

**PHYSICS, CHEMISTRY & MATHEMATICS**

Pattern - CPT-1

QP Code: 100061

PAPER - 1

Time Allotted: 3 Hours

Maximum Marks: 402

- 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: +6* 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 **+6 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 (08-14)** – Contains seven (07) multiple choice questions which have **ONLY ONE CORRECT** answer. Each question carries **+6 marks** for correct answer and **-2 marks** for wrong answer.
- (iii) **Part-A (15-18)** - This section contains Two paragraphs. Based on each paragraph, there are Two multiple choice questions. Each question has only one correct answer and carries **+5 marks** for the correct answer and **-1 marks** for wrong answer.
- (iv) **Part-B (01-05)** contains five (05) 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 **+6 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)**

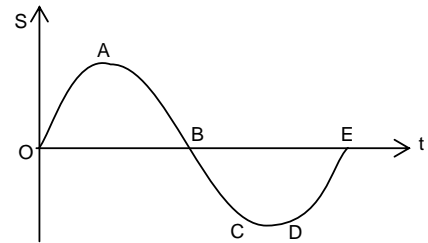
This section contains 7 **multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

- 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  $4\sqrt{2}$  m/s.  
(D) none of the above.
- Choose the correct option(s)  
(A) If only conservative forces act on a particle, the kinetic energy stays constant.  
(B) If the net force acting on an object is zero, then the object is at rest.  
(C) If net work is done on a body, the velocity of body must change.  
(D) If net work is done on a body, the speed of body must change.
- One end of a light rope is tied directly to the ceiling. A man of mass  $m$  initially at rest on the ground starts climbing (slowly) the rope without slipping upto a height  $\ell$  which is quite large in comparison to the dimension of man. From the time he starts at rest on the ground to the time he is hanging at rest at a height  $\ell$ . Then  
(A) work done on man by rope is zero.  
(B) work done by gravity is  $-mg\ell$   
(C) work done by man is  $mg\ell$   
(D) work done by man is zero.
- 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



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5. A particle has a rectilinear motion and the figure gives its displacement as a function of time. Which of the following statements are true with respect to the motion.



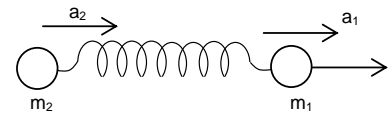
- (A) in motion between 0 to A, the velocity is positive and acceleration is negative  
 (B) between A and B, the velocity and acceleration are positive  
 (C) between B and C, the velocity is negative and acceleration is positive  
 (D) between D and E, the acceleration is positive
6. A particle of mass 'M' is attached to a light string of length ' $\ell$ ' the other end of which is fixed. Initially the string is kept horizontal and the particle is given an upward velocity 'u'. The particle is just able to complete a circle.
- (A) the string becomes slack when the particle reaches its highest point.  
 (B) the velocity of the particle becomes  $\sqrt{g\ell}$  at the highest point.  
 (C) the velocity of the ball at the initial position is  $\sqrt{4g\ell}$ .  
 (D) the particle never passes again through the initial position.
7. A spring connects two particles  $m_1$  and  $m_2$  horizontal force F acts on  $m_1$  shown in figure. When the elongation of the spring is x then

(A)  $a_2 = \frac{kx}{m_2}$

(B)  $a_1 = \frac{F - kx}{m_1}$

(C)  $F = m_1 a_1 + m_2 a_2$

(D)  $a_1 = a_2 = \frac{F}{m_1 + m_2}$  at the maximum elongation of spring



### (Single Correct Choice Type)

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

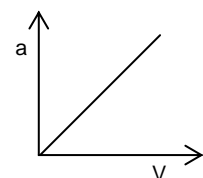
8. The acceleration-velocity graph of a particle moving in a straight line is as shown in figure. Then slope of velocity-displacement graph

