

**VIVEKANNADA VIDYALAYA MATRIC HIGHER
SECONDARY SCHOOL, PANNAIKADU**

CHEMISTRY

QUESTION BANK FOR

XITH STD

Prepared by
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WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON -1]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**

1. When 22.4 litres of H_2 (g) is mixed with 11.2 litres of Cl_2 (g), each at 273 K at 1 atm the moles of HCl (g), formed is equal to

- (a) 2 moles of HCl (g) (b) 0.5 moles of HCl (g)
(c) 1.5 moles of HCl (g) (d) 1 moles of HCl (g)

2. Hot concentrated sulphuric acid is a moderately strong oxidising agent. Which of the following reactions does not show oxidising behaviour?

- (a) $Cu + 2H_2 \rightarrow CuSO_4 + SO_2 + 2 H_2O$ (b) $C + 2 H_2SO_4 \rightarrow CO_2 + 2 SO_2 + 2 H_2O$
(c) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$ (d) none of the above

3. The equivalent mass of a trivalent metal element is 9 g eq^{-1} the molar mass of its anhydrous oxide is

- (a) 102 g (b) 27 g (c) 270 g (d) 78 g

4. Carbon forms two oxides, namely carbon monoxide and carbon dioxide. The equivalent mass of which element remains constant?

- (a) Carbon (b) Oxygen (c) both carbon and oxygen (d) neither carbon nor oxygen

5. 40 ml of methane is completely burnt using 80 ml of oxygen at room temperature. The volume of gas left after cooling to room temperature

- (a) 40 ml CO_2 (b) 40 ml CO_2 gas and 80 ml H_2O gas
(c) 60 ml CO_2 gas and 60 ml H_2O gas (d) 120 ml CO_2 gas

II. TWO MARKS:**(5 X 2 = 10)**

6. What is the empirical formula of the following?

- i) Fructose ($C_6H_{12}O_6$) found in honey ii) Caffeine ($C_8H_{10}N_4O_2$) a substance found in tea.

7. How many moles of hydrogen is required to produce 10 moles of ammonia ?

8. What do you understand by the term mole?

9. Calculate the amount of water produced by the combustion of 32 g of methane.

10. Define equivalent mass.

III. THREE MARKS:**(5 X 3 = 15)**

11. Calculate the molar mass of the following compounds.

- (i) urea [$CO(NH_2)_2$] (ii) acetone [CH_3COCH_3] (iii) boric acid [H_3BO_3] (iv) sulphuric acid [H_2SO_4]

12. How many moles of ethane is required to produce 44 g of CO_2 (g) after combustion.

Balanced equation for the combustion of ethane.

13. Distinguish between oxidation and reduction.

14. What is the difference between molecular mass and molar mass?

15. Calculate the amount of water produced by the combustion of 32 g of methane.

IV. FIVE MARK:**(1 X 5 = 5)**

16. A Compound on analysis gave Na = 14.31% S = 9.97% H = 6.22% and O = 69.5% calculate the molecular formula of the compound if all the hydrogen in the compound is present in combination with oxygen as water of crystallization, (molecular mass of the compound is 322).

WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON -1]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**

1. The equivalent mass of ferrous oxalate is

- (a) molar mass of ferrous oxalate 1 (b) molar mass of ferrous oxalate 2
 (c) molar mass of ferrous oxalate 3 (d) none of these

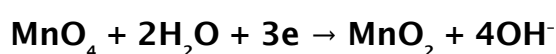
2. Which of the following compound(s) has/have a percentage of carbon same as that in ethylene (C₂H₄)

- (a) Propene (b) ethyne (c) benzene (d) ethane

3. Which one of the following is used as a standard for atomic mass.

- (a) ${}^6_6\text{C}^{12}$ (b) ${}^7_7\text{C}^{12}$ (c) ${}^6_6\text{C}^{13}$ (d) ${}^6_6\text{C}^{14}$

4. The equivalent mass of potassium permanganate in an alkaline medium is



- (a) 31.6 (b) 52.7 (c) 79 (d) None of these

5. The mass of a gas that occupies a volume of 612.5 ml at room temperature and pressure (25°C and 1 atm pressure) is 1.1 g. The molar mass of the gas is

- (a) 66.25 g mol⁻¹ (b) 44 g mol⁻¹ (c) 24.5 g mol⁻¹ (d) 662.5 g mol⁻¹

II. TWO MARKS:**(5 X 2 = 10)**

6. What do you understand by the term oxidation number.

7. What is Avogadro's number?

8. What is combination reaction? Give example.

9. Define equivalent mass.

10. What is meant by limiting reagent?

III. THREE MARKS:**(5 X 3 = 15)**

11. Calculate the empirical and molecular formula of a compound containing 76.6% carbon, 6.38 % hydrogen and rest oxygen its vapour density is 47

12. What is disproportionation reactions? Give example.

13. Calculate the oxidation number of underlined elements.

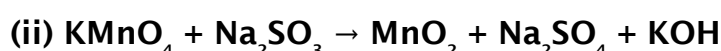
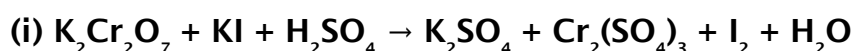
- i) $\underline{\text{C}}\text{O}_2$ ii) $\text{H}_2\underline{\text{S}}\text{O}_4$ iii) $\underline{\text{Cr}}_2\underline{\text{O}}_7^{2-}$ iv) $\underline{\text{S}}\text{O}_2$

14. What do you understand by the terms empirical formula and molecular formula?

15. An organic compound present in vinegar has 40 % carbon, 6.6 % hydrogen and 53.4 % oxygen. Find the empirical formula of the compound.

IV. FIVE MARK:**(1 X 5 = 5)**

16. Balance the following equations by oxidation number method



WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON - 2]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**

- The energy of light of wavelength 45nm is
(a) 6.65×10^{15} J (b) 6.67×10^{11} J (c) 4.42×10^{-18} J (d) 4.42×10^{-5} V
- Which of the following pairs of d-orbitals will have electron density along the axes?
(a) dz^2 , dxz (b) dxz , dyz (c) dx^2 , $dx^2 - y^2$ (d) dxy , $dx^2 - y^2$
- The maximum number of electrons in a sub shell is given by the expression
(a) $2n^2$ (b) $2l + 1$ (c) $4l + 2$ (d) none of these
- Two electron occupying the same orbital are distinguished by
(a) Azimuthal quantum number (b) Spin quantum number
(c) Magnetic quantum number (d) Orbital quantum number
- Electronic configuration of species M^{2+} is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$ and its atomic weight is 56. The number of neutrons in the nucleus of species M is
(a) 26 (b) 22 (c) 30 (d) 24

II. TWO MARKS:**(5 X 2 = 10)**

- How many orbitals are possible for $n = 4$?
- State Heisenberg's uncertainty principle.
- State Hund's rule of maximum multiplicity.
- Define orbital. What are 'n' and 'l' values for $3p_x$ and $4d_{x^2 - y^2}$ electron?
- Calculate the total number of angular nodes and radial nodes present in 3d and 4f orbitals.

III. THREE MARKS:**(5 X 3 = 15)**

- Identify the missing quantum numbers and the sub energy level.

n	l	m	Sub energy level
?	?	0	4d
3	1	0	?
?	?	?	5p
?	?	-2	3d

- For each of the following, give the sub level designation, the allowable m values and the number of orbitals,

(i) $n = 1, l = 2$

(ii) $n = 5, l = 3$

(iii) $n = 7, l = 0$

- How many radial nodes for 2s, 4p, 5d and 4f orbitals exhibit? How many angular nodes?

- Describe about Bohr atom model.

- Which ion has the stable electronic configuration? Ni^{2+} or Fe^{3+}

IV. FIVE MARK:**(1 X 5 = 5)**

- Give the electronic configuration of Mn^{2+} and Cr^{3+} .
 - Determine the values of all the four quantum numbers of the 8th electron in the O - atom and 15th electron in the Cl atom and the last electron in Chromium.

WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON - 2]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**

1. The energy of an electron in the 3rd orbit of a hydrogen atom is $-E$. The energy of an electron in the first orbit will be

- (a) $-3E$ (b) $-E/3$ (c) $-E/9$ (d) $-9E$

2. If uncertainty in position and momentum are equal, then minimum uncertainty in velocity is

- a) $\frac{1}{m} \sqrt{\frac{h}{\pi}}$ d) $\sqrt{\frac{h}{\pi}}$ c) $\frac{1}{2m} \sqrt{\frac{h}{\pi}}$ d) $\frac{h}{4\pi}$

3. Electron density in the yz plane of $3d_x^2 - y^2$ orbital is

- (a) zero (b) 0.50 (c) 0.75 (d) 0.90

4. The total number of orbitals associated with the principal quantum number $n = 3$ is

- (a) 9 (b) 8 (c) 5 (d) 7

5. Which of the following does not represent the mathematical expression for the Heisenberg uncertainty principle?

- (a) $\Delta x \cdot \Delta p \geq h/4$ (b) $\Delta x \cdot \Delta v \geq h/4\pi m$ (c) $\Delta E \cdot \Delta t \geq h/4\pi$ (d) $\Delta E \cdot \Delta x \geq h/4\pi$

II. TWO MARKS:**(5 X 2 = 10)**

6. What is Zeeman and Stark effect?

7. Explain briefly the time-independent Schrodinger wave equation.

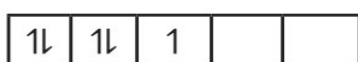
8. Write de Broglie equation and explain the terms in it.

9. Calculate the energy required for the process.

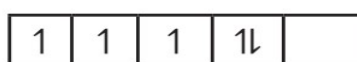
10. State and explain Pauli's exclusion principle.

III. THREE MARKS:**(5 X 3 = 15)**

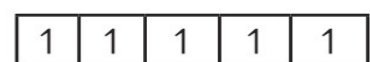
11. Consider the following electronic arrangements for the d^5 configuration.



(a)



(b)



(c)

(i) Which of these represents the ground state?

(ii) Which configuration has the maximum exchange energy?

12. An atom of an element contains 35 electrons and 45 neutrons. Deduce

(i) the number of protons (ii) the electronic configuration for the element

(iii) All the four quantum numbers for the last electron.

13. Explain Davisson and Germer experiment

14. Describe the Aufbau principle.

15. What are the conclusions of Rutherford's α - rays scattering experiment?

IV. FIVE MARK:**(1 X 5 = 5)**

16. What are quantum numbers? Explain its types.

WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON - 3]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**

1. The group of elements in which the differentiating electron enters the anti penultimate shell of atoms are called

- (a) p-block elements (b) d-block elements
(c) s-block elements (d) f-block elements

2. Which one of the following arrangements represent the correct order of least negative to most negative electron gain enthalpy

- (a) Al < O < C < Ca < F (b) Al < Ca < O < C < F
(c) C < F < O < Al < Ca (d) Ca < Al < C < O < F

3. What would be the IUPAC name for an element with atomic number 222?

- (a) bibibium (b) bididium (c) didibium (d) bibibium

4. In the third period the first ionization potential is of the order.

- (a) Na > Al > Mg > Si > P (b) Na < Al < Mg < Si < P
(c) Mg > Na > Si > P > Al (d) Na < Al < Mg < P < Si

5. Which one of the following is the least electronegative element?

- (a) Bromine (b) Chlorine (c) Iodine (d) Hydrogen

II. TWO MARKS:**(5 X 2 = 10)**

6. What are isoelectronic ions? Give examples.

7. In what period and group will an element with Z = 118 will be present?

8. Define electronegativity.

9. Give the general electronic configuration of lanthanides and actinides?

10. Define modern periodic law.

III. THREE MARKS:**(5 X 3 = 15)**

11. Justify that the fifth period of the periodic table should have 18 elements on the basis of quantum numbers.

12. Explain the periodic trend of ionisation potential.

13. Explain the diagonal relationship

14. State the trends in the variation of electronegativity in group and periods.

15. State the trends in the variation of electronegativity in groups and periods.

IV. FIVE MARK:**(1 X 5 = 5)**

16. Explain the Pauling method for the determination of ionic radius.

WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON - 4]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**

1. The cause of permanent hardness of water is due to

- (a) $\text{Ca}(\text{HCO}_3)_2$ (b) $\text{Mg}(\text{HCO}_3)_2$ (c) CaCl_2 (d) MgCO_3

2. The hybridisation of oxygen atom in H_2O and H_2O_2 are, respectively

- (a) sp and sp^3 (b) sp and sp (c) sp and sp^2 (d) sp^3 and sp^3

3. Ionic hydrides are formed by

- (a) halogens (b) chalogens (c) inert gases (d) group one elements

4. Zeolite used to soften hardness of water is, hydrated

- (a) Sodium aluminium silicate (b) Calcium aluminium silicate
(c) Zinc aluminium borate (d) Lithium aluminium hydride

5. Which of the following statements about hydrogen is incorrect?

- (a) Hydrogen ion, H_3O^+ exists freely in solution.
(b) Dihydrogen acts as a reducing agent.
(c) Hydrogen has three isotopes of which tritium is the most common.
(d) Hydrogen never acts as cation in ionic salts.

II. TWO MARKS:**(5 X 2 = 10)**

6. Give the uses of heavy water.

7. What is water-gas shift reaction ?

8. What are isotopes? Write the names of isotopes of hydrogen.

9. Explain the different methods of preparation of Tritium.

10. What is temporary hardness of water? How is it removed?

III. THREE MARKS:**(5 X 3 = 15)**

11. Explain why hydrogen is not placed with the halogen in the periodic table.

12. How do you convert para hydrogen into ortho hydrogen ?

13. What are the different types of hydrides?

14. Compare the structures of H_2O and H_2O_2 .

15. Explain ortho and para hydrogen

IV. FIVE MARK:**(1 X 5 = 5)**

16. What is hydrogen bonding? What are the types of hydrogen bonding? Give example.

WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON - 5]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**

1. Lithium shows diagonal relationship with

- (a) sodium (b) magnesium (c) calcium (d) aluminium

2. Sodium is stored in

- (a) alcohol (b) water (c) kerosene (d) none of these

3. Which of the following has highest hydration energy

- (a)
- $MgCl_2$
- (b)
- $CaCl_2$
- (c)
- $BaCl_2$
- (d)
- $SrCl_2$

4. The product obtained as a result of a reaction of nitrogen with CaC_2 is

- (a)
- $Ca(CN)_3$
- (b)
- CaN_2
- (c)
- $Ca(CN)_2$
- (d)
- Ca_3N_2

5. The suspension of slaked lime in water is known as

- (a) lime water (b) quick lime (c) milk of lime (d) aqueous solution of slaked lime

II. TWO MARKS:**(5 X 2 = 10)**

6. Why alkaline earth metals are harder than alkali metals.

7. Give the systematic names for the following: i) milk of magnesia ii) lye iii) lime iv) caustic potash v) washing soda

8. Give the uses of gypsum.

9. How is plaster of paris prepared?

10. Beryllium halides are covalent whereas magnesium halides are ionic why?

III. THREE MARKS:**(5 X 3 = 15)**

11. Write balanced chemical equation. (i) Lithium metal with nitrogen gas

(ii) Heating solid sodium bicarbonate (iii) Rubidium with oxygen gas

12. What are the uses of Strontium and Barium.

13. Alkaline earth metal (A), belongs to 3rd period reacts with oxygen and nitrogen to form compound (B) and (C) respectively. It undergoes a metal displacement reaction with $AgNO_3$ solution to form a compound (D)

14. Write balanced chemical equation for the following processes:

- (a) heating calcium in oxygen (b) heating calcium carbonate

15. Mention the uses of plaster of paris

IV. FIVE MARK:**(1 X 5 = 5)**

16. Describe briefly the biological importance of Calcium and magnesium

WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON - 6]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**

1. The temperatures at which real gases obey the ideal gas laws over a wide range of pressure is called

- (a) Critical temperature (b) Boyle temperature
(c) Inversion temperature (d) Reduced temperature

2. The use of hot air balloon in sports at meteorological observation is an application of (a) Boyle's law (b) Newton's law (c) Kelvin's law (d) Brown's law

3. The compressibility factor for CO_2 at 400 K and 71.0 bar is 0.8697. The molar volume of CO_2 under these conditions is

- (a) 22.04 dm³ (b) 2.24 dm³ (c) 0.41 dm³ (d) 19.5 dm³

4. The temperatures at which real gases obey the ideal gas laws over a wide range of pressure is called

- (a) Critical temperature (b) Boyle temperature
(c) Inversion temperature (d) Reduced temperature

5. In a closed room of 1000 m³ a perfume bottle is opened up. The room develops a smell. This is due to which property of gases?

- (a) Viscosity (b) Density (c) Diffusion (d) None

II. TWO MARKS:**(5 X 2 = 10)**

6. Define Dalton's law of partial pressure.

7. What is meant by Joule-Thomson effect?

8. Define Graham's law of diffusion.

9. Can a Vander Waals gas with $a = 0$ be liquefied? Explain.

10. Explain the different methods used for liquefaction of gases.

III. THREE MARKS:**(5 X 3 = 15)**

11. Explain why aerated water bottles are kept under water during summer?

12. Distinguish between diffusion and effusion.

13. Derive ideal gas equation.

14. What are ideal gases? In what way real gases differ from ideal gases.

15. When ammonia combines with HCl, NH_4Cl is formed as white dense fumes. Why do more fumes appear near HCl?

IV. FIVE MARK:**(1 X 5 = 5)**

16. Write the Van der Waals equation for a real gas. Explain the correction term for pressure and Volume.

WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON -7]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**

1. Which of the following is not a thermodynamic function?

(a) internal energy (b) enthalpy (c) entropy (d) frictional energy

2. The intensive property among the quantities below is

(a) mass (b) volume (c) enthalpy (d) mass/volume

3. Heat of combustion is always

(a) positive (b) negative (c) zero (d) either positive or negative

4. If one mole of ammonia and one mole of hydrogen chloride are mixed in a closed container to form ammonium chloride gas, then

(a) $\Delta H > \Delta U$ (b) $\Delta H - \Delta U = 0$ (c) $\Delta H + \Delta U = 0$ (d) $\Delta H < \Delta U$

5. In an adiabatic process, which of the following is true?

(a) $q = w$ (b) $q = 0$ (c) $\Delta E = q$ (d) $P\Delta V = 0$ **II. TWO MARKS:****(5 X 2 = 10)**

6. Explain intensive properties with two examples.

7. Define Hess's law of constant heat summation.

8. Define enthalpy of neutralization.

9. State the first law of thermodynamics.

10. Define Gibb's free energy.

III. THREE MARKS:**(5 X 3 = 15)**

11. What are spontaneous reactions? What are the conditions for the spontaneity of a process?

12. What are state and path functions? Give two examples.

13. Write down the Born-Haber cycle for the formation of CaCl_2

14. State the various statements of the second law of thermodynamics.

15. List the characteristics of internal energy.

IV. FIVE MARK:**(1 X 5 = 5)**

16. i) List the characteristics of Gibbs free energy. ii) What is lattice energy?

WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON -8]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**

1. The equilibrium constant for a reaction at room temperature is K_1 and that at 700 K is K_2 . If $K_1 > K_2$, then

- a) The forward reaction is exothermic b) The forward reaction is endothermic
c) The reaction does not attain equilibrium d) The reverse reaction is exothermic

2. Solubility of carbon dioxide gas in cold water can be increased by

- a) increase in pressure b) decrease in pressure
c) increase in volume d) none of these

3. In the reaction $\text{Fe(OH)}_3(\text{s}) \rightleftharpoons \text{Fe}^{3+}(\text{aq}) + 3\text{OH}^-(\text{aq})$, if the concentration of OH^- ions is decreased by 1/4 times, then the equilibrium concentration of Fe^{3+} will

- a) not changed b) also decreased by 1/4 times
c) increase by 4 times d) increase by 64 times

4. For the reaction $\text{AB}(\text{g}) \rightleftharpoons \text{A}(\text{g}) + \text{B}(\text{g})$, at equilibrium, AB is 20 % dissociated at a total pressure of P, the equilibrium constant K_p is related to the total pressure by the expression

- a) $P = 24 K_p$ b) $P = 8 K_p$ c) $24 P = K_p$ d) none of these

5. An equilibrium constant of 3.2×10^{-6} for a reaction means, the equilibrium is

- a) largely towards forward direction b) largely towards reverse direction
c) never established d) none of these

II. TWO MARKS:**(3 X 2 = 6)**

6. What is reaction quotient?

7. State law of mass action.

8. State Le - Chatelier principle.

III. THREE MARKS:**(3 X 3 = 9)**

11. Consider the following reactions, a) $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$

b) $\text{CaCO}_3(\text{s}) \rightleftharpoons \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$ c) $\text{S}(\text{s}) + 3\text{F}_2(\text{g}) \rightleftharpoons \text{SF}_6(\text{g})$

12. One mole of PCl_5 is heated in one litre closed container. If 0.6 mole of chlorine is found at equilibrium, Calculate the value of equilibrium constant.

13. Write the K_p and K_c for the following equation.

i) $2\text{NH}_3(\text{g}) \rightleftharpoons \text{N}_2(\text{g}) + 3\text{H}_2(\text{g})$ ii) $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$ iii) $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$

IV. FIVE MARK:**(2 X 5 = 10)**

14. Deduce the Vant Hoff equation.

15. Derive the relation between K_p and K_c .

WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON -9]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**1. Osmotic pressure (π) of a solution is given by the relation

- a) $\pi = nRT m$ b) $\pi V = nRT$ c) $\pi RT = n$ d) none of these

2. Which one of the following gases has the lowest value of Henry's law constant?

- a) N_2 b) He c) CO_2 d) H_2

3. Which one of the following binary liquid mixtures exhibits positive deviation from Raoult's law?

- a) acetone + chloroform b) water + nitric acid c) HCl + water d) ethanol + water

4. Normality of 1.25 M sulphuric acid is

- a) 1.25 N b) 3.75 N c) 2.5 N d) 2.25 N

5. The molality of a solution containing 1.8 g of glucose dissolved in 250 g of water is

- a) 0.2 M b) 0.01 M c) 0.02 M d) 0.04 M

II. TWO MARKS:**(5 X 2 = 10)**

6. Define osmotic pressure.

7. What are ideal solution? Give example.

8. Define mole fraction.

9. What is osmosis?

10. State Raoult's law.

III. THREE MARKS:**(5 X 3 = 15)**

11. Define i) Molality ii) Normality

12. Limitations of Henry's law

13. What are colligative properties? Give example.

14. You are provided with a solid. 'A' and three solutions of A dissolved in water - one saturated, one unsaturated, and one supersaturated. How would you determine which solution is which?

15. Explain the effect of pressure on the solubility

IV. FIVE MARK:**(1 X 5 = 5)**

16. i) State and explain Henry's law. ii) Define the term isotonic

WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON -10]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**1. 4. Which of the following molecule contain no π bond?

- a) SO_2 b) NO_2 c) CO_2 d) H_2O

2. In which of the following compound does the central atom obey the octet rule?

- a) XeF_4 b) AlCl_3 c) SF_6 d) SCl_2

3. Which one of the following is diamagnetic?

- a) O_2 b) O_2^{2-} c) O_2^+ d) None of these

4. Non - Zero dipole moment is shown by

- a) CO_2 b) p - dichlorobenzene c) carbontetrachloride d) water

5. Shape and hybridisation of IF_5 are

- a) Trigonal bipyramidal, sp^3d^2 b) Trigonal bipyramidal, sp^3d
 c) Square pyramidal, sp^3d^2 d) Octahedral, sp^3d^2

II. TWO MARKS:**(5 X 2 = 10)**

6. Define coordinate covalent bond.

7. What is dipole moment?

8. Which bond is stronger or π ? Why?

9. What type of hybridisations are possible in the following geometries? i) octahedral ii) tetrahedral iii) square planar.

