HALF – YEARLY EXAMINATION – 2024
CHEMISTRY

11 – STD
Time allowed : 3 hours

Maximum Marks = 70

SECTION – I

Note: 1) Answer all the questions. 2) Choose the most suitable answer from the given four alternatives and write the option code and the corresponding answer.

15 X 1 = 15

1. Which of the following compound(s) has/have percentage of carbon same as that in ethylene (C_2H_4).
   a) propene   b) ethyne   c) benzene   d) ethane

2. A macroscopic particle of mass 100g and moving at a velocity of 100 cms⁻¹ will have a de Broglie wavelength of
   a) 6.6×10^{-29} cm   b) 6.6×10^{-30} cm   c) 6.6×10^{-31} cm   d) 6.6×10^{-32} cm

3. The electron with positive electron gain enthalpy is
   a) Hydrogen   b) Sodium   c) Argon   d) Fluorine

4. In solid ice, 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.

5. The name 'Blue John' is given to which of the following compounds?
   a) CaH_2 b) CaF_2 c) $Ca_3(PO_4)_2$ d) CaO

6. Passenger aeroplane cabin is artificially pressurised since
   a) Pressure decreases with the increase in altitude   b) Pressure increases with the increase in altitude
   c) Temperature increases with the increase in altitude   d) None of the above

7. In which of the following process, the process is always non feasible.
   a) $\Delta H > 0$, $\Delta S > 0$ b) $\Delta H < 0$, $\Delta S > 0$ c) $\Delta H > 0$, $\Delta S < 0$ d) $\Delta H < 0$, $\Delta S < 0$

8. Match the following.

	Column – I		Column – II
A	$H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$	i)	$\Delta n_g = 2$
B	$2NH_{3(g)} \rightleftharpoons N_{2(g)} + 3H_{2(g)}$	ii)	$\Delta n_g = -1$
C	$2H_{2(g)} + O_{2(g)} \rightleftharpoons 2H_2O_{(g)}$	iii)	$\Delta n_g = 1$
D	$CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$	iv)	$\Delta n_g = 0$

	A	B	C	D
a)	iii)	iv)	i)	ii)
b)	iii)	iv)	ii)	i)
c)	ii)	i)	iv)	iii)
d)	iv)	i)	ii)	iii)

9. A Pressure cooker reduces cooking time for food because
   a) cooking involves chemical changes   b) heat is more evenly distributed is help by rise of temperature
   c) Boiling point of water involved in cooking is increased
   d) The higher pressure inside cooker crushes the food material.

10. **Assertion (A) :** Oxygen molecule is paramagnetic.
    Reason (R)   : It has two unpaired electron in its bonding molecular orbital.
    a) Both (A) and (R) are true and (R) is the correct explanation of (A)
    b) Both (A) and (R) are true and (R) is not the correct explanation of (A)
    c) (A) is true but (R) is false   d) Both (A) and (R) are false

11. $CH_3 - CH_2 - \underset{\underset{COOH}{|}}{CH} - CH = CH_2$ The IUPAC name of the compound is
    a) 2-ethyl but-3-enoic acid b) Pent-1-ene-3-oic acid c) Pent-4-ene-3-oic acid d) 2-ethyl but-4-enoic acid

12. Homolytic fission of covalent bond leads to the formation of
    a) electrophile   b) nucleophile   c) Carbo cation   d) free radical

13. Identify the compound 'Z' in the following reaction.
    $$C_2H_6O \xrightarrow[623\,K]{Al_2O_3} X \xrightarrow{O_3} Y \xrightarrow{Zn/H_2O} (Z)$$
    a) Formaldehye   b) Acetaldehyde   c) Formic acid   d) none of these

14. The carbocation formed in S_N1 reaction of alkyl halide in the slow step is
    a) sp^3 hybridised   b) sp^2 hybridised   c) sp hybridised   d) none of these

15. Haemoglobin of the blood forms carboxy haemoglobin with
    a) carbon dioxide b) carbon tetrachloride c) Carbon monoxide   d) carbonic acid

SECTION – II

Answer any six questions and question number 24 is compulsory.

6 X 2 = 12

16. Define equivalent mass.

HMY-11-CHEM-EM-1

17. NH_3 has exceptionally high melting point and boiling point as compared to those of the hydrides of the remaining element of group 15. Why?
18. How is plaster of Paris prepared?
19. State the third law of thermodynamics?
20. Draw the Lewis Structures for the following species i) HNO_3. ii) O_3
21. Explain cyclicpolymerisation reaction.
22. What is green chemistry?
23. Compare S_N1 and S_N2 reaction mechanisms.
24. For the reaction $SrCO_{3(S)} \rightarrow SrO_{(S)} + CO_{2(g)}$, the value of equilibrium constant Kp = 2.2×10^{-4} at1002K. Calculate Kc for the reaction.