(A) increases linearly

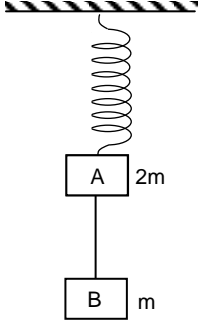
(B) decreases linearly

(C) is constant

(D) increases parabolically



Space For Rough Work

9. Two forces, each of magnitude  $F$  have a resultant of the same magnitude  $F$ . The angle between the two forces is  
 (A)  $45^\circ$  (B)  $120^\circ$  (C)  $150^\circ$  (D)  $60^\circ$
10. A spring of force constant  $k$  is cut into two pieces such that one piece is double the length of the other. Then the long piece will have a force constant of  
 (A)  $\frac{2}{3}k$  (B)  $\frac{3}{2}k$  (C)  $3k$  (D)  $6k$
11. Two blocks A and B of masses  $2m$  and  $m$  respectively, are connected by a massless and inextensible string. The whole system is suspended by a massless spring as shown in the figure and they are in equilibrium. The magnitude of acceleration of A and B, immediately after the string is cut are respectively,  
 (A)  $g, \frac{g}{2}$  (B)  $\frac{g}{2}, g$   
 (C)  $g, g$  (D)  $\frac{g}{2}, \frac{g}{2}$
- 
12. A boat which has a speed of  $5 \text{ km/h}$  in still water crosses a river of width  $1 \text{ km}$  along the shortest possible path in  $15 \text{ min}$ . The velocity of the river water in  $\text{km/h}$  is  
 (A)  $1$  (B)  $3$  (C)  $4$  (D)  $\sqrt{41}$
13. A particle moves on a rough horizontal ground with some initial velocity  $v_0$ . If  $\frac{3}{4}$ th of its K.E. is lost in friction in time  $t_0$ , the coefficient of friction between the particle and the ground is  
 (A)  $\frac{v_0}{2gt_0}$  (B)  $\frac{v_0}{4gt_0}$  (C)  $\frac{3v_0}{4gt_0}$  (D)  $\frac{v_0}{gt_0}$
14. A vector of magnitude  $a$  is turned through angle  $\theta$ . The magnitude of change in the vector is given by  
 (A)  $|2a \sin \theta|$  (B)  $|2a \sin(\theta/2)|$  (C)  $\left| \frac{a}{2} \sin \theta \right|$  (D)  $\left| \frac{a}{2} \sin\left(\frac{\theta}{2}\right) \right|$

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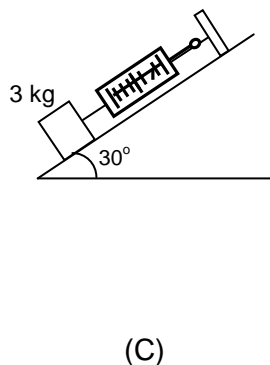
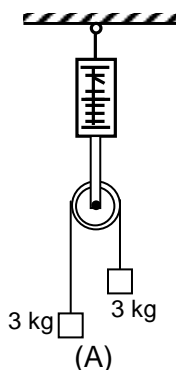
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**(Paragraph Type)**

This section contains **2 paragraphs**. Based upon the paragraphs **2 multiple choice questions** have to be answered. Each of these questions has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

**Paragraph for Question no. 15 to 16**

In the systems shown in figure (A), and (C) the scales of the spring are calibrated in Newton.



Assume that

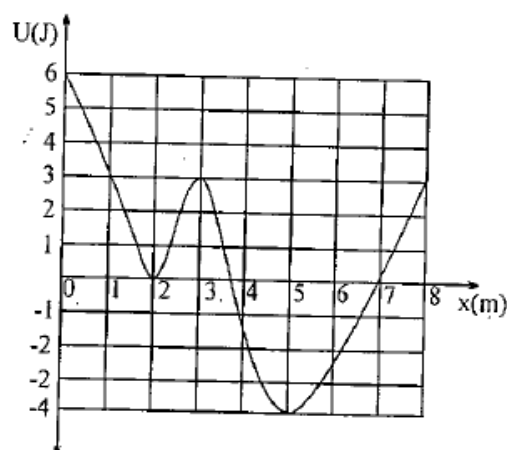
- Pulleys are massless and frictionless
- Strings are massless
- The surface in figure (C) is frictionless

Answer these questions. ( $g = 10 \text{ m/s}^2$ )

15. Reading of the spring scale in figure (A) is  
 (A) 30 N (B) 45 N (C) 60 N (D) 22.5 N
16. Reading of the spring scale in figure (C) is  
 (A) 30 N (B) 45 N (C) 15 N (D) 22.5 N

**Paragraph for Question no. 17 to 18**

Potential energy curve  $U$  of a particle as function of the position of a particle is shown. The particle has total mechanical energy  $E$  of 3.0 joules.