10. Define bond length and bond angle.

III. THREE MARKS:**(5 X 3 = 15)**11. Draw the Lewis structures for the following species. i) NO_3^- ii) SO_4^{2-} iii) HNO_3 iv) O_3

12. Describe Fajan's rule.

13. Explain the bond formation in BeCl_2 and MgCl_2 .14. Explain sp^2 hybridisation in BF_3 .15. Define the following: i) Bond order ii) Hybridisation iii) σ - bond**IV. FIVE MARK:****(1 X 5 = 5)**16. Discuss the formation of N_2 molecule using MO Theory.

WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON -11]****STD: XI****MARKS: 35****TIME: 1.00 HRS****I. CHOOSE THE CORRECT ANSWER:****(5 X 1 = 5)**1. The IUPAC name of the compound $\text{CH}_3 - \text{CH} = \text{CH} - \text{C} \equiv \text{CH}$ is

- a) Pent - 4- yn - 2 - ene b) Pent - 3- en - 1- yne
c) Pent - 2 - en - 4 - yne d) Pent - 1 yn - 3 - ene

2. IUPAC name of is $\begin{array}{c} \text{CH}_3 \\ \diagdown \\ \text{CH} - \text{CH} - \text{COOH} \\ \diagup \quad | \\ \text{Br} \quad \text{CH}_3 \end{array}$ is

- a) 2 - Bromo - 3- methyl butanoic acid b) 2 - methyl - 3 bromo butanoic acid
c) 3 - Bromo - 2 - methylbutanoic acid d) 3 - Bromo - 2, 3 - dimethyl propanoic acid

3. The IUPAC name of the compound $\begin{array}{c} \text{CH}_3 - \text{CH} - \text{COOH} \\ | \\ \text{OH} \end{array}$ is

- a) 2 - Hydroxypropionic acid b) 2 - Hydroxy Propanoic acid
c) Propan - 2 - ol - 1 - oic acid d) 1 - Carboxyethanol

4. Select the molecule which has only one π bond.

- a) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_3$ b) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CHO}$
c) $\text{CH}_3 - \text{CH} = \text{CH} - \text{COOH}$ d) All of these

5. Which of the following is optically active?

- a) 3 - Chloropentane b) 2- Chloro propane c) Meso - tartaric acid d) Glucose

II. THREE MARKS:**(5 X 3 = 15)**

6. Trans isomer is more stable than cis isomer. Justify this statement.

7. Briefly explain geometrical isomerism in alkenes by considering 2- butene as an example.

8. Write a note on homologous series.

9. What is meant by a functional group? Identify the functional group in the following compounds. a) acetaldehyde b) oxalic acid

- c) dimethyl ether d) methylamine

10. Give the general characteristics of organic compounds.

III. FIVE MARK:**(2 X 5 = 10)**

11. Describe the classification of organic compounds based on their structure

12. Describe optical isomerism with suitable example.

WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON -12]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**

1. What is the hybridisation state of benzyl carbonium ion?

- a) sp^2 b) spd^2 c) sp^3 d) sp^2d

2. Heterolytic fission of C - Br bond results in the formation of

- a) free radical b) Carbanion c) Carbocation d) Carbanion and Carbocation

3. Which of the group has highest + I effect?

- a) CH_3- b) $CH_3 - CH_2 -$ c) $(CH_3)_2 - CH-$ d) $(CH_3)_3 - C -$

4. The geometrical shape of carbocation is

- a) Linear b) tetrahedral c) Planar d) Pyramidal

5. Which of the group has highest + I effect?

- a) CH_3- b) $CH_3 - CH_2 -$ c) $(CH_3)_2 - CH-$ d) $(CH_3)_3 - C -$

II. THREE MARK:**(5 X 3 = 15)**

6. Write short notes on a) Resonance b) Hyper Conjugation

7. What are electrophiles and nucleophiles? Give suitable examples for each.

8. Differentiate the carbocation and carbanion.

9. Mention the types of fission of a covalent bond?

10. What are the types of substitution reactions?

III. FIVE MARK:**(2 X 5 = 10)**

11. Give examples for the following types of organic reactions

- (i) β - elimination (ii) Electrophilic substitution

12. Explain inductive effect with suitable example.

WEEKLY UNIT TEST**SUBJECT: CHEMISTRY****[LESSON -13]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**

1. Which of the following is optically active

- a) 2 - methyl pentane b) citric acid c) Glycerol d) none of these

2. The compound formed at anode in the electrolysis of an aqueous solution of potassium acetate are

- a) CH_4 and H_2 b) CH_4 and CO_2 c) C_2H_6 and CO_2 d) C_2H_4 and Cl_2

3. The major product formed when 2 - bromo - 2 - methyl butane is refluxed with ethanolic KOH is

- a) 2 - methylbut - 2- ene b) 2 - methyl butan - 1 - ol
c) 2 - methyl but - 1 - ene d) 2 - methyl butan - 2- ol

4. Which of the following compounds will not undergo Friedal - crafts reaction easily?

- a) Nitro benzene b) Toluene c) Cumene d) Xylene

5. The compound that will react most readily with gaseous bromine has the formula

- a) C_3H_6 b) C_2H_2 c) C_4H_{10} d) C_2H_4

II. THREE MARKS:**(5 X 3 = 15)**

6. Explain Markovnikoffs rule with suitable example.

7. What is BHC? How will you prepare BHC? Mention its uses

8. Suggest a simple chemical test to distinguish propane and propene.

9. What happens when ethylene is passed through cold dilute alkaline potassium permanganate.

10. Write Friedel craft's reaction.

III. FIVE MARK:**(1 X 5 = 5)**

11. Explain the structure of benzene.

12. Describe the mechanism of Nitration of benzene.

WEEKLY UNIT TEST -1**SUBJECT: CHEMISTRY****[LESSON -14]****STD: XI****MARKS: 35****TIME: 1.00 HRS****I. CHOOSE THE CORRECT ANSWER:****(5 X 1 = 5)**

1. With respect to the position of - Cl in the compound $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_2 - \text{Cl}$, it is classified as a) Vinyl b) Allyl c) Secondary d) Aralkyl

2. The treatment of ethyl formate with excess of RMgX gives

- a) $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{R}$ b) $\text{R}-\overset{\text{OH}}{\underset{|}{\text{CH}}}-\text{R}$
 c) $\text{R}-\text{CHO}$ d) $\text{R}-\text{O}-\text{R}$

3. The most easily hydrolysed molecules under S_N^1 condition is

- a) allyl chloride b) ethyl chloride c) isopropyl chloride d) benzyl chloride

4. The raw material for Raschig process

- a) chloro benzene b) phenol c) benzene d) anisole

5. Freon - 12 manufactured from tetrachloro methane by

- a) Wurtz reaction b) Swarts reaction c) Haloform reaction d) Gattermann reaction

II. TWO MARKS:**(5 X 2 = 10)**

6. Classify the following compounds in the form of alkyl, allylic, vinyl, benzylic

- a) $\text{CH}_3 - \text{CH} = \text{CH} - \text{Cl}$ (iii) $\text{CH}_3 - \overset{\text{Br}}{\underset{|}{\text{CH}}} - \text{CH}_3$
 (ii) $\text{C}_6\text{H}_5\text{CH}_2\text{I}$ (iv) $\text{CH}_2 = \text{CH} - \text{Cl}$

7. Mention the uses of chloroform.

8. Explain Williamson's synthesis.

9. Explain Sandmeyer's reaction.

10. Why chlorination of methane is not possible in dark?

III. THREE MARKS:**(5 X 3 = 15)**

11. An organic compound (A) with molecular formula $\text{C}_2\text{H}_5\text{Cl}$ reacts with KOH gives compounds (B) and with alcoholic KOH gives compound (C). Identify (A), (B) and (C)

12. Explain the preparation of the following compounds: i) DDT ii) Chloroform

13. Write short notes on Raschig, Dows & Darzens process.

14. What are Freons? Discuss their uses and environmental effects.

15. Compare S_N^1 and S_N^2 reaction mechanisms.

IV. FIVE MARK:**(1 X 5 = 5)**

16. Explain the mechanism of S_N^1 reaction by highlighting the stereochemistry behind it.

WEEKLY UNIT TEST -1**SUBJECT: CHEMISTRY****[LESSON -15]****STD: XI****MARKS: 35****TIME: 1.00 HRS**

I. CHOOSE THE CORRECT ANSWER:**(5 X 1 = 5)**

1. Bhopal Gas Tragedy is a case of _____.

(a) thermal pollution (b) air pollution (c) nuclear pollution (d) land pollution

2. Haemoglobin of the blood forms carboxy haemoglobin with

(a) Carbon dioxide (b) Carbon tetra chloride (c) Carbon monoxide (d) Carbonic acid

3. The gaseous envelope around the earth is known as atmosphere. The region lying between an altitudes of 11 - 50 km is _____.

(a) Troposphere (b) Mesosphere (c) Thermosphere (d) Stratosphere

4. The pH of normal rain water is

(a) 6.5 (b) 7.5 (c) 5.6 (d) 4.6

5. Ozone depletion will cause

(a) forest fires (b) eutrophication (c) bio magnification (d) global warming

II. TWO MARKS:**(5 X 2 = 10)**

6. What would happen, if the greenhouse gases were totally missing in the earth's atmosphere?

7. Which is considered to be the earth's protective umbrella? Why?

8. What is green chemistry?

9. Define smog.

10. Explain how oxygen deficiency is cause by carbon monoxide in our blood? Give its effect.

III. THREE MARKS:**(5 X 3 = 15)**

11. How does classical smog differ from photochemical smog?

12. How is acid rain formed? Explain its effect.

13. What are the various methods you suggest to protect our environment from pollution?

14. What are particulate pollutants? Explain any three

15. What are degradable and non - degradable pollutants?

IV. FIVE MARK:**(1 X 5 = 5)**

16. Differentiate the following:

(i) BOD and COD (ii) Viable and non-viable particulate pollutants.

IMPORTANCE QUESTIONS LESSONWISE

LESSON - 1

BOOK BACK QUESTIONS:

1. Define relative atomic mass
2. Define equivalent mass
3. Distinguish between oxidation and reduction.
4. What is the difference between molecular mass and molar mass?
5. What is the empirical formula of the following?
 - i) Fructose ($C_6H_{12}O_6$) found in honey
 - ii) Caffeine ($C_8H_{10}N_4O_2$) a substance found in tea.
6. How many moles of ethane is required to produce 44 g of CO_2 (g) after combustion.
7. Balance the equations by oxidation number method.
8. Explain the term oxidation number
9. What do you understand by the term mole.
10. Problems to determine Empirical formula.
11. Problems to find molar mass
12. Calculate the oxidation number of underlined elements.

BOOK INTERIOR:

1. Define Avogadro Number.
2. What is meant by limiting reagent?
3. What is combination reaction? Give example.
4. What is disproportionation reactions? Give example.

LESSON - 2

BOOK BACK QUESTIONS:

1. How many orbitals are possible for $n = 4$?
2. How many radial nodes for 2s, 4p, 5d and 4f orbitals exhibit? How many angular nodes?
3. State and explain Pauli's exclusion principle..
4. Define orbital? What are the n and l values for $3p_x$ and $4d_{x^2-y^2}$ electron?

5. Determine the values of all the four quantum numbers of the 8th electron in O – atom and 15th electron in Cl atom and the last electron in chromium.
6. Give the electronic configuration of Mn²⁺ and Cr³⁺
7. Describe the Aufbau principle.

BOOK INTERIOR:

1. State Heisenberg's uncertainty principle.
2. What are quantum numbers?
3. State Hund's rule of maximum multiplicity.
4. What are the limitations of Bohr's atom model?
5. Explain Davisson and Germer experiment
6. Write a note about principal quantum number.
7. Describe about Bohr atom model.
8. Explain about the significance of de Broglie equation.
9. Calculate the total number of angular nodes and radial nodes present in 3d and 4f orbitals.

LESSON -3**BOOK BACK QUESTIONS:**

1. Define modern periodic law.
2. What are isoelectronic ions? Give examples.
3. What is effective nuclear charge ?
4. Define electronegativity.
5. In what period and group will an element with Z = 118 will be present?
6. Justify that the fifth period of the periodic table should have 18 elements on the basis of quantum numbers.
7. Give the general electronic configuration of lanthanides and actinides?
8. Mention any two anomalous properties of second period elements.
9. Explain the Pauling method for the determination of ionic radius.
10. Explain the periodic trend of ionisation potential.
11. Explain the diagonal relationship.

12. Explain the following, give appropriate reasons.
 - (i) Ionisation potential of N is greater than that of O
 - (ii) First ionisation potential of C-atom is greater than that of B atom, where as the reverse is true is for second ionisation potential
13. What is screening effect?
14. Why halogens act as oxidising agents?
15. State the trends in the variation of electronegativity in group and periods.

BOOK INTERIOR:

1. Ionization energy of beryllium is greater than the ionization energy of boron. Why?
2. Explain about the factors that influence the ionization enthalpy.
3. Distinguish between electron affinity and electron negativity.
4. Define ionization energy.

LESSON -4**BOOK BACK QUESTIONS:**

1. Discuss the three types of Covalent hydrides.
2. Do you think that heavy water can be used for drinking purposes ?
3. What is water-gas shift reaction ?
4. Justify the position of hydrogen in the periodic table
4. What are isotopes? Write the names of isotopes of hydrogen.
5. Give the uses of heavy water.
6. Explain the exchange reactions of deuterium.
7. How do you convert para hydrogen into ortho hydrogen ?
8. Mention the uses of deuterium.
9. Compare the structures of H_2O and H_2O_2 .

BOOK INTERIOR:

1. Explain the different methods of preparation of Tritium.
2. What is temporary hardness of water? How is it removed?

3. What are the different types of hydrides?
4. What is hydrogen bonding?
5. What are the types of hydrogen bonding? Give example.
6. Explain about the exchange reactions of deuterium oxide.
7. What are the uses of hydrogen peroxide?
8. What are intra molecular hydrogen bonding? Explain with an example.
9. Explain ortho and para hydrogen.

LESSON -5

BOOK BACK QUESTIONS:

1. Write the chemical equations for the reactions involved in solvay process of preparation of sodium carbonate.
2. Write balanced chemical equation.
 - (i) Lithium metal with nitrogen gas
 - (ii) Heating solid sodium bicarbonate
 - (iii) Rubidium with oxygen gas
3. Discuss briefly the similarities between beryllium and aluminium.
4. Give the systematic names for the following: i) milk of magnesia ii) lye iii) lime iv) caustic potash v) washing soda
5. Mention the uses of plaster of paris
6. Beryllium halides are covalent whereas magnesium halides are ionic why?
7. Discuss the similarities between beryllium and aluminium.
8. Why alkaline earth metals are harder than alkali metals.
9. How is plaster of paris prepared?
10. Give the uses of gypsum.
11. Describe briefly the biological importance of Calcium and magnesium.
12. Write balanced chemical equation for the following processes:
 - (a) heating calcium in oxygen
 - (b) heating calcium carbonate

BOOK INTERIOR:

1. Write about the uses of strontium.
2. What are the uses of calcium hydroxide?
3. Mention the uses of sodium chloride.
4. Write about the uses of sodium bicarbonate.

LESSON -6

BOOK BACK QUESTIONS:

1. State Boyle's law.
2. What are ideal gases? In what way real gases differ from ideal gases.
3. Can a Van der Waals gas with $a = 0$ be liquefied? Explain.
4. Distinguish between diffusion and effusion.
5. Write the Van der Waals equation for a real gas.
6. When ammonia combines with HCl, NH_4Cl is formed as white dense fumes. Why do more fumes appear near HCl?
7. Derive the values of critical constants from the Van der Waals constants.
8. Explain why aerated water bottles are kept under water during summer?

BOOK INTERIOR:

1. State Charles' law.
2. Define Dalton's law of partial pressure.
3. Define Graham's law of diffusion.
4. What is compression factor?
5. What is meant by Joule-Thomson effect?
6. Derive ideal gas equation.
7. Explain the different methods used for liquefaction of gases.
8. State Gay-Lussac's law.

LESSON -7

BOOK BACK QUESTIONS:

1. State the first law of thermodynamics.
2. Define Hess's law of constant heat summation.
3. Explain intensive properties with two examples.
4. Define Gibb's free energy.
5. Define molar heat capacity. Give its unit.
6. What is lattice energy?
7. What are state and path functions? Give two examples.
8. State the third law of thermodynamics.
9. Write down the Born-Haber cycle for the formation of CaCl_2
10. List the characteristics of internal energy.
11. Derive the relation between ΔH and ΔU for an ideal gas.
12. List the characteristics of Gibbs free energy.

BOOK INTERIOR:

1. Define Zeroth law of thermodynamics
2. What is sublimation?

LESSON -8**BOOK BACK QUESTIONS:**

1. What is the relation between K_p and K_c . Give one example for which K_p is equal to K_c .
2. State Le – Chatelier principle.
3. State law of mass action.
4. Explain how will you predict the direction of an equilibrium reaction.
5. Derive a general expression for the equilibrium constant K_p and K_c for the reaction.

$$3\text{H}_2(\text{g}) + \text{N}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$$
6. Derive the relation between K_p and K_c .
7. Deduce the Vant Hoff equation
8. What is the effect of added inert gas on the reaction at equilibrium at constant volume
9. Write a balanced chemical equation for an equilibrium reaction for which the equilibrium constant is given by expression.

BOOK INTERIOR:

1. Derive the values of K_c and K_p for the synthesis of HI.
2. Derive the values of K_c and K_p for dissociation of PCl_5
3. What is reaction quotient?

LESSON -9**BOOK BACK QUESTIONS:**

1. Define i) Molality ii) Normality
2. State and explain Henry's law.
3. State Raoult law and obtain expression for lowering of vapour pressure when nonvolatile solute is dissolved in solvent
4. What is osmosis?
5. Define the term isotonic
6. Explain the effect of pressure on the solubility

BOOK INTERIOR:

1. Define mole fraction.
2. What are ideal solution? Give example.
3. What are colligative properties? Give example.
4. Define osmotic pressure.
5. Define Van't Hoff factor.
6. Define freezing point and depression in freezing point.
7. Explain about the factors that are responsible for deviation from Raoult's law.

LESSON -10**BOOK BACK QUESTIONS:**

1. Define the following i) Bond order ii) Hybridisation iii) σ - bond iv) π -bond
2. Explain sp^2 hybridisation in BF_3 .
3. Draw the M.O diagram for oxygen molecule and calculate its bond order and show that O_2 is paramagnetic.

4. Discuss the formation of N_2 molecule using MO Theory.
5. What is dipole moment?
6. Draw the Lewis structures for the following species. i) NO_3^- ii) SO_4^{2-} iii) HNO_3 iv) O_3
7. Explain the bond formation in $BeCl_2$ and $MgCl_2$.
8. Which bond is stronger or π ? Why?
9. Define bond energy.
10. What type of hybridisations are possible in the following geometries? i) octahedral ii) tetrahedral iii) square planar.
11. Explain VSEPR theory.
12. CO_2 and H_2O both are triatomic molecules but their dipole moment values are different. Why?
13. Which one of the following has highest bond order? N_2 , N_2^+ or N_2^- ?
14. Describe Fajan's rule.
15. Draw the Lewis structures for i) Nitrous acid (HNO_2) ii) Phosphoric acid iii) Sulphur trioxide (SO_3)

BOOK INTERIOR:

1. State octet rule.
2. Define bond length and bond angle.
3. Lithium chloride is more covalent than sodium chloride. Justify this statement.
4. Define coordinate covalent bond.

LESSON - 11

BOOK BACK QUESTIONS:

1. Give the general characteristics of organic compounds.
2. Describe the classification of organic compounds based on their structure.
3. Write a note on homologous series.
4. What is meant by a functional group?
5. Describe the reactions involved in the detection of nitrogen in an organic compound by Lassaigne method.
6. Explain paper chromatography.

7. Describe optical isomerism with suitable example.
8. Briefly explain geometrical isomerism in alkenes by considering 2-butene as an example.
9. IUPAC NAME
10. Find out the functional groups.

BOOK INTERIOR:

1. Trans isomer is more stable than cis isomer. Justify this statement.
2. Differentiate between the principle of estimation of nitrogen in an organic compound by i) Dumas method ii) Kjeldahl's method.
3. What are various methods for chromatography.

LESSON - 12

BOOK BACK QUESTIONS:

1. Write short notes on:
(a) Resonance (b) Hyper conjugation
2. What are electrophiles and nucleophiles? Give suitable examples for each.
3. Explain inductive effect with suitable example.
4. Explain electromeric effect.
5. Give examples for the following types of organic reactions i) β -elimination ii) Electrophilic substitution.

LESSON - 13

BOOK BACK QUESTIONS:

1. How does Huckel rule help to decide the aromatic character of a compound?
2. Suggest a simple chemical test to distinguish propane and propene.
3. What happens when isobutylene is treated with acidified potassium permanganate?
4. Explain Markovnikov's rule with suitable example.
5. What happens when ethylene is passed through cold dilute alkaline potassium permanganate.
6. Describe the mechanism of Nitration of benzene.

7. How will you convert ethyl chloride in to – i) Ethane ii) n – butane

BOOK INTERIOR:

1. What is Wurtz reaction?
2. What is Wurtz-fitting reaction?
3. What is BHC? How will you prepare BHC? Mention its uses.
4. Explain the structure of benzene.
5. How ozone reacts with 2-methyl propene?
6. Friedel craft's reaction.

LESSON - 14

BOOK BACK QUESTIONS:

1. Why chlorination of methane is not possible in dark?
2. How does chlorobenzene react with sodium in the presence of ether? What is the name of the reaction?
3. What happens when chloroform reacts with oxygen in the presence of sunlight?
4. Compare S_N^1 and S_N^2 reaction mechanisms.
5. What are Freons? Discuss their uses and environmental effects.
6. Explain the mechanism of S_N^1 reaction by highlighting the stereochemistry behind it.
7. Write short notes on Raschig, Dows & Darzens process.
8. Starting from CH_3MgI . How will you prepare the following? i) Acetic acid ii) Acetone iii) Ethyl acetate iv) Isopropyl alcohol
9. Explain the preparation of the following compounds: i) DDT ii) Chloroform iii) Biphenyl iv) Chloropicrin v) Freon-12
10. An organic compound (A) with molecular formula C_2H_5Cl reacts with KOH gives compounds (B) and with alcoholic KOH gives compound (C). Identify (A), (B) and (C)
11. Simplest alkene (A) reacts with HCl to form compound (B). Compound (B) reacts with ammonia to form compound (C) of molecular formula C_2H_7N . Compound (C) undergoes carbylamine test. Identify (A), (B), and (C).

BOOK INTERIOR:

1. How methane reacts with Cl_2 in the presence of light?
2. Explain-Finkelstein reaction and Swartz reaction
3. Explain Williamson's synthesis.
4. What is Grignard reagent? How is it prepared from ethyl bromide?
5. Explain Sandmeyer's reaction.
6. Explain Wurtz-fittig reaction.
7. Mention the uses of chloroform.
8. What are the uses of carbon tetrachloride?
9. Explain S_N^2 mechanism with suitable examples.
10. Explain E_2 and E_1 reaction mechanism with a suitable example.
11. What are the uses of Freons and DDT.

LESSON - 15

BOOK BACK QUESTIONS:

1. What would happen, if the greenhouse gases were totally missing in the earth's atmosphere?
2. Define smog.
3. Which is considered to be earth's protective umbrella? Why?
4. What are bio-degradable and non-biodegradable pollutants?
5. What is green chemistry?
6. Explain how does greenhouse effect cause global warming.
7. What are particulate pollutants? Explain any three.
8. How is acid rain formed? Explain its effect.
9. Differentiate the following: i) BOD and COD ii) Viable and non-viable particulate pollutants.
10. Explain how oxygen deficiency is caused by carbon monoxide in our blood? Give its effect.

