

சிந்தி செயல்படுத்தி கற்றுக்கொள், கற்றுக்கொள்
 உயர்நிலைப்பள்ளி கல்விப்பேரறிவு

QUARTERLY EXAMINATION - 2023	Exam No.
Time: 3-00 Hrs.	XI - CHEMISTRY
	Marks : 70

PART - I

Note : 1) Answer all the questions.

2) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer. (15x1=15)

1. 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
2. 7.5g of a gas occupies a volume of 5.6 litres at 0°C and 1 atm pressure. The gas is
 - a) NO
 - b) N₂O
 - c) CO
 - d) CO₂
3. Splitting of spectral lines in an electric field is called
 - a) zeeman effect
 - b) shielding effect
 - c) compton effect
 - d) stark effect
4. Which of the following pairs of d-orbitals will have electron density along have axes?
 - a) d_z² , d_{xy}
 - b) d_{xz} , d_{yz}
 - c) d_z² , d_{x²-y²}
 - d) d_{xy} , d_{x²-y²}
5. Which of the following orders of ionic radii is correct?
 - a) H⁻ > H⁺ > H
 - b) Na⁺ > F⁻ > O²⁻
 - c) F > O²⁻ > Na⁺
 - d) none of these
6. Number of periods in Modern Periodic Table is
 - a) 17
 - b) 7
 - c) 18
 - d) 9
7. The cause of permanent hardness of water is due to
 - a) Ca(HCO₃)₂
 - b) Mg(HCO₃)₂
 - c) CaCl₂
 - d) MgCO₃
8. In a reversible process, the change in entropy of the universe is
 - a) >0
 - b) ≥ 0
 - c) <0
 - d) =0
9. Which law of thermodynamics is known as the law of conservation of energy
 - a) zeroth law
 - b) first law
 - c) second law
 - d) third law
10. The value of gas constant R is
 - a) 0.082 dm³ atm
 - b) 0.987 cal mol⁻¹ k⁻¹
 - c) 8.3 J mol⁻¹ k⁻¹
 - d) 8 erg mol⁻¹ k⁻¹
11. If K_b and K_f for a reversible reaction are 0.8 x 10⁻⁵ and 1.6x 10⁻⁴ respectively, the value of equilibrium constant is,
 - a) 20
 - b) 0.2x10⁻¹
 - c) 0.05
 - d) none of these
12. The IUPAC name of the compound CH₃ - CH = CH - C ≡ 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
13. CH₃ - O - C₃H₇ and C₂H₅ - O - C₂H₅ The above compounds are the example of the following
 - a) Metamerism
 - b) Position Isomerism
 - c) Functional Isomerism
 - d) Chain Isomerism
14. Which of the following groups has highest +I effect
 - a) CH₃ -
 - b) CH₃ - CH₂ -
 - c) (CH₃)₂ - CH
 - d) (CH₃)₃ - C -
15. The geometrical shape of carbocation is
 - a) linear
 - b) tetrahedral
 - c) planar
 - d) pyramidal

PART - II**(6x2=12)****Note: Answer any 6 questions. Question No. 24 is compulsory.**

16. Distinguish between oxidation and reduction.
17. State Pauli Exclusion principle.
18. What is effective nuclear charge.
19. Differentiate Hardwater and softwater.
20. State Dalton's Law of partial pressure.
21. What are state and path functions?
22. Write any four of characteristic properties of organic compounds.
23. Write a short note on Resonance.
24. What is the relationship between K_p and K_c . Give one example for which K_p is equal to K_c .

PART - III**(6x3=18)****Note: Answer any 6 questions. Question No. 33 is compulsory.**

25. Define equivalent mass.
26. Write short notes on diagonal relationship.
27. What are the uses of heavy water?
28. Distinguish between diffusion and effusion.
29. What is the Kelvin-Planck statement of Second Law of Thermodynamics?
30. Why is the chemical equilibrium considered as the dynamic equilibrium?
31. Give the IUPAC names of the following compounds.
 - i) $(CH_3)_2CH - CH_2 - CH(CH_3) - CH(CH_3)_2$
 - ii) $CH_3 - \underset{\substack{| \\ CH_3}}{CH} - \underset{\substack{| \\ Br}}{CH} - CH_3$
 - iii) $CH_3 - O - CH_3$
32. Write a note on homologous series.
33. Define orbital. What are the n and l values for $3p_x$ and $4d_{x^2-y^2}$ electron?

PART - IV**(5x5=25)****Note: Answer all the questions.**

34. a) Explain Bohr's Atomic model.

