

2020

Time : 3 Hrs

Full Marks : 75

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Answer six questions, selecting at least one from each group, in which Q.No.1 is compulsory.

1. Choose the correct answer from the options given below:

$1\frac{1}{2} \times 10 = 15$

(a) The root mean square velocity of gas molecule is given by the relation:

(i) $u = \sqrt{2RT / M}$

(ii) $u = \sqrt{RT / M}$

(iii) $u = \sqrt{3RT / M}$

(iv) $u = \sqrt{8RT / M}$

(b) The property of a system which depends on the amount of the substance is called:

(i) Intensive property

(ii) Extensive property

(iii) Azotropic

(iv) None of these

(c) The standard free energy and equilibrium constant are related to each other as:

(i) $\Delta G^\circ = RT \ln k$

(ii) $\Delta G^\circ = \ln k$

(iii) $\Delta G^\circ = RT$

(iv) None of these

(d) The valid set of quantum numbers are:

(i) $n = 3, l = 3, m = 0$

(ii) $n = 3, l = 2, m = 0$

(iii) $n = 3, l = 3, m = 4$

(iv) $n = 3, l = 2, m = -3$

(e) Which of the following exhibits inert pair effect?

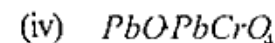
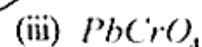
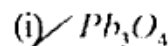
(i) B

(ii) Al

(iii) Sn

(iv) Sc

(f) Red lead is represented by the following formula:



(g) The energy is lowest for the orbital:

(i) 3d

(ii) 4s

(iii) 5s

(iv) 4p

(h) Which of the following is dihydric alcohol?

(i) Glycerol

(ii) Ethylene glycol

(iii) Catechol

(iv) Resorcinol

(i) The chemical used in Hinsberg test for amines is:

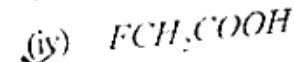
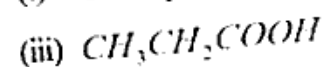
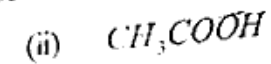
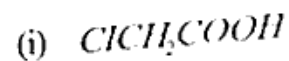
(i) Chlorobenzene

(ii) Benzene Sulphonyl Chloride

(iii) Sulphuric acid

(iv) Nitric acid

(j) Which of the following compound is most acidic?



P.T.O.

Group-A

2. What is an ideal gas? Does it exist in nature? Discuss Vander Waals equation of state for a real gas. $2+2+8=12$
3. What do you mean by equilibrium constant? Describe the effect of temperature on it, Establish the relation between K_p and K_c . $2+3+7=12$
4. (a) Derive an expression for work done in Isothermal reversible expansion of an ideal gas.
(b) State and explain Hess's Law. $6+6=12$
5. Write short notes on any three of the following: $4 \times 3=12$
- (a) Adiabatic process
 - (b) Depression in Freezing point
 - (c) Kirchhoff's Law
 - (d) Average velocity
 - (e) Le-Chatelier's principle.

Group-B

6. How Lead is extracted from Galena? How does it react with the following? <https://www.tmbuonline.com> $8+4=12$
- (i) NaOH
 - (ii) HNO_3
7. Define Electron affinity, Electronegativity and Ionization potential. How they vary in periodic table? $6+6=12$
8. Define Lattice energy. How can this be known by Born Haber cycle? $4+8=12$

9. Write notes on any two of the following: $6+6=12$
- (a) Diagonal relationship
 - (b) Borax bead Test
 - (c) Valence Bond Theory
 - (d) Quantum Numbers

Group-C

10. (a) What are amines and how are they classified?
(b) How will you distinguish Primary, Secondary and Tertiary amines using Hinsberg test? $6+6=12$
11. (a) How will you obtain glycerol from propylene?
(b) How does glycerol react with the following?
(i) Oxalic acid
(ii) Hydrogen iodide $6+3+3=12$
12. (a) Write IUPAC name of the following compounds: $1\frac{1}{2} \times 4=6$
- (i) $\text{CH}_3\text{O}-\text{CH}(\text{CH}_3)-\text{CH}_3$
 - (ii) $\text{CH}_3-\text{C}(\text{CH}_3)_2-\text{CH}_2\text{Cl}$
 - (iii) $\text{CH}_2=\text{CHCHO}$
 - (iv) $\text{C}_6\text{H}_5-\text{CH}=\text{CHCOOH}$
- (b) Write down the structural formula of the following: $1\frac{1}{2} \times 4=6$
- (i) Propane-1, 2, 3-triol
 - (ii) Lactic acid
 - (iii) 2-phenyl ethanoic acid
 - (iv) 3, 4-Dimethyl hexane.
13. Write notes on any two of the following: $6+6=12$
- (a) Electromeric effect
 - (b) Wurtz reaction
 - (c) Tetravalency of Carbon
 - (d) Tollen's reagent