7. 1 g of an impure sample of magnesium carbonate (containing no thermally decomposable impurities) on complete thermal decomposition gave 0.44 g of carbon dioxide gas. The percentage of impurity in the sample is

- (a) 0 % (b) 4.4 % (c) 16 % (d) 8.4 %

8. When 6.3 g of sodium bicarbonate is added to 30 g of acetic acid solution, the residual solution is found to weigh 33 g. The number of moles of carbon dioxide released in the reaction is

- (a) 3 (b) 0.75 (c) 0.075 (d) 0.3

9. When 22.4 litres of H_2 (g) is mixed with 11.2 litres of Cl_2 (g), each at 273 K at 1 atm the moles of HCl (g), formed is equal to

- (a) 2 moles of HCl (g) (b) 0.5 moles of HCl (g)
(c) 1.5 moles of HCl (g) (d) 1 moles of HCl (g)

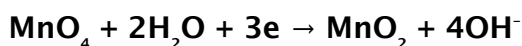
10. Hot concentrated sulphuric acid is a moderately strong oxidising agent. Which of the following reactions does not show oxidising behaviour?

- (a) $Cu + 2H_2 \rightarrow CuSO_4 + SO_2 + 2H_2O$ (b) $C + 2H_2SO_4 \rightarrow CO_2 + 2SO_2 + 2H_2O$
(c) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$ (d) none of the above

11. Choose the disproportionation reaction among the following redox reactions.

- (a) $3Mg_{(s)} + N_{2(g)} \rightarrow Mg_3N_{2(s)}$ (b) $P_{4(s)} + 3NaOH + 3H_2O \rightarrow PH_{3(g)} + 3NaH_2PO_{2(aq)}$
(c) $Cl_{2(g)} + 2KI_{(aq)} \rightarrow 2KCl_{(aq)} + I_{2(s)}$ (d) $Cr_2O_{3(s)} + 2Al_{(s)} \rightarrow Al_2O_{3(s)} + 2Cr_{(s)}$

12. The equivalent mass of potassium permanganate in an alkaline medium is



- (a) 31.6 (b) 52.7 (c) 79 (d) None of these

13. Which one of the following represents 180g of water?

- (a) 5 Moles of water (b) 90 moles of water
(c) $6.022 \times 10^{23} / 180$ (d) $6.022 \times 10^{23} / 1.7$

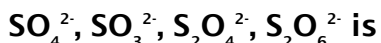
14. 7.5 g of a gas occupies a volume of 5.6 litres at 0° C and 1 atm pressure. The gas is

- (a) NO (b) N_2O (c) CO (d) CO_2

15. Total number of electrons present in 1.7 g of ammonia is

- (a) 6.022×10^{23} (b) $6.022 \times 10^{22} / 1.7$ (c) $6.022 \times 10^{24} / 1.7$ (d) $6.022 \times 10^{23} / 1.7$

16. The correct increasing order of the oxidation state of sulphur in the anions



- (a) $SO_3^{2-} < SO_4^{2-} < S_2O_4^{2-} < S_2O_6^{2-}$ (b) $SO_4^{2-} < S_2O_4^{2-} < S_2O_6^{2-} < SO_3^{2-}$
(c) $S_2O_4^{2-} < SO_3^{2-} < S_2O_6^{2-} < SO_4^{2-}$ (d) $S_2O_6^{2-} < S_2O_4^{2-} < SO_4^{2-} < SO_3^{2-}$

17. The equivalent mass of ferrous oxalate is

- (a) molar mass of ferrous oxalate 1 (b) molar mass of ferrous oxalate 2

(c) molar mass of ferrous oxalate 3 (d) none of these

18. If Avogadro number were changed from 6.022×10^{23} to 6.022×10^{20} , this would change

(a) the ratio of chemical species to each other in a balanced equation

(b) the ratio of elements to each other in a compound

(c) the definition of mass in units of grams

(d) the mass of one mole of carbon

19. Two 22.4 liter containers A and B contains 8 g of O_2 and 8 g of SO_2 respectively at 273 K and 1 atm pressure, then

(a) Number of molecules in A and B are the same

(b) Number of molecules in B is more than that in A.

(c) The ratio between the number of molecules in A to number of molecules in B is 2 : 1

(d) Number of molecules in B is three times greater than the number of molecules in A.

20. What is the mass of precipitate formed when 50 ml of 8.5 % solution of $AgNO_3$ is mixed with 100 ml of 1.865 % potassium chloride solution?

(a) 3.59 g

(b) 7 g

(c) 14 g

(d) 28 g

21. The mass of a gas that occupies a volume of 612.5 ml at room temperature and pressure (25°C and 1 atm pressure) is 1.1 g. The molar mass of the gas is

(a) 66.25 g mol⁻¹

(b) 44 g mol⁻¹

(c) 24.5 g mol⁻¹

(d) 662.5 g mol⁻¹

22. Which of the following contain the same number of carbon atoms as in 6 g of carbon -12.

(a) 7.5 g ethane

(b) 8 g methane

(c) both (a) and (b)

(d) none of these

23. Which of the following compound(s) has/have a percentage of carbon same as that in ethylene (C_2H_4)

(a) Propene

(b) ethyne

(c) benzene

(d) ethane

24. Which of the following is/are true with respect to carbon -12.

(a) relative atomic mass is 12 u

(b) oxidation number of carbon is +4 in all its compounds.

(c) 1 mole of carbon-12 contains 6.022×10^{22} carbon atoms.

(d) all of these

25. Which one of the following is used as a standard for atomic mass.

(a) ${}_6C^{12}$

(b) ${}_7C^{12}$

(c) ${}_6C^{13}$

(d) ${}_6C^{14}$

II. WRITE BRIEF ANSWER TO THE FOLLOWING QUESTIONS:

(i) Calculate the mass of Al_2O_3 formed.

(ii) How much of the excess reagent is left at the end of the reaction?

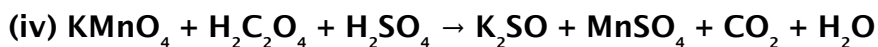
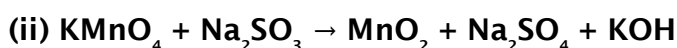
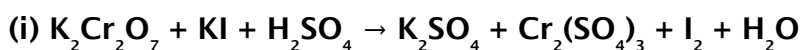
40. How many moles of ethane is required to produce 44 g of CO_2 (g) after combustion. Balanced equation for the combustion of ethane.

41. Hydrogen peroxide is an oxidising agent. It oxidises ferrous ion to ferric ion and reduced itself to water. Write a balanced equation.

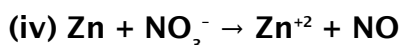
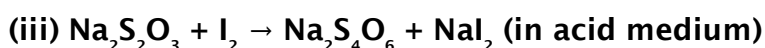
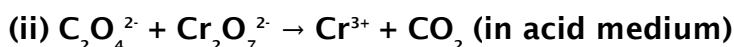
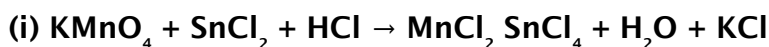
42. Calculate the empirical and molecular formula of a compound containing 76.6% carbon, 6.38 % hydrogen and rest oxygen its vapour density is 47.

43. A Compound on analysis gave Na = 14.31% S = 9.97% H= 6.22% and O= 69.5% calculate the molecular formula of the compound if all the hydrogen in the compound is present in combination with oxygen as water of crystallization, (molecular mass of the compound is 322).

44. Balance the following equations by oxidation number method



45. Balance the following equations by ion electron method.



LESSON - 2

I. CHOOSE THE BEST ANSWER:

1. Electronic configuration of species M^{2+} is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$ and its atomic weight is 56. The number of neutrons in the nucleus of species M is

- (a) 26 (b) 22 (c) 30 (d) 24

2. The energy of light of wavelength 45nm is

- (a) 6.65×10^{15} J (b) 6.67×10^{11} J (c) 4.42×10^{-18} J (d) 4.42×10^{-5} V

3. The energies E_1 and E_2 of two radiation are 25 eV and 50 eV respectively. The radiation between their wavelengths i.e., λ_1 and λ_2 will be

- (a) $\lambda_1 / \lambda_2 = 1$ (b) $\lambda_1 = 2 \lambda_2$ (c) $\lambda_1 = \sqrt{25 \times 50} \lambda_2$ (d) $2\lambda_1 = \lambda_2$

4. Splitting of spectral lines in an electric field is called

- (a) Zeeman effect (b) shielding effect (c) Compton effect (d) Stark effect

5. Based on equation $E = -2.178 \times 10^{-18} J(z^2/n^2)$, certain conclusions are written. Which of them is not correct?

(a) Equation can be used to calculate the change in energy when the electron changes orbit

(b) For $n - 1$, the electron has a more negative energy than it does for $n = 6$ which means that the electron is more loosely bound in the smallest allowed orbit

(c) The negative sign in equation simply means that the energy of electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from nucleus.

(d) Larger the value of n , the larger is the orbit radius.

6. According to the Bohr Theory, which of the following transitions in the hydrogen atom will give rise to least energetic photon?

- (a) $n = 6$ to $n = 1$ (b) $n = 5$ to $n = 4$ (c) $n = 5$ to $n = 3$ (d) $n = 6$ to $n = 5$

7. Assertion: The spectrum of He^+ is expected to be similar to that of hydrogen

Reason: He^+ is also one electron system.

(a) If both assertion and reason are true and reason is the correct explanation of assertion.

(b) If both assertion and reason are true but reason is not the correct explanation of assertion.

(c) If assertion is true but reason is false

(d) If both assertion and reason are false

8. Which of the following pairs of d-orbitals will have electron density along the axes?

- (a) dz^2, dxz (b) dxz, dyz (c) $dx^2, dx^2 - y^2$ (d) $dxy, dx^2 - y^2$

9. Two electrons occupying the same orbital are distinguished by

- (a) Azimuthal quantum number (b) Spin quantum number

- (c) Magnetic quantum number (d) Orbital quantum number
10. The electronic configuration of Eu (Atomic no, 63), Gd (Atomic no . 64), and Tb (Atomic no. 65) are
- (a) [Xe] 4f⁶ 5d¹ 6s², [Xe] 4f⁷ 5d¹ 6s² and [Xe] 4f⁸ 5d¹ 6s²
 (b) [Xe] 4f⁷ 6s², [Xe] 4f¹ 5d¹ 6s² and [Xe] 4f⁹ 6s²
 (c) [Xe] 4f⁷ 6s², [Xe] 4f⁸ 6s² and [Xe] 4f⁸ 5d¹ 6s²
 (d) [Xe] 4f⁶ 5d¹ 6s², [Xe] 4f¹ 5d¹ 6s² and [Xe] 4f⁹ 6s²

11. The maximum number of electrons in a sub shell is given by the expression

- (a) 2n² (b) 2l + 1 (c) 4l + 2 (d) none of these

12. For d-electrons, the orbit angular momentum is

- (a) 2√h²π (b) 2h√2π (c) 2×4√ h²π (d) 6√ h²π

13. What is the maximum number electrons that can be associated with following set of quantum numbers? n = 3, l = 1 and m = -1

- (a) 4 (b) 6 (c) 2 (d) 10

14. Assertion: The number of radials and angular nodes for 3p orbital are 1, 1 respectively.

Reason: The number of radials and angular nodes depends only on the quantum number.

- (a) Both assertion and reason are true and the reason is the correct explanation of the assertion
 (b) Both assertion and reason are true but the reason is not the correct explanation of the assertion
 (c) Assertion is true but the reason is false
 (d) Both assertion and reason are false

15. The total number of orbitals associated with the principal quantum number n = 3 is (a) 9 (b) 8 (c) 5 (d) 7

16. If n = 6, the sequence for filling electrons will be,

- (a) ns → (n - 2)f → (n - 1)d → np (b) ns → (n - 1)d → (n - 2)f → np
 (c) ns → (n - 2)f → np → (n - 1)d (d) none of these are correct

17. Consider the following sets of quantum numbers:

	n	l	m	s
(i)	3	0	0	+ 1/2
(ii)	2	2	1	- 1/2
(iii)	4	3	-2	+ 1/2
(iv)	1	0	-1	+ 1/2
(v)	3	4	3	- 1/2

Which of the following sets of quantum numbers is not possible?

- (a) (i), (ii) and (iv) (b) (ii), (iv) and (v) (c) (i) and (iii) (d) (ii), (iii) and (iv)

18. How many electrons in an atom with atomic number 105 can have $(n + l) = 8$?

- (a) 30 (b) 17 (c) 15 (d) unpredictable

19. Electron density in the yz plane of $3d_x^2 - y^2$ orbital is

- (a) zero (b) 0.50 (c) 0.75 (d) 0.90

20. If uncertainty in position and momentum are equal, then minimum uncertainty in velocity is

- a) $\frac{1}{m} \sqrt{\frac{h}{\pi}}$ d) $\sqrt{\frac{h}{\pi}}$ c) $\frac{1}{2m} \sqrt{\frac{h}{\pi}}$ d) $\frac{h}{4\pi}$

21. A macroscopic particle of mass 100 g and moving at a velocity of 100 cm s^{-1} will have a de Broglie wavelength of

- (a) $6.6 \times 10^{-29} \text{ cm}$ (b) $6.6 \times 10^{-30} \text{ cm}$ (c) $6.6 \times 10^{-31} \text{ cm}$ (d) $6.6 \times 10^{-32} \text{ cm}$

22. The ratio of de Broglie wavelengths of a deuterium atom to that of an α - particle, when the velocity of the former is five times greater than that of later, is

- (a) 4 (b) 0.2 (c) 2.5 (d) 0.4

23. The energy of an electron in the 3rd orbit of a hydrogen atom is -E. The energy of an electron in the first orbit will be

- (a) -3E (b) -E/3 (c) -E/9 (d) -9E

24. Time independent Schrodinger wave equation is

- (a) $H\psi = E\psi$ (b) $\Delta^2\psi + 8\pi^2m(E + V)\psi$
 (c) $\partial^2\psi\partial x^2 + \partial^2\psi\partial y^2 + \partial^2\psi\partial z^2 + 2mh^2(E - V)\psi = 0$ (d) all of these

25. Which of the following does not represent the mathematical expression for the Heisenberg uncertainty principle?

- (a) $\Delta x \cdot \Delta p \geq h/4$ (b) $\Delta x \cdot \Delta v \geq h/4\pi m$ (c) $\Delta E \cdot \Delta t \geq h/4\pi$ (d) $\Delta E \cdot \Delta x \geq h/4\pi$

II. WRITE BRIEF ANSWERS TO THE FOLLOWING QUESTIONS:

26. Which quantum number reveals information about the shape, energy, orientation, and size of orbitals?

27. How many orbitals are possible for $n = 4$?

28. How many radial nodes for 2s, 4p, 5d and 4f orbitals exhibit? How many angular nodes?

29. The stabilization of a half-filled d - orbital is more pronounced than that of the p-orbital. Why?

30. Consider the following electronic arrangements for the d^5 configuration.



(a)



(b)



(c)

(i) Which of these represents the ground state?

(ii) Which configuration has the maximum exchange energy?

31. State and explain Pauli's exclusion principle.

32. Define orbital. What are 'n' and 'l' values for $3p_x$ and $4d_{x^2 - y^2}$ electron?

33. Explain briefly the time-independent Schrodinger wave equation.

34. Calculate the uncertainty in position of an electron, if $\Delta v = 0.1\%$ and $v = 2.2 \times 10^6 \text{ ms}^{-1}$.

35. Determine the values of all the four quantum numbers of the 8th electron in the O - atom and 15th electron in the Cl atom and the last electron in Chromium.

36. The quantum mechanical treatment of the hydrogen atom gives the energy value: $E_n = -13.6/n^2 \text{ eV/atom}^{-1}$

(i) Use this expression to find ΔE between $n = 3$ and $n = 4$.

(ii) Calculate the wavelength corresponding to the above transition.

37. How fast must a 54g tennis ball travel in order to have a de Broglie wavelength that is equal to that of a photon of green light 5400 \AA ?

38. For each of the following, give the sub level designation, the allowable m values and the number of orbitals, (i) $n = 1, l = 2$ (ii) $n = 5, l = 3$ (iii) $n = 7, l = 0$

39. Give the electronic configuration of Mn^{2+} and Cr^{3+} .

40. Describe the Aufbau principle.

41. An atom of an element contains 35 electrons and 45 neutrons. Deduce

(i) the number of protons

(ii) the electronic configuration for the element

(iii) All the four quantum numbers for the last electron.

42. Show that the circumference of the Bohr orbit for the hydrogen atom is an integral multiple of the de Broglie wavelength associated with the electron revolving around the nucleus.

43. Calculate the energy required for the process. $\text{He}_{(g)}^+ \rightarrow \text{He}_{(g)}^{2+} + e^-$

The ionization energy for the H atom in its ground state is -13.6 eV/atom .

44. An ion with mass number 37 possesses unit negative charge. It the ion contains 11.1% more neutrons than electrons. Find the symbol of the ion.

45. The Li^{2+} ion is a hydrogen-like ion that can be described by the Bohr model.

Calculate the Bohr radius of the third orbit and calculate the energy of an electron in 4th orbit.

46. Protons can be accelerated in particle accelerators. Calculate the wavelength (in Å) of such accelerated proton moving at $2.85 \times 10^8 \text{ms}^{-1}$

(mass of proton is $1.673 \times 10^{-27} \text{ kg}$).

47. What is the de Broglie wavelength (in cm) of a 160g cricket ball travelling at 140 Km hr^{-1} .

48. Suppose that the uncertainty in determining the position of an electron in an orbit is 0.6 Å. What is the uncertainty in its momentum?

49. Show that if the measurement of the uncertainty in the location of the particle is equal to its de Broglie wavelength, the minimum uncertainty in its velocity (ΔV) is equal to $1/4\pi$ of its velocity(V)

50. What is the de Broglie wave length of an electron, which is accelerated from the rest, through a potential difference of 100V?

51. Identify the missing quantum numbers and the sub energy level.

n	l	m	Sub energy level
?	?	0	4d
3	1	0	?
?	?	?	5p
?	?	-2	3d

LESSON - 3

I. CHOOSE THE BEST ANSWER:

1. What would be the IUPAC name for an element with atomic number 222?

(a) bibibium (b) bididium (c) didibium (d) bibibium

2. The electronic configuration of the elements A and B are $1s^2, 2s^2, 2p^6, 3s^2$ and $1s^2,$

$2s^2, 2p^5$ respectively. The formula of the ionic compound that can be formed between these elements is (a) AB (b) AB_2 (c) A_2B (d) none of the above

3. The group of elements in which the differentiating electron enters the anti penultimate shell of atoms are called

- (a) p-block elements (b) d-block elements
(c) s-block elements (d) f-block elements

4. In which of the following options the order of arrangement does not agree with the variation of property indicated against it?

- (a) $I < Br < Cl < F$ (increasing electron gain enthalpy)
(b) $Li < Na < K < Rb$ (increasing metallic radius)
(c) $Al^{3+} < Mg^{2+} < Na^+ < F^-$ (increasing ionic size)
(d) $B < C < O < N$ (increasing first ionisation enthalpy)

5. Which of the following elements will have the highest electronegativity?

- (a) Chlorine (b) Nitrogen (c) Cesium (d) Fluorine

6. Various successive ionisation enthalpies (in kJmol^{-1}) of an element are given below.

IE_1	IE_2	IE_3	IE_4	IE_5
577.5	1,810	2,750	11,580	14,820

The element is (a) phosphorus (b) Sodium (c) Aluminium (d) Silicon

7. In the third period the first ionization potential is of the order.

- (a) $Na > Al > Mg > Si > P$ (b) $Na < Al < Mg < Si < P$
(c) $Mg > Na > Si > P > Al$ (d) $Na < Al < Mg < P < Si$

8. Identify the wrong statement.

- (a) Amongst the isoelectronic species, smaller the positive charge on cation, smaller is the ionic radius
(b) Amongst isoelectronic species greater the negative charge on the anion, larger is the ionic radius
(c) Atomic radius of the elements increases as one moves down the first group of the periodic table
(d) Atomic radius of the elements decreases as one moves across from left to right in the 2nd period of the periodic table.

9. Which one of the following arrangements represent the correct order of least negative to most negative electron gain enthalpy

- (a) $Al < O < C < Ca < F$ (b) $Al < Ca < O < C < F$

(c) $C < F < O < Al < Ca$ (d) $Ca < Al < C < O < F$

10. The correct order of electron gain enthalpy with negative sign of F, Cl, Br and I having atomic number 9, 17, 35 and 53 respectively is

(a) $I > Br > Cl > F$ (b) $F > Cl > Br > I$ (c) $Cl > F > Br > I$ (d) $Br > I > Cl > F$

11. Which one of the following is the least electronegative element?

(a) Bromine

(b) Chlorine

(c) Iodine

(d) Hydrogen

12. The element with positive electron gain enthalpy is

(a) Hydrogen

(b) Sodium

(c) Argon

(d) Fluorine

13. The correct order of decreasing electronegativity values among the elements X, Y, Z and A with atomic numbers 4, 8, 7 and 12 respectively

(a) $Y > Z > X > A$ (b) $Z > A > Y > X$ (c) $X > Y > Z > A$ (d) $X > Y > A > Z$

14. Assertion: Helium has the highest value of ionisation energy among all the elements known

Reason: Helium has the highest value of electron affinity among all the elements known

(a) Both assertion and reason are true and reason is correct explanation for the assertion

(b) Both assertion and reason are true but the reason is not the correct explanation for the assertion

(c) Assertion is true and the reason is false

(d) Both assertion and the reason are false

15. The electronic configuration of the atom having | maximum difference in first and second ionisation energies is

(a) $1s^2, 2s^2, 2p^6, 3s^1$ (b) $1s^2, 2s^2, 2p^6, 3s^2$ (c) $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^1$ (d) $1s^2, 2s^2, 2p^6, 3s^2, 3p^1$

16. Which of the following is second most electronegative element?

(a) Chlorine

(b) Fluorine

(c) Oxygen

(d) Sulphur

17. IE_1 and IE_2 of Mg are 179 and 348 kcal mol⁻¹ respectively. The energy required for the reaction $Mg \rightarrow Mg^{2+} + 2e^-$ is

(a) + 169 kcal mol⁻¹(b) -169 kcal mol⁻¹(c) +527 kcal mol⁻¹(d) -527 kcal mol⁻¹

18. In a given shell the order of screening effect is

(a) $s > p > d > f$ (b) $s > p > f > d$ (c) $f > d > p > s$ (d) $f > p > s > d$

19. Which of the following orders of ionic radii is correct?

(a) $H > H^+ > H^-$ (b) $Na^+ > F^- > O^{2-}$ (c) $F > O^{2-} > Na^+$

(d) None of these

20. The First ionisation potential of Na, Mg and Si are 496, 737 and 786 kJ

mol⁻¹ respectively. The ionisation potential of Al will be closer to

- (a) 760 kJ mol⁻¹ (b) 575 kJ mol⁻¹ (c) 801 kJ mol⁻¹ (d) 419 kJ mol⁻¹

21. Which one of the following is true about metallic character when we move from left to right in a period and top to bottom in a group?

