

STAR OLYMPIAD FOUNDATION
INTERNATIONAL SCIENCE OLYMPIAD- CLASS XI
Sample Paper 2023-2024

PHYSICS

1. A soap bubble assumes a spherical shape. Which of the following statements is wrong?

- (A) The soap film tends to shrink to as small surface area as possible.
- (B) The soap film consists of two surface layers.
- (C) Pressure of air enclosed by the soap film is same as that of the atmosphere outside.
- (D) Pressure of air enclosed by the soap film is more than the atmospheric pressure.

2. Viscous force is somewhat like friction as it opposes the motion and is non-conservative but not exactly so, why?

- (A) It is velocity dependent while friction is not.
- (B) It's velocity decreases and becomes zero.
- (C) It is temperature independent while friction is not.
- (D) It is independent of area like surface tension while friction depends on the area of contact.

3. The weight of a person on the Moon is about $1/6$ times that on the Earth. He can lift a mass of 23 kg on the Earth. What will be the maximum mass, which can be lifted by the same force applied by the person on the Moon?

- A) 136 kg (B) 276 kg (C) 138 kg (D) 248 kg

CHEMISTRY

1. What is the correct increasing order of oxidation state of nitrogen in following compounds? $\text{NH}_3, \text{N}_2, \text{NH}_2\text{OH}, \text{NO}_2$

- (A) $\text{NH}_3 < \text{NO}_2 < \text{N}_2 < \text{NH}_2\text{OH}$
- (B) $\text{NO}_2 < \text{NH}_3 < \text{NH}_2\text{OH} < \text{N}_2$
- (C) $\text{NH}_3 < \text{NH}_2\text{OH} < \text{NO}_2 < \text{N}_2$
- (D) $\text{NH}_3 < \text{NH}_2\text{OH} < \text{N}_2 < \text{NO}_2$

2. Adithi added a dilute ferrous sulphate solution gradually to the beaker containing acidified permanganate solution. She noticed that the light purple colour of the solution fades and finally disappears.

Which of the following is the correct explanation for the observation?

- (A) KMnO_4 is an unstable compound and decomposes in presence of FeSO_4 to a colorless compound.

- (B) KMnO_4 is an oxidising agent, it oxidises FeSO_4 .
- (C) FeSO_4 acts as an oxidising agent and oxidises KMnO_4 .
- (D) The colour disappears due to dilution; no reaction is involved.
3. The bond angle in PH_3 is expected to be
- (A) 90° (B) 105° (C) 109° (D) 120°

MATHS

1. From 3 different books and 6 different boxes, 4 boxes and 1 book are to be selected and arranged in a row on a shelf so that the book is always in the middle. The number of such arrangement is
- (A) at least 1000 (B) less than 500
- (C) at least 500 but less than 750 (D) at least 750 but less than 1000
2. In the family of 4 members, twenty years ago the average age of them was 60 years. 2 children were born in this span of 20 years. But the present average age of the family remains the same. Among the two children who were born during the 20 years, if the older child at present is 8 years older than the younger one, what is the ratio of the present age of the older child to the present age of the younger child?
- (A) 4: 3 (B) 7: 3 (C) 3: 2 (D) 7: 4
3. Which of the following is true about the graph of the inequations $x \geq 0, y \geq 0, 3x + 4y \leq 12$?
- (A) Exterior of a triangle.
- (B) Interior of a triangle including the points on the sides.
- (C) In the second quadrant.
- (D) Does not exist.

[OR]

BIOLOGY

1. Phagocytosis may be characterized by which of the following statements?
- (A) It is a constitutive process
- (B) It involves fluid uptake by small vesicles
- (C) It is important in digestive processes in mammals
- (D) It involves the uptake of cellular debris in large endocytic vesicles

2. Read the given statements and select the correct option.

Statement 1 : Chloroplasts and mitochondria are semi-autonomous bodies.

Statement 2 : Chloroplasts and mitochondria have their own DNA and protein synthesizing machinery.

(A) Both statements 1 and 2 are correct and statement 2 is the correct explanation of statement 1.

(B) Both statements 1 and 2 are correct but statement 2 is not the correct explanation of statement 1.

(C) Statement 1 is correct and statement 2 is incorrect.

(D) Both statements 1 and 2 are incorrect.

3. The phloem formed from vascular cambium is known as

(A) Primary Phloem

(B) Protophloem

(C) Secondary Phloem

(D) Metaphloem