

PHYSICS, CHEMISTRY & MATHEMATICS

Pattern - CPT-1

QP Code:

PAPER - 1

Time Allotted: 3 Hours

Maximum Marks: 183

- 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 (01-07)** – Contains seven (07) multiple choice questions which have **One or More** correct answer.
Full Marks: +4 If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.
Partial Marks: +1 For darkening a bubble corresponding to **each correct option**, provided NO incorrect option is darkened.
Zero Marks: 0 If none of the bubbles is darkened.
Negative Marks: -1 In all other cases.
For example, if **(A), (C) and (D)** are all the correct options for a question, darkening all these three will result in **+4 marks**; darkening only **(A) and (D)** will result in **+2 marks**; and darkening **(A) and (B)** will result in **-1 marks**, as a wrong option is also darkened.
- (ii) **Part-A (08-13)** – 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-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 : _____

SECTION-1 : PHYSICS

PART – A

(Multi Correct Choice Type)

This section contains 7 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

1. Two blocks B and C in the figure have mass m each. The strings AB and BC are light, having tensions T_1 and T_2 respectively. The system is in equilibrium with a constant horizontal force mg acting on C.

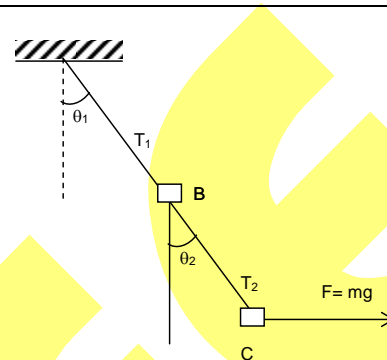
(A) $\tan\theta_1 = 1/2$

(B) $\tan\theta_2 = 1$

(C) $T_1 = \sqrt{5} mg$

(D)

$T_2 = \sqrt{2} mg$



1. **ABCD**

2. A man who can swim at a speed v relative to the water wants to cross a river of width d , flowing with a speed u . The point opposite him across the river is P.

(A) The minimum time in which he can cross the river is $\frac{d}{v}$.

(B) He can reach the point P in time $\frac{d}{v}$.

(C) He can reach the point P in time $\frac{d}{\sqrt{v^2 - u^2}}$

(D) He cannot reach P if $u > v$.

2. **ACD**

3. If the kinetic energy of a body is directly proportional to time 't', the magnitude of the force acting on the body is

(A) directly proportional to \sqrt{t}

(B) inversely proportional to \sqrt{t}

(C) directly proportional to the speed of the body

(D) inversely proportional to the speed of the body

3. **BD**

4. Let v and a denote the velocity and acceleration respectively of a body in one dimensional motion

(A) $|\vec{v}|$ must decrease when $a < 0$

(B) speed must increase when $a > 0$

(C) speed will increase when both v and a are less than zero

(D) speed will decrease when $v < 0$ & $a > 0$

4. **CD**

5. A block of weight 9.8N is placed on a table. The table surface exerts an upward force of 10N on the block. Assume $g = 9.8 \text{ m/s}^2$

(A) The block exerts a force of 10N on the table

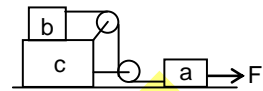
(B) The block exerts a force of 19.8 N on the table

(C) The block exerts a force of 9.8N on the table

(D) The block has an upward acceleration

5. **AD**

6. Three blocks a, b, and c of masses 10 kg, 10 kg and 20 kg are arranged as shown in figure. All the surfaces are frictionless and string is inextensible. Pulleys are light. A constant force $F = 20$ N is applied on block a as shown. Pulleys and string are light. Part of the string connecting both pulleys is vertical and part of the strings connecting pulleys with blocks a and b are horizontal.



- (A) Acceleration of mass blocks a, b and c is 0.5 m/s^2 .
 (B) Acceleration of mass block b is 1.
 (C) Tension in the string is 10 N.
 (D) Acceleration of mass block c is 0.5

6. **BC**

7. A particle of mass m moves along a curve $y = x^2$. When particle has x-co-ordinate as $\frac{1}{2}$ and x-component of velocity as 4 m/s then.