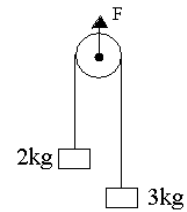
17. What is the kinetic energy of the particle at  $x = 5$ .  
 (A) 3 J (B) -3 J (C) -7 J (D) 7 J
18. What is the force on the particle at  $x = 5$ ?  
 (A) -4 N (B) 7 N (C) 6 N (D) 0 N

## PART – B

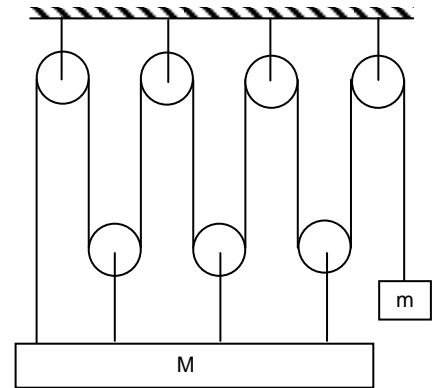
### (Numerical based)

1. At what angle  $\theta_0$  (is  $\pi/n$ ) should a shell be fired if at the top of its trajectory its path has a radius of curvature equal to twice the maximum height of the trajectory. Then 'n' is

2. The pulley is light and frictionless. The thread is light and inextensible. The force  $F$  is such that the acceleration of 3kg block is zero. The acceleration of the pulley in S.I units is:

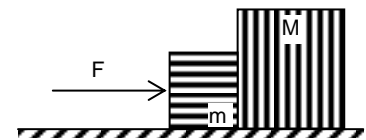


3. The system as shown in figure is in equilibrium. The ratio of  $\frac{M}{m}$  is 5 n. Find the value of 'n'.



4. If  $\vec{A} = 4\hat{i} - 2\hat{j} + 6\hat{k}$  and  $\vec{B} = -\hat{i} + 2\hat{j} + 3\hat{k}$ ,  $\frac{\vec{A} \cdot \vec{B}}{2}$  is equal to  $2n$ . Find the value of 'n'.

5. Two blocks of mass  $m = 1\text{kg}$  and  $M = 2\text{kg}$  are in contact on a frictionless table. A horizontal force  $F (=3\text{N})$  is applied to  $m$ . The force (In N) of contact between the blocks will be  $5n$ . Find the value of 'n'.



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## **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.  $\text{MnO}_4^- + \text{C}_2\text{O}_4^{2-} + \text{H}^+ \longrightarrow \text{Mn}^{2+} + \text{CO}_2 + \text{H}_2\text{O}$   
In above equation  
(A) 2 moles of  $\text{MnO}_4^-$  completely reacts with 5 moles of  $\text{C}_2\text{O}_4^{2-}$  to produce 10 moles of  $\text{CO}_2$   
(B) the n-factor of  $\text{MnO}_4^-$  ion is 5  
(C)  $\text{H}^+$  ion is reduced in the reaction  
(D) the reaction is carried out in acidic medium
  
2. The van der Waal's equation for n moles of a real gas is given below  

$$\left(P + \frac{n^2 a}{V^2}\right)(V - nb) = nRT$$
 Choose correct statement regarding the equation  
 (A) the term  $\frac{n^2 a}{V^2}$  depends on the density of gas molecules in the container.  
 (B)  $(V - nb)$  is the volume which is available for free movement of gas molecules.  
 (C) the volume correction term or excluded volume b is equal to  $4 V_m$  where  $V_m$  is the volume of an individual gas molecule.  
 (D) the term  $(V - nb)$  is temperature independent.
  
3. The correct statement(s) regarding 2p-subshell is/are  
 (A) it contains three atomic orbitals namely  $2p_x$ ,  $2p_y$  and  $2p_z$ .  
 (B) the magnetic quantum numbers for the orbital is one.  
 (C) the orbital angular momentum of any electron present in it, is  $\sqrt{2} \frac{h}{2\pi}$ .  
 (D) the number of angular nodes or nodal surface of any of it's orbital is one.
  
