aqueous solution  
 (B) Its density is 0.1 g mL<sup>-1</sup>  
 (C) solution contains 3.33 × 10<sup>20</sup> glucose molecules per mL  
 (D) solution contains 24 g atoms

**COMMON TEST # 1 – C-XI-6**

10. Select the correct statements ?  
(A) vapour may be condensed to liquid by the application of pressure  
(B) To liquify a gas one must lower the temperature below  $T_c$  and apply pressure  
(C) At  $T_c$  there is no distinction between liquid and vapour state  
(D) At  $T_c$ , density of liquid is very high as compared to its gaseous state
11. 8 gm of oxygen has the same number of molecules as in:  
(A) 11 gm  $\text{CO}_2$                       (B) 22 gm  $\text{CO}_2$                       (C) 7 gm CO                      (D) 14 gm. CO
12. One mole of  $(\text{NH}_4)_2\text{SO}_4$  contains  
(A) 28 g of nitrogen                      (B) Two moles of di-hydrogen( $\text{H}_2$ )  
(C) One mole of sulphur atom                      (D)  $(6.023 \times 10^{23} \times 4)$  atoms of oxygen
13. A solution contains 4 g NaOH. Which of the following solutions can completely neutralize it?  
(A) 200 mL of 0.5 M HCl                      (B) 500 mL of 0.1 M  $\text{H}_2\text{SO}_4$   
(C) 400 mL of 0.25 M KOH                      (D) 1000 mL of 0.1 M NaCl

**SECTION – C**  
**(Numerica Type)**

This section contains **5 questions** 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).

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1. Calculate the root mean square speed of oxygen molecules having kinetic energy of  $8.368 \text{ kJ mol}^{-1}$ . At what temperature would the molecules have this value of root mean square speed. The temperaure is
2. A sample of hard water contains 1 mg  $\text{CaCl}_2$  and 1 mg  $\text{MgCl}_2$  per litre. Calculate the hardness in terms of  $\text{CaCO}_3$  in ppm?
3. 0.5 g of fumic sulphuric acid called oleum is diluted with water. This solution completely neutralized 26.7 mL of 0.4 M NaOH. Find the percentage of free  $\text{SO}_3$  in the sample solution.
4. The compression factor for 1 mole of a van der Waal's gas at  $0^\circ\text{C}$  and 100 atm pressure found to be 0.5. Assuming that the volume of a gas molecule is negligible. Calculate van der Waal constant 'a'
5. 500 mL of 1.5 N acidified permanganate solution is exactly decolourised by 600 mL of  $\text{H}_2\text{O}_2$  solution? What is the volume strength of  $\text{H}_2\text{O}_2$  solution?

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*Space for rough work*

**PART – III: MATHEMATICS****SECTION – 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** is correct.

- The line through point  $(m, -9)$  and  $(7, m)$  has slope  $m$ . The  $y$  – intercept of this line is  
 (A) 18 (B)  $-6$  (C) 6 (D)  $-18$
- The coordinates of the foot of perpendicular drawn from the point  $(4, 2)$  on the line  $3x - 2y + 5 = 0$  are  
 (A)  $(-2, 6)$  (B)  $(1, 4)$  (C)  $(3, 7)$  (D) None of these
- The complete solution of the inequality  $(x - 1)(x - 3)(x - 7) \geq 0$  is  
 (A)  $x \in [1, 3] \cup [7, \infty)$  (B)  $x \in [7, \infty)$   
 (C)  $x \in [1, \infty) - \{4, 5, 6\}$  (D) None of these
- If the two vertices of a triangle are  $(7, 2)$  and  $(1, 6)$  and its centroid is  $(4, 6)$  then the coordinate of the third vertex are  $(a, b)$ . The value of  $(a + b)$ , is  
 (A) 13 (B) 14 (C) 15 (D) 16
- $\int \tan^4 x \, dx$  is equal to  
 (A)  $\frac{1}{3} \tan^3 x + \tan x + x + c$  (B)  $\tan^3 x - \tan x - x + c$   
 (C)  $\frac{1}{3} \tan^3 x - \tan x + x + c$  (D)  $\tan^3 x - \tan x + x + c$

**(Multi 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.

- Which of the following is/are **INCORRECT**?  
 (A)  $\lim_{x \rightarrow \pi} \frac{\sin x}{x} = 1$  (B)  $\lim_{x \rightarrow \infty} \frac{\sin x}{x} = 1$  (C)  $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$  (D)  $\lim_{x \rightarrow \pi} \frac{1 - \cos x}{x^2} = \frac{1}{2}$
- Which of the following, when simplified, reduces to unity?  
 (A)  $\log_3 \log_{27} \log_4 64$  (B)  $2 \log_{18} (\sqrt{2} + \sqrt{8})$   
 (C)  $\log_2 \sqrt{10} + \log_2 \left( \frac{2}{\sqrt{5}} \right)$  (D)  $-\log_{\sqrt{2}-1} (\sqrt{2} + 1)$