(OR)

 b) Balance the following equation by oxidation number method.

$$FeSO_4 + KMnO_4 + H_2SO_4 \rightarrow Fe_2(SO_4)_3 + MnSO_4 + K_2SO_4 + H_2O$$
35. a) (i) Derive de-Broglie's equation. (3)
(ii) State Hund's rule. (2)

(OR)

 b) State the trends in the variation of electronegativity in group and period.
36. a) How is hydrogen prepared by electrolysis.

(OR)

 b) i) Derive ideal gas equation. (3)
ii) State Graham's Law of diffusion. (2)
37. a) List the characteristics of internal energy.

(OR)

 b) Derive the equilibrium constants for HI formation reaction.
38. a) Explain constitutional isomers with example.

(OR)

 b) Write short notes on
 - i) Inductive Effect (3)
 - ii) Electromeric Effect (2)

QUARTERLY EXAMINATION 2023
PUDUKOTTAI DT
1ST STANDARD
CHEMISTRY
Question and Answer Key

சிறப்பு மெல் கிணைப்பினி
கல்யாணி, புதுக்கோட்டை-DT

Kallur 622 209 Pudukottai.Dt
Cell 9789724276

PART I Choose the Correct Answer (Please see Answer in the question Paper marked above)

PART II

6x2=12

Answer any 6 questions

16. Distinguish between oxidation and reduction.

Oxidation

Reduction

1. Removal of electron

1. Addition of electron

2. Positive charge increases

2. Negative charge increases

3. Addition of oxygen or Removal of Hydrogen

3. Addition of hydrogen or removal of Oxygen

17. State and explain Pauli's exclusion principle.

"No two electrons in an atom can have the same set of values of all four quantum numbers." Eg. For the electron in Helium [He]₂

Value of Quantum number	Ist electron	IInd electron
n	1	1
l	0	0
m	0	0
s	+½	-½

18. What is effective nuclear charge

The net nuclear charge experienced by the valence electron in the outermost shell is called as effective nuclear charge

Effective Nuclear charge $Z_{\text{eff}} = Z - S$

Z = atomic number

S = Shielding constant

19. Differentiate Soft water and Hard water

• Water free from calcium and magnesium salts is called soft water.

- Water containing chlorides and sulphate of magnesium & calcium ions is called as Hard water.

20. Dalton law of Partial pressure

The total pressure of a gaseous mixture is equal to the sum of the partial pressure of the gases present in the mixture.

$$P_{\text{Tot}} = p_1 + p_2 + p_3 + \dots$$

P_{Tot} = Total pressure $p_1 + p_2 + p_3$ = Partial pressure

21. Define Path function

A Path function is a thermodynamic property of a system whose value depends on the path by which the system changes from its initial to final state. Eg. Work and Heat.

Define state function

A state function is a thermodynamic property of a system whose value does not depend on the path by which the system changes from its initial to final state. Eg. P, V and T

22. What are the Characteristics of Organic compounds.

- They are covalent compound of carbon.
- They are insoluble in water but soluble in organic solvents like

Benzene

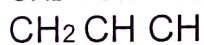
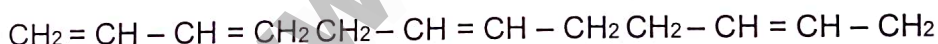
- They are highly flammable
- They have low melting and boiling points.
- They have characteristic functional groups.
- They form isomerism
- They form Homologous series.

23. Write short note on Resonance

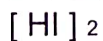
The same molecular formula different structure delocalised

Are called Resonance

The resonance structures in 1,3-Butadiene



24. Write the Equilibrium constant K_c for the following reactions-



$$K_c = \frac{[\text{H}_2][\text{I}_2]}{[\text{HI}]^2}$$

$$np - nr = 0$$

PART III

6x3=18

Answer any 6 questions

25. Define equivalent mass.

Gram equivalent mass of an element, compound or ion is the mass that combines or displaces 1.008 g hydrogen or 8 g oxygen or 35.5 g chlorine.

2617. Define Diagonal relationship

The similarities in the properties between the diagonally present elements are called as Diagonal relationship.

Eg Li and Mg have same properties.

Example Be B C

lithium and magnesium

have similar properties Li

Na Mg Al Si

27. Give the uses of Heavy Water

- It is used as **Moderators** in Nuclear reactor.
- It is used as **tracer** element to study the mechanisms of organic reactions.
- It is used as **coolant** in nuclear reactors to absorb the heat.

28 Give the difference between diffusion and Effusion

Diffusion

The movement of the gas molecules through another gas from high concentration to low concentration is called as Diffusion.