4.  $\text{N}(Z = 7): 1s^2 2s^2 2p^3$   
 $\text{O}(Z = 8): 1s^2 2s^2 2p^4$   
 Which of the following property(ies) of N and O are given in correct order?  
 (A) First ionization energy:  $\text{N} > \text{O}$                       (B) Second ionization energy:  $\text{O} > \text{N}$   
 (C) Electron affinity:  $\text{O} > \text{N}$                               (D) Bond order:  $\text{N}_2 > \text{O}_2$
  
5. Which of the following compound(s) form  $\text{H}_2\text{O}_2$  when treated with  $\text{H}_2\text{SO}_4$ ?  
 (A)  $\text{BaO}_2 \cdot 8\text{H}_2\text{O}$     (B)  $\text{Na}_2\text{O}_2$   
 (C)  $\text{CaO}$     (D)  $\text{Mg}(\text{OH})_2$

*Space For Rough Work*

6. Which of the following hydroxides forms oxide upon heating?  
 (A)  $\text{Mg}(\text{OH})_2$  (B)  $\text{NaOH}$   
 (C)  $\text{KOH}$  (D)  $\text{LiOH}$
7. Which of the following constituent(s) of hard water are removed by adding  $\text{Na}_2\text{CO}_3$ ?  
 (A)  $\text{SO}_4^{2-}$  (B)  $\text{Cl}^-$   
 (C)  $\text{Ca}^{2+}$  (D)  $\text{Mg}^{2+}$

**(Single Correct Choice Type)**

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

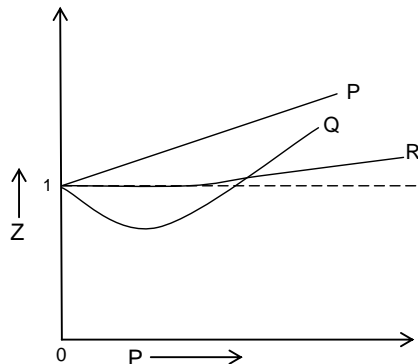
8. According to Heisenberg's uncertainty principle,

$$\Delta x \cdot \Delta v = \frac{h}{4\pi m}$$

Which statement is correct?

- (A) If  $\Delta x = \text{zero}$ , the position of particle is most likely to be determined.  
 (B) If  $\Delta v = \text{zero}$ , the particle does not move at all.  
 (C) if  $\Delta x = 0$ , the particle moves and it's position can't be ascertained.  
 (D) if  $\Delta v = 0$ , the position of particle can be located easily

9.



The behaviour of three gases P, Q and R has been represented in above compressibility factor(Z) versus pressure(P) curve, choose the correct statement

- (A) value of 'a'(van der Waal's constant) is highest for gas-P.  
 (B) R displays ideal behavior at all temperature and pressure.  
 (C) gas P may be  $\text{NH}_3$  & Q is hydrogen  
 (D) all the gases at low pressure & high temperature follow ideal gas equation
10. Li and Mg have a lot of similar properties and they are called diagonal elements. Which characteristics of the two elements has minimum difference?  
 (A) First ionization energy (B) Electron gain enthalpy  
 (C) Polarising power (D) Hydration energy

*Space For Rough Work*



11. Which property of group-1 elements decreases on moving down the group?  
 (A) Ionization energy (B) Ionic radius  
 (C) Solubility of hydroxides (D) Shielding constant
12. Which of the following substance on heating produces O<sub>2</sub> gas?  
 (A) Na<sub>2</sub>CO<sub>3</sub> (B) NaNO<sub>3</sub>  
 (C) Na<sub>2</sub>SO<sub>4</sub> (D) NaOH
13. Which solution becomes violet coloured when H<sub>2</sub>O<sub>2</sub> is added to it's acidified solution?  
 (A) PbS (B) KI  
 (C) NaNO<sub>2</sub> (D) PbSO<sub>3</sub>
14. In BeCl<sub>2</sub> polymer, the Be atom is tetrahedrally surrounded by four Cl atoms. In forming polymers the central atom Be  
 (A) reduces it's electron deficiency  
 (B) increases it's electron affinity which brings stability in the molecule  
 (C) increases the amphoteric behaviour of its chloride  
 (D) increases the solubility of its chloride

**(Paragraph Type)**

This section contains **2 paragraphs**. Based upon the paragraphs **2 multiple choice questions** have to be answered. Each of these questions has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

**Paragraph for Question no. 15 to 16**

The Schrodinger equation is

$$\frac{d^2\psi}{dx^2} + \frac{d^2\psi}{dy^2} + \frac{d^2\psi}{dz^2} + \frac{8\pi^2m}{h^2}(E - V) = 0$$

This equation represents the connection between the location of electron and it's energy. The solutions of the equation are represented by  $\Psi$ 's which are called wave functions of the electrons.  $\Psi$  is a function of coordinates of orbitals in which the electrons spend maximum time. Indirectly  $\Psi$  is a function of coordinates of electrons. Since the position of orbitals are found out by the quantum numbers ( $n$ ,  $\ell$  and  $m$ ), so the wave functions( $\Psi$ ) assigned with the three quantum numbers to represent atomic orbital.

