



# ISO SCIENCE OLYMPIAD

## Sample Paper

Basic:(3Points)

- In which of the following reaction is zinc hydroxide not behaving as a base?
  - $\text{Zn(OH)}_2 + 2\text{HCl} \rightarrow \text{ZnCl}_2 + 2\text{H}_2\text{O}$
  - $\text{Zn(OH)}_2 + 2\text{NaOH} \rightarrow \text{Na}_2\text{Zn(OH)}_4$
  - $3\text{Zn(OH)}_2 + 2\text{H}_3\text{P}_4 \rightarrow \text{Zn}_3(\text{PO}_4)_2 + 6\text{H}_2\text{O}$
  - $\text{Zn(OH)}_2 + (\text{NH}_4)_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + 2\text{NH}_3 + 2\text{H}_2\text{O}$
- Which of the following describes correctly the difference between solutions of strong and weak acids of equal concentration?
  - Strong acid solutions have higher pH than weak acid solution
  - Strong acid solutions react with zinc while weak acid solution do not
  - Strong acid solutions conduct electricity better than weak acid solutions
  - Strong acid solutions require greater amount of alkali for neutralization compared to weak acid solutions

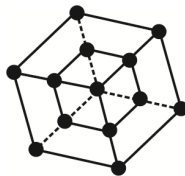
- The elements X, Y and Z form the covalent compound of formula:



Which of the following shows the possible electron structures of the atoms of X, Y and Z?

	X	Y	Z
(A)	1	2.2	2.5
(B)	1	2.4	2.3
(C)	2.8.7	2.2	2.3
(D)	2.8.7	2.4	2.5

4. The structure below represents the arrangement of the atoms of element X in its crystal lattice.



Which group does element X belong to in the Periodic Table?

- (A) Group I  
(B) Group II  
(C) Group III  
(D) Group IV
5. Choose the incorrect statement
- (A) Fleming's right-hand rule is a simple rule to know the direction of induced current  
(B) The right-hand thumb rule is used to find the direction of magnetic fields due to current carrying conductors  
(C) The difference between the direct and alternating currents is that the direct current always flows in one direction, whereas the alternating current reverses its direction periodically  
(D) In India, the AC changes direction after every  $1/50$  second

Foundation: (4 Points)

6. When light of wavelength  $x$  is incident on an equilateral prism, kept on its minimum deviation position, it is found that the angle of deviation equals the angle of the prism itself. The refractive index of the material of the prism for the wavelength  $x$  is
- (A)  $\sqrt{3}$                       (B)  $\sqrt{3}/2$                       (C) 2                      (D)  $\sqrt{2}$
7. A concave mirror of radius of curvature 60 cm is placed at the bottom of a tank containing water up to a height of 20 cm. The mirror faces upwards with its axis vertical. Solar light falls normally on the surface of water and the image of the sun is formed. If  $\mu = \frac{4}{3}$ , then with the observer in air, the distance of the image from the surface of water is
- (A) 30 cm                      (B) 10 cm                      (C) 7.5 cm below                      (D) 7.5 cm above
8. A wire has a resistance  $16 \Omega$ . If it is melted and drawn into a wire of half its length. Calculate the resistance of the new wire. What is the percentage change in its resistance?
- (A) 80%                      (B) 72%                      (C) 70%                      (D) 75%
9. A battery of four cells in series, each having an e.m.f. of 1.4 V and an internal resistance of  $2 \Omega$  is to be used to charge a small 2V accumulator of negligible internal resistance. What is the charging current?
- (A) 0.1 A                      (B) 0.2 A                      (C) 0.3 A                      (D) 0.45 A
10. Three identical bulbs are connected in parallel with a battery. The current drawn from the battery is 6A. If one of the bulbs gets fused, what be the total current drawn from the battery?
- (A) 4 A                      (B) 2 A                      (C) 6 A                      (D) 8 A

## Exploration: (5 Points)

11. The magnitude of two forces is in the ratio 3 : 5 and the angle between their direction is  $60^\circ$ . If their resultant force is 35 N then their magnitude will be  
(A) 12 N, 20 N      (B) 15 N, 25 N      (C) 18 N, 30 N      (D) 21 N, 28 N
12. A particle moves with constant acceleration for 6 seconds after starting from rest. The distance travelled during the consecutive 2 seconds interval are in the ratio  
(A) 1 : 1 : 1      (B) 1 : 2 : 3      (C) 1 : 3 : 5      (D) 1 : 5 : 9
13. A particle moves with a constant acceleration such that in the successive time intervals  $t_1$ ,  $t_2$  and  $t_3$  its average velocities are  $v_1$ ,  $v_2$  and  $v_3$ . The ratio of  $v_1 - v_2$  and  $v_2 - v_3$  is  
(A)  $t_1 - t_2 : t_2 + t_3$       (B)  $t_1 + t_2 : t_2 + t_3$       (C)  $t_1 - t_2 : t_2 - t_3$       (D)  $t_1 - t_2 : t_2 - t_3$
14. A student can throw a ball vertically to a maximum height of 40 m. The same student can throw the ball in horizontal direction to a maximum distance of  
(A)  $40\sqrt{2} n$       (B)  $20\sqrt{2} m$       (C) 20 m      (D) 80 m
15. The excitation energy of an electron from second orbit to third orbit of an atom with + Ze nuclear charge is 47.2 eV. If the energy of H-atom in lowest energy state is  $-13.6$  eV. What will be the value of Z?  
(A) 4      (B) 5      (C) 6      (D) 7

□□□

## ANSWER KEY

1-B	2-C	3-D	4-D	5-D	6-A	7-C	8-D
9-D	10-A	11-B	12-C	13-B	14-D	15-B	