Effusion

The movement of the gas molecules through a small hole from high concentration to low concentration is called as Effusion

29. Give Kelvin Plank statement of second law of thermodynamics.

"It is impossible to construct an engine which operated in a complete cycle will absorb heat from a single body and convert it completely to work without leaving some changes in the working system"

30. Why chemical equilibrium is considered as dynamic equilibrium (OR)
(What is Dynamic Equilibrium)

At equilibrium the forward and the backward reactions will *proceed at the same rate*. So no macroscopic changes is observed.

31. i) 3 methyl 2 Bromo Butane ii) Methoxy Methane iii) 2,3,5 tri methyl Hexane

32. Write a note on homologous series.

- A series of organic compounds each containing a characterised functional group and the successive members differ from each other in molecular formula by a - CH₂- group is called homologous series.
- Eg. **Alkanes**: Methane (CH₄), Ethane (C₂H₆), etc.. **Alcohols**: Methanol (CH₃OH), Ethanol (C₂H₅OH) etc..
- Alkanes C_nH_{2n+2}, Alkenes C_nH_{2n}, Alkynes C_nH_{2n-2}
- They show regular gradation in physical properties but have almost similar chemical property

33. Define orbital? what are the n and l values for 3p_x and 4d_{x²-y²} electron?

Orbital is a three dimensional space which the probability of finding the electron is maximum

3p_x orbital n = 3 & l = -1
 4d_{x²-y²} orbital n = 4 & l = -2

PART IV

Answer the following questions

5x5=25

34. Explain Bohr atomic Model Theory

i) The energy of electron is quantized

ii) The electron move around nucleus in circular path is called as stationary orbit

iii) The angular momentum of electron is given by

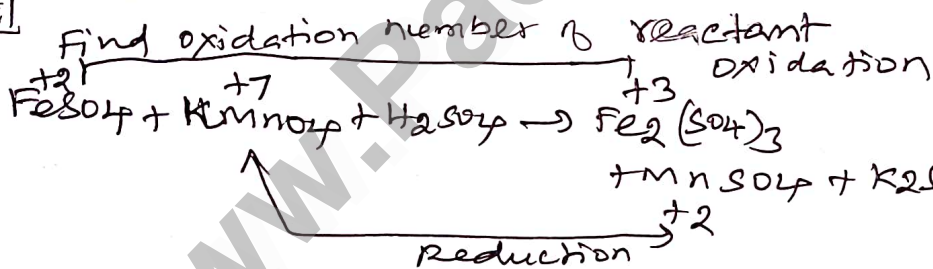
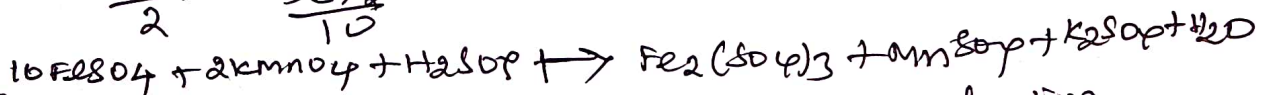
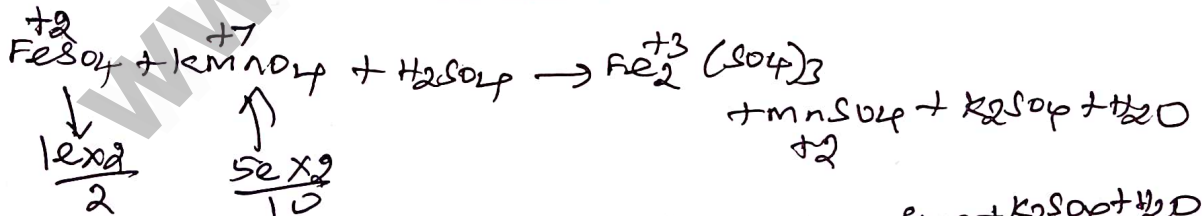
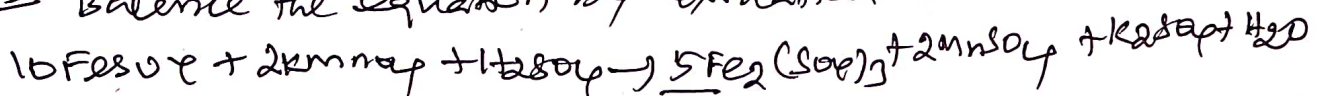
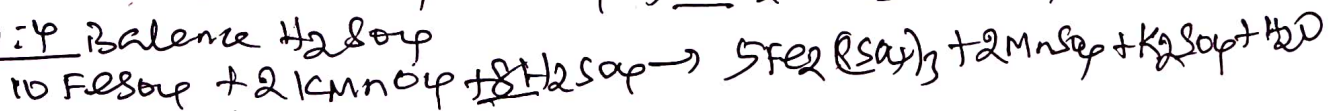
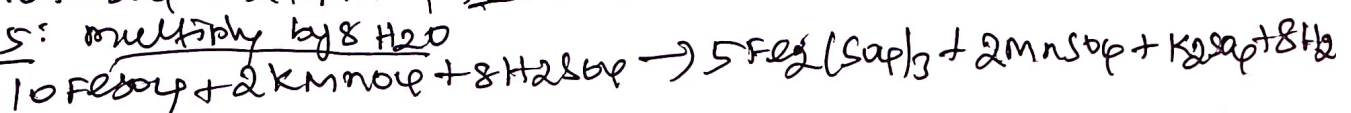
$$mvr = nh/2\pi \quad n=1,2,3$$

