Version No.			

ROLL NUMBER						

Answer Sheet No._____

Sign. of Candidate _____

Sign. of Invigilator _____

CHEMISTRY SSC–I (3rd Set)

SECTION – A (Marks 12)

Time allowed: 20 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. **Do not use lead pencil.**

Q.1 Fill the relevant bubble for each part. Each part carries one mark.

(1) Predict the oxidation number of Chromium in $K_2Cr_2O_7$ is:

A. +2 ◯ B. +3 ◯

C. +5 ◯ D. +6 ◯

(2) Identify which one of the following is **NOT** amorphous solid:

A. Rubber ◯ B. Glass ◯

C. Table Sugar ◯ D. Plastic ◯

(3) Predict which one of the following halogen has the lowest electronegativity?

A. Iodine ◯ B. Bromine ◯

C. Chlorine ◯ D. Fluorine ◯

(4) Name the element which has electronic configuration $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$:

A. Calcium ◯ B. Magnesium ◯

C. Neon ◯ D. Argon ◯

(5) Elements of the same group have same valence shell electronic configuration. Predict which one of the following pair of elements has similar chemical properties:

A. K, Cr ◯ B. Cu, Ca ◯

C. F, Cl ◯ D. N, O ◯

(6) The amount of NaOH required to prepare 0.5 M solution is:

A. 20g ◯ B. 30g ◯

C. 40g ◯ D. 80g ◯

(7) Name the process by which metal lose electron:

A. Electroplating ◯ B. Electrolysis ◯

D. Electronegativity ◯ D. Electropositivity ◯

(8) Identify which one of the following is a formula unit:

A.	NaCl	◯	B.	H_2O	◯
C.	HCl	◯	D.	HNO_3	◯

(9) Predict the mass number of an atom depend upon:

A.	Only protons	◯
B.	Neutron and Electron	◯
C.	Electron and Proton	◯
D.	Proton and Neutron	◯

(10) Predict which is cause of shielding effect in elements:

A.	Neutrons	◯	B.	Protons	◯
C.	Inner Electrons	◯	D.	Reduction in effective nuclear change	◯

(11) Identify which one of the following is an example of milk:

A.	Solution	◯	B.	Colloid	◯
C.	Suspension	◯	D.	Compound	◯

(12) Identify the bond present in HCN.

A.	Polar-covalent bond	◯
B.	Ionic bond	◯
C.	Non-polar covalent bond	◯
D.	Metallic bond	◯

CHEMISTRY MODEL QUESTION PAPER (3rd SET SOLUTION)
SSC-I
SECTION A

Q1: MCQs

1	2	3	4	5	6	7	8	9	10	11	12
D	C	A	D	C	A	D	A	D	C	B	A

SECTION – B (Marks 33)

Q.2 Attempt any **ELEVEN** parts from the following. All parts carry equal marks.

$(11 \times 3 = 33)$

i. Differentiate between analytical and physical chemistry (at least two).

Answer:

Analytical Chemistry

It is the branch of chemistry which deals with qualitative and quantitative analysis of substances. For example, study of soil components.

Physical Chemistry:

Physical Chemistry is the branch of chemistry that deals with the laws and theories to understand the structure and physical and chemical changes of matter. Such as laws of gases, properties of solids etc.

ii. Explain the method of preparation of 0.5M NaOH in $100cm^3$ solution from 1M NaOH.

Answer: Given Data

Molarity of stock solution of NaOH= M_1 = 1M
Molarity of dilute solution of NaOH to be prepared = M_2 = 0.5 M
Volume of the dilute solution of NaOH = $100cm^3$
Volume of the stock solution = V1 = ?

Using dilution formula, a dilute solution can be prepared from a stock solution.