SECTION – III

Answer any six questions and question number 33 iscompulsory.   6 x 3 = 18

25. Differentiate Classical smog and photochemical smog.
26. Derive the de- Broglie equation.
27. Write short notes on ortho and Para hydrogen.
28. What are ideal gases? In what way real gases differ from ideal gases.
29. List the characteristics of Gibbs free energy.
30. What is osmosis? Define the term 'isotonic solution'.
31. 0·30g of an organic Compound on Kjeldahl's analysis gave enough ammonia to just neutralise 30ml of 0·1N H_2SO_4 · Calculate the Percentage of nitrogen in the compound.
32. Starting from CH_3MgI, how will you prepare(i) Acetone   ii) Acetic acid . CH_3G
33. A compound on analysis was found to contain C- 34.6%, H- 3.85% and O-61.55%. Calculate its empirical formula.

SECTION – IV

Answer all the questions.   5 x 5 = 25

34. A. i) Calculate the oxidation number of nitrogen in nitrous acid (HNO_2) and nitric acid (HNO_3).(2)
    ii) State Heisenberg's uncertainty Principle and give its mathematical expression. (3)
<div align="center">OR</div>
B. Explain Pauling method for the determination of ionic radius. (5)

35. A.i) Which would you expect to have a higher melting point, magnesium oxide or magnesium fluoride. (2)
   ii) Discuss the three types of Covalent hydrides.(3)
<div align="center">OR</div>
B. Derive the values of Critical constants in terms of Vander waals Constant. (5)

36. A.i) State Le - Chatelier Principle,   (2)
    ii) Explain an indirect method to calculate lattice enthalpy of Sodium chloride crystal.(3)
<div align="center">OR</div>
B. i) Describe Fajan's rule.   (2)
ii) ExplainHe_2 molecule on the basis of MO theory.   (3)

37. A.i) What are the conditions for a compound to be optically active ? (2)
   ii) Define chromatography and mention its various methods. (3)
<div align="center">OR</div>
B. i) Write an equation for Elimination reaction.   (2)
   ii) Distinguish between electrophiles and nucleophiles.   (3)

38. A. i) Give two examples for Particulate pollutants.   (2)
ii) Complete the following
a) $2 - butyne \xrightarrow{\text{Lindlar Catalyst}}$?
b)? $CH_2 = CH_2 \xrightarrow{I_2}$ (3)
<div align="center">OR</div>
B. i) How will you Prepare Freon -12 .   (2)
ii) An organic compound (A) with molecular formula C_2H_5Cl reacts with aqueous KOH gives compound (B) and with alcoholic KOH gives compound (C). Identify A, B, & C.   (3)   HMY-11-CHEM-EM-2

XI - Chemistry

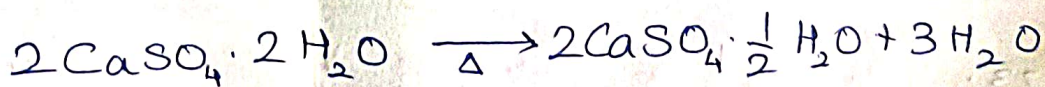Half yearly Answer key

P. Prakash - M.Sc, B.Ed, Krishnagiri - 04

P. Prakash

1 - M

1. a)
2. c)
3. c)
4. a)
5. b)

6. a)
7. b)
8. d)
9. d)
10. c)

11. c)
12. d)
13. a)
14. b)
15. c)

2 - m

16. **Equivalent mass :** It is defined as the mass of an element that combines or displaces 1.008 g hydrogen or 8 g oxygen or 35.5 g chloride

17. Due to intermolecular hydrogen bonding.

18. **Preparation of plaster of paris**

$$2CaSO_4 \cdot 2H_2O \xrightarrow{\Delta} 2CaSO_4 \cdot \frac{1}{2}H_2O + 3H_2O$$

Gypsum   Plaster of paris

19. **Third law of thermodynamics**
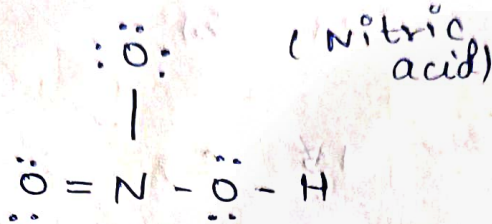   The entropy of pure