iv) As long as electron fixed orbit it will not lose energy, But if the electron jump from higher level to lower energy level it will emit energy radiation.

$$V = E_2 - E_1 / h$$

iv) If energy supplied electron jump from lower energy level to higher energy level

35. Balance the following equation

Step:1Step:2Step:3 Balance the equation by oxidation reductionStep:4 Balance H₂SO₄Step:5 multiply by 8 H₂O

35 Derive Debroglie euation

$$E=MC^2 \text{ -----(1)}$$

$$E= h v \text{ -----(2)}$$

$$h v=MC^2 \text{ -----(3)}$$

$$v =c/ \lambda$$

$$h c/ \lambda=MC^2 \text{ -----(4)}$$

$$\lambda =h / mc \text{ -----(5)}$$

(or)

$$\lambda =h / mv$$

$$\lambda =h / p$$

ii)State Hunds Rule**hund's rule of maximum multiplicity**

It states that electron pairing in the degenerate orbitals does not take place until all the available orbitals contain one electron each.

Ex :- Electronic configuration of Carbon $1\uparrow 1\downarrow 1\uparrow 1\downarrow$
 $1s^2 2s^2 2p_x^1 2p_y^1$

(or)**b)State Trend variations electronegativity in period and group**

electron negativity and explain the variation in the periodic table.

Electro negativity is a tendency of a element present in covalent molecule to attract the shared pair of electrons towards itself.

Along the Group : It decreases along the group.

- As we move down the group the nuclear charge decreases
- The atomic size increases.
- Along the period : It increases along the period

Reason

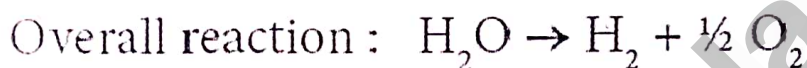
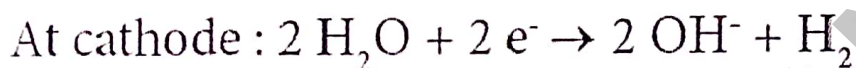
- As we move along the period the nuclear charge increases
- The atomic size decreases.
- The attraction between the valence electron and the nucleus

Increases

36 Explain the electrolysis method of preparing Hydrogen
Hydrogen is prepared by the electrolysis of water containing small amount of NaOH.

Anode = Nickel

Cathode = Iron



(Or)

Derive Ideal gas equation

Derive the ideal gas equation

1

Boyles law $V \propto \frac{1}{P}$

Charles law $V \propto T$

Avogadro law $V \propto n$

nT

$V \propto \frac{nT}{P}$

$P = \frac{nRT}{V}$

V

$PV = nRT$

P=Pressure R=Gas constant T=Temperature V=Volume

ii) State Grahams Law of diffusion

The Rate of diffusion of a gas is inversely proportional to the square root of the molar mass.

Rate of Diffusion (r) $\propto \frac{1}{\sqrt{M}}$

37 List the Characteristics of internal energy

- Internal energy is an extensive property. It depends on the mass of the substance.
- Internal energy is a state function. It depends on T, P and V of the

system.

