SOF OLYMPIADS

CLASS 11

SAMPLE PAPER 2025-26

NSO SOF NATIONAL SCIENCE OLYMPIAD

Total Questions : 50 Time : 1 hr.

| PATTERN & MARKING SCHEME | | | |
|---|---|---|---|
| Section | (1) Physics & Chemistry | (2) Achievers Section | (3) Mathematics or Biology |
| No. of Questions | 25 | 5 | 20 |
| Marks per Ques. | 1 | 3 | 1 |

**SYLLABUS**

**Section – 1 :** Physics : Units and Measurements, Mechanics, Properties of Matter, Heat and Thermodynamics, Oscillations, Waves.

Chemistry : Some Basic Concepts of Chemistry, Structure of Atom, Classification of Elements and Periodicity in Properties, Chemical Bonding and Molecular Structure, Thermodynamics, Equilibrium, Redox Reactions, Organic Chemistry - Some Basic Principles and Techniques, Hydrocarbons.

**Section – 2 :** Higher Order Thinking Questions - Syllabus as per Section – 1.

**Section – 3 :** Sets, Relations and Functions, Logarithms, Complex Numbers, Linear Inequalities, Sequences and Series, Trigonometry, Straight Lines, Conic Sections, Permutations and Combinations, Binomial Theorem, Statistics, Limits and Derivatives, Probability, Introduction to 3-D Geometry.

OR

**Section – 3 :** Diversity in the Living World, Structural Organisation in Plants and Animals, Cell : Structure and Functions, Plant Physiology, Human Physiology.

## PHYSICS AND CHEMISTRY

**1.** 28 g of iron is reacted with hydrochloric acid separately as given in the following two cases:
**Case I :** In a closed vessel of fixed volume.
**Case II :** In an open beaker at 27°C.
Then the work done in case I and case II are respectively
(Given, $R$ = 2 cal $K^{-1}$ $mol^{-1}$)

(A) 0 and –600 cal
(B) 0 and –300 cal
(C) –300 cal and 0
(D) –600 cal and 0

**2.** Arrange the following compounds in the increasing oxidation number of carbon atom.

| $CH_4$ | $CH_3Cl$ | CO | $CO_2$ | $NaHCO_3$ |
|---|---|---|---|---|
| *P* | *Q* | *R* | *S* | *T* |

(A) $P = Q < R < S < T$
(B) $P = Q < S < R < T$
(C) $P < Q < R < S = T$
(D) $R = Q < P < S < T$

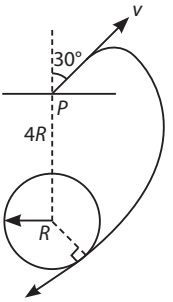
**3.** $X + 2Y + 3Z \rightleftharpoons XY_2Z_3$

Reaction of 6.0 g of $X$, $6.0 \times 10^{23}$ atoms of $Y$ and 0.036 mol of $Z$ yields 4.8 g of compound $XY_2Z_3$. If the atomic masses of $X$ and $Z$ are 60 u and 80 u, respectively, the atomic mass of $Y$ is

(Given : Avogadro no. = $6 \times 10^{23}$)

(A) 40 u (B) 50 u (C) 60 u (D) 70 u

**4.** A satellite is launched from international space station from point $P$, which is at a distance of $4R$ from the centre of the Earth of radius $R$. The speed of the satellite is $v$ in a direction making 30° with the line joining the centre of the Earth and point $P$, as shown in the given figure.




What will be the speed $v$ if the satellite passes grazing the surface of the Earth? (Consider only gravitational interaction.)

(A) $\frac{4000}{\sqrt{2}}$ m/s (B) $\frac{8000}{\sqrt{2}}$ m/s

(C) $\frac{6000}{\sqrt{2}}$ m/s (D) $8000\sqrt{2}$ m/s

**5.** Two students of equal mass stand at the opposite ends of the diameter of a turntable disc of certain mass, moving with constant angular velocity. The two students make their way towards the middle of the turntable at equal rates. Which one of the following statements is correct?

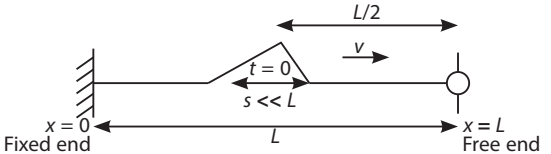
(A) Kinetic energy of rotation has increased while angular momentum remains same.

(B) Kinetic energy of rotation has decreased while angular momentum remains same.