- (A) the position coordinate of particle are $(\frac{1}{2}, \frac{1}{4})$
 (B) the velocity of particle will be along the line $4x - 4y - 1 = 0$.
 (C) the magnitude of velocity at that instant is $4\sqrt{2} \text{ m/s}$
 (D) none of the above.

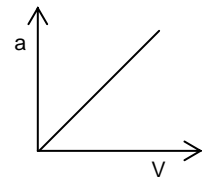
7. **AC**

(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**.

8. The acceleration-velocity graph of a particle moving in a straight line is as shown in figure. Then slope of velocity-displacement graph

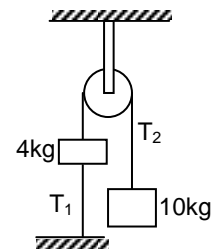
- (A) increases linearly
 (B) decreases linearly
 (C) is constant
 (D) increases parabolically



8. **C**

9. Two bodies of masses 4 kg and 10 kg are attached to the ends of a string passing over a pulley. The 4 kg mass is also attached to another string whose other end is attached to the horizontal surface. The tension in this string T_1 is equal to

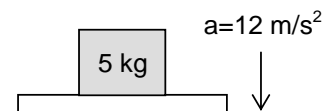
- (A) 40 N
 (B) 44.3 N
 (C) 100 N
 (D) 60 N



9. **D**

10. A block 5 kg is kept on the floor of an elevator at rest. As the elevator starts descending with an acceleration of 12 m/s^2 , (Taking $g = 10 \text{ m/s}^2$) the displacement of the block during the first 0.2 sec.

- (A) 0.04 meter
 (B) 0.24
 (C) 0.2 meter
 (D) 0.02
 meter



10. **C**

11. A ball is projected with velocity v_0 at an angle θ with the ground. The time after which the velocity of the ball is perpendicular to its initial direction of motion is

- (A) $\frac{v_0}{g \cos \theta}$
 (B) $\frac{v_0}{g \sin \theta}$
 (C) $\frac{v_0}{g} \tan \theta$
 (D) $\frac{v_0}{g} \cot \theta$

11. **B**
12. When a body of mass M slides down an inclined plane of inclination θ , through a distance s , the work done by normal reaction is: (μ is coefficient of friction)
- (A) zero (B) $\mu Mg \sin \theta s$
 (C) $Mg (\mu \cos \theta - \sin \theta)s$ (D) None of the above
12. **A**
13. A person walking at the rate of 3 km/hr , the rain appears to fall vertically when he increases his speed to 6 km/hr it appears to meet him at an angle of 45° with the vertical. The speed of rain is
- (A) $3\sqrt{2}\text{ km/hr}$ (B) $\frac{3}{\sqrt{2}}\text{ km/hr}$
 (C) $6\sqrt{2}\text{ km/hr}$ (D) $2\sqrt{3}\text{ km/hr}$
13. **A**

PART – B
(Numerical based)

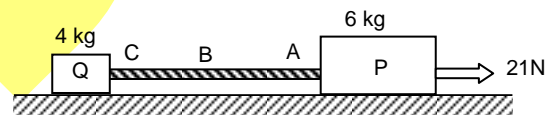
1. If $\vec{A} \cdot \vec{B} = |\vec{A} \times \vec{B}|$ and $|\vec{A}|$ & $|\vec{B}|$ are $2\sqrt{2}$ and 3 respectively, determine $|\vec{C}| = |\vec{A} \times \vec{B}|$.

1. **6**

2. A block of mass 1 kg lies on a horizontal surface in a truck. The coefficient of static friction between the block and the surface is 0.6 . If the acceleration of the truck is 5 m/s^2 , then what frictional force acting on the block (in newton).

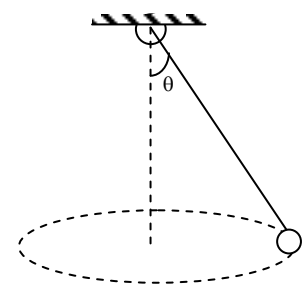
2. **5**

3. Two blocks of masses 6 kg and 4 kg connected by a rope of mass 4 kg are resting on a frictionless floor as shown. If a constant force of 21 Newton is applied to the 6 kg block, tension (in N) in the rope at point B is $2n$ ($CB : BA = 1 : 1$). Find the value of 'n'.