- (a) Decreases in a period and increases along the group
 (b) Increases in a period and decreases in a group
 (c) Increases both in the period and the group
 (d) Decreases both in the period and in the group

22. How does electron affinity change when we move from left to right in a period in the periodic table?

- (a) Generally increases (b) Generally decreases
 (c) Remains unchanged (d) First increases and then decreases

23. Which of the following pairs of elements exhibit diagonal relationship?

- (a) Be and Mg (b) Li and Mg (c) Be and B (d) Be and Al

II. WRITE BRIEF ANSWER TO THE FOLLOWING QUESTIONS:

24. Define modern periodic law.

25. What are isoelectronic ions? Give examples.

26. What is an effective nuclear charge?

27. Is the definition given below for ionization enthalpy is correct?

28. Magnesium loses electrons successively to form Mg⁺, Mg²⁺ and Mg³⁺ ions. Which step will have the highest ionization energy and why?

29. Define electronegativity.

30. How would you explain the fact that the second ionisation potential is always higher than the first ionisation potential?

31. The energy of an electron in the ground state of the hydrogen atom is -2.8×10^{-8} J. Calculate the ionization enthalpy of atomic hydrogen in terms of kJ mol⁻¹

32. The electronic configuration of an atom is one of the important factors which affects the value of ionization potential and electron gain enthalpy. Explain.

33. In what period and group will an element with Z = 118 will be present?

34. Justify that the fifth period of the periodic table should have 18 elements on the basis of quantum numbers.

35. Elements a, b, c and d have the following electronic configurations:

a: 1s², 2s², 2p⁶

b: 1s², 2s², 2p⁶, 3s², 3p¹

c: 1s², 2s², 2p⁶, 3s², 3p⁶

d: 1s², 2s², 2p¹

Which elements among these will belong to the same group of the periodic table?

36. Give the general electronic configuration of lanthanides and actinides?

37. Why do halogens act as oxidizing agents?
38. Mention any two anomalous properties of second-period elements.
39. Explain the Pauling method for the determination of ionic radius.
40. Explain the periodic trend of ionisation potential.
41. Explain the diagonal relationship.
42. Why the first ionisation enthalpy of sodium is lower than that of magnesium while its second ionisation enthalpy is higher than that of magnesium?
43. By using Pauling's method calculate the ionic radii of K^+ and Cl^- ions in the potassium chloride crystal. Given that $d^{K^+ - Cl^-} = 3.14 \text{ \AA}$.
44. Explain the following, give appropriate reasons.
 - (i) Ionisation potential of N is greater than that of O:
 - (ii) First ionisation potential of the C-atom is greater than that of the B atom, whereas the reverse is true is for the second ionisation potential.
 - (iii) The electron affinity values of Be, Mg, and noble gases are zero, and those of N (0.02 eV) and P (0.80 eV) are very low.
 - (iv) The formation of F^- from $F(g)$ is exothermic while that of O^{2-} from $O(g)$ is endothermic.
45. What is the screening effect?
46. Briefly give the basis for Pauling's scale of electronegativity.
47. State the trends in the variation of electronegativity in groups and periods.

LESSON - 4

I. CHOOSE THE BEST ANSWER:

1. Which of the following statements about hydrogen is incorrect?
 - (a) Hydrogen ion, H_3O^+ exists freely in solution.
 - (b) Dihydrogen acts as a reducing agent.
 - (c) Hydrogen has three isotopes of which tritium is the most common.
 - (d) Hydrogen never acts as cation in ionic salts.
2. Water gas is

(a) $H_2O(g)$	(b) $CO + H_2O$	(c) $CO + H_2$	(d) $CO + N_2$
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3. Which one of the following statements is incorrect with regard to ortho and para dihydrogen ?
 - (a) They are nuclear spin isomers
 - (b) Ortho isomer has zero nuclear spin whereas the para isomer has one nuclear spin
 - (c) The para isomer is favoured at low temperatures
 - (d) The thermal conductivity of the para isomer is 50% greater than that of the ortho

isomer.

4. Ionic hydrides are formed by

- (a) halogens (b) chalogens (c) inert gases (d) group one elements

5. Tritium nucleus contains

- (a) $1p + 0n$ (b) $2p + 1n$ (c) $1p + 2n$ (d) none of these

6. Non-stoichiometric hydrides are formed by

- (a) palladium, vanadium (b) carbon, nickel
(c) manganese, lithium (d) nitrogen, chlorine

7. Assertion: Permanent hardness of water is removed by treatment with washing soda.

Reason: Washing soda reacts with soluble calcium and magnesium chlorides and sulphates in hard water to form insoluble carbonates

- (a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true but reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false
(d) Both assertion and reason are false

8. If a body of a fish contains 1.2 g hydrogen in its total body mass, if all the hydrogen is replaced with deuterium then the increase in body weight of the fish will be

- (a) 1.2 g (b) 2.4 g (c) 3.6 g (d) $4.8\sqrt{2}$ g

9. The hardness of water can be determined by volumetrically using the reagent

- (a) sodium thiosulphate (b) potassium permanganate
(c) hydrogen peroxide (d) EDTA

10. The cause of permanent hardness of water is due to

- (a) $\text{Ca}(\text{HCO}_3)_2$ (b) $\text{Mg}(\text{HCO}_3)_2$ (c) CaCl_2 (d) MgCO_3

11. Zeolite used to soften hardness of water is, hydrated

- (a) Sodium aluminium silicate
(b) Calcium aluminium silicate
(c) Zinc aluminium borate
(d) Lithium aluminium hydride

12. A commercial sample of hydrogen peroxide marked as 100 volume H_2O_2 , it means that

- (a) 1 ml of H_2O_2 will give 100 ml O_2 at STP

(b) 1 L of H_2O_2 will give 100 ml O_2 at STP

(c) 1 L of H_2O_2 will give 22.4 L O_2

(d) 1 ml of H_2O_2 will give 1 mole of O_2 at STP

13. When hydrogen peroxide is shaken with an acidified solution of potassium dichromate in presence of ether, the ethereal layer turns blue due to the formation of (a) Cr_2O_3 (b) CrO_4^{2-} (c) $\text{CrO}(\text{O}_2)_2$ (d) none of these

14. For decolourisation of 1 mole of acidified KMnO_4 , the moles of H_2O_2 required is (a) 12 (b) 32 (c) 52 (d) 72

15. Volume strength of 1.5 NH_2O_2 is

(a) 1.5 (b) 4.5 (c) 16.8 (d) 8.4

16. The hybridisation of oxygen atom in H_2O and H_2O_2 are, respectively

(a) sp and sp^3 (b) sp and sp (c) sp and sp^2 (d) sp^3 and sp^3

17. The reaction $\text{H}_3\text{PO}_2 + \text{D}_2\text{O} \rightarrow \text{H}_2\text{DPO}_2 + \text{HDO}$ indicates that hypo-phosphorus acid is (a) tribasic acid (b) dibasic acid (c) monobasic acid (d) none of these

18. In solid ice, the oxygen atom is surrounded by

(a) tetrahedrally by 4 hydrogen atoms

(b) octahedrally by 2 oxygen and 4 hydrogen atoms

(c) tetrahedrally by 2 hydrogen and 2 oxygen atoms

(d) octahedrally by 6 hydrogen atoms

19. The type of H-bonding present in ortho nitrophenol and p-nitrophenol are respectively

(a) intermolecular H-bonding and intra molecular H-bonding

(b) intramolecular H-bonding and intermolecular H-bonding

(c) intramolecular H - bonding and no H - bonding

(d) intramolecular H -bonding and intramolecular H-bonding

20. Heavy water is used as

(a) the modulator in nuclear reactions

(b) coolant in nuclear reactions

(c) both (a) and (b)

(d) none of these

21. Water is a (a) basic oxide

(b) acidic oxide

(c) amphoteric oxide

(d) none of these

II. WRITE BRIEF ANSWER TO THE FOLLOWING QUESTIONS:

22. Explain why hydrogen is not placed with the halogen in the periodic table.

23. A cube at 0°C is placed in some liquid water at 0°C , the ice cube sinks - Why?

24. Discuss the three types of Covalent hydrides.

25. Predict which of the following hydrides is gas on a solid (a) HCl (b) NaH . Give your reason.

26. Write the expected formulas for the hydrides of 4th-period elements. What is the trend in the formulas? In what way the first two numbers of the series different from the others?
27. Write the chemical equation for the following reactions.
- (i) the reaction of hydrogen with tungsten (VI) oxide WO_3 on heating.
- (ii) hydrogen gas and chlorine gas.
28. Complete the following chemical reactions and classify them into (a) hydrolysis (b) redox (c) hydration reactions.
- i. $\text{KMnO}_4 + \text{H}_2\text{O}_2 \rightarrow$ ii. $\text{CrCl}_3 + \text{H}_2\text{O} \rightarrow$ iii. $\text{CaO} + \text{H}_2\text{O} \rightarrow$
29. Hydrogen peroxide can function as an oxidizing agent as well as a reducing agent. Substantiate this statement with suitable examples.
30. Do you think that heavy water can be used for drinking purposes?
31. What is the water-gas shift reaction?
32. Justify the position of hydrogen in the periodic table?
33. What are isotopes? Write the names of isotopes of hydrogen.
34. Give the uses of heavy water.
35. Explain the exchange reactions of deuterium.
36. How do you convert parahydrogen into ortho hydrogen?
37. Mention the uses of deuterium.
38. Explain the preparation of hydrogen using electrolysis.
39. A group-1 metal (A) which is present in common salt reacts with (B) to give compound (C) in which hydrogen is present in -1 oxidation state. (B) on reaction with gas to give universal solvent (D). The compound (D) reacts with (A) to give (E), a strong base. Identify A, B, C, D, and E. Explain the reactions.
40. An isotope of hydrogen (A) reacts with diatomic molecule of element which occupies group number 16 and period number 2 to give compound (B) is used as a moderator in nuclear reaction. (A) adds on to a compound (C), which has the molecular formula C_3H_6 to give (D). Identify A, B, C and D.
41. NH_3 has an exceptionally high melting point and boiling point as compared to those of the hydrides of the remaining element of group 15- Explain.
42. Why interstitial hydrides have a lower density than the parent metal?
43. How do you expect the metallic hydrides to be useful for hydrogen storage?
44. Arrange NH_3 , H_2O , and HF in the order of increasing magnitude of hydrogen bonding and explain the basis for your arrangement.
45. Compare the structures of H_2O and H_2O_2 .

LESSON - 5

I. CHOOSE THE BEST ANSWER:

1. For alkali metals, which one of the following trends is incorrect?

- (a) Hydration energy: $\text{Li} > \text{Na} > \text{K} > \text{Rb}$ (b) Ionisation energy: $\text{Li} > \text{Na} > \text{K} > \text{Rb}$
 (c) Density: $\text{Li} < \text{Na} < \text{K} < \text{Rb}$ (d) Atomic size: $\text{Li} < \text{Na} < \text{K} < \text{Rb}$

2. Which of the following statements is incorrect?

- (a) Li^+ has minimum degree of hydration among alkali metal cations
 (b) The oxidation state of K in KO_2 is +1
 (c) Sodium is used to make Na / Pb alloy
 (d) MgSO_4 is readily soluble in water

3. Which of the following compounds will not evolve H_2 gas on reaction $\text{M}^+(\text{g}) \xrightarrow[\text{Medium}]{\text{Aqueous}} \text{M}^+(\text{aq})$ metals?
 (a) ethanoic acid (b) ethanol (c) phenol (d) none of these

4. Which of the following has the highest tendency to give the reaction,

- (a) Na (b) Li (c) Rb (d) K

5. Sodium is stored in

- (a) alcohol (b) water (c) kerosene (d) none of these

6. RbO_2 is (a) superoxide and paramagnetic (b) peroxide and diamagnetic

- (c) superoxide and diamagnetic (d) peroxide and paramagnetic

7. Find the wrong statement

- (a) sodium metal is used in organic qualitative analysis
 (b) sodium carbonate is soluble in water and it is used in inorganic qualitative analysis
 (c) potassium carbonate can be prepared by solvay process
 (d) potassium bicarbonate is acidic salt

8. Lithium shows diagonal relationship with

(c) assertion is true but reason is false

(d) both assertion and reason are false

16. Which is the correct sequence of solubility of carbonates of alkaline earth metals?

(a) $\text{BaCO}_3 > \text{SrCO}_3 > \text{CaCO}_3 > \text{MgCO}_3$ (b) $\text{MgCO}_3 > \text{CaCO}_3 > \text{SrCO}_3 > \text{BaCO}_3$

(c) $\text{CaCO}_3 > \text{BaCO}_3 > \text{SrCO}_3 > \text{MgCO}_3$ (d) $\text{BaCO}_3 > \text{CaCO}_3 > \text{SrCO}_3 > \text{MgCO}_3$

17. In context with beryllium, which one of the following statements is incorrect?

(a) It is rendered passive by nitric acid (b) It forms Be_2C

(c) Its salts are rarely hydrolyzed (d) Its hydride is electron-deficient and polymeric

18. The suspension of slaked lime in water is known as

(a) lime water (b) quick lime (c) milk of lime (d) aqueous solution of slaked lime

19. A colourless solid substance (A) on heating evolved CO_2 and also gave a white residue, soluble in water. Residue also gave CO_2 when treated with dilute HCl.

(a) Na_2CO_3 (b) NaHCO_3 (c) CaCO_3 (d) $\text{Ca}(\text{HCO}_3)_2$

20. The compound (X) on heating gives a colourless gas and a residue that is dissolved in water to obtain (Y). Excess of CO_2 is bubbled through aqueous solution of Y, Z is formed. Solid (Z) on heating gives back X. (Y) is

(a) CaCO_3 (b) $\text{Ca}(\text{OH})_2$ (c) Na_2CO_3 (d) NaHCO_3

21. Which of the following statement is false?

(a) Ca^{2+} ions are not important in maintaining the regular beating of the heart

(b) Mg^{2+} ions are important in the green parts of the plants

(c) Mg^{2+} ions form a complex with ATP

(d) Ca^{2+} ions are important in blood clotting

22. The name 'Blue John' is given to which of the following compounds?

(a) CaH_2 (b) CaF_2 (c) $\text{Ca}_3(\text{PO}_4)_2$ (d) CaO

23. Formula of Gypsum is

(a) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ (b) $\text{CaSO}_4 \cdot 12\text{H}_2\text{O}$ (c) $3\text{CaSO}_4 \cdot \text{H}_2\text{O}$ (d) $2\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

24. When CaC_2 is heated in atmospheric nitrogen in an electric furnace the compound formed is (a) $\text{Ca}(\text{CN})_2$ (b) CaNCN (c) CaC_2N_2 (d) CaNC_2

25. Among the following the least thermally stable is

(a) K_2CO_3 (b) Na_2CO_3 (c) BaCO_3 (d) Li_2CO_3

II. WRITE BRIEF ANSWER TO THE FOLLOWING QUESTIONS:

26. Why sodium hydroxide is much more water-soluble than chloride?

27. Explain what to mean by efflorescence.

28. Write the chemical equations for the reactions involved in the Solvay process of preparation of sodium carbonate.
29. An alkali metal (x) forms a hydrated sulphate, $X_2SO_4 \cdot 10H_2O$. Is the metal more likely to be sodium (or) potassium?
30. Write a balanced chemical equation for each of the following chemical reactions.
- (i) Lithium metal with nitrogen gas (ii) heating solid sodium bicarbonate
(iii) Rubidium with oxygen gas (iv) solid potassium hydroxide with CO_2
(v) heating calcium carbonate (vi) heating calcium with oxygen
31. Discuss briefly the similarities between beryllium and aluminium.
32. Give the systematic names for the following
(i) milk of magnesia (ii) lye (iii) lime (iv) Caustic potash (v) washing soda (vi) soda ash (vii) trona
33. Substantiate lithium fluoride has the lowest solubility among group one metal fluorides.
34. Mention the uses of plaster of paris.
35. Beryllium halides are Covalent whereas magnesium halides are ionic why?
36. Alkaline earth metal (A), belongs to 3rd period reacts with oxygen and nitrogen to form compound (B) and (C) respectively. It undergoes a metal displacement reaction with $AgNO_3$ solution to form a compound (D).
37. Write the balanced chemical equation for the following processes
(a) heating calcium in oxygen
(b) heating calcium carbonate
(c) evaporating a solution of calcium hydrogen carbonate
(d) heating calcium oxide with carbon
38. Explain the important common features of Group 2 elements.
39. Discuss the similarities between beryllium and aluminium.
40. Why alkaline earth metals are harder than alkali metals?
41. How is plaster of paris prepared?
42. Give the uses of gypsum.
43. Describe briefly the biological importance of Calcium and magnesium.
44. Which would you expect to have a higher melting point, magnesium oxide or magnesium fluoride?
- *****

LESSON - 6**I. CHOOSE THE BEST ANSWER:**

1. Gases deviate from ideal behavior at high pressure. Which of the following statement(s) is correct for non-ideality?

- (a) at high pressure the collision between the gas molecule become enormous
- (b) at high pressure the gas molecules move only in one direction
- (c) at high pressure, the volume of gas become insignificant
- (d) at high pressure the intermolecular interactions become significant

2. Rate of diffusion of a gas is

- (a) directly proportional to its density
- (b) directly proportional to its molecular weight
- (c) directly proportional to its square root of its molecular weight
- (d) inversely proportional to the square root of its molecular weight

3. Which of the following is the correct expression for the equation of state of van der Waals gas?

- (a) $\left(P + \frac{a}{n^2V^2} \right) (V - nb) = nRT$
- (b) $\left(P + \frac{na}{n^2V^2} \right) (V - nb) = nRT$
- (c) $\left(P + \frac{an^2}{V^2} \right) (V - nb) = nRT$
- (d) $\left(P + \frac{n^2a^2}{V^2} \right) (V - nb) = nRT$

4. When an ideal gas undergoes unrestrained expansion, no cooling occurs because the molecules

- (a) are above inversion temperature
- (b) exert no attractive forces on each other
- (c) do work equal to the loss in kinetic energy
- (d) collide without loss of energy

5. Equal weights of methane and oxygen are mixed in an empty container at 298 K. The fraction of total pressure exerted by oxygen is

- (a) 1/3
- (b) 1/2
- (c) 2/3
- (d) 1/3 × 273 × 298

6. The temperatures at which real gases obey the ideal gas laws over a wide range of pressure is called

- (a) Critical temperature
- (b) Boyle temperature
- (c) Inversion temperature
- (d) Reduced temperature

7. In a closed room of 1000 m³ a perfume bottle is opened up. The room develops a smell. This is due to which property of gases?

- (a) Viscosity
- (b) Density
- (c) Diffusion
- (d) None

8. A bottle of ammonia and a bottle of HCl connected through a long tube are opened simultaneously at both ends. The white ammonium chloride ring first formed will be

- (a) At the center of the tube (b) Near the hydrogen chloride bottle
(c) Near the ammonia bottle (d) Throughout the length of the tube

9. The value of the universal gas constant depends upon

- (a) Temperature of the gas (b) Volume of the gas
(c) Number of moles of the gas (d) units of pressure and volume

10. The value of the gas constant R is

- (a) $0.082 \text{ dm}^3\text{atm}$ (b) $0.987 \text{ cal mol}^{-1}\text{K}^{-1}$ (c) $8.3\text{J mol}^{-1}\text{K}^{-1}$ (d) $8\text{erg mol}^{-1}\text{K}^{-1}$

11. The use of hot air balloon in sports at meteorological observation is an application of

- (a) Boyle's law (b) Newton's law (c) Kelvin's law (d) Brown's law

12. The table indicates the value of vanderWaals constant 'a' in $(\text{dm}^3)^2 \text{ atm. mol}^{-2}$. The gas which can be most easily liquefied is

Gas	O ₂	N ₂	NH ₃	CH ₄
A	1.360	1.390	4.170	2.253

- (a) O₂ (b) N₂ (c) NH₃ (d) CH₄

13. Consider the following statements

- (i) Atmospheric pressure is less at the top of a mountain than at sea level
(ii) Gases are much more compressible than solids or liquids
(iii) When the atmospheric pressure increases the height of the mercury column rises : Select the correct statement

- (a) I and II (b) II and III (c) I and III (d) I, II, and III

14. The compressibility factor for CO₂ at 400 K and 71.0 bar is 0.8697. The molar volume of CO₂ under these conditions is

- (a) 22.04 dm^3 (b) 2.24 dm^3 (c) 0.41 dm^3 (d) 19.5 dm^3

15. If the temperature and volume of an ideal gas is increased to twice its values the initial pressure P becomes

- (a) 4P (b) 2P (c) P (d) 3P

16. At identical temperature and pressure, the rate of diffusion of hydrogen gas is 3 times that of a hydrocarbon having molecular formula C_nH_{2n-2}. What is the value of n? (a) 8 (b) 4 (c) 3 (d) 1

17. Equal moles of hydrogen and oxygen gases are placed in a container, with a pin-hole through which both can escape what fraction of oxygen escapes in the time required for one-half of the hydrogen to escape.

- (a) 38 (b) 12 (c) 18 (d) 14

18. The variation of volume V , with temperature T , keeping pressure constant is called the coefficient of thermal expansion i.e., $\alpha = 1[\partial V/\partial T]_P$. For an ideal gas, α is equal to

- (a) T (b) $1/T$ (c) P (d) none of these

19. Four gases P, Q, R, and S have almost the same values of 'b' but their 'a' values (a, b are Vander Waals Constants) are in the order $Q < R < S < P$. At a particular temperature, among the four gases, the most easily liquefiable one is

- (a) P (b) Q (c) R (d) S

20. Maximum deviation from ideal gas is expected

- (a) $CH_4(g)$ (b) $NH_3(g)$ (c) $H_2(g)$ (d) $N_2(g)$

21. The units of Vander Waals constants 'b' and 'a' respectively

- (a) $mol\ L^{-1}$ and $L\ atm^2\ mol^{-1}$ (b) $mol\ L$ and $L\ atm\ mol^2$
 (c) $mol^{-1}\ L$ and $L^2\ atm\ mol^{-2}$ (d) none of these

22. Assertion: Critical temperature of CO_2 is 304 K. it can be liquefied above 304 K.

Reason: For a given mass of gas, volume is directly proportional to pressure at constant temperature

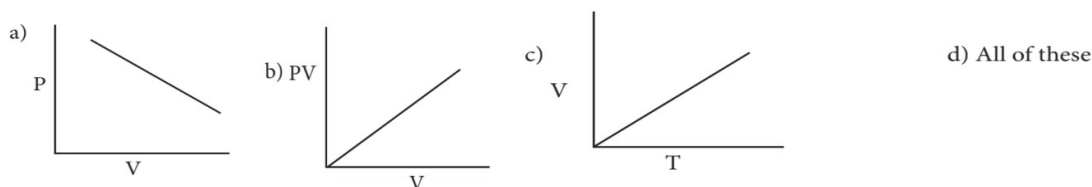
- (a) both assertion and reason are true and reason is the correct explanation of assertion
 (b) both assertion and reason are true but reason is not the correct explanation of assertion
 (c) assertion is true but reason is false
 (d) both assertion and reason are false

23. What is the density of N_2 gas at $227^\circ C$ and 5.00 atm pressure?

($R = 0.082\ L\ atm\ K^{-1}\ mol^{-1}$)

- (a) 1.40 g/L (b) 2.81 g/L (c) 3.41 g/L (d) 0.29 g/L

24. Which of the following diagrams correctly describes the behaviour of a fixed mass of an ideal gas? (T is measured in K)



25. 25g of each of the following gases are taken at $27^\circ C$ and 600 mm Hg pressure. Which of these will have the least volume?