$\therefore \Psi_{n, \ell, m}$  represents an atomic orbital. This wave function  $\Psi_{n, \ell, m}$  contain two parts. One represents the distance of orbital from the nucleus and the other represents the orientation of orbitals around the nucleus.

$$\Psi_{n, \ell, m} \begin{cases} \rightarrow \Psi_{\ell, m} \\ \rightarrow \Psi_{n, \ell} \end{cases}$$

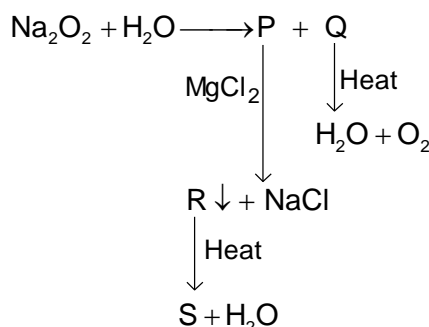
Answer the following questions on the basis of above write up.

15. Which wave function represents one of the orbitals of 3p-subshell?  
 (A)  $\Psi_{3, 2, 1}$  (B)  $\Psi_{3, 1, 0}$   
 (C)  $\Psi_{3, 1, 2}$  (D)  $\Psi_{3, 2, 0}$

*Space For Rough Work*

16. Which wave function represent an orbital that is present at the maximum distance from the nucleus?  
 (A)  $\Psi_{4,0}$  (B)  $\Psi_{5,2}$  (C)  $\Psi_{4,1}$  (D)  $\Psi_{3,1}$

**Paragraph for Question no. 17 to 18**



Answer the following questions on the basis of above reaction sequence.

17. How many total number of covalent bonds are present in Q?  
 (A) 2 (B) 3 (C) 4 (D) 1
18. What is 'S'?  
 (A)  $\text{MgH}_2$  (B)  $\text{MgO}$  (C)  $\text{Mg}_3\text{N}_2$  (D)  $\text{MgO}_2$

**PART – B**  
**(Numerical based)**

- A one litre solution was prepared by adding  $\text{NaOH}$  and  $\text{Na}_2\text{CO}_3$ . 10 mL of the solution required 4 mL of 0.5 N  $\text{HCl}$  for titration in presence of phenolphthalein indicator. If the solution contains 0.1 mole of  $\text{Na}_2\text{CO}_3$ , how much gram of  $\text{NaOH}$  is present in the solution?
- How much Kg of  $\text{CaCO}_3$  should be completely decomposed in order to produce 0.22 Kg of  $\text{CO}_2$  gas?  

$$\text{CaCO}_3 \xrightarrow{\text{Heat}} \text{CaO} + \text{CO}_2$$
- 13.44 g of  $\text{MgCO}_3$  was dissolved in 800 mL of 0.5 M  $\text{HCl}$  solution. After complete reaction, the excess  $\text{HCl}$  required 160 mL of  $\text{NaOH}$  for neutralization. What is the normality of the  $\text{NaOH}$  solution?
- The electron of a  $\text{He}^+$  ion jumps from third orbit to the second orbit. If the wavelength of the emitted radiation is expressed as  $\frac{x}{yR}$ , ( $R = \text{Rydberg constant}$ ), the value of  $(x + y)$  is:
- How many total number of covalent bond(s) is/are present in  $\text{NH}_4^+$  ion?