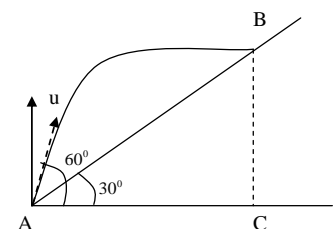
3. **4.50**

4. In the conical pendulum, the centripetal force will be ($\theta = 45^\circ$, $m = 0.1\text{ kg}$, $g = 10\text{ m/s}^2$)



4. **1**

5. The time taken by a projectile to reach from A to B is t then the distance of AB is $\frac{ut}{\sqrt{2k}}$ then $k =$ _____



5. **1.50**

SECTION-2 : CHEMISTRY

PART – A

(Multi Correct Choice Type)

This section contains 7 **multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

1. Which of the following ion(s) contain(s) unpaired electrons?
 (A) O^+ (B) O^{2-}
 (C) O_2^+ (D) O_2^{2-}
1. AC
2. Which of the following electron affinity order(s) is/are correct?
 (A) $O < S$ (B) $N > O$
 (C) $P > N$ (D) $C > N$
2. ACD
3. Which of the following molecule(s) contain lone pairs?
 (A) PCl_5 (B) SF_4
 (C) XeF_4 (D) $BeCl_2$
3. BC
4. Which of the following statement(s) will be correct if van der Waal's equation for **one mole of gas** is subjected to high pressure?
 (A) $PV > RT$ (B) $\left(P + \frac{a}{V^2}\right)V = RT$
 (C) $Z > 1$ (D) $a = 0$
4. AC
5. Which of the following substance(s) undergoes dehydration on heating?
 (A) $LiOH$ (B) $NaOH$
 (C) $Mg(OH)_2$ (D) KOH
5. AC
6. Which of the following substance(s) undergo(es) deuterium exchange reaction with D_2O ?
 (A) H_2SO_4 (B) CO_2
 (C) $CaCO_3$ (D) $NaHCO_3$
6. AD
7. Which hydride(s) has/have lower boiling point than NaH ?
 (A) BeH_2 (B) BH_3
 (C) CH_4 (D) NH_3
7. ABCD

(Single Correct Choice Type)