It is impossible to lower the temperature of an object to absolute zero to finite number of steps.

$$\lim_{T \to 0} S = 0 \text{ for perfect crystalline state}$$
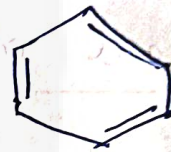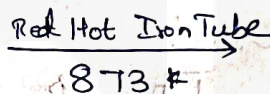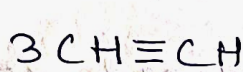
20. **Lewis Structure for**

i) HNO_3 : (Nitric acid)

$$\ddot{O} = N - \ddot{O} - H$$

ii) O_3 (ozone)

21. **Cyclic Polymerisation reaction:**

$$3CH \equiv CH \xrightarrow[873\,K]{Red\ Hot\ Iron\ Tube}$$

Benzene

22. **Green Chemistry**

It means science of environmentally favorable chemical synthesis

23.

S_N1	S_N2
* It is unimolecular reaction	* It is bimolecular reaction
* It occurs in two steps	* It is one step process
Reactivity:	Reactivity:
Methyl $\angle 1° \angle 2° \angle 3°$	Methyl $> 1° > 2° > 3°$

Comp

$$SrCO_3 \rightleftharpoons SrO + CO_2$$
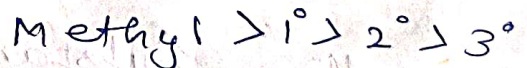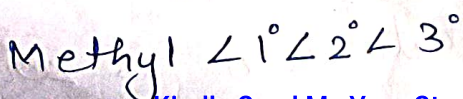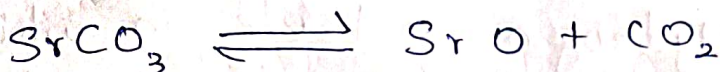
$$\Delta ng = 1 - 0$$

$$= 1$$

$$\therefore K_p = K_c (RT)$$

$$2.2 \times 10^{-4} = K_c (0.0821)(1002)$$

$$K_c = \frac{2.2 \times 10^{-4}}{0.0821 \times 1002}$$

$$K_c = 2.674 \times 10^{-6}$$

3-m

25.

Classical Smog	Photochemical Smog
It occurs in cool humid climate	It occurs in warm and dry climate
The chemical composition in the mixture of SO_2, SO_3 and humidity	It is formed by the combination of smoke, fog, dust and air pollutants
It is responsible for acid acid rain and causes bronchial irritation	It causes irritation of eyes, skin and lungs

26. de - Broglie equation:

(i) Planck's quantum hypothesis,

$$E = h\upsilon \qquad \rightarrow (1)$$

(ii) Einstein's mass-energy relationship:

$$E = mc^2 \qquad \rightarrow (2)$$

From (1) & (2)

$$h\upsilon = mc^2$$

$$hc/\lambda = mc^2$$

$$\lambda = \frac{hc}{x} \qquad \lambda = \frac{h}{}$$

27.

Ortho hydrogen:

Hydrogen molecule in which protons in the nuclei of both H-atoms are known to spin in same direction is termed as ortho hydrogen.

Para hydrogen:

H-atoms are known to spin in opposite direction is known as para hydrogen.

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28. Ideal gas:

$$PV = nRT$$

P → pressure ;   R → ideal gas constant

V → volume   T → temperature

n → no. of moles

Ideal gas	Real gas
It obey all gas laws under all conditions of temperature and pressure	Real gas obey gas laws only at low pressure and high temperature

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29. Gibbs free energy:

$$\boxed{G = H - TS}$$

'G' has a single value for thermodynamic state of system.

$\Delta G = \Delta H - T\Delta S \quad \rightarrow (1)$

$\Delta H = \Delta U + P\Delta V$

$\Delta G = \Delta U + P\Delta V - T\Delta S$

$\Delta U = q + W$

$\Delta G = W \pm P\Delta V$

$-\Delta G = -W - P\Delta V$

negative sign due to expansion against a constant external pressure.

30. **Osmosis :**

It is a spontaneous process by which the solvent molecules pass through a semi permeable membrane from a solution of lower concentration to a solution of higher concentration.