*Space For Rough Work*

## **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.

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1. Solutions of the equation  $2\log_9 x + 9\log_x 3 = 10$  are given by  
 (A) 1 (B) 3  
 (C)  $9^3$  (D)  $3^9$
  
2. The circles  $x^2 + y^2 = 1$  and  $x^2 + y^2 = 2x$   
 (A) intersect in two distinct points  
 (B) intersect on the line  $x = \frac{1}{2}$   
 (C) intersect in the points  $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$  and  $\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$   
 (D) have a common chord of length  $\sqrt{3}$
  
3. The inequation,  $(x-1)^1(x-2)^2(x-3)^3(x-4)^4 < 0$  has  
 (A) infinite positive integral solutions (B) infinite negative integral solutions  
 (C) zero positive integral solution (D) zero negative integral solution
  
4. If opposite angular points of a square are (3, 4) and (1, -1), then the remaining vertex of square can be:  
 (A)  $\left(\frac{9}{2}, \frac{1}{2}\right)$  (B)  $\left(\frac{1}{2}, \frac{5}{2}\right)$   
 (C)  $\left(-\frac{1}{2}, \frac{5}{2}\right)$  (D)  $\left(\frac{9}{2}, -\frac{1}{2}\right)$
  
5. If  $\alpha$  and  $\beta$  are acute angles such that  $\cos \alpha = \frac{3}{5}$  and  $\cos \beta = \frac{5}{13}$  then  
 (A)  $\cos(\alpha + \beta) = \frac{33}{65}$  (B)  $\sin(\alpha + \beta) = \frac{56}{65}$   
 (C)  $\sin^2\left(\frac{\alpha - \beta}{2}\right) = \frac{1}{65}$  (D)  $\cos(\alpha - \beta) = \frac{63}{65}$

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*Space For Rough Work*

6. If the area of quadrilateral formed by the tangents from the origin to the circle  $x^2 + y^2 + 6x - 10y + c = 0$  and the pair of radii at the points of contact of these tangents to the circle is 8 sq. unit, then the value of  $c$  is  
 (A) 2 (B) 4  
 (C) 16 (D) 32
7. If  $\log_4 5 = x$  and  $\log_5 6 = y$  then  
 (A)  $\log_4 6 = xy$  (B)  $\log_6 4 = xy$   
 (C)  $\log_3 2 = \frac{1}{2xy - 1}$  (D)  $\log_2 3 = \frac{1}{2xy - 1}$

**(Single Correct Choice Type)**

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

8. A rectangle ABCD has its side AB parallel to the line  $y = x$  and vertices A, B and D lie on  $y = 1$ ,  $x = 2$  and  $x = -2$  respectively. Locus of vertex C is:  
 (A)  $x - y = 5$  (B)  $x = 5$   
 (C)  $x + y = 5$  (D)  $y = 5$
9. If  $\log_8 (\log_4 (\log_2 x)) = 0$  then  $x^{\frac{-2}{3}}$  equals  
 (A) 64 (B)  $\frac{1}{64}$   
 (C)  $4\sqrt[3]{4}$  (D)  $\frac{\sqrt[3]{2}}{8}$
10. If  $y = \tan^2(\ln x)$  then  $\frac{dy}{dx}$  is  
 (A)  $\sec^2(\ln x)$  (B)  $\frac{2(\tan \ln x) \cdot \sec^2(\ln x)}{x}$   
 (C)  $\frac{\sec^2 \ln x}{x}$  (D) none of these
11. The equation  $x^2 + y^2 + 2xy + 2gx + 2fy + 4 = 0$  represents a pair of real lines. The number of positive integral values of  $g$  less than or equal to 8 is  
 (A) 9 (B) 8  
 (C) 7 (D) 6

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*Space For Rough Work*

12. If maximum value of  $k \sin x + 2 \cos \left( x + \frac{\pi}{3} \right)$  be 1, then the value of k is  
(A)  $\sqrt{2}$  (B) 1  
(C)  $\sqrt{3}$  (D) 2
13. A pair of perpendicular straight lines drawn through the origin to form an isosceles triangle with line  $2x + 3y = 6$ , then area of the triangle so formed is:  
(A)  $\frac{36}{13}$  (B)  $\frac{12}{17}$   
(C)  $\frac{13}{5}$  (D)  $\frac{17}{13}$
14.  $\lim_{x \rightarrow 0} x \cot 3x$  is  
(A) 3 (B) 1  
(C) 0 (D)  $\frac{1}{3}$

**(Paragraph Type)**

This section contains **2 paragraphs**. Based upon the paragraphs **2 multiple choice questions** have to be answered. Each of these questions has 4 choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

**Paragraph for Question no. 15 to 16**

Consider the circle  $x^2 + y^2 = 10$ . Tangents are drawn to the circle from P(4, 2). The tangents touch the circle at Q and R.