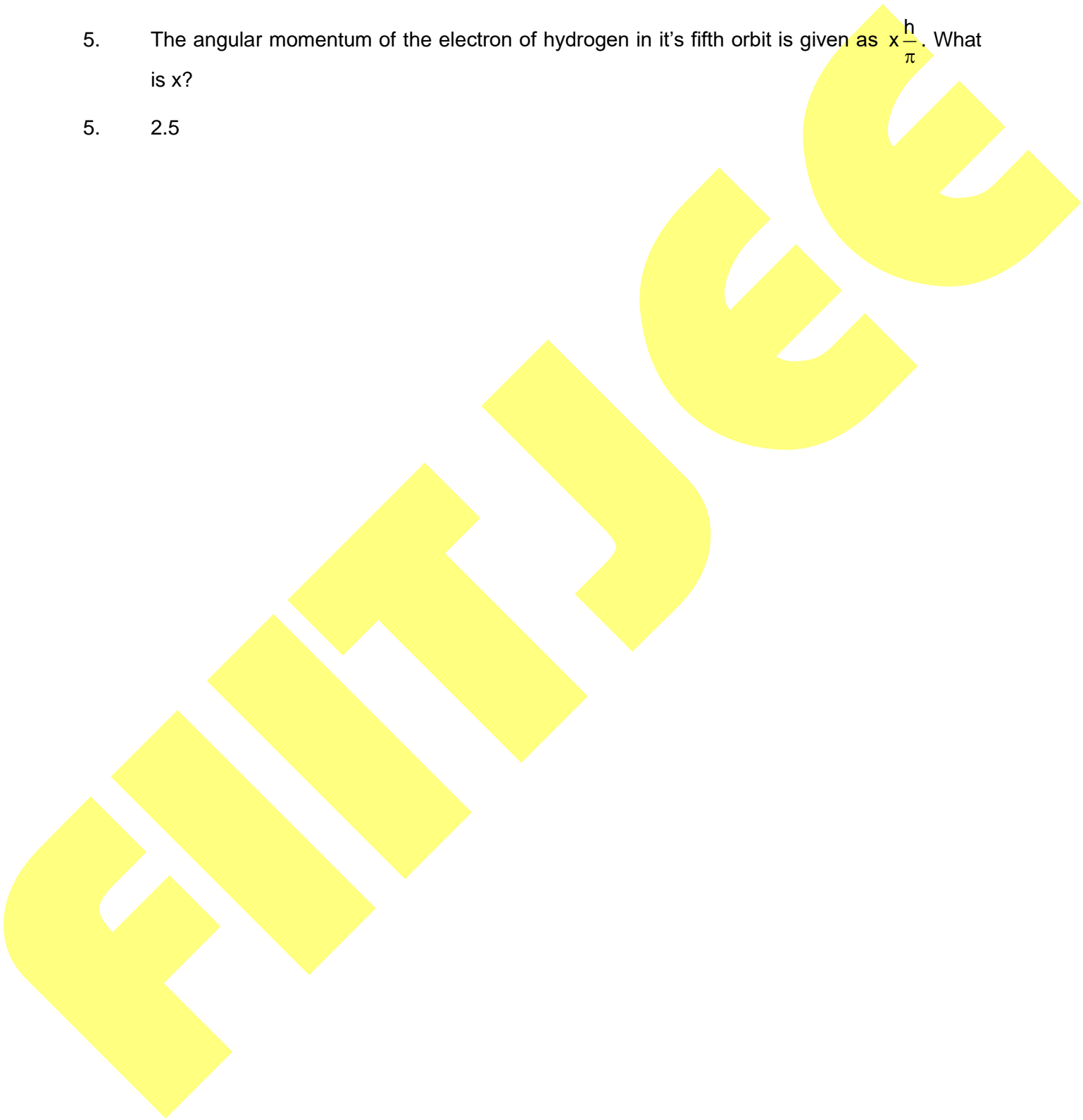
This section contains **6 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct**.

8. Which of the following has the largest ionic radius?
 (A) Na^+ (B) K^+
 (C) Mg^{2+} (D) Be^{2+}
8. **B**
9. How many moles of oxygen atom is present in 90 g of water?
 (A) $5 \times 6.023 \times 10^{23}$ (B) 10
 (C) 5 (D) 6.023×10^{22}
9. **C**
10. Which of the following ion does not contribute to hardness of water?
 (A) Mg^{2+} (B) Ca^{2+}
 (C) HCO_3^- (D) NO_3^-
10. **D**
11. Which of the following electron transition in hydrogen atom emits radiation of largest wavelength?
 (A) $n = 3 \rightarrow n = 1$ (B) $n = 4 \rightarrow n = 3$
 (C) $n = 4 \rightarrow n = 1$ (D) $n = 3 \rightarrow n = 2$
11. **B**
12. What is the shape of CCl_4 molecule?
 (A) Triangular planar (B) Octahedral
 (C) Tetrahedral (D) Pyramidal
12. **C**
13. Which of the following compound on heating produces O_2 gas?
 (A) Na_2CO_3 (B) NaNO_3
 (C) NaHCO_3 (D) Na_2SO_4
13. **B**

PART – B
(Numerical based)

1. How many total number of nodes(radial and angular) is/are associated with 4s orbital?
 1. **3**
2. A mixed halide of phosphorus is $\text{P}(\text{Cl})_m(\text{F})_n$. What will be the value of 'm' if the dipole moment of the molecule is zero?
 2. **3**
3. $\text{MnO}_4^- + \text{Sn}^{2+} + \text{H}^+ \longrightarrow \text{Mn}^{2+} + \text{Sn}^{4+} + \text{H}_2\text{O}$
 What will be the sum of the stoichiometric coefficients of MnO_4^- and Sn^{2+} if the above equation is balanced in acidic medium?