- (a) HBr (b) HCl (c) HF (d) HI

II. ANSWER THESE QUESTIONS BRIEFLY:

26. State Boyle's law.
27. A balloon filled with air at room temperature and cooled to a much lower temperature can be used as a model for Charles's law.
28. Name two items that can serve as a model for 'Gay Lussac' law and explain.
29. Give the mathematical expression that relates gas volume and moles. Describe in words what the mathematical expression means.
30. What are ideal gases? In what way real gases differ from ideal gases?
31. Can a Vander Waals gas with $a = 0$ be liquefied? Explain.
32. Suppose there is a tiny sticky area on the wall of a container of gas. Molecules hitting this area stick there permanently. Is the pressure greater or less than on the ordinary area of walls?
33. Explain the following observations
- (a) Aerated water bottles are kept underwater during summer
 - (b) Liquid ammonia bottle is cooled before opening the seal
 - (c) The tyre of an automobile is inflated to slightly lesser pressure in summer than in winter
 - (d) The size of a weather balloon becomes larger and larger as it ascends up to a larger altitude.
34. Give a suitable explanation for the following facts about gases.
- (a) Gases don't settle at the bottom of a container.
 - (b) Gases diffuse through all the space available to them.
35. Suggest why there is no hydrogen in our atmosphere. Why does the moon have no atmosphere?
36. Explain whether a gas approaches ideal behavior or deviates from ideal behaviour if
- (a) it is compressed to a smaller volume at constant pressure.
 - (b) the temperature is raised while keeping the volume constant.
 - (c) More gas is introduced into the same volume and at the same temperature.
37. Which of the following gases would you expect to deviate from ideal behavior under conditions of low-temperature F_2 , Cl_2 , or Br_2 ? Explain.
38. Distinguish between diffusion and effusion.
39. Aerosol cans carry a clear warning of heating of the can. Why?
40. When the driver of an automobile applies the brake, the passengers are pushed toward the front of the car but a helium balloon is pushed toward the back of the car. Upon forward acceleration, the passengers are pushed toward the front of the

car. Why?

41. Would it be easier to drink water with a straw on the top of Mount Everest?

42. Write the Van der Waals equation for a real gas. Explain the correction term for pressure and Volume.

43. Derive the values of van der Waals equation constants in terms of critical constants.

44. Why do astronauts have to wear protective suits when they are on the surface of the moon?

45. When ammonia combines with HCl, NH_4Cl is formed as white dense fumes. Why do more fumes appear near HCl?

46. A sample of gas at 15°C at 1 atm. has a volume of 2.58 dm^3 . When the temperature is raised to 38°C at 1 atm does the volume of the gas Increase? If so, calculate the final volume.

47. Of two samples of nitrogen gas, sample A contains 1.5 moles of nitrogen In a vessel of volume of 37.6 dm^3 at 298K, and sample B is in a vessel of volume 16.5 dm^3 at 298K. Calculate the number of moles in sample B.

48. Sulphur hexafluoride Is a colourless, odourless gas; calculate the pressure exerted by 1.82 moles of the gas In a steel vessel of volume 5.43 dm^3 at 69.5°C , assuming Ideal gas behaviour.

49. Argon is an Inert gas used In light bulbs to retard the vaporization of the tungsten filament. A certain light bulb containing argon at 1.2 atm and 18°C Is heated to 85°C at constant volume. Calculate its final pressure in atm.

50. A small bubble rises from the bottom of a lake where the temperature and pressure are 6°C and 4 atm. to the water surface, where the temperature is 25°C and pressure Is 1 atm. Calculate the final volume in (mL) of the bubble, If its initial volume 1.5 mL.

51. Hydrochloric acid Is treated with a metal to produce hydrogen gas. Suppose a student carries out this reaction and collects a volume of $154.4 \times 10^{-3}\text{ dm}^3$ of a gas at a pressure of 742 mm of Hg at a temperature of 298 K. What mass of hydrogen gas (in mg) did the student collect?

52. It takes 192 sec for an unknown gas to diffuse through a porous wall and 84 sec for N_2 gas to effuse at the same temperature and pressure. What Is the molar mass of the unknown gas?

LESSON - 7

I. CHOOSE THE BEST ANSWER:

- The amount of heat exchanged with the surrounding at constant temperature and pressure is given by the quantity
(a) ΔE (b) ΔH (c) ΔS (d) ΔG
- All the naturally occurring processes proceed spontaneously in a direction which leads to (a) decrease in entropy (b) increase in enthalpy
(c) increase in free energy (d) decrease in free energy
- In an adiabatic process, which of the following is true?
(a) $q = w$ (b) $q = 0$ (c) $\Delta E = q$ (d) $P\Delta V = 0$
- In a reversible process, the change in entropy of the universe is
(a) > 0 (b) ≥ 0 (c) < 0 (d) $= 0$
- In an adiabatic expansion of an ideal gas
(a) $w = -\Delta U$ (b) $w = \Delta U + \Delta H$ (c) $\Delta U = 0$ (d) $w = 0$
- The intensive property among the quantities below is
(a) mass (b) volume (c) enthalpy (d) mass/volume
- An ideal gas expands from the volume of $1 \times 10^{-3} \text{ m}^3$ to $1 \times 10^{-2} \text{ m}^3$ at 300 K against a constant pressure at $1 \times 10^5 \text{ Nm}^{-2}$. The work done is
(a) -900 J (b) 900 kJ (c) 270 kJ (d) - 900 kJ
- Heat of combustion is always
(a) positive (b) negative (c) zero (d) either positive or negative
- The heat of formation of CO and CO_2 are -26.4 kCal and -94 kCal, respectively. Heat of combustion of carbon monoxide will be
(a) + 26.4 kcal (b) - 67.6 kcal (c) - 120.6 kcal (d) + 52.8 kcal
- $\text{C}(\text{diamond}) \rightarrow \text{C}(\text{graphite})$, $\Delta H = -ve$, this indicates that
(a) graphite is more stable than diamond (b) graphite has more energy than diamond
(c) both are equally stable (d) stability cannot be predicted
- The enthalpies of formation of Al_2O_3 and Cr_2O_3 are - 1596 kJ and - 1134 kJ, respectively. ΔH for the reaction $2\text{Al} + \text{Cr}_2\text{O}_3 \rightarrow 2\text{Cr} + \text{Al}_2\text{O}_3$ is
(a) - 1365 kJ (b) 2730 kJ (c) - 2730 kJ (d) -462 kJ
- Which of the following is not a thermodynamic function?
(a) internal energy (b) enthalpy (c) entropy (d) frictional energy
- If one mole of ammonia and one mole of hydrogen chloride are mixed in a closed container to form ammonium chloride gas, then
(a) $\Delta H > \Delta U$ (b) $\Delta H - \Delta U = 0$ (c) $\Delta H + \Delta U = 0$ (d) $\Delta H < \Delta U$
- Change in internal energy, when 4 kJ of work is done on the system and 1 kJ of

heat is given out by the system is

- (a) +1 kJ (b) -5 kJ (c) +3 kJ (d) -3 kJ

15. The work is done by the liberated gas when 55.85 g of iron (molar mass 55.85 g mol⁻¹) reacts with hydrochloric acid in an open beaker at 25°C

- (a) -2.48 kJ (b) -2.22 kJ (c) +2.22 kJ (d) +2.48 kJ

16. The value of ΔH for cooling 2 moles of an ideal monatomic gas from 1250°C to 250°C at constant pressure will be [given $C_p = 5/2R$]

- (a) - 250 R (b) - 500 R (c) 500 R (d) + 250 R

17. Given that $C_{(g)} + O_{2(g)} \rightarrow CO_{2(g)}$ $\Delta H^\circ = -a$ kJ; $2 CO_{(g)} + O_{2(g)} \rightarrow 2CO_{2(g)}$ $\Delta H^\circ = -b$ kJ;

Calculate the ΔH° for the reaction $C_{(g)} + \frac{1}{2}O_{2(g)} \rightarrow CO_{(g)}$

- a) $\frac{b+2a}{2}$ b) $2a-b$ c) $\frac{2a-b}{2}$ d) $\frac{b-2a}{2}$

18. When 15.68 litres of a gas mixture of methane and propane are fully combusted at 0° C and 1 atmosphere, 32 litres of oxygen at the same temperature and pressure are consumed. The amount of heat released from this combustion in kJ is ($\Delta H_{C(CH_4)}$) = - 890 kJ mol and $\Delta H_{C(C_3H_8)}$ = -2220 kJ mol⁻¹)

- (a) -889 kJ (b) -1390 kJ (c) -3180 kJ (d) -632.68 kJ

19. The bond dissociation energy of methane and ethane are 360 kJ mol⁻¹ and 620 kJ mol⁻¹ respectively. Then, the bond dissociation energy of the C-C bond is

- (a) 170 kJ mol⁻¹ (b) 50 kJ mol⁻¹ (c) 80 kJ mol⁻¹ (d) 220 kJ mol⁻¹

20. The correct thermodynamic conditions for the spontaneous reaction at all temperature is

- (a) $\Delta H < 0$ and $\Delta S > 0$ (b) $\Delta H < 0$ and $\Delta S < 0$
(c) $\Delta H > 0$ and $\Delta S = 0$ (d) $\Delta H > 0$ and $\Delta S > 0$

21. The temperature of the system decreases in an

- (a) Isothermal expansion (b) Isothermal Compression
(c) adiabatic expansion (d) adiabatic compression

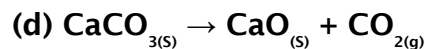
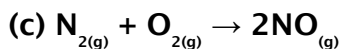
22. In an isothermal reversible compression of an ideal gas the sign of q, ΔS and w are respectively (a) +, -, - (b) -, +, - (c) +, -, + (d) -, -, +

23. Molar heat of vapourisation of a liquid is 4.8 kJ mol⁻¹ If the entropy change is 16 J mol⁻¹ K⁻¹. the boiling point of the liquid is

- (a) 323 K (b) 27°C (c) 164 K (d) 0.3 K

24. ΔS is expected to be maximum for the reaction

- (a) $Ca_{(s)} + 1/2 O_{2(g)} \rightarrow CaO_{(s)}$ (b) $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$



25. The values of ΔH and ΔS for a reaction are respectively 30 kJ mol^{-1} and $100 \text{ JK}^{-1} \text{ mol}^{-1}$. Then the temperature above which the reaction will become spontaneous is

- (a) 300 K (b) 30 K (c) 100 K (d) 20°C

II. WRITE BRIEF ANSWERS TO THE FOLLOWING QUESTIONS:

26. State the first law of thermodynamics.

27. Define Hess's law of constant heat summation.

28. Explain intensive properties with two examples.

29. Define the following terms:

(a) isothermal process (b) adiabatic process (c) isobaric process (d) isochoric process

30. What is the usual definition of entropy? What is the unit of entropy?

31. Predict the feasibility of a reaction when

1. both ΔH and ΔS positive
2. both ΔH and ΔS negative

32. Define Gibbs free energy.

33. Define enthalpy of combustion.

34. Define molar heat capacity. Give its unit.

35. Define the calorific value of food. What is the unit of calorific value?

36. Define enthalpy of neutralization.

37. What is lattice energy?

38. What are state and path functions? Give two examples.

39. Give Kelvin a statement of the second law of thermodynamics.

40. The equilibrium constant of a reaction is 10, what will be the sign of ΔG ? Will this reaction be spontaneous?

41. Enthalpy of neutralization is always a constant when a strong acid is neutralized by a strong base: account for the statement.

42. State the third law of thermodynamics.

43. Write down the Born-Haber cycle for the formation of CaCl_2 .

44. Identify the state and path functions out of the following: (a) Enthalpy (b) Entropy (c) Heat (d) Temperature (e) Work (f) Free energy.

45. State the various statements of the second law of thermodynamics.

46. What are spontaneous reactions? What are the conditions for the spontaneity of a process?

47. List the characteristics of internal energy.
48. Explain how heat absorbed at constant volume is measured using a bomb calorimeter with a neat diagram.
49. Calculate the work involved in expansion and 1 compression process.
50. Derive the relation between ΔH and ΔU for an ideal gas. Explain each term involved in the equation.
51. Suggest and explain an indirect method to calculate lattice enthalpy of sodium chloride crystal.
52. List the characteristics of Gibbs free energy.
53. Calculate the work done when 2 moles of an ideal gas expands reversibly and isothermally from a volume of 500 ml to a volume of 2 L at 25°C and normal pressure.

Solution:

54. In a constant-volume calorimeter, 3.5 g of gas with molecular weight 28 was burnt in excess oxygen at 298 K. The temperature of the calorimeter was found to increase from 298 K to 298.45 K due to the combustion process. Given that the calorimeter constant is 2.5 kJ K^{-1} . Calculate the enthalpy of combustion of the gas in kJ mol^{-1} .
55. Calculate the entropy change in the system, and surroundings, and the total entropy change in the universe during a process in which 245 J of heat flow out of the system at 77°C to the surrounding at 33°C.
56. 1 mole of an ideal gas, maintained at 4.1 atm and at a certain temperature, absorbs heat 3710 J and expands to 2 liters. Calculate the entropy change in the expansion process.
57. 30.4 kJ is required to melt one mole of sodium chloride. The entropy change during melting is $28.4 \text{ JK}^{-1} \text{ mol}^{-1}$. Calculate the melting point of sodium chloride.
58. Calculate the standard heat of formation of propane, if its heat of combustion is $-2220.2 \text{ kJ mol}^{-1}$. The heats of formation of $\text{CO}_2(\text{g})$ and $\text{H}_2\text{O}(\text{l})$ are -393.5 and $-285.8 \text{ kJ mol}^{-1}$ respectively.
59. You are given normal boiling points and standard enthalpies of vapourisation. Calculate the entropy of vapourisation of liquids listed below.
60. For the reaction $\text{Ag}_2\text{O}(\text{s}) \rightarrow 2\text{Ag}(\text{s}) + \frac{1}{2}\text{O}_2(\text{g})$ $\Delta H = 30.56 \text{ kJ mol}^{-1}$ and $\Delta S = 6.66 \text{ JK}^{-1} \text{ mol}^{-1}$ (at 1 atm). Calculate the temperature at which G is equal to zero. Also predict the direction of the reaction (i) at this temperature and (ii) below this temperature.
61. What is the equilibrium constant K_{eq} for the following reaction at 400K.

$2\text{NOCl(g)} \rightleftharpoons 2\text{NO(g)} + \text{Cl}_2\text{(g)}$, given that $\Delta H^\circ = 77.2 \text{ kJ mol}^{-1}$ $\Delta S^\circ = 122 \text{ JK}^{-1} \text{ mol}^{-1}$

62. Cyanamide (NH_2CN) is completely burnt in excess oxygen in a bomb calorimeter, ΔU was found to be $-742.4 \text{ kJ mol}^{-1}$, calculate the enthalpy change of the reaction at 298K. $\text{NH}_2\text{CN(s)} + 3/2 \text{ O}_2\text{(g)} \rightarrow \text{N}_2\text{(g)} + \text{CO}_2\text{(g)} + \text{H}_2\text{O (l)}$ $\Delta H = ?$

63. Calculate the enthalpy of hydrogenation of ethylene from the following data. Bond energies of C - H, C - C, C = C and H - H are 414, 347, 618 and 435 kJ mol^{-1} .

64. Calculate the lattice energy of CaCl_2 from the given data

$\text{Ca(s)} + \text{Cl}_2\text{(g)} \rightarrow \text{CaCl}_2\text{(s)}$ $\Delta H_f^\circ = -795 \text{ kJ mol}^{-1}$

65. Calculate the enthalpy change for the reaction $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$ from the following data.

66. When 1-pentyne (A) is treated with 4N alcoholic KOH at 175°C , it is converted slowly into an equilibrium mixture of 1.3% 1-pentyne(A), 95.2% 2-pentyne(B), and 3.5% of 1,2 pentadiene (C) the equilibrium was maintained at 175°C , calculate ΔG° for the following equilibria.

$\text{B} \rightleftharpoons \text{A}$; $\Delta G_1^\circ = ?$

$\text{B} \rightleftharpoons \text{C}$; $\Delta G_2^\circ = ?$

67. At 33K, N_2O_4 is fifty percent dissociated. Calculate the standard free energy change at this temperature and at one atmosphere.

68. The standard enthalpies of formation of SO_2 and SO_3 are -297 kJ mol^{-1} and -396 kJ mol^{-1} respectively. Calculate the standard enthalpy of reaction for the reaction:

$\text{SO}_2 + 1/2\text{O}_2 \rightarrow \text{SO}_3$

69. For the reaction at 298 K: $2\text{A} + \text{B} \rightarrow \text{C}$

$\Delta H = 400 \text{ J mol}^{-1}$; $\Delta S = 0.2 \text{ JK mol}^{-1}$ Determine the temperature at which the reaction would be spontaneous.

70. Find out the value of equilibrium constant for the following reaction at 298K, $2\text{NH}_3 + \text{CO}_2 \rightleftharpoons \text{NH}_2\text{CONH}_2\text{(aq)} + \text{H}_2\text{O (l)}$ Standard Gibbs energy change, ΔG_r° at the given temperature is $-13.6 \text{ kJ mol}^{-1}$.

71. A gas mixture of 3.67 lit of ethylene and methane on complete combustion at 25°C and at 1 atm pressure produces 6.11 lit of carbon dioxide. Find out the amount of heat evolved in kJ, during this combustion. ($\Delta H_{\text{C(CH}_4)}$) = -890 kJ mol^{-1} and $\Delta H_{\text{C(C}_2\text{H}_4)}$ = $-1423 \text{ kJ mol}^{-1}$

LESSON - 8

I. CHOOSE THE BEST ANSWER:

1. If K_b and K_f for a reversible reaction are 0.8×10^{-5} and 1.6×10^{-4} respectively, the value of the equilibrium constant is,

- a) 20 b) 0.2×10^{-1} c) 0.05 d) None of these

2. At a given temperature and pressure, the equilibrium constant values for the equilibria



The relation between K_1 and K_2 is

- a) $K_1 = \frac{1}{\sqrt{K_2}}$ b) $K_2 = K_1^{-1/2}$ c) $K_1^2 = 2K_2$ d) $\frac{K_1}{2} = K_2$

3. The equilibrium constant for a reaction at room temperature is K_1 and that at 700 K is K_2 . If $K_1 > K_2$, then

- a) The forward reaction is exothermic b) The forward reaction is endothermic
c) The reaction does not attain equilibrium d) The reverse reaction is exothermic

4. The formation of ammonia from $N_2(g)$ and $H_2(g)$ is a reversible reaction $2NO(g) +$

$O_2(g) \xrightleftharpoons{K_2} 2NO_2(g) + \text{Heat}$ What is the effect of increase of temperature on this equilibrium reaction

- a) equilibrium is unaltered b) formation of ammonia is favoured
c) equilibrium is shifted to the left d) reaction rate does not change

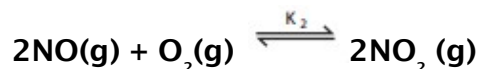
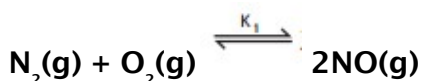
5. Solubility of carbon dioxide gas in cold water can be increased by

- a) increase in pressure b) decrease in pressure
c) increase in volume d) none of these

6. Which one of the following is incorrect statement?

- a) for a system at equilibrium, Q is always less than the equilibrium constant
b) equilibrium can be attained from either side of the reaction
c) the presence of catalyst affects both the forward reaction and reverse reaction to the same extent
d) Equilibrium constant varied with temperature

7. K_1 and K_2 are the equilibrium constants for the reactions respectively.



What is the equilibrium constant for the reaction $NO_2(g) \rightleftharpoons \frac{1}{2} N_2(g) + O_2(g)$

- a) $\frac{1}{\sqrt{K_1 K_2}}$ b) $(K_1 = K_2)^{1/2}$ c) $\frac{1}{2K_1 K_2}$ d) $\left(\frac{1}{K_1 K_2}\right)^{3/2}$

8. In the equilibrium, $2A(g) \rightleftharpoons 2B(g) + C_2(g)$ the equilibrium concentrations of A, B and C_2 at 400K are $1 \times 10^{-4} M$, $2.0 \times 10^{-3} M$, $1.5 \times 10^{-4} M$ respectively. The value of K_c for the equilibrium at 400 K is

- a) 0.06 b) 0.09 c) 0.62 d) 3×10^{-2}

9. An equilibrium constant of 3.2×10^{-6} for a reaction means, the equilibrium is

- a) largely towards forward direction b) largely towards reverse direction
c) never established d) none of these

10. $\frac{K_c}{K_p}$ for the reaction,
 $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ is

- a) $\frac{1}{RT}$ b) \sqrt{RT} c) RT d) $(RT)^2$

11. For the reaction $AB(g) \rightleftharpoons A(g) + B(g)$, at equilibrium, AB is 20 % dissociated at a total pressure of P, the equilibrium constant K_p is related to the total pressure by the expression

- a) $P = 24 K_p$ b) $P = 8 K_p$ c) $24 P = K_p$ d) none of these

12. In which of the following equilibrium, K_p and K_c are not equal?

- a) $2NO(g) \rightleftharpoons N_2(g) + O_2(g)$ b) $SO_2(g) + NO_2 \rightleftharpoons SO_3(g) + NO(g)$
c) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ d) $PCl_5 \rightleftharpoons PCl_3(g) + Cl_2(g)$

13. If x is the fraction of PCl_5 dissociated at equilibrium in the reaction $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ then starting with 0.5 mole of PCl_5 , the total number of moles of reactants and products at equilibrium is

- a) $0.5 - x$ b) $x + 0.5$ c) $2x + 0.5$ d) $x + 1$

14. The values of K_{p1} and K_{p2} ; for the reactions, $X \rightleftharpoons Y + Z$, $A \rightleftharpoons 2B$ are in the ratio 9 : 1 if degree of dissociation of X and A be equal then total pressure at equilibrium P_1 , and P_2 are in the ratio

- a) 36 : 1 b) 1 : 1 c) 3 : 1 d) 1 : 9

15. In the reaction $Fe(OH)_3(S) \rightleftharpoons Fe^{3+}(aq) + 3OH^-(aq)$, if the concentration of OH^- ions is decreased by 1/4 times, then the equilibrium concentration of Fe^{3+} will

- a) not changed b) also decreased by 1/4 times
c) increase by 4 times d) increase by 64 times

16. Consider the reaction where $K_p = 0.5$ at a particular temperature $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$ if the three gases are mixed in a container so that the partial pressure of each gas is initially 1 atm, then which one of the following is true.

- a) more PCl_3 will be produced b) more Cl_2 will be produced

c) more PCl_5 will be produced

d) None of these

17. Equimolar concentrations of H_2 and I_2 are heated to equilibrium in a 1 liter flask. What percentage of the initial concentration of H_2 has reacted at equilibrium if the rate constant for both forward and reverse reactions are equal

a) 33%

b) 66%

c) (33)²%

d) 16.5 %

18. In a chemical equilibrium, the rate constant for the forward reaction is 2.5×10^{-2} and the equilibrium constant is 50. The rate constant for the reverse reaction is,

a) 11.5

b) 50

c) 2×10^2

d) 2×10^{-3}

19. Which of the following is not a general characteristic of equilibrium involving physical process

a) Equilibrium is possible only in a closed system at a given temperature

b) The opposing processes occur at the same rate and there is a dynamic but stable condition

c) All the physical processes stop at equilibrium

d) All measurable properties of the system remains constant

20. For the formation of Two moles of $\text{SO}_3(\text{g})$ from SO_2 and O_2 , the equilibrium constant is K_1 . The equilibrium constant for the dissociation of one mole of SO_3 into SO_2 and O_2 is

a) $\frac{1}{K_1}$

b) K_1^2

c) $\left(\frac{1}{K_1}\right)^{\frac{1}{2}}$

d) $\frac{K_1}{2}$

21. Match the equilibria with the corresponding conditions:

i) Liquid \rightleftharpoons Vapour

ii) Solid \rightleftharpoons Liquid

iii) Solid \rightleftharpoons Vapour

iv) Solute(s) \rightleftharpoons Solute (Solution)

1) Melting point

2) Saturated solution

3) Boiling point

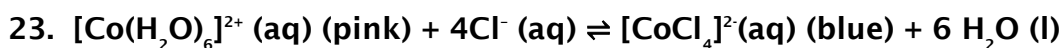
4) Sublimation point

5) Unsaturated solution

	(i)	(ii)	(iii)	(iv)
(a)	1	2	3	4
(b)	3	1	4	2
(c)	2	1	3	4
(d)	3	2	4	5

22. Consider the following reversible reaction at equilibrium, $\text{A} + \text{B} \rightleftharpoons \text{C}$, If the concentration of the reactants A and B are doubled, then the equilibrium constant will

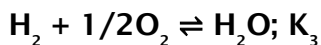
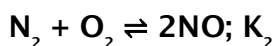
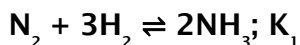
- a) be doubled b) become one fourth c) be halved d) remain the same



In the above reaction at equilibrium, the reaction mixture is blue in colour at room temperature. On cooling this mixture, it becomes pink in color. On the basis of this information, which one of the following is true?