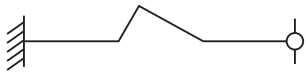
(C) Kinetic energy of rotation has decreased but angular momentum has increased.

(D) Both kinetic energy of rotation and angular momentum have decreased.

**6.** A small pulse is travelling with a speed $v$ in a string. At time $t = 0$, it is moving towards the free end as shown in the given figure.




Which of the following pairs is/are incorrectly matched?

(i) $t = \frac{L}{v}$ (p) 

(ii) $t = \frac{2L}{v}$ (q) 

(iii) $t = \frac{3L}{v}$ (r) 

(A) (i) and (iii) only (B) (ii) only

(C) (iii) only (D) All pairs are correctly matched

## ACHIEVERS SECTION

**7.** A solution contains 0.1 M $Cl^-$ and 0.001 M $CrO_4^{2-}$, in this solution solid $AgNO_3$ is gradually added. Assume that the addition does not change in volume.

Given : $K_{sp}$ (AgCl) = $1.7 \times 10^{-10}$ $M^2$ and

$K_{sp}$ ($Ag_2CrO_4$) = $1.9 \times 10^{-12}$ $M^3$.

Select the incorrect statement(s) from the following.

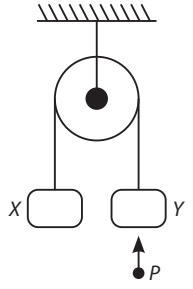
I. AgCl will precipitate first as the amount of $Ag^+$ needed to precipitate is low.

II. $Ag_2CrO_4$ will precipitate first because the amount of $Ag^+$ needed is low.

III. Remaining concentration of $Cl^-$ when $Ag_2CrO_4$ will start precipitating will be $4.9 \times 10^{-4}$ M.

(A) I, II and III (B) II only (C) I and III only (D) II and III only

**8.** Two identical blocks *X* and *Y* each of mass 2 kg are hanging stationary by a light inextensible flexible string, passing over a light and frictionless pulley, as shown in the given figure. A shell *P* of mass 1 kg moving vertically upward with velocity 9 m/s collides with block *Y* and is stuck to it.




Which of the following statements are correct?

(i) The time after which block *Y* starts moving downwards is 0.3 s.

(ii) The maximum height reached by *Y* is 0.45 m.

(iii) The loss of mechanical energy upto the instant till *Y* reaches highest point is 20 J.

(A) (i) and (ii) only (B) (ii) and (iii) only

(C) (i) and (iii) only (D) (i), (ii) and (iii)

## MATHEMATICS

**9.** If $X = \{4^n - 3n - 1 : n \in N\}$ and $Y = \{9(n - 1) : n \in N\}$, then $X \cup Y$ is equal to

(A) $X$ (B) $Y$ (C) $N$ (D) Z

**10.** If all the words (with or without meaning) having five letters, formed by using the letters of the word SMALL and arranged as in a dictionary, then the position of the word SMALL, is

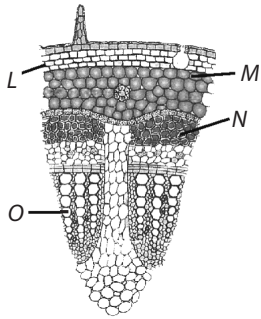
(A) $46^{th}$ (B) $59^{th}$ (C) $52^{nd}$ (D) $58^{th}$

## BIOLOGY

**9.** Glucagon is a hormone that stimulates the conversion of glycogen into glucose in response to low blood glucose concentration.
Which other hormone has a similar effect on blood glucose concentration?

(A) Anti-diuretic hormone (B) Adrenaline
(C) Insulin (D) Testosterone

**10.** Consider the following statements regarding the given figure and select the incorrect one(s).




(i) '*L*' is the collenchymatous hypodermis that provides mechanical strength and flexibility to the young dicot stems.
(ii) '*M*' is the innermost layer of cortex which usually possesses casparian strips.
(iii) '*N*' is the parenchymatous pericycle that synthesises food.
(iv) '*O*' is xylem which is exarch with respect to the positions of protoxylem and metaxylem.

(A) (i) only (B) (i) and (ii) only
(C) (iv) only (D) (ii), (iii) and (iv) only

## ANSWER KEY

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Physics and Chemistry** | 1. (B) | 2. (C) | 3. (B) | 4. (B) | 5. (A) | 6. (B) | 7. (D) | 8. (A) |
| **Mathematics** | 9. (B) | 10.(D) | | | | | | |
| **Biology** | 9. (B) | 10.(D) | | | | | | |