3. 7
4. The most probable velocity of an ideal gas at 200 K is expressed as $10\sqrt{R}$ unit. What is the molecular mass of the unknown gas?
4. 4
5. The angular momentum of the electron of hydrogen in its fifth orbit is given as $x \frac{h}{\pi}$. What is x?
5. 2.5



SECTION-3 : MATHEMATICS

PART – A

(Multi Correct Choice Type)

This section contains 7 **multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

1. If $ax + y = 1$ intersects the curve $5x^2 - 15y^2 + 3xy + 5 = 0$ in A and B and AB subtends 90° at origin then 'a' is equal to
 (A) 1 (B) -1
 (C) 2 (D) -2
1. AB
2. The equation of three sides of a triangle are $x = 2$, $y + 1 = 0$ and $x + 2y = 4$. If coordinate of circumcentre is (α, β) , then
 (A) $\alpha = 4$ (B) $\beta = 0$
 (C) $\alpha = 3$ (D) $\alpha + \beta = 4$
2. ABD
3. Area of a triangle is 1 sq. units and two of its vertices are (1, 1) and (2, 1) then 3rd vertex is
 (A) (1, 3) (B) (3, 1)
 (C) (-1, -3) (D) (-3, -1)
3. AD
4. If $2\sin^2 \theta + \sin^2 2\theta = 2$ then $\sin^2 \theta$ equal to
 (A) 1 (B) $\frac{1}{2}$
 (C) $\frac{1}{3}$ (D) $\frac{1}{4}$
4. AB
5. If distance between $(x, x + 1)$ and (5, 6) is $5\sqrt{2}$, then x is equal to
 (A) 0 (B) 5
 (C) 10 (D) 15
5. AC
6. If $y = \sin^2 x$ then $\frac{dy}{dx}$ is equal to
 (A) $3\sin^3 x$ (B) $2\sin x$
 (C) $\sin 2x$ (D) $2\sin x \cdot \cos x$
6. CD
7. $\int 5\sin^4 x \cos x dx$ is equal to
 (A) $\sin^3 x - \cos^2 x \sin^3 x + c$ (B) $\sin^2 x - \cos^3 x \sin^2 x + c$
 (C) $\sin^5 x + c$ (D) $\sin^4 x + c$

7. AC

(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**.

8. The equation of the line passing through (1, 2) and perpendicular to $x + y + 7 = 0$ is

- (A) $y - x + 1 = 0$ (B) $y - x - 1 = 0$
 (C) $y - x + 2 = 0$ (D) $y - x - 2 = 0$.

8. B

9. The point of concurrency of $(a + 3b)x + (b - 4a)y = 3a - 2b$.

- (A) $(\frac{4}{3}, 1)$ (B) (0, 0)
 (C) $(\frac{-5}{13}, \frac{-11}{13})$ (D) None of these

9. C

10. Solution of the equation $|x + 4| > |2x - 3|$ is

- (A) $(-\frac{1}{3}, 7)$ (B) $(-7, \frac{1}{3})$
 (C) $(-4, \frac{1}{3})$ (D) $(\frac{1}{3}, 4)$

10. A

11. If $\log_a x = 0.3$ and $\log_a 3 = 0.4$, then $\log_3 x$ is :

- (A) 0.12 (B) 0.7
 (C) $\frac{3}{4}$ (D) $\frac{4}{3}$

11. C

12. $\frac{\cos \theta}{\sin(90 + \theta)} + \frac{\sin(-\theta)}{\sin(180 + \theta)}$ is

- (A) 0 (B) 1
 (C) 2 (D) None of these

12. C

13. The equation of the normal to the circle $x^2 + y^2 - 4x + 4y - 17 = 0$ which passes through (1, 1) is $3x + y - k = 0$, Find k.

- (A) 4 (B) 1
 (C) 2 (D) None of these

13. A

PART – B
(Numerical based)