- a) $\Delta H > 0$ for the forward reaction
 b) $\Delta H = 0$ for the reverse reaction
 c) $\Delta H < 0$ for the forward reaction
 d) Sign of the ΔH cannot be predicted based on this information

24. The equilibrium constants of the following reactions are:



The equilibrium constant (K) for the reaction;



- a) $\frac{K_2^3 K_3}{K_1}$ b) $\frac{K_1 K_3^3}{K_2}$ c) $\frac{K_2 K_3^3}{K_1}$ d) $\frac{K_2 K_3}{K_1}$

25. A 20 litre container at 400 K contains CO_2 (g) at pressure 0.4 atm and an excess (neglect the volume of solid SrO). The volume of the container is now decreased by moving the movable piston fitted in the container. The maximum volume of the container, when the pressure of CO_2 attains its maximum value will be: Given that:



- a) 2 litre b) 5 litre c) 10 litre d) 4 litre

II. WRITE BRIEF ANSWER TO THE FOLLOWING QUESTIONS:

26. If there is no change in concentration, why is the equilibrium state considered dynamic?

27. For a given reaction at a particular temperature, the equilibrium constant has a constant value. Is the value of Q also constant? Explain.

28. What is the relation between K_p and K_c ? Given one example for which K_p is equal to K_c .

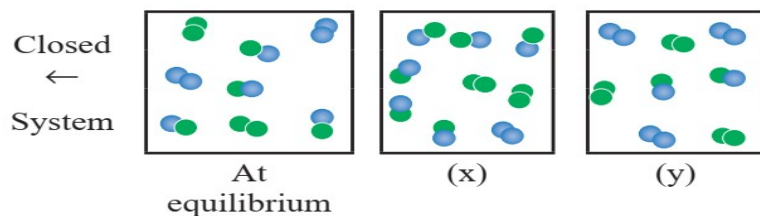
29. For a gaseous homogeneous reaction at equilibrium, number of moles of products are greater than the number of moles of reactants. Is K_c is larger or smaller than K_p .

30. When the numerical value of the reaction quotient (Q) is greater than the

equilibrium constant, in which direction does the reaction proceed to reach equilibrium?

31. For the reaction, $A_2(g) + B_2(g) \rightleftharpoons 2AB(g)$; ΔH is -ve.

the following molecular scenes represent different reaction mixture. (A-green, B-blue)



i) Calculate the equilibrium constant K_p and (K_c) .

ii) For the reaction mixture represented by scene (x), (y) the reaction proceed in which directions?

iii) What is the effect of increase in pressure for the mixture at equilibrium.

32. State Le - Chateller principle.

33. Consider the following reactions, a) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

b) $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$ c) $S(s) + 3 F_2(g) \rightleftharpoons SF_6(g)$

In each of the above reactions find out whether you have to increase (or) decrease the volume to increase the yield of the product.

34. State law of mass action.

35. Explain how will you predict the direction of an equilibrium reaction.

36. Derive a general expression for the equilibrium constant K_p and K_c for the reaction, $3H_2(g) + N_2(g) \rightleftharpoons 2NH_3(g)$.

37. Write the balanced chemical equation for an equilibrium reaction for which the equilibrium constant is given by expression.

38. What is the effect of added Inert gas on the reaction at equilibrium?

39. Derive the relation between K_p and K_c .

40. One mole of PCl_5 is heated in one litre closed container. If 0.6 mole of chlorine is found at equilibrium, Calculate the value of equilibrium constant.

41. For the reaction $SrCO_3(s) \rightleftharpoons SrO(s) + CO_2(g)$ the value of equilibrium constant $K_p = 2.2 \times 10^{-4}$ at 1002 K. Calculate K_c for the reaction.

42. To study the decomposition of hydrogen iodide, a student fills an evacuated 3 litre flask with 0.3 mol of HI gas and allows the reaction to proceed at 500°C. At equilibrium he found the concentration of HI which is equal to 0.05 M. Calculate K_c and K_p .

43. Oxidation of nitrogen monoxide was studied at 200 with initial pressures of 1

- atm NO and 1 atm of O_2 . At equilibrium partial pressure of oxygen is found to be 0.5 atm calculate K_p value.
44. 1 mol of CH_4 , 1 mole of CS_2 and 2 mol of H_2S are 2 mol of H_2 are mixed in a 500 ml flask. The equilibrium constant for the reaction $K_c = 4 \times 10^{-2} \text{ mol}^2 \text{ lit}^{-2}$. In which direction will the reaction proceed to reach equilibrium ?
45. At particular temperature $K_c = 4 \times 10^{-2}$ for the reaction, $H_2S \rightleftharpoons 2H_2(g) + S_2(g)$. Calculate the K_c for each of the following reaction.
- i) $2H_2S(g) \rightleftharpoons 2H_2 + S_2(g)$ ii) $3H_2S(g) \rightleftharpoons 3H_2(g) + 3/2 S_2(g)$
46. 28 g of Nitrogen and 6 g of hydrogen were mixed in a 1 litre closed container. At equilibrium 17 g NH_3 was produced. Calculate the weight of nitrogen, hydrogen at equilibrium.
47. The equilibrium for the dissociation of XY_2 is given as,
 $2 XY_2(g) \rightleftharpoons 2 XY(g) + Y_2(g)$
 if the degree of dissociation x is so small compared to one. Show that $2 K_p = PX^3$ where P is the total pressure and K_p is the dissociation equilibrium constant of XY_2 .
48. A sealed container was filled with 0.3 mol $H_2(g)$, 0.4 mol $I_2(g)$ and 0.2 mol $HI(g)$ at 800 K and total pressure 1.00 bar. Calculate the amounts of the components in the mixture at equilibrium given that $K = 870$ for the reaction, $H_2(g) + I_2(g) \rightleftharpoons 2 HI(g)$.
49. Deduce the Vant Hoff equation.
50. The equilibrium constant K_p for the reaction $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ is 8.19×10^2 at 298 K and 4.6×10^{-1} at 498 K. Calculate ΔH° for the reaction.
51. The partial pressure of carbon dioxide in the reaction $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$ is 1.017×10^{-3} atm at 500°C. Calculate K_p at 600°C for the reaction. ΔH for the reaction is 181 KJ mol^{-1} and does not change in the given range of temperature.
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LESSON - 9

I. CHOOSE THE BEST ANSWER:

1. The molality of a solution containing 1.8 g of glucose dissolved in 250 g of water is
 - a) 0.2 M
 - b) 0.01 M
 - c) 0.02 M
 - d) 0.04 M
2. Which of the following concentration terms is / are independent of temperature
 - a) molality
 - b) molarity
 - c) mole fraction
 - d) a and b
3. Stomach acid, a dilute solution of HCl can be neutralized by reaction with aluminium hydroxide $\text{Al(OH)}_3 + 3\text{HCl (aq)} \rightarrow \text{AlCl}_3 + 3\text{H}_2\text{O}$. How many milliliters of 0.1 M Al(OH)_3 solution is needed to neutralize 21 ml of 0.1 M HCl?
 - a) 14 mL
 - b) 7 mL
 - c) 21 mL
 - d) none of these
4. The partial pressure of nitrogen in air is 0.76 atm and its Henry's law constant is 7.6×10^4 atm at 300 K. What is the mole fraction of nitrogen gas in the solution obtained when air is bubbled through water at 300 K ?
 - a) 1×10^{-4}
 - b) 1×10^4
 - c) 2×10^{-5}
 - d) 1×10^{-5}
5. Henry's law constant for the solubility of Nitrogen gas in water at 350 K is 8×10^4 atm. The mole fraction of nitrogen in air is 0.5. The number of moles of Nitrogen from air dissolved in 10 moles of water at 350 K and 4 atm pressure is
 - a) 4×10^{-4}
 - b) 4×10^4
 - c) 2×10^{-2}
 - d) 2.5×10^{-4}
6. Which one of the following is incorrect for an ideal solution?
 - a) $\Delta H_{\text{mix}} = 0$
 - b) $\Delta U_{\text{mix}} = 0$
 - c) $\Delta P = P_{\text{observed}} - P_{\text{calculated by Raoult's law}} = 0$
 - d) $\Delta G_{\text{mix}} = 0$
7. Which one of the following gases has the lowest value of Henry's law constant?
 - a) N_2
 - b) He
 - c) CO_2
 - d) H_2
8. P_1 and P_2 are the vapour pressures of pure liquid components, 1 and 2 respectively of an ideal binary solution. If x_1 represents the mole fraction of component 1, the total pressure of the solution formed by 1 and 2 will be
 - a) $P_1 + x_1 (P_2 - P_1)$
 - b) $P_2 - x_1 (P_2 + P_1)$
 - c) $P_1 - x_2 (P_1 - P_2)$
 - d) $P_1 + x_2 (P_1 - P_2)$
9. Osmotic pressure (π) of a solution is given by the relation
 - a) $\pi = nRT m$
 - b) $\pi V = nRT$
 - c) $\pi RT = n$
 - d) none of these
10. Which one of the following binary liquid mixtures exhibits positive deviation

from Raoult's law?

a) acetone + chloroform b) water + nitric acid c) HCl + water d) ethanol + water

11. The Henry's law constants for two gases A and B are x and y respectively. The ratio of mole fractions of A to B is 0.2. The ratio of mole fraction of B and A dissolved in water will be

a) $2x/y$ b) $y/0.2x$ c) $0.2x/y$ d) $5x/y$

12. At 100°C the vapour pressure of a solution containing 6.5g a solute in 100g water is 732 mm. If $K_b = 0.52$, the boiling point of this solution will be

a) 102°C b) 100°C c) 101°C d) 100.52°C

13. According to Raoult's law, the relative lowering of vapour pressure for a solution is equal to

a) mole fraction of solvent b) mole fraction of solute
c) number of moles of solute d) number of moles of solvent

14. At same temperature, which pair of the following solutions are isotonic?

a) 0.2 M BaCl_2 and 0.2 M urea b) 0.1 M glucose and 0.2 M urea
c) 0.1 M NaCl and 0.1 M K_2SO_4 d) 0.1 M $\text{Ba}(\text{NO}_3)_2$ and 0.1 M Na_2SO_4

15. The empirical formula of a non-electrolyte (X) is CH_2O . A solution containing six grams of X exerts the same osmotic pressure as that of 0.025 M glucose solution at the same temperature. The molecular formula of X is

a) $\text{C}_2\text{H}_4\text{O}_2$ b) $\text{C}_8\text{H}_{16}\text{O}_8$ c) $\text{C}_4\text{H}_8\text{O}_4$ d) CH_2O

16. The K_H for the solution of oxygen dissolved in water is 4×10^4 atm at a given temperature. If the partial pressure of oxygen in air is 0.4 atm, the mole fraction of oxygen in solution is

a) 4.6×10^3 b) 1.6×10^4 c) 1×10^{-5} d) 1×10^5

17. Normality of 1.25 M sulphuric acid is

a) 1.25 N b) 3.75 N c) 2.5 N d) 2.25 N

18. Two liquids X and Y on mixing gives a warm solution. The solution is

a) ideal
b) non-ideal and shows positive deviation from Raoult's law
c) ideal and shows negative deviation from Raoult's Law
d) non-ideal and shows negative deviation from Raoult's Law

19. The relative lowering of vapour pressure of a sugar solution in water is 2.5×10^{-3} . The mole fraction of water in that solution is

a) 0.0035 b) 0.35 c) 0.0035/18 d) 0.9965

20. The mass of a non-volatile solute (molar mass 80 g mol^{-1}) should be dissolved

in 92g of toluene to reduce its vapour pressure to 90%

- a) 10 g b) 20 g c) 9.2 g d) 8 g

21. For a solution, the plot of osmotic pressure (π) versus the concentration (c in mol L^{-1}) gives a straight line with slope $310 R$ where 'R' is the gas constant. The temperature at which osmotic pressure measured is

- a) $310 \times 0.082 \text{ K}$ b) 310° C c) 37° C d) 3100.082 K

22. 200 ml of an aqueous solution of a protein contains 1.26 g of protein. At 300 K, the osmotic pressure of this solution is found to be $2.52 \times 10^{-3} \text{ bar}$. The molar mass of protein will be ($R = 0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$)

- a) $62.22 \text{ kg mol}^{-1}$ b) 12444 g mol^{-1} c) 300 g mol^{-1} d) None of these

23. The Van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is

- a) 0 b) 1 c) 2 d) 3

24. Which is the molality of a 10% w/w aqueous sodium hydroxide solution?

- a) 2.778 b) 2.5 c) 10 d) 0.4

25. The correct equation for the degree of an associating solute, 'n' molecules of which undergoes association in solution, is

- a) $\alpha = n(i-1)/n-1$ b) $\alpha^2 = n(1-i)/(n-1)$ c) $\alpha = n(i-1)/1-n$ d) $\alpha = n(1-i)/n(1-i)$

26. Which of the following aqueous solutions has the highest boiling point?

- a) 0.1 M KNO_3 b) 0.1 M Na_3PO_4 c) 0.1 M BaCl_2 d) 0.1 M K_2SO_4

27. The freezing point depression constant for water is $1.86^\circ \text{ K Kg mol}^{-1}$. If 5 g Na_2SO_4 is dissolved in 45 g water, the depression in freezing point is 3.64° C . The Vant Hoff factor for Na_2SO_4 is

- a) 2.57 b) 2.63 c) 3.64 d) 5.50

28. Equimolal aqueous solutions of NaCl and KCl are prepared, If the freezing point of NaCl is -2° C , the freezing point of KCl solution is expected to be

- a) -2° C b) -4° C c) -1° C d) 0° C

29. Phenol dimerizes in benzene having van't Hoff factor 0.54. What is the degree of association? a) 0.46 b) 92 c) 46 d) 0.92

30. Assertion: An ideal solution obeys Raoult's Law.

Reason: In an ideal solution, solvent - solvent as well as solute - solute interactions are similar to solute-solvent interactions.

a) both assertion and reason are true and reason is the correct explanation of assertion

b) both assertion and reason are true but reason is not the correct explanation of assertion

c) assertion is true but reason is false

d) both assertion and reason are false

II. WRITE BRIEF ANSWER TO THE FOLLOWING QUESTIONS:

31. Define: (i) Molality (ii) Normality

32. a) What is a vapour pressure of liquid?

b) What is a relative lowering of vapour pressure?

33. State and explain Henry's law.

34. State Raoult law and obtain the expression for lowering of vapour pressure when the nonvolatile solute is dissolved in solvent.

35. What is molal depression constant? Does it depend on nature of the solute?

36. What is osmosis?

37. Define the term 'isotonic solution'.

38. You are provided with a solid 'A' and three solutions of A dissolved in water - one saturated, one unsaturated, and one supersaturated. How would you determine which solution is which?

39. Explain the effect of pressure on solubility.

40. A sample of 12 M Concentrated hydrochloric acid has a density 1.2 g mL^{-1} calculate the molality.

41. A 0.25 M glucose solution, at 370.28 K has approximately the pressure as blood does what is the osmotic pressure of blood?

42. Calculate the molality of a solution containing 7.5 g glycine ($\text{NH}_2\text{-CH}_2\text{-COOH}$) dissolved in 500g of water.

43. Which solution has the lower freezing point? 10 g of methanol (CH_3OH) in 100g of water (or) 20 g of ethanol ($\text{C}_2\text{H}_5\text{OH}$) in 200 g of water.

44. How many moles of solute particles are present in one liter of 10^{-4} M potassium sulphate?

45. Henry's law constant for solubility of methane in benzene is 4.2×10^{-5} mm Hg at a particular constant temperature. At this temperature calculate the solubility of methane at i) 750 mm Hg ii) 840 mm Hg.

46. The observed depression in freezing point of water for a particular solution is 0.093°C calculate the concentration of the solution in molality. Given that molal depression constant for water is $1.86 \text{ K Kg mol}^{-1}$.

47. The vapour pressure of pure benzene (C_6H_6) at a given temperature is 640 mm Hg. 2.2 g of non-volatile solute is added to 40 g of benzene. The vapour pressure of the solution is 600 mm Hg. Calculate the molar mass of the solute?

LESSON - 10

I. CHOOSE THE BEST ANSWER:

1. In which of the following compound does the central atom obey the octet rule?

- a) XeF_4 b) AlCl_3 c) SF_6 d) SCl_2

2. In the molecule $\text{O}_A = \text{C} = \text{O}_B$, the formal charge on O_A , C and O_B are respectively.

- a) -1, 0, +1 b) +1, 0, -1 c) -2, 0, +2 d) 0, 0, 0

3. Which of the following is electron deficient?

- a) PH_3 b) $(\text{CH}_3)_2$ c) BH_3 d) NH_3

4. Which of the following molecule contain no π bond?

- a) SO_2 b) NO_2 c) CO_2 d) H_2O

5. The ratio of number of sigma (σ) bond and pi (π) bonds in 2 - butynal is

- a) 8/3 b) 5/3 c) 8/2 d) 9/2

6. Which one of the following is the likely bond angles of sulphur tetrafluoride molecule?

- a) $120^\circ, 80^\circ$ b) $109^\circ 28'$ c) 90° d) $89^\circ, 117^\circ$

7. Assertion: Oxygen molecule is paramagnetic.

Reason : It has two unpaired electron in its bonding molecular orbital

- a) both assertion and reason are true and reason is the correct explanation of assertion.
 b) both assertion and reason are true but reason is not the correct explanation of assertion.
 c) assertion is true but reason is false.
 d) both assertion and reason are false.

8. According to Valence bond theory, a bond between two atoms is formed when

- a) fully filled atomic orbitals overlap
 b) half filled atomic orbitals overlap
 c) non - bonding atomic orbitals overlap
 d) empty atomic orbitals overlap

9. In ClF_3 , NF_3 and BF_3 molecules the chlorine, nitrogen and boron atoms are

- a) sp^3 hybridised
 b) sp^3 , sp^3 and sp^2 respectively
 c) sp^3 hybridised
 d) sp^3d , sp^3 and sp hybridised respectively

10. When one s and three p orbitals hybridise,

- a) four equivalent orbitals at 90° to each other will be formed

20. Some of the following properties of two species, NO_3^- and H_3O^+ are described below. Which one of them is correct?

- a) dissimilar in hybridisation for the central atom with different structure
- b) isostructural with same hybridisation for the central atom.
- c) different hybridisation for the central atom with same structure.
- d) none of these

21. The types of hybridisation on the five-carbon atom from right to left in the, 2,3 pentadiene.

- a) $sp^3, sp^2, sp, sp^2, sp^3$
- b) sp^3, sp, sp, sp, sp^3
- c) $sp^2, sp, sp^2, sp^2, sp^3$
- d) $sp^3, sp^3, sp^2, sp^3, sp^3$

22. XeF_2 is isostructural with a) SbCl_2 b) BaCl_2 c) TeF_2 d) ICl_2^-

23. The percentage of s-character of the hybrid orbitals in methane, ethane, ethene, and ethyne are respectively

- a) 25, 25, 33.3, 50
- b) 50, 50, 33.3, 25
- c) 50, 25, 33.3, 50
- d) 50, 25, 25, 50

24. Of the following molecules, which have shape similar to carbondioxide?

- a) SnCl_2
- b) NO_2
- c) C_2H_2
- d) All of these

25. According to VSEPR theory, the repulsion between different parts of electrons obey the order

- a) $1. p - 1. p > b. p - b. p > 1. p - b. p$
- b) $b. p - b. p > b. p - 1. p > 1. p - b. p$
- c) $1. p - 1. p > b. p - 1. p > b. p - b. p$
- d) $b. p - b. p > 1. p - 1. p > b. p - 1. p$

26. Shape of ClF_3 is

- a) Planar triangular
- b) Pyramidal
- c) "T" Shaped
- d) none of these

27. Non - Zero dipole moment is shown by

- a) CO_2
- b) p - dichlorobenzene
- c) carbontetrachloride
- d) water

28. Which of the following conditions is not correct for resonating structures?

- a) the contributing structure must have the same number of unpaired electrons
- b) the contributing structures should have similar energies
- c) the resonance hybrid should have higher energy than any of the contributing structure.
- d) none of these

29. Among the following, the compound that contains, ionic, covalent, and Coordinate linkage is

- a) NH_4Cl
- b) NH_3
- c) NaCl
- d) none of these

30. CaO and NaCl have the same crystal structure and approximately the same radii.

If U is the lattice energy of NaCl , the approximate lattice energy of CaO is

- a) U
- b) $2U$
- c) $U/2$
- d) $4U$

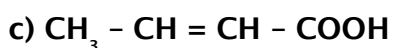
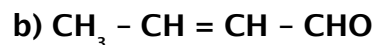
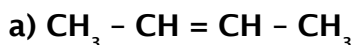
II. WRITE BRIEF ANSWER TO THE FOLLOWING QUESTIONS:

31. Define the following: i) Bond order ii) Hybridisation iii) σ - bond
32. What is a pi - bond?
33. In CH_4 , NH_3 , and H_2O , the central atom undergoes sp^3 hybridization - yet their bond angles are different. Why?
34. Explain sp^2 hybridization in BF_3 .
35. Draw the M.O diagram for oxygen molecule calculate its bond order and show that O_2 is paramagnetic.
36. Draw MO diagram of CO and calculate its bond order.
37. What do you understand by the Linear combination of atomic orbitals in MO theory?
38. Discuss the formation of N_2 molecule using MO theory.
39. What is dipole moment?
40. Linear form of carbondioxide molecule has two polar bonds. Yet the molecule has Zero dipole moment. Why?
41. Draw the Lewis structures for the following species.
(i) NO_3^- (ii) SO_4^{2-} (iii) HNO_3 (iv) O_3
42. Explain the bond formation if BeCl_2 and MgCl_2 .
43. Which bond is stronger σ or π ? Why?
44. Define bond energy.
45. Hydrogen gas is diatomic whereas inert gases are monoatomic - Explain on the basis of MO theory.
46. What is the Polar Covalent bond? Explain with example.
47. considering x-axis as the molecular axis which out of the following will form a sigma bond.
i) $1s$ and $2p_y$ ii) $2p_x$ and $2p_y$ iii) $2p_x$ and $2p_z$ iv) $1s$ and $2p_z$
48. Explain resonance with reference to a carbonate ion.
49. Explain the bond formation in ethylene and acetylene.
50. What type of hybridization is possible in the following geometries?
i) Octahedral ii) Tetrahedral iii) Square planar
51. Explain VSEPR theory. Applying this theory to predict the shapes of IF_7 and SF_6 .
52. CO_2 and H_2O both are triatomic molecule but their dipole moment values are different. Why?
53. Which one of the following has highest bond order? (i) N_2 (ii) N_2^+ (iii) N_2^-
54. Explain the covalent character in ionic bond.
55. Describe Fajan's rule.