15. The angle between the tangents is  
(A)  $\frac{\pi}{6}$  (B)  $\frac{\pi}{4}$   
(C)  $\frac{\pi}{3}$  (D)  $\frac{\pi}{2}$
16. The equation of circum circle of triangle PQR is  
(A)  $x^2 + y^2 + 4x + 2y = 0$  (B)  $x^2 + y^2 - 4x - 2y = 0$   
(C)  $x^2 + y^2 - 4x + 2y = 0$  (D) None of these

*Space For Rough Work*

**Paragraph for Question no. 17 to 18**

Let  $ax + by = 1$  be a chord of the curve  $3x^2 - y^2 - 2x + 4y = 0$  intersecting the curve at the points A and B such that AB subtends a right angle at the origin 'O'

17. The value of  $a - 2b + 1$  is equal to  
(A) 0 (B) 1  
(C) 2 (D) -1
18. If  $a$  and  $b$  are parameters, then  $ax + by = 1$  always passes through  
(A) (1, 2) (B) (-1, 2)  
(C) (1, 1) (D) (1, -2)

**PART – B**  
**(Numerical based)**

1. The value of  $x$  if  $x = \frac{1 - 4 \sin 10^\circ \cdot \sin 70^\circ}{2 \sin 10^\circ}$  is \_\_\_\_\_
2.  $\lim_{x \rightarrow 1} \frac{\sqrt{2-x} - 1}{\sqrt{5-x} - 2}$  is equal to \_\_\_\_\_.
3. If  $\sin^4 \theta + \sin^2 \theta = 1$ , then  $\frac{1}{\tan^4 \theta} + \frac{1}{\tan^2 \theta}$  is \_\_\_\_\_
4. The value of  $x$ , satisfying  $3^{4 \log_9(x+1)} = 2^{2 \log_2 x} + 3$  is \_\_\_\_\_.
5. The number of integral values of  $x$  satisfying  $\frac{(x-2)(2x-3)^2(x-6)^3}{(x+5)^4} < 0$  is \_\_\_\_\_

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*Space For Rough Work*

# FIITJEE INTERNAL TEST

BATCHES: Two Year CRP(2224) A-lot\_PAPER-1  
PHASE TEST – I

PHYSICS, CHEMISTRY & MATHEMATICS

ANSWER KEY

Paper Code  
100061

## SECTION-1 : PHYSICS

### PART – A

- |        |       |         |       |
|--------|-------|---------|-------|
| 1. ABC | 2. CD | 3. ABC  | 4. AD |
| 5. ACD | 6. AB | 7. ABCD | 8. C  |
| 9. B   | 10. B | 11. B   | 12. B |
| 13. A  | 14. B | 15. C   | 16. C |
| 17. D  | 18. D |         |       |

### PART – B

- |         |         |         |         |
|---------|---------|---------|---------|
| 1. 4.00 | 2. 2.50 | 3. 1.40 | 4. 2.50 |
| 5. 0.40 |         |         |         |

## SECTION – 2 : CHEMISTRY

### PART – A

- |        |        |        |         |
|--------|--------|--------|---------|
| 1. ABD | 2. ABC | 3. ACD | 4. ABCD |
| 5. AB  | 6. AD  | 7. CD  | 8. A    |
| 9. D   | 10. C  | 11. A  | 12. B   |
| 13. B  | 14. A  | 15. B  | 16. B   |
| 17. B  | 18. B  |        |         |

### PART – B

- |        |        |      |  |
|--------|--------|------|--|
| 1. 4   | 2. 0.5 |      |  |
| 3. 0.5 | 4. 14  | 5. 4 |  |

## SECTION – 3 : MATHEMATICS

### PART – A

- |        |         |       |       |
|--------|---------|-------|-------|
| 1. BD  | 2. ABCD | 3. CD | 4. AC |
| 5. BCD | 6. AD   | 7. AC | 8. D  |
| 9. D   | 10. B   | 11. C | 12. C |
| 13. A  | 14. D   | 15. D | 16. B |
| 17. C  | 18. D   |       |       |

### PART – B

- |      |      |      |      |
|------|------|------|------|
| 1. 1 | 2. 2 | 3. 1 | 4. 1 |
| 5. 3 |      |      |      |