- The change in the internal energy is given by

$$\Delta U = U_f - U_i$$

U_f = internal energy of the final state

U_i = internal energy of the initial state

- If $U_f > U_i$ then $\Delta U = U_f - U_i =$ Positive

- If $U_f < U_i$ then $\Delta U = U_f - U_i =$ Negative

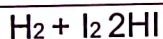
- For a cyclic process, $\Delta U =$ Zero

(Or)

Derive the relation between K_p and K_c for the formation of HI

Content $H_2 + I_2 \rightleftharpoons 2HI$

	H_2	I_2	$2HI$
Initial number of moles	a	b	0
Number of moles reacted	x	x	0
moles remaining	a-x	b-x	2x
Equilibrium concentration	$\frac{a-x}{V}$	$\frac{b-x}{V}$	$\frac{2x}{V}$



$$[HI]^2$$

$$K_c = \frac{[HI]^2}{[H_2][I_2]} \quad (1)$$

$$[H_2][I_2]$$

Substitute the concentration values in eqn (1)

$$\frac{2x \times 2}{V}$$

$$V$$

$$K_c = \frac{[HI]^2}{[H_2][I_2]}$$

$$\frac{(a-x)}{V} \times \frac{(b-x)}{V}$$

$$V \quad V$$

$$K_c = \frac{\frac{4x^2}{V_2}}{(a-x)(b-x)}$$

$$K_c = \frac{4x^2}{V_2} \times \frac{V_2}{(a-x)(b-x)}$$

$$K_p = K_c = \frac{4x^2}{(a-x)(b-x)}$$

$$n = n_2 - n_1$$

$$n = 2 - 2 = 0$$

$$n = \text{Zero}$$

$$K_p = K_c (RT)^{-n}$$

$$K_p = K_c (RT)^0$$

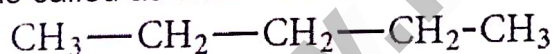
$$K_p = K_c$$

38 Explain the various Structural or Constitutional isomers in organic compounds.

Structural or Constitutional isomers are isomers have same molecular formula but different bonding sequence. There are 6 types.

a) Chain Isomerism

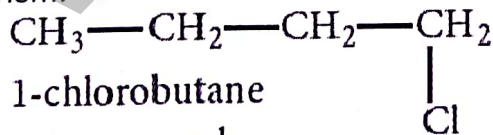
Compounds have same molecular formula but different carbon skeleton is called as chain isomerism.

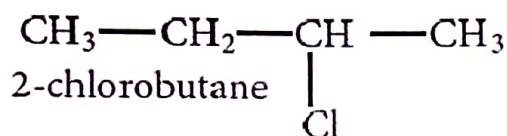


n-Pentane

b) Position isomerism

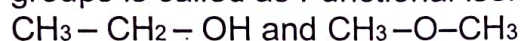
Compounds have same molecular formula and same carbon skeleton but different position of the functional groups is called as Position isomerism.





c) Functional isomerism

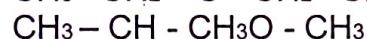
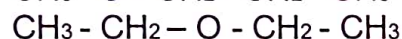
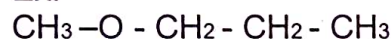
Compounds have same molecular formula but different Functional groups is called as Functional isomerism.



d) Metamerism

Compounds have same molecular formula but different alkyl groups on either side of the functional group is called as Metamerism

Ex.

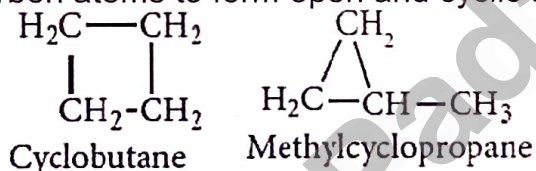


e) Tautomerism

When a single compound exists in two inter convertible structures that differ in the position of at least one atom is called as Tautomerism

f) Ring Chain Isomerism

Compounds having same molecular formula but different bonding of carbon atoms to form open and cyclic structures



(Or)

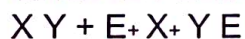
Explain Electrometric effect

Electro metric effect is a temporary effect in unsaturated compounds, in the presence of an attacking reagent.

There are two types

a) Positive Electrometric effect (E+)

When the electrons are transferred towards the attacking reagent , it is called as Positive Electrometric effect



b) Negative Electrometric effect (E-)

When the electrons are transferred away from the attacking reagent , it is called as Negative Electrometric effect



What are the types of Mesomeric effect

a) Positive Mesomeric effect.

When the electrons move away from the group attached to the conjugated system it is called as Positive Mesomeric effect. Ex. $-\text{OH}$

b) Negative Mesomeric effect.

When the electrons move towards the group attached to the conjugated system it is called as Negative Mesomeric effect. Ex. $-\text{COOH}$

Wish You All Success

Dr.C.A.R

Post Graduate Teacher Chemistry

Gov Hr Sec School

Kallur 622 209 Pudukottai.Dt

Cell 9789724276