LESSON - 11

I. CHOOSE THE BEST ANSWER:

1. Select the molecule which has only one π bond.



d) All of these

2. In the hydrocarbon $\overset{7}{\text{CH}_3} - \overset{6}{\text{CH}_2} - \overset{5}{\text{CH}} = \overset{4}{\text{CH}} - \overset{3}{\text{CH}_2} - \overset{2}{\text{C}} \equiv \overset{1}{\text{CH}}$ the state of hybridization of carbon 1, 2, 3, 4 and 7 are in the following sequence.

a) sp, sp, sp^3, sp^2, sp^3 b) $sp^2, sp, sp^3, sp^2, sp^3$ c) sp, sp, sp^2, sp, sp^3 d) none of

these

3. The general formula for alkadiene is

- a) $C_n H_{2n}$ b) $C_n H_{2n-1}$ c) $C_n H_{2n-2}$ d) $C_n H_{n-2}$

4. Structure of the compound whose IUPAC name is 5, 6 - dimethylhept - 2 - ene is

5. The IUPAC name of the compound is

- a) 2, 3 - Dimethylheptane
 b) 3 - methyl - 4 - ethyloctane
 c) 5 - ethyl - 6- methyloctane
 d) 4 - Ethyl - 3 methyloctane

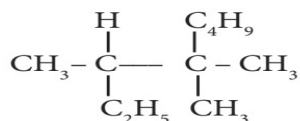
6. Which one of the following names does not fit a real name?

- a) 3 - Methyl - 3- hexanone b) 4 - Methyl - 3 - hexanone
 c) 3 - Methyl - 3 hexanol d) 2 - Methyl cyclo hexanone

7. The IUPAC name of the compound $CH_3 - CH = CH - C \equiv CH$ is

- a) Pent - 4- yn - 2 - ene b) Pent - 3- en - 1- yne
 c) Pent - 2 - en - 4 - yne d) Pent - 1 yn - 3 - ene

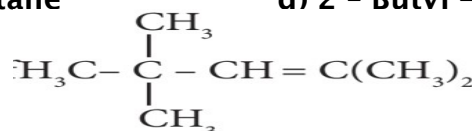
8. IUPAC name of



is

- a) 3, 4, 4 - Trimethylheptane b) 2 - Ethyl - 3, 3, - dimethyl heptane
 c) 3, 4, 4 - Trimethyloctane d) 2 - Butyl - 2 - methyl - 3 ethyl - butane

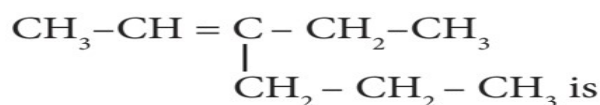
9. The IUPAC name of



is

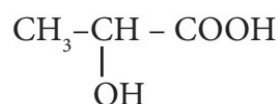
- a) 2,4,4 - Trimethylpent - 2 - ene b) 2,4,4 - Trimethylpent - 3 - ene
 c) 2,2,4 - Trimethylpent - 3 - ene d) 2,2,4 - Trirnethylpent - 2 - ene

10. The IUPAC name of the compound



- a) 3 - Ethyl - 2 - hexane b) 3 - Propyl - 3 - hexene
 c) 4 - Ethyl - 4 - hexane d) 3 - Propyl - 2 - hexene

11. The IUPAC name of the compound



is

- a) $\text{NH}_2\text{NH}_2\text{HCl}$ and $\text{ClCH}_2 - \text{CHO}$ b) NH_2CSNH_2 and $\text{CH}_3 - \text{CH}_2\text{Cl}$
 c) $\text{NH}_2\text{CH}_2\text{COOH}$ and NH_2CONH_2 d) $\text{C}_6\text{H}_5\text{NH}_2$ and $\text{ClCH}_2 - \text{CHO}$

23. Sodium nitropruside reacts with sulphide ion to give a purple colour due to the formation of

- a) $[\text{Fe}(\text{CN})_5\text{NO}]^{3-}$ b) $[\text{Fe}(\text{NO})_5\text{CN}]^+$ c) $[\text{Fe}(\text{CN})_5\text{NOS}]^{4-}$ d) $[\text{Fe}(\text{CN})_5\text{NOS}]^{3-}$

24. An organic Compound weighing 0.15 g gave on carius estimation, 0.12 g of silver bromide. The percentage of bromine in the Compound will be close to

- a) 46 % b) 34 % c) 3.4 % d) 4.6 %

25. A sample of 0.5 g of an organic compound was treated according to Kjeldahl's method. The ammonia evolved was absorbed in 50mL of 0.5 M H_2SO_4 . The remaining acid after neutralization by ammonia consumed 80 mL of 0.5 M NaOH. The percentage of nitrogen in the organic compound is.

- a) 14 % b) 28 % c) 42 % d) 56 %

26. In an organic compound, phosphorus is estimated as

- a) $\text{Mg}_2\text{P}_2\text{O}_7$ b) $\text{Mg}_3(\text{PO}_4)_2$ c) H_3PO_4 d) P_2O_5

27. Ortho and para - nitro phenol can be separated by

- a) azeotropic distillation b) destructive distillation
 c) steam distillation d) cannot be separated

28. The purity of an organic - compound is determined by

- a) Chromatography b) Crystallization
 c) melting or boiling point d) both (a) and (c)

29. A liquid which decomposes at its boiling point can be purified by

- a) distillation at atmospheric pressure b) distillation under reduced pressure
 c) fractional distillation d) steam distillation

30. Assertion:
$$\begin{array}{c} \text{CH}_3 - \text{C} = \text{CH} - \text{COOH} \text{ is} \\ | \\ \text{COOC}_2\text{H}_5 \end{array}$$

Reason: The principal functional group gets lowest number followed by double bond (or) triple bond.

- a) both the assertion and reason are true and the reason is the correct explanation of assertion.
 b) both assertion and reason are true and the reason is not the correct explanation of assertion.
 c) assertion is true but reason is false.
 d) both the assertion and reason are false

II. WRITE BRIEF ANSWERS TO THE FOLLOWING QUESTIONS:

31. Give the general characteristics of organic compounds..
32. Describe the classification of organic compounds based on their structure.
33. Write a note on homologous series.
34. What is meant by a functional group? Identify the functional group in the following compounds. a) acetaldehyde b) oxalic acid
c) dimethyl ether d) methylamine
35. Give the general formula for the following classes of organic compounds
a) Aliphatic monohydric alcohol b) Aliphatic ketones c) Aliphatic amines
36. Write the molecular formula of the first six members of homologous series of nitre
37. Write the molecular formula and possible structural formula of the first four members of homologous series of carboxylic acids.
38. Give the IUPAC names of the following compounds.
39. Give the structure for the following compound
(i) 3 - ethyl - 2 methyl - 1 - pentene (ii) 1, 3, 5 - Trimethyl cyclohex - 1 - ene
(iii) tetry butyl iodide (iv) 3 - Chlorobutanal (v) 3 - Chlorobutanol
(vi) 2 - Chloro - 2 - methyl propane (vii) 2, 2 - dimethyl - 1 - chloropropane
(viii) 3 - methylbut -1- ene (ix) Butan - 2, 2 - diol (x) Octane - 1, 3 - diene
(xi) 1, 3 - Dimethylcyclohexane (xii) 3 - Chlorobut - 1 - ene
(xiii) 2 - methylbutan - 3 - ol (xiv) acetaldehyde
40. Describe the reactions involved in the detection of nitrogen in an organic compound by Lassaigne method.
41. Give the principle involved in the estimation of halogen in an organic compound by
42. Give a brief description of the principles of i) Fractional distillation
ii) Column Chromatography
43. Explain paper chromatography.
44. Explain various types of constitutional isomerism (structural isomerism) in organic compounds.
45. Describe optical isomerism with suitable example.
46. Briefly explain geometrical isomerism in alkene by considering 2-butene as an example.
47. 0.30 g of a substance gives 0.88 g of carbon dioxide and 0.54 g of water calculate the percentage of carbon and hydrogen in it.
48. The ammonia evolved from 0.20 g of an organic compound by Kjeldahl method neutralized 15 ml of N / 20 sulphuric acid solution. Calculate the percentage of

Nitrogen.

49. 0.32 g of an organic compound, after heating with fuming nitric acid and barium nitrate crystals in a sealed tube gave 0.466 g of barium sulphate. Determine the percentage of sulphur in the compound.

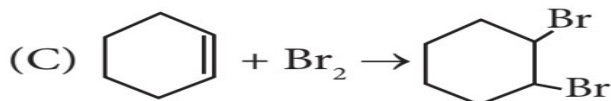
50. 0.24 g of an organic compound gave 0.287 g of silver chloride in the Carius method. Calculate the percentage of chlorine in the compound.

51. In the estimation of nitrogen present in an organic compound by Dumas method 0.35 g yielded 20.7 mL of nitrogen at 15° C and 760 mm pressure. Calculate the percentage of nitrogen in the compound.

LESSON - 12

I. CHOOSE THE BEST ANSWER:

1. For the following reactions



Which of the following statement is correct?

- (A) is elimination, (B) and (C) are substitution
- (A) is substitution, (B) and (C) are elimination
- (A) and (B) are elimination and (C) is addition reaction
- (A) is elimination, (B) is substitution and (C) is addition reaction

2. What is the hybridisation state of benzyl carbonium ion?

- sp^2
- spd^2
- sp^3
- sp^2d

3. Decreasing order of nucleophilicity is

- $\text{OH}^- > \text{NH}_2^- > -\text{OCH}_3 > \text{RNH}_2$
- $\text{NH}_2^- > \text{OH}^- > -\text{OCH}_3 > \text{RNH}_2$
- $\text{NH}_2^- > \text{CH}_3\text{O}^- > \text{OH}^- > \text{RNH}_2$
- $\text{CH}_3\text{O}^- > \text{NH}_2^- > \text{OH}^- > \text{RNH}_2$

4. Which of the following species is not electrophilic in nature?

- Cl^+
- BH_3
- H_3O^+
- $^+\text{NO}_2$

5. Homolytic fission of covalent bond leads to the formation of

- electrophile
- nucleophile
- carbocation
- free radical

6. Hyper conjugation is also known as

- no bond resonance
- Baker - nathan effect
- both (a) and (b)
- none of these

7. Which of the group has highest + I effect?

- CH_3-
- CH_3-CH_2-
- $(\text{CH}_3)_2-\text{CH}-$
- $(\text{CH}_3)_3-\text{C}-$

8. Which of the following species does not exert a resonance effect?

- $\text{C}_6\text{H}_5\text{OH}$
- $\text{C}_6\text{H}_5\text{Cl}$
- $\text{C}_6\text{H}_5\text{NH}_2$
- $\text{C}_6\text{H}_5\text{NH}_3$

9. - I effect is shown by

- Cl
- Br
- both (a) and (b)
- CH_3

10. Which of the following carbocation will be most stable?

- Ph_3C^+
- $\text{CH}_3-\text{CH}_2^+$
- $(\text{CH}_3)_2-\text{CH}^+$
- $\text{CH}_2=\text{CH}-\text{CH}_2^+$

11. Assertion: Tertiary Carbocations are generally formed more easily than primary Carbocations ions.

Reason: Hyper conjugation as well as inductive effect due to additional alkyl group stabilize tertiary carbonium ions.

- both assertion and reason are true and reason is the correct explanation of

assertion.

b) both assertion and reason are true but reason is not the correct explanation of assertion.

c) assertion is true but reason is false.

d) both assertion and reason are false.

12. Heterolytic fission of C - Br bond results in the formation of

a) free radical b) Carbanion c) Carbocation d) Carbanion and Carbocation

13. Which of the following represent a set of nucleophiles?

a) BF_3 , H_2O , NH_2^- b) AlCl_3 , BF_3 , NH_3 c) CN^- , RCH_2^- , ROH d) H^+ , RNH_3^+ , $:\text{CCl}_2$

14. Which of the following species does not acts as a nucleophile?

a) ROH b) ROR c) PCl_3 d) BF_3

15. The geometrical shape of carbocation is

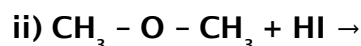
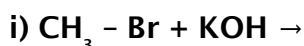
a) Linear b) tetrahedral c) Planar d) Pyramidal

II. WRITE BRIEF ANSWER TO THE FOLLOWING QUESTIONS:

16. Write short notes on a) Resonance b) Hyper Conjugation

17. What are electrophiles and nucleophiles? Give suitable examples for each.

18. Show the heterolysis of covalent bond by using curved arrow notation and complete the following equations. Identify the nucleophile in each case.



19. Explain inductive effect with suitable example.

20. Explain electromeric effect with suitable example.

21. Give examples for the following types of organic reactions

(i) β - elimination

(ii) Electrophilic substitution

LESSON - 13

I. CHOOSE THE BEST ANSWER:

1. The correct statement regarding the comparison of staggered and eclipsed conformations of ethane, is

a) The eclipsed conformation of ethane is more stable than staggered conformation even though the eclipsed conformation has torsional strain.

b) The staggered conformation of ethane is more stable than eclipsed conformation, because staggered conformation has no torsional strain.

c) The staggered conformation of ethane is less stable than eclipsed conformation, because staggered conformation has torsional strain.

- a)  b) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{OH}$ c) $\text{H}_2\text{C} = \text{C} = \text{O}$ d) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2\text{Br}$

11. Which among the following alkenes on reductive ozonolysis produces only propanone?

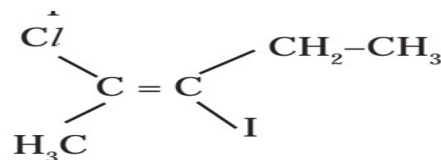
- a) 2 - Methyl propene b) 2 - Methyl but - 2 - ene
c) 2, 3 - Dimethyl but - 1 - ene d) 2, 3 - Dimethyl but - 2 - ene

12. The major product formed when 2 - bromo - 2 - methyl butane is refluxed with ethanolic KOH is

- a) 2 - methylbut - 2 - ene b) 2 - methyl butan - 1 - ol
c) 2 - methyl but - 1 - ene d) 2 - methyl butan - 2 - ol

13. Major product of the below mentioned reaction is, $(\text{CH}_3)_2\text{C} = \text{CH}_2 \xrightarrow{\text{ICl}}$

- a) 2 - chloro - 1 - iodo - 2 - methyl propane
b) 1 - chloro - 2 - iodo - 2 - methyl propane
c) 1, 2 - dichloro - 2 - methyl propane
d) 1, 2 - diiodo - 2 - methyl propane



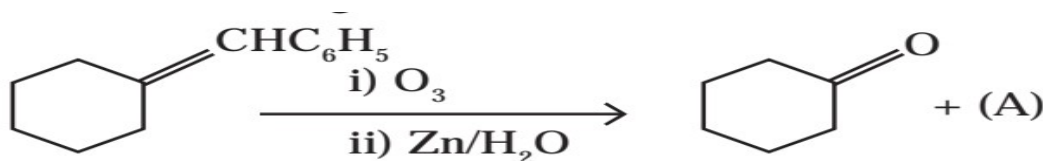
14. The IUPAC name of the following compound is


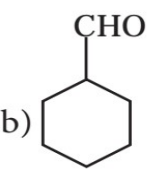
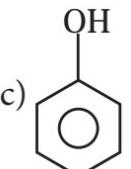
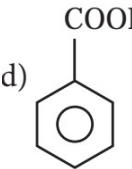
- a) trans - 2 - chloro - 3 - iodo - 2 - pentane
b) cis - 3 - iodo - 4 chloro - 3 - pentane
c) trans - 3 - iodo - 4 - chloro - 3 - pentene
d) cis - 2 - chloro - 3 iodo - 2 - pentene

15. Cis - 2 - butene and trans - 2 - butene are

- a) conformational isomers b) structural isomers
c) configurational isomers d) optical isomers

16. Identify the compound (A) in the following reaction



- a)  b)  c)  d) 

Answer: a)

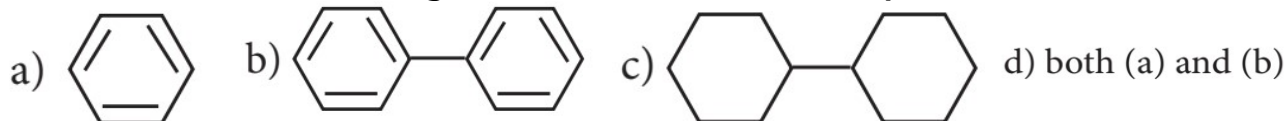
17. $\text{CH}_2 - \text{CH}_2 \xrightarrow{\text{(A)}} \text{CH} \equiv \text{CH}$, where A is,
| |
Br Br

- a) Zn b) conc. H_2SO_4 c) alc. KOH d) dil. H_2SO_4

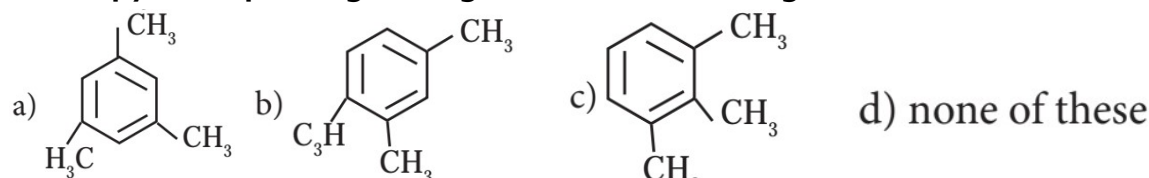
18. Consider the nitration of benzene using mixed conc H_2SO_4 and HNO_3 if a large quantity of $KHSO_4$ is added to the mixture, the rate of nitration will be

- a) unchanged b) doubled c) faster d) slower

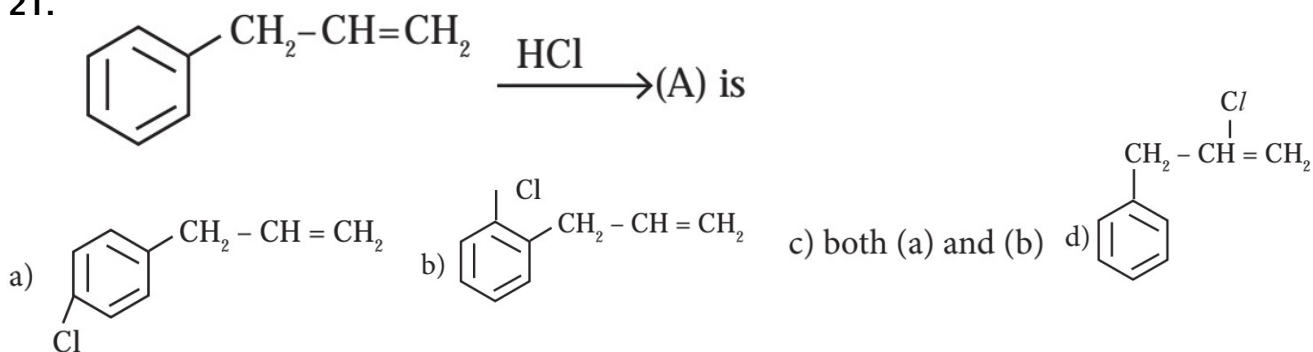
19. In which of the following molecules, all atoms are co-planar



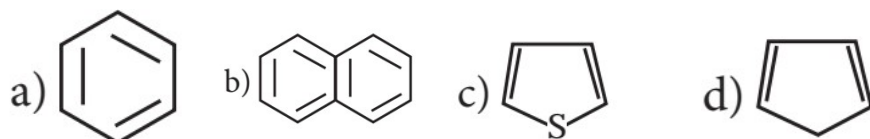
20. Propyne on passing through red hot iron tube gives



21.



22. Which one of the following is non aromatic?



23. Which of the following compounds will not undergo Friedal - crafts reaction easily?

- a) Nitro benzene b) Toluene c) Cumene d) Xylene

24. Some meta-directing substituents in aromatic substitution are given. Which one is most deactivating?

- a) $-COOH$ b) $-NO_2$ c) $-C \equiv N$ d) $-SO_3H$

25. Which of the following can be used as the halide component for friedal - crafts reaction?

- a) Chloro benzene b) Bromo benzene c) Chloro ethane d) Isopropyl chloride

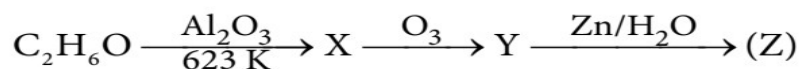
26. An alkane is obtained by decarboxylation of sodium propionate. Same alkane can be prepared by

- a) Catalytic hydrogenation of propene
 b) action of sodium metal on iodomethane
 c) reduction of 1 - chloro propane
 d) reduction of bromomethane

27. Which of the following is aliphatic saturated hydrocarbon

- a) C_8H_{18} b) C_9H_{18} c) C_8H_{14} d) All of these

28. Identify the compound 'Z' in the following reaction



- a) Formaldehyde b) Acetaldehyde c) Formic acid d) none of these

29. Peroxide effect (Kharasch effect) can be studied in case of

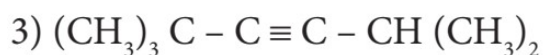
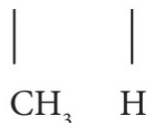
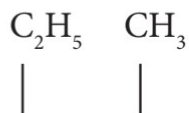
- a) Oct - 4 - ene b) hex - 3 - ene c) pent - 1 - ene d) but - 2 - ene

30. 2 - butyne on chlorination gives

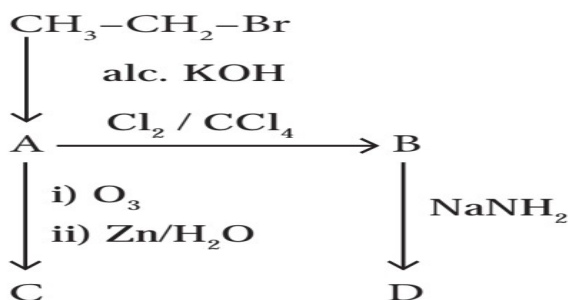
- a) 1 - chloro butane b) 1, 2 - dichloro butane
 c) 1, 1, 2, 2 - tetrachlorobutane d) 2, 2, 3, 3 - tetra chloro butane

II. WRITE BRIEF ANSWER TO THE FOLLOWING QUESTIONS:

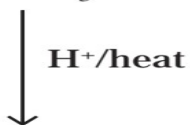
31. Give IUPAC names for the following compounds.