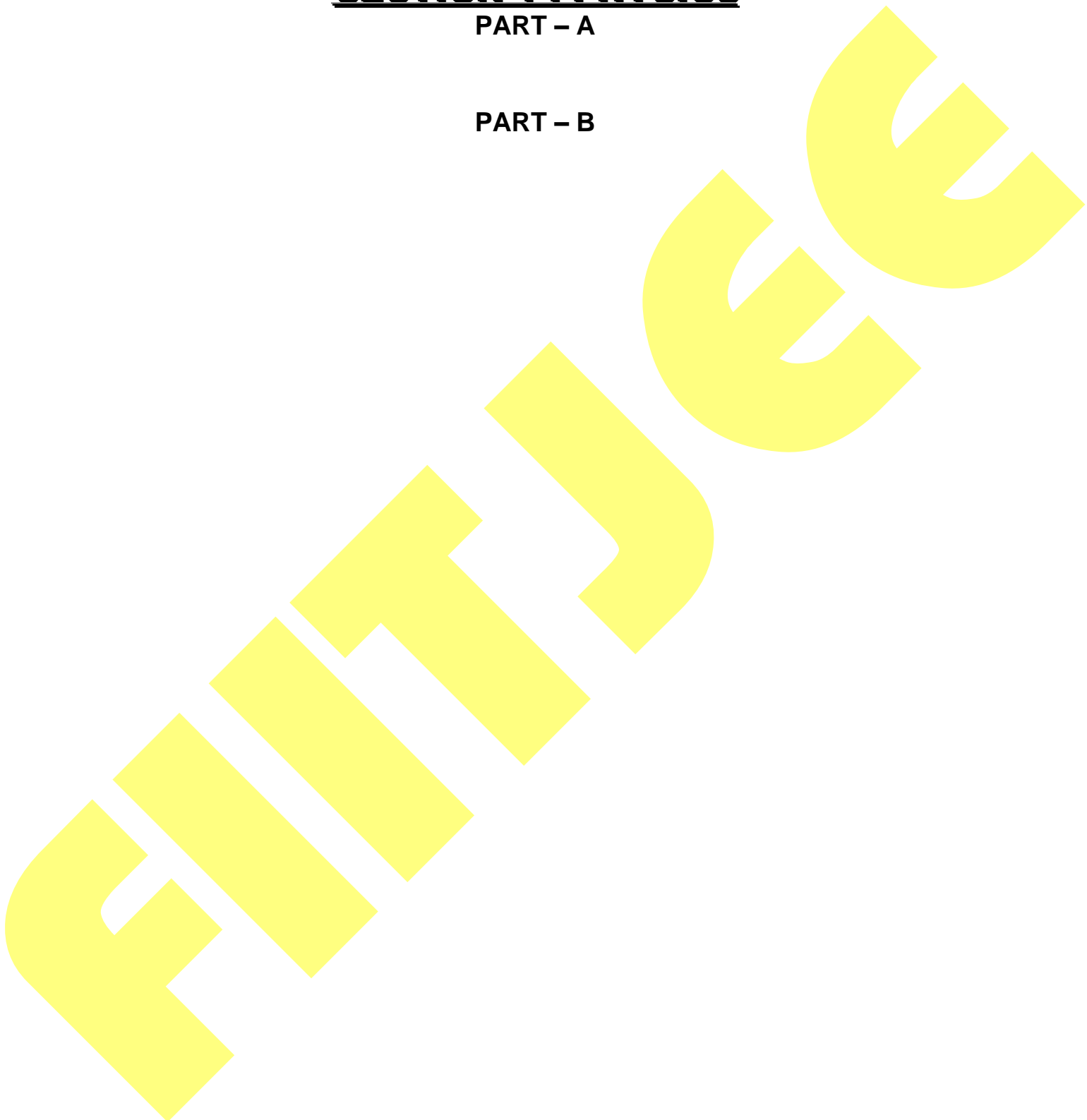
1. The value of $\sum_{k=1}^{13} \tan \frac{k\pi}{12} \tan \frac{(k-1)\pi}{12}$ is
 1. -12
2. Radius of the circle $(x-4)(x+2) + (y^2 - 16) = 0$ is
 2. 5
3. $\lim_{x \rightarrow 0} \frac{1+x+x^2 - e^x}{x^2} = k$, then k is equal to
 3. 0.5
4. If $(2, -3)$ lies on $kx^2 - 3y^2 + 2x + y - 2 = 0$ then k is equal to
 4. 7
5. If x is integer then number of integral solutions of $\frac{x(x-2)(x-5)}{(x-2)} \leq 0$ is
 5. 5

ANSWERS

SECTION-1 : PHYSICS

PART – A

PART – B



PAPER – 1 : CHEMISTRY

PART – A

PART – B



SECTION – 3 : MATHEMATICS

PART – A

PART – B