Isotonic solution :

Two solutions having same osmotic pressure at a given temperature are called isotonic solution.
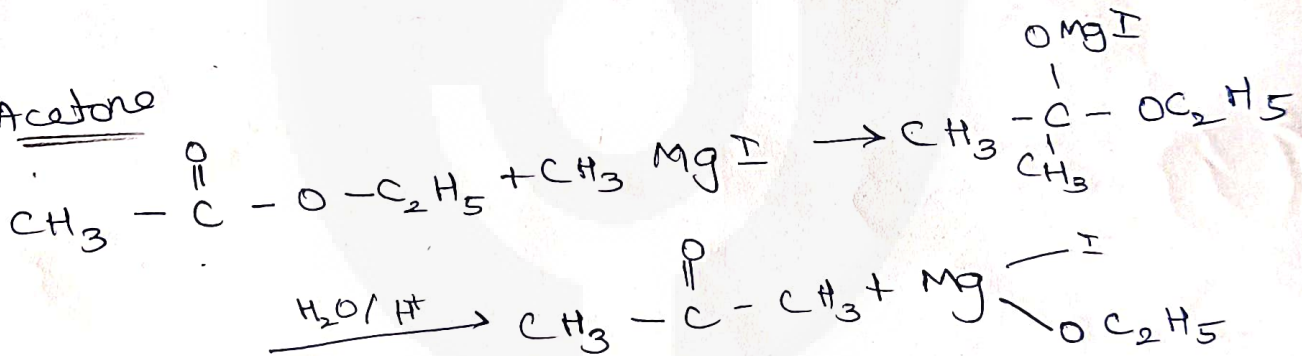

31.

$W = 0.30$ g

$N = 0.1$ N

$V = 30$ ml

% of nitrogen $= \left[\dfrac{14 \times N \times V}{1000 \times W} \right] \times 100$
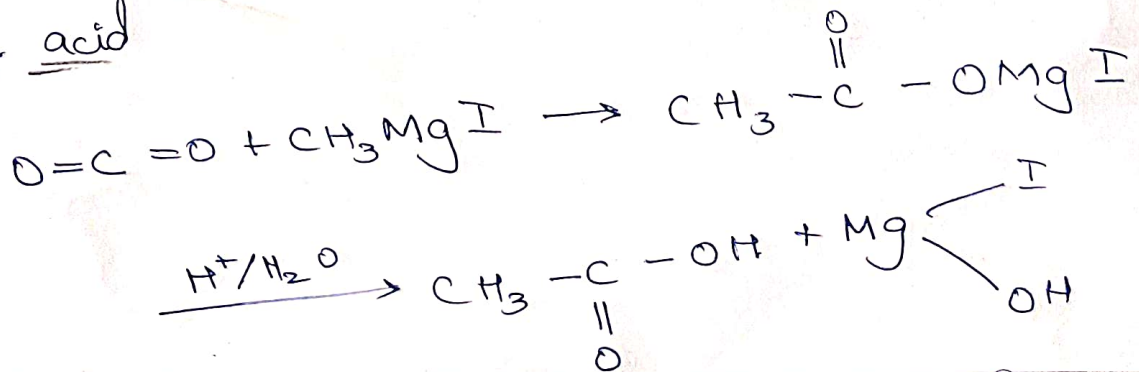
$= \dfrac{14 \times 0.1 \times 30}{0.3}$

$\boxed{= 14 \%}$

32.

i) Acetone

$CH_3 - \overset{O}{\overset{\|}{C}} - O - C_2H_5 + CH_3 Mg I \longrightarrow CH_3 - \underset{CH_3}{\overset{OMgI}{\overset{|}{\underset{|}{C}}}} - OC_2H_5$

$\xrightarrow{H_2O/H^+} CH_3 - \overset{O}{\overset{\|}{C}} - CH_3 + Mg \overset{I}{\underset{O C_2H_5}{\diagdown}}$

ii) Acetic acid

$O = C = O + CH_3 Mg I \longrightarrow CH_3 - \overset{O}{\overset{\|}{C}} - OMg I$

$\xrightarrow{H^+/H_2O} CH_3 - \overset{}{\underset{\overset{\|}{O}}{C}} - OH + Mg \overset{I}{\underset{OH}{\diagdown}}$

3-m
Comp

33.

		12			
C	34.6%	12	$\dfrac{34.6}{12} = 2.88$	$\dfrac{2.88}{2.88} = 1$	1
H	3.85%	1	$\dfrac{3.85}{1} = 3.85$	$\dfrac{3.85}{2.88} = 1.335$	4
O	61.55%	16	$\dfrac{61.55}{16} = 3.85$	$\dfrac{3.85}{2.88}$	4

$= C_3H_4O_4$