32. Identify the compound A, B, C and D in the following series of reactions.

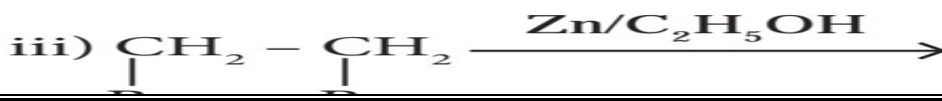


33. Write short notes on ortho, para directors in aromatic electrophilic substitution reactions.
34. How is propyne prepared from an alkene dihalide?
35. An alkylhalide with molecular formula $C_6H_{13}Br$ on dehydro halogenation gave two isomeric alkenes X and Y with molecular formula C_6H_{12} . On reductive ozonolysis, X and Y gave four compounds CH_3COCH_3 , CH_3CHO , CH_3CH_2CHO and $(CH_3)_2CHCHO$. Find the alkylhalide.
36. Describe the mechanism of Nitration of benzene.
37. How does Huckel rule help to decide the aromatic character of a compound.
38. Suggest the route for the preparation of the following from benzene.
- 3 - chloro nitrobenzene
 - 4 - chlorotoluene
 - Bromo benzene
 - m - dinitro benzene
39. Suggest a simple chemical test to distinguish propane and propene.
41. How will you convert ethyl chloride into (i) ethane (ii) n - butane
42. Describe the conformers of n - butane.
43. Write the chemical equations for combustion of propane.
44. Explain Markovnikoff's rule with suitable example.
45. What happens when ethylene is passed ' through cold dilute alkaline potassium permanganate.
46. Write the structures of following alkanes.
- 2, 3 - Dimethyl - 6 - (2 - methyl propyl) decane
 - 5 - (2 - Ethyl butyl) - 3, 3, - dimethyldecane
 - 5 - (1, 2 - Dimethyl propyl) - 2 - methylnonane
47. How will you prepare propane from a sodium salt of fatty acid?
48. $CH_3 - CH(CH_3) - CH(OH) - CH_3$



Identify A and B

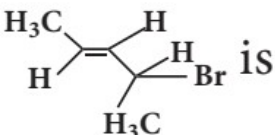
49. Complete the following :



50. How will distinguish 1 - butyne and 2 - butyne?

LESSON - 14

I. CHOOSE THE BEST ANSWER:

1. The IUPAC name of  is

a) 2 - Bromo pent - 3 - ene

b) 4 - Bromo pent - 2 - ene

c) 2 - Bromo pent - 4 - ene

d) 4 - Bromo pent - 1 - ene

2. Of the following compounds, which has the highest boiling point?

a) n - Butyl chloride

b) Isobutyl chloride

c) t - Butyl chloride

d) n - Propyl chloride

3. Arrange the following compounds in increasing order of their density

A) CCl_4

B) CHCl_3

C) CH_2Cl_2

D) CH_3Cl

a) $\text{D} < \text{C} < \text{B} < \text{A}$

b) $\text{C} > \text{B} > \text{A} > \text{D}$

c) $\text{A} < \text{B} < \text{C} < \text{D}$

d) $\text{C} > \text{A} > \text{B} > \text{D}$

4. With respect to the position of - Cl in the compound $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_2 - \text{Cl}$, it is classified as a) Vinyl b) Allyl c) Secondary d) Aralkyl

5. What should be the correct IUPAC name of diethyl chloromethane?

a) 3 - Chloro pentane

b) 1 - Chloropentane

c) 1 - Chloro - 1, 1 - diethyl methane

d) 1 - Chloro-1-ethyl propane

6. C - X bond is strongest in

a) Chloromethane

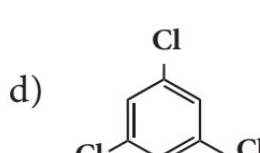
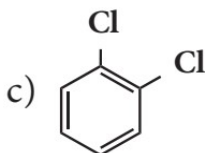
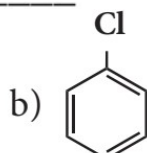
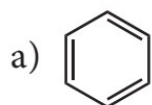
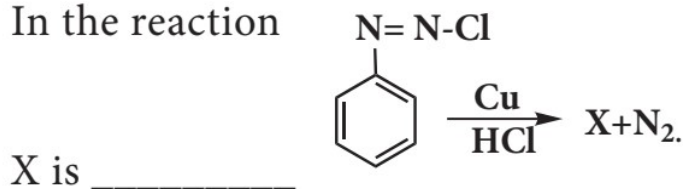
b) Iodomethane

c) Bromomethane

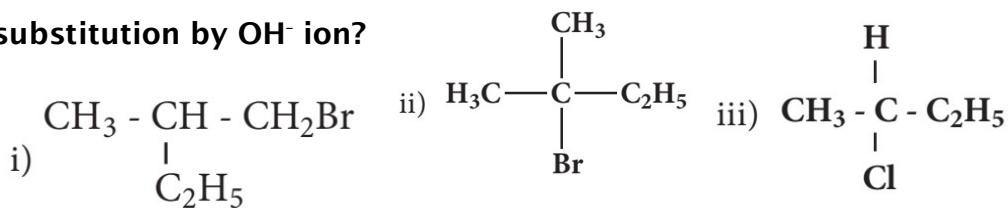
d)

Fluoromethane

7. In the reaction

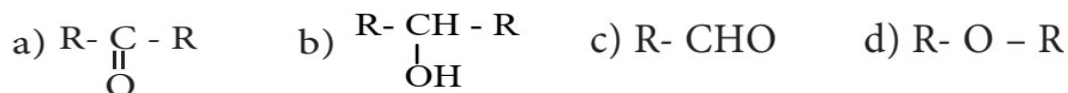


8. Which of the following compounds will give racemic mixture on nucleophilic substitution by OH⁻ ion?



a) (i) b) (ii) and (iii) c) (iii) d) (i) and (ii)

9. The treatment of ethyl formate with excess of RMgX gives



10. Benzene reacts with Cl₂ in the presence of FeCl₃ and in absence of sunlight to form

a) Chlorobenzene b) Benzyl chloride c) Benzal chloride d) Benzene hexachloride

11. The name of C₂F₄C₁₂ is

a) Freon - 112 b) Freon - 113 c) Freon - 114 d) Freon - 115

12. Which of the following reagent is helpful to differentiate ethylene dichloride and ethylidene chloride?

a) Zn / methanol b) KOH / ethanol c) aqueous KOH d) ZnCl₂ / Con HCl

13. Match the compounds given in Column I with suitable items given in Column II:

Column I (Compound)	Column II (Uses)
A. Iodoform	1. Fire extinguisher
B. Carbon tetra chloride	2. Insecticide
C. CFC	3. Antiseptic
D. DDT	4. Refrigerants

Code

a) A → 2 B → 4 C → 1 D → 3

b) A → 3 B → 2 C → 4 D → 1

c) A → 1 B → 2 C → 3 D → 4

d) A → 3 B → 1 C → 4 D → 2

14. Assertion: In monohaloarenes, electrophilic substitution occurs at ortho and para positions.


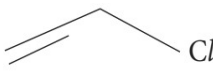
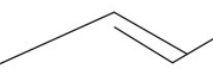

Reason: Halogen atom is a ring deactivator.

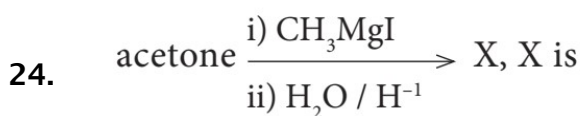
(i) If both assertion and reason are true and reason is the correct explanation of assertion.

(ii) If both assertion and reason are true but reason is not the correct explanation of assertion.

(iii) If assertion is true but reason is false.

(iv) If both assertion and reason are false.

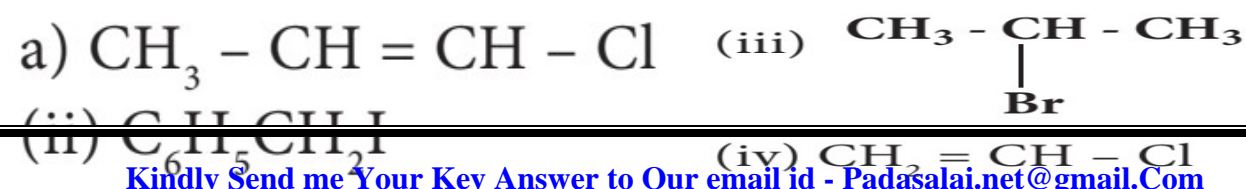
- a) (i) b) (ii) c) (iii) d) (iv)
15. Consider the reaction,
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br} + \text{NaCN} \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{CN} + \text{NaBr}$ This reaction will be the fastest in
 a) ethanol b) methanol c) DMF (N, N' - dimethyl formamide) d) water
16. Freon - 12 manufactured from tetrachloro methane by
 a) Wurtz reaction b) Swarts reaction c) Haloform reaction d) Gattermann reaction
17. The most easily hydrolysed molecules under $\text{S}_\text{N}1$ condition is
 a) allyl chloride b) ethyl chloride c) isopropyl chloride d) benzyl chloride
18. The carbon cation formed in $\text{S}_\text{N}1$ reaction of alkyl halide in the slow step is
 a) sp^3 hybridized b) sp^2 hybridized c) sp hybridized d) none of these
- a)  Cl b)  Cl c)  Cl d)  Cl
- a) 1 - chloro - 4 - nitrobenzene b) 1 - chloro - 2 - nitrobenzene
 c) 1 - chloro - 3 - nitrobenzene d) 1 - chloro - 1 - nitrobenzene
20. Which one of the following is most reactive towards nucleophilic substitution reaction?
21. Ethylidene chloride on treatment with aqueous KOH gives
 a) acetaldehyde b) ethylene glycol c) formaldehyde d) glyoxal
22. The raw material for Raschig process
 a) chloro benzene b) phenol c) benzene d) anisole
23. Chloroform reacts with nitric acid to produce
 a) nitro toluene b) nitro glycerine c) chloropicrin d) chloropicric acid



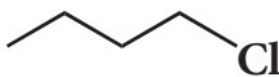
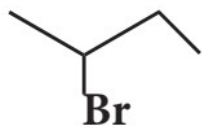
- a) 2 - propanol b) 2 - methyl - 2 - propanol c) 1 - propanol d) acetone
25. Silverpropionate when refluxed with Bromine in carbon tetrachloride gives
 a) propionic acid b) chloroethane c) Bromo ethane d) chloro propane

II. WRITE BRIEF ANSWER TO THE FOLLOWING QUESTIONS:

26. Classify the following compounds in the form of alkyl, allylic, vinyl, benzylic halides.



27. Why chlorination of methane is not possible in dark?
 28. How will you prepare n propyl iodide from n - propyl bromide?
 29. Which alkyl halide from the following pair is i) chiral ii) undergoes faster S_N^2 reaction?



30. How does chlorobenzene react with sodium in the presence of ether? What is the name of the reaction?
 31. Give reasons for the polarity of C - X bond in haloalkane.
 32. Why is it necessary to avoid even traces of moisture during the use of Grignard reagent?
 33. What happens when acetyl chloride is treated with an excess of CH_3MgI ?
 34. Arrange the following alkyl halide in increasing order of bond enthalpy of RX.
 CH_3Br , CH_3F , CH_3Cl , CH_3I
 35. What happens when chloroform reacts with oxygen in the presence of sunlight?
 36. Write down the possible isomers of $C_5H_{11}Br$ and give their IUPAC and common names.
 37. Mention any three methods of preparation of haloalkanes from alcohols.
 38. Compare S_N^1 and S_N^2 reaction mechanisms.
 39. Reagents and the conditions used in the reactions are given below. Complete the table by writing down the product and the name of the reaction.

Reaction	Product	Name of the reaction
$CH_3CH_2OH + SOCl_2 \xrightarrow{\text{pyridine}} ?$	-----	-----
$CH_3CH_2Br + AgF \longrightarrow ?$	-----	-----
$C_6H_5Cl + Na \xrightarrow{\text{ether}} ?$	-----	-----

40. Discuss the aromatic nucleophilic substitutions reaction of chlorobenzene.
 41. Account for the following:
 (i) t - butyl chloride reacts with aqueous KOH by S_N^1 mechanism while n - butyl chloride reacts with S_N^2 mechanism.

(ii) p - dichlorobenzene has a higher melting point than those of o - and m - dichlorobenzene.

42. In an experiment methyl iodide in ether is allowed to stand over magnesium pieces. Magnesium dissolves and product is formed.

- Name of the product and write the equation for the reaction.
- Why all the reagents used in the reaction should be dry? Explain.
- How is acetone prepared from the product obtained in the experiment?

43. Write a chemical reaction useful to prepare the following.

- Freon - 12 from Carbon tetrachloride
- Carbon tetrachloride from carbon disulphide.

44. What are Freons? Discuss their uses and environmental effects.

45. Predict the products when Bromo ethane is treated with the following.

- KNO_2
- AgNO_2

46. Explain the mechanism of $\text{S}_\text{N}1$ reaction by highlighting the stereochemistry behind it.

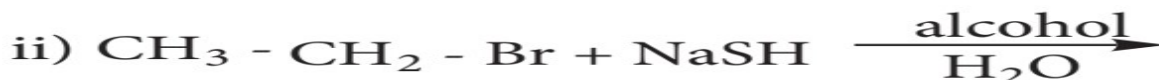
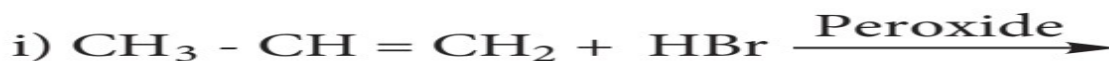
47. Write short notes on the following.

- Raschig process
- Dows process
- Darzen's process

48. Starting from CH_3MgI , How will you prepare the following?

- Acetic acid
- Acetone
- Ethyl acetate
- Isopropyl alcohol
- Methyl cyanide

49. Complete the following reactions.



50. Explain the preparation of the following compounds.

- DDT
- Chloroform
- Biphrnyl
- Chloropicrin
- Freon - 12

51. An organic compound (A) with molecular formula $\text{C}_2\text{H}_5\text{Cl}$ reacts with KOH gives compounds (B) and with alcoholic KOH gives compound (C). Identify (A), (B), (C).

52. The simplest alkene (A) reacts with HCl to form compound (B). Compound (B) reacts with ammonia to form compound (C) of molecular formula $\text{C}_2\text{H}_7\text{N}$. Compound

(C) undergoes carbylamine test. Identify (A), (B) and (C).

53. A hydrocarbon C_3H_6 (A) reacts with HBr to form compound (B). Compound (B) reacts with aqueous potassium hydroxide to give (C) of molecular formula C_3H_6O . What are the (A), (B) and (C). Explain the reactions.

54. Two isomers (A) and (B) have the same molecular formula $C_2H_4Cl_2$. Compound (A) reacts with aqueous KOH gives compound (C) of molecular formula C_2H_4O . Compound (B) reacts with aqueous KOH gives compound (D) of molecular formula $C_2H_6O_2$. Identify (A), (B), (C) and (D).

LESSON - 15

I. CHOOSE THE BEST ANSWER:

1. The gaseous envelope around the earth is known as atmosphere. The region lying between an altitudes of 11 - 50 km is _____.

(a) Troposphere (b) Mesosphere (c) Thermosphere (d) Stratosphere

2. Which of the following belongs to secondary air pollutant?

(a) Hydrocarbon (b) Peroxy acetyl nitrate (c) Carbon monoxide (d) Nitric oxide

3. Which of the following is natural and human disturbance in ecology?

(a) Forest fire (b) Floods (c) Acid rain (d) Green house effect

4. Bhopal Gas Tragedy is a case of _____.

(a) thermal pollution (b) air pollution (c) nuclear pollution (d) land pollution

5. Haemoglobin of the blood forms carboxy haemoglobin with

(a) Carbon dioxide (b) Carbon tetra chloride (c) Carbon monoxide (d) Carbonic acid

6. Which sequence for green house gases is based on GWP?

(a) $CFC > N_2O > CO_2 > CH_4$ (b) $CFC > CO_2 > N_2O > CH_4$

(c) $CFC > N_2O > CH_4 > CO_2$ (d) $CFC > CH_4 > N_2O > CO_2$

7. Photo chemical smog formed in congested metropolitan cities mainly consists of

(a) Ozone, SO_2 and hydrocarbons (b) Ozone, PAN and NO_2
(c) PAN, smoke and SO_2 (d) Hydrocarbons, SO_2 and CO_2

8. The pH of normal rain water is

(a) 6.5 (b) 7.5 (c) 5.6 (d) 4.6

9. Ozone depletion will cause

(a) forest fires (b) eutrophication (c) bio magnification (d) global warming

10. _____ is considered to be ozone friendly substitute for CFC'S

(a) HFC (Hydro Fluro Carbon) (b) Halons
(c) PAN (Peroxy acetyl nitrate) (d) PAH (Polycyclic aromatic hydrocarbon)

11. Identify the wrong statement in the following.

- (a) The clean water would have a BOD value of less than 5 ppm
- (b) Greenhouse effect is also called Global warming
- (c) Minute solid particles in air are known as particulate pollutants
- (d) Biosphere is the protective blanket of gases surrounding the earth

12. Living in the atmosphere of CO is dangerous because it

- (a) combines with O₂ present inside to form CO₂
- (b) Reduces organic matter of tissues
- (c) Combines with hemoglobin and makes it incapable to absorb oxygen
- (d) Dries up the blood

13. World Ozone layer protection Day is celebrated in _____.

- (a) June 5
- (b) Nov - 19
- (c) Sep - 16
- (d) Jan - 26

14. Release of oxides of nitrogen and hydrocarbons into the atmosphere by motor vehicles is prevented by using

- (a) grit chamber
- (b) scrubbers
- (c) trickling filters
- (d) catalytic converters

15. Biochemical oxygen Demand value less than 5 ppm indicates a water sample to be

- (a) highly polluted
- (b) poor in dissolved oxygen
- (c) rich in dissolved oxygen
- (d) low COD

18. Assertion (A): If the BOD level of water in a reservoir is more than 5 pm it is highly polluted.

Reason (R): High biological oxygen demand means the high activity of bacteria in water.

- (i) Both (A) and (R) are correct and (R) is the correct explanation of (A)
 - (ii) Both (A) and (R) are correct and (R) is not the correct explanation of (A)
 - (iii) Both (A) and (R) are not correct
 - (iv) (A) is correct but (R) is not correct
- (a) i (b) ii (c) iii (d) iv

19. Assertion (A): Excessive use of chlorinated pesticides causes soil and water pollution.

Reason (R): Such pesticides are non - biodegradable.

- (i) Both (A) and (R) are correct and (R) is the correct explanation of (A)
 - (ii) Both (A) and (R) are correct and (R) is not the correct explanation of (A)
 - (iii) Both (A) and (R) are not correct
 - (iv) (A) is correct but (R) is not correct
- (a) i (b) ii (c) iii (d) iv

20. Assertion (A): Oxygen plays a key role in the troposphere

Reason (R): The troposphere is not responsible for all biological activities

- (i) Both (A) and (R) are correct and (R) is the correct explanation of (A)
 - (ii) Both (A) and (R) are correct and (R) is not the correct explanation of (A)
 - (iii) Both (A) and (R) are not correct
 - (iv) (A) is correct but (R) is not correct
- (a) i (b) ii (c) iii (d) iv

II. WRITE BRIEF ANSWER TO THE FOLLOWING QUESTIONS:

21. Dissolved oxygen in water is responsible for aquatic life. What processes are responsible for the reduction in dissolved oxygen in water?

22. What would happen, if the greenhouse gases were totally missing in the earth's atmosphere?

23. Define smog.

24. Which is considered to be the earth's protective umbrella? Why?

25. What are degradable and non - degradable pollutants?

26. From where does ozone come in the photochemical smog?

27. A person was using water supplied by corporation. Due to shortage of water he started using underground water. He felt laxative effect. What could be the cause?

28. What is green chemistry?

29. Explain how does greenhouse effect cause global warming.

30. Mention the standards prescribed by BIS for quality of drinking water.

31. How does classical smog differ from photochemical smog?

32. What are particulate pollutants? Explain any three.

33. Even though the use of pesticides increases crop production, they adversely affect the living organisms. Explain the function and the adverse effects of the pesticides.

34. Ethane burns completely in air to give CO_2 , while in a limited supply of air gives CO. The same gases are found in automobile exhaust. Both CO and CO_2 are atmospheric pollutants.

35. On the basis of chemical reactions involved, explain how do CFC's cause depletion of ozone layer in stratosphere?

36. How is acid rain formed? Explain its effect.

37. What is sewage? What are the major steps involved in the treatment of sewage waste?

38. Differentiate the following:

(i) BOD and COD (ii) Viable and non-viable particulate pollutants.

39. Explain how oxygen deficiency is caused by carbon monoxide in our blood? Give its effect.

40. What are the various methods you suggest to protect our environment from pollution?

HALF YEARLY EXAMINATION- 2023

XI STD ---CHEMISTRY ANSWER KEY -DINDIGUL DISTRICT

**PART- I****I. CHOOSE THE CORRECT ANSWER:**

1. The balanced equation for the formation of ammonia is $N_2 + 3H_2 \rightleftharpoons 2NH_3$, when 15 moles of H, react to form
2. Which of the following pairs of d-orbitals will have electron density along the axes?
3. Which among the following oxide is amphoteric?
4. Ionic hydrides are formed by
5. Which of the following has highest hydration energy?
6. The value of universal gas constant depends upon
7. In an adiabatic process, which of the following is true?
8. What is the relation between K_p & K_c of the reaction $2H_2S(g) \rightleftharpoons 2H_2(g) + S_2(g)$
9. According to VSEPR theory, the repulsion between different pairs of electrons obey the order
10. Which of the following binary liquid mixtures exhibits negative deviation from Raoult's law?
11. Select the molecule which has only one bond
12. Hyper conjugation is also known as
13. Acetylene heated with Red hot iron tube gives X, what, is X?
14. The name of $C_2F_4Cl_2$ is
15. Haemoglobin of the blood forms carboxy haemoglobin with

PART- II**II. ANSWER ANY SIX QUESTIONS. Q.NO. 24 IS COMPULSORY****6×2=12**

16. Distinguish between oxidation and reduction.
17. What is effective nuclear charge?
18. Mention the uses of Plaster of paris.
19. What are state and path functions.
20. Which Geometrical isomers of 2-butene is more stable? why?
21. Mention two limitations of Henry's law.
22. Classify the following groups as ortho, Para and meta directors,
i) -OH ii) -NO₂ iii) -NH₂ iv) -COOH
23. What would happen, if the green house gases were totally missing in the earth's atmosphere?
24. Calculate the entropy change during the melting of one mole of ice into water at 273K and 1 atm pressure Enthalpy of fusion of ice is 6008 KJ mole⁻¹

PART- III**II. ANSWER ANY SIX QUESTIONS. Q.NO. 33 IS COMPULSORY****6×3=18**

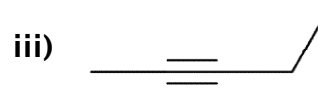
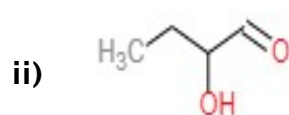
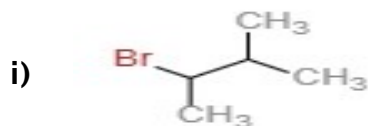
- 25 Give the electronic configuration of Mn²⁺ and Cr³⁺
26. How do you convert para hydrogen into ortho hydrogen.
27. Define compressibility factor.
28. Define Le-chatelier's principle.
29. Draw the Lewis structures for the following species i) NO₃⁻ ii) SO₄²⁻ iii) HNO₃ iv) O₃

30. What are electrophiles and nucleophiles? Give one example for each.

31. How is prepared DDT?

32. Write short note on Wurtz-Fittig reaction.

33. Give the IUPAC Names of the following compounds:



(5 x 5 =25)

IV. ANSWER THE FOLLOWING QUESTIONS:

34. a) i) Calculate the molar mass of the following compounds.

i) Urea [$\text{CO}(\text{NH}_2)_2$] ii) sulphuric acid [H_2SO_4]

ii) Write the Pauli's exclusion principle

[OR]

b) Explain the Pauling's method for the determination of ionic radius.

36. A) i) How will you prepare Tritium from Lithium?

ii) Describe briefly the biological importance of calcium and magnesium.

[OR]

b) i) Derive ideal-gas equation

ii) State the third law of thermodynamics.

36 . a) i) Derive the relation between K_p & K_c

[OR]

b) ii) Discuss the formation of N_2 molecule using MO-theory.

37. a) i) Describe the reactions involved in the detection of nitrogen in an organic compound by Lassaigne method.

ii) Define Resonance.

b) i) Explain Markownikoff's rule with suitable example.

ii) Differentiate BOD and COD

38. a) A compound on analysis gave Na-14.31% 8-9.97% H-6.22% and O-69.5% calculate the mole formula of the compound, if all the hydrogen in the compound is present in combination with oxygen as of crystallization. (molecular mass of the compound is 322)

[OR]

b) Simplest alkene (A) reacts with HCl to form compound (B). Compound (B) reacts with ammonia to compound (C) of molecular formula $\text{C}_2\text{H}_7\text{N}$. compound (C) undergoes carbylamine test, Identify (A), (B) and (C). Explain the reactions.