

# CHEMISTRY

Time: 1 Hour

Max.Marks : 60

## Instructions:

- (1) Answer must be written either in English or the medium of instruction of the candidate in high school.
- (2) There will be no negative marking.
- (3) Use of calculators or graph papers is not permitted.
- (4) There are FOUR Questions. Answer all the questions.

**I. The questions below (1-10) consist of an 'Assertion' in column 1 and the 'Reason' in column 2. Use the following key to choose the appropriate answer.**

[10x1½=15 Marks]

- A. If both *assertion* and *reason* are CORRECT, and *reason* is the CORRECT explanation of the *assertion*.
- B. If both *assertion* and *reason* are CORRECT, but *reason* is NOT the CORRECT explanation of the *assertion*.
- C. If *assertion* is CORRECT, but *reason* is INCORRECT.
- D. If *assertion* is INCORRECT, but *reason* is CORRECT.

Assertion (column 1)	Reason (column 2)
1 The rate at which sugar dissolves in water increases with stirring	Stirring exposes the surface of solute crystal to a less concentrated layer of solution
2 Diamond has a higher melting point	In a diamond crystal, the carbon atoms are held in place by ionic bonds
3 Potassium has a lower I <sup>st</sup> ionisation energy than lithium has	Potassium has more protons in its nucleus than lithium has
4 Zinc metal will reduce Cu <sup>2+</sup> in solution	Zinc is a more reactive metal than copper
5 $\text{CH}_3\text{COOH} + \text{H}_2\text{O} \rightleftharpoons \text{CH}_3\text{COO}^- + \text{H}_3\text{O}^+$	The equilibrium constant of a reaction changes as the concentration of reactant changes

If some acetic acid is added to the equilibrium mixture represented

by the equation above, the concentration of  $\text{H}^+\text{O}$  decreases.

- |    |   |   |
|----|---|---|
| 6  | Fluorine is the highest electronegative element   | Electro-negativity is the inherent property of the free atom of an element                        |
| 7  | Aromatic compounds give more soot than aliphatic compounds  | Aromatic compounds are highly inflammable compounds   |
| 8  | $\text{C}_6^{12}$ $\text{C}_6^{14}$ have different chemical properties  | They have the same number of electrons and also similar electronic configuration                  |
| 9  | Heat of neutralisation for both $\text{HNO}_3$ and $\text{HCl}$ with $\text{NaOH}$ is $53.7\text{kJ mole}^{-1}$ | The bond strength in $\text{O-H}$ in $\text{HNO}_3$ and $\text{H-Cl}$ in $\text{HCl}$ are equal   |
| 10 | Bond angle in methane is $109^\circ 28'$  | Mixing of the atomic orbitals prior to overlap which changes the special distribution of orbitals |

## II. Explain the following Facts: [10x2=20 Marks]

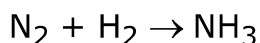
1.  $\text{SO}_2$  has dipole moment but  $\text{CO}_2$  has no dipole moment.
2. Amino acids are covalent compounds but exhibit properties like ionic salts.
3.  $\text{N}^{3-}$  and  $\text{O}^{2-}$  are isoelectronic but  $\text{N}^{3-}$  is larger in size than  $\text{O}^{2-}$ .
4. Oxygen, Nitrogen and carbon have unpaired electrons 2,3,2 respectively. Their valencies are 2, 3 and 4 respectively.
5. All minerals are not used to extract the metal.
6. Melting point and Boiling point of Ionic compounds are higher than the covalent compound.
7. Glass is called as super cooled liquid.
8.  $\text{p}^{\text{H}}$  of aq.solution of  $\text{NaCl}$  is 7, but aq.solution of  $\text{NaF}$  is greater than 7.
9.  $\text{KOH}$  is much more soluble in liquid  $\text{NH}_3$  containing water than in pure liquid Ammonia.
10. Iron is mostly used in the form of steel.

## III. Differentiate the following: [10x2=20 Marks]

1. drugs - pharmaceuticals
2. magic numbers - quantum numbers
3. molecular formula - structural formula
4. amino acid - proteins
5. heat of reaction - activation energy
6. mixture - compound
7. emulsion - suspensions
8. displacement reaction - double decomposition reaction
9. mono saccharides - polysaccharides
10. barometer - manometer

**VI. Solve the following:** [5 Marks]

1. A friend is trying to balance the following equation



He presents you with his version of the balanced equation  $\text{N} + \text{H}_3 \rightarrow \text{NH}_3$ . You immediately recognize that he has committed a serious error; however, he argues that there is nothing wrong, since the equation is balanced. What reason can you give to convince him that his method of balancing the equation is flawed. 1M

2. Titanium dioxide is used as the base powder for a variety of cosmetics. Say you decide to manufacture  $\text{TiO}_2$  in a furnace by the reaction  $\text{Ti} + \text{O}_2 \rightarrow \text{TiO}_2$ . Your titanium supplier can supply titanium at Rs.2.00 per gram. In your process, the reaction has a 33% yield. Market forces demand that you sell your  $\text{TiO}_2$  product at a cost no more than Rs.3.50 per gram.

- a. Assuming that you can sell as much  $\text{TiO}_2$  as you can make and the  $\text{O}_2$  is freely available from the atmosphere, is it profitable for you to manufacture  $\text{TiO}_2$ ?
- b. If it is not profitable to make  $\text{TiO}_2$ , what do you need to charge, per gram, in order to break even, assuming no other costs than the Ti metal?
- c. If you can't increase the price of the  $\text{TiO}_2$ , yet you still want to make a profit, what specific thing do you need to do with your process?(Atomic Wt. Ti=48)  
2M

3. Carborundum is silicon carbide,  $\text{SiC}$ , a very hard material used as an abrasive on sandpaper and in other applications. It is prepared by the reaction of pure sand,  $\text{SiO}_2$ , with carbon at high temperature. Carbon monoxide,  $\text{CO}$ , is the other product of this reaction. Write the balanced equation for the reaction,

and calculate how much  $\text{SiO}_2$  is required to produce 3.00 kg of SiC. (Atomic Wt. Si = 28) 2M