**COMMON TEST # 1 – C-XI-8**

8. Which of the following is **INCORRECT**?
- (A) If  $\frac{d}{dx} \left( \frac{1+x^2+x^4}{1+x+x^2} \right) = ax + b$ , then  $a + b = 3$
- (B) If  $y = e^{\tan x}$ , then  $\left. \frac{dy}{dx} \right|_{x=0} = 0$
- (C)  $\lim_{x \rightarrow 1} \frac{x-1}{2x^2-7x+5} = 0$
- (D)  $\lim_{h \rightarrow 0} \frac{\sqrt{x+h} - \sqrt{x}}{h} = \frac{1}{\sqrt{x}}$
9. Which of the following is **INCORRECT**?
- (A) The complete solution set of the inequality  $x^2 > 25$  is  $(5, \infty)$
- (B) The inequality  $\frac{x-2}{x+3} < 2$  can be solved by multiplying both sides by  $x+3$  resulting in the equivalent inequality  $x-2 < 2(x+3)$
- (C)  $(x+3)(x-1) > 0$  and  $\frac{x-1}{x+3} > 0$  have the same solution set
- (D)  $\log(x+2y)$  can be written as  $(\log x)(\log 2y)$
10. The equation of the altitude of the  $\triangle ABC$  whose vertices are A  $(-4, 2)$ , B  $(6, 5)$  and C  $(1, -4)$  can be
- (A)  $10x + 3y + 2 = 0$  (B)  $5x + 9y + 2 = 0$
- (C)  $6x - 5y - 11 = 0$  (D)  $5x - 6y = 0$
11. If the lines  $2x + 3y = 5$ ,  $t^2x + ty - 6 = 0$  and  $3x - 2y - 1 = 0$  are concurrent, then the value of  $t$  can be
- (A) 2 (B) -3 (C) -2 (D) 3
12. For the equation:  $|x|^2 + |x| - 6 = 0$ , the correct statements (s) is/are :
- (A) Sum of real roots is zero. (B) Product of real roots is -4.
- (C) There are 4 real roots. (D) There are only two real roots.
13. Which of the following centers of the triangle always lie inside the triangle?
- (A) centroid (B) incentre (C) circumcentre (D) orthocenter



**SECTION – C**  
**(Numerica Type)**

This section contains **5 questions** 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).

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1. If the reflection of origin in the line  $4x - 2y - 5 = 0$  is the point  $(p, q)$  then the value of  $\frac{8p + 2q}{5}$  is
2. The number of integral solutions of the inequality  $\frac{2x}{2x^2 + 5x + 2} > \frac{1}{x + 1}$  is
3. If  $P(1, 2)$ ,  $Q(4, 6)$ ,  $R(5, 7)$  and  $S(a, b)$  are the vertices of a parallelogram PQRS, then the value of  $\frac{b}{a}$  is equal to
4. If  $A = \log_2 \log_2 \log_4 256 + 2 \log_{\sqrt{2}} 2$ , then the value of  $(A + 1)$  is equal to
5. The perpendicular bisector of a line segment AB is  $x - y + 5 = 0$ . If point A is  $(1, -2)$  then the length of AB is  $k\sqrt{2}$  units, where the value of k is

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*Space for rough work*

# FIITJEE COMMON TEST - I

BATCHES – NWCM822O1S, NWCM2022X1R, NWCM2022Y1R, NWCM2022A1R, NWCM2022A2R, NWCM2022A1W, NWCM2022A2W, NWCM2022A3W, NWCM2022A4W, NWCM2022X1W, NWCM2022Y1W, NWCM2022Z1W, NWCM2022XA1W, NWCM2022XA2W, PANINI2022-XI 1, PANINI2022-XI 2, & PANINI2022-G 1

## ANSWERS KEY

QP Code:

Physics

SECTION – A

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

SECTION – C

- |         |         |      |         |
|---------|---------|------|---------|
| 1. 2    | 2. 1.50 | 3. 4 | 4. 0.80 |
| 5. 1.25 |         |      |         |

Chemistry

SECTION – A

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

SECTION – C

- |                 |                   |
|-----------------|-------------------|
| 1. 6.50 to 6.90 | 2. 1.90 to 1.98   |
| 3. 20.4 to 20.8 | 4. 1.250 to 1.254 |
| 5. 7.0          |                   |

## MATHEMATICS

SECTION – A

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

SECTION – C

- |        |      |        |      |
|--------|------|--------|------|
| 1. 2.8 | 2. 0 | 3. 1.5 | 4. 6 |
| 5. 8   |      |        |      |