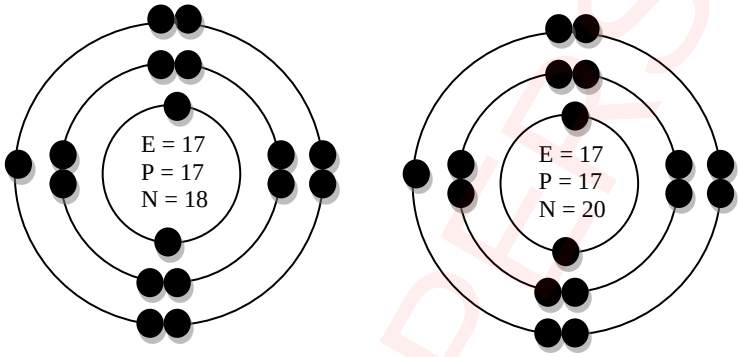
Therefore $M_1 \times V_1 = M_2 \times V_2$

$$V_1 = \frac{M_2 \times V_2}{M_1} = \frac{0.5M \times 100cm^3}{1M} = 50\ cm^3$$

Thus, it is evident that by taking 50 cm^3 of the stock solution and transferring it to a volumetric flask of 100 cm^3 and making it up to the mark give rise to 0.5M dilute solution of NaOH.

iii. Draw the structure of isotopes of chlorine.

Answer: Isotopes of Chlorine



iv. Briefly explain octet and duplet rule with example.

Answer:

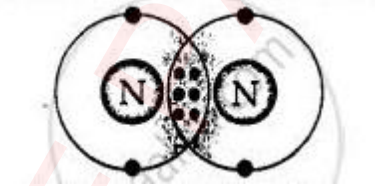
Duplet Rule

The tendency of atoms to acquire two electron configurations in their valence shell during chemical bonding is called duplet rule.

Each hydrogen share one electron so in a molecule it becomes two electrons.

Octet Rule:

The tendency of atoms to acquire eight electron configurations in their valence shell during chemical bonding is called octet rule. Most of the elements have incomplete octet, they form bond to complete their octet such as Nitrogen needs three electrons to complete its octets. So each N atom shares three unpaired electrons with another one to complete its octet.



v. Identify the characteristic of ionic compounds.

Answer: Properties of Ionic Compounds

a) Ionic bond is a very strong bond, therefore, ionic compounds have high melting point.
b) Ionic compounds form crystals.
c) Ionic compounds do not conduct electricity in a solid-state but they do conduct electricity in the molten state.

vi. Demonstrate diffusion and effusion of the gasses with the help of examples.

Answer:
Diffusion:
Diffusion is defined as spontaneous mixing up of molecules by random motion to form a homogeneous mixture. Diffusion occurs due to difference in concentration.
Examples: We can smell perfume because it diffuses into the air.

Effusion:
The escape of molecules of gases through a tiny hole is called effusion. For example when a tyre gets punctured, air effuses out.

vii. Differentiate between saturated and unsaturated solutions (at least two).

Answer:

S.No	Unsaturated Solution	Saturated Solution
01	Unsaturated solutions are solutions in which the amount of dissolved solute is less than the saturation point of the solvent at a specific temperature.	Saturated solutions are the solutions in which the amount of dissolved solute at a specific temperature is equal to the saturation point of the solvent.
02	More solutes can be dissolved at the same temperature.	More solutes cannot be dissolved at the same temperature.

viii. Describe the formation of solution by mixing solid into gases with example.

Answer: Solid particles released into the air get mixed with air forming a solid-gas solution. For example, carbon particles from different sources released into the air such as smoking.

ix. State the common rules for assigning the oxidation number.

Answer:
Common Rules For Assigning Oxidation Number

a. The oxidation number of elements in a free or uncombined state is always zero. For example, the oxidation state of all free state elements like Cl_2, H_2, Zn, Na, and Mg, etc are zero.
b. The oxidation number of a single ion is the same as the charge on ions. For example**,** the oxidation states of Na^{+},Ca^{+2},Cl^{-}, Al^{3+}, and S^{2-} are (+1),(+2),(-1),(+3), and (-2) respectively.
c. The oxidation number of hydrogen in all of its compounds is (+1), but if hydrogen is linked with metals, then the oxidation state of hydrogen is seen as (-1). For example, in HCl, the oxidation number of hydrogen is (+1).
d. The oxidation number of each of the atoms in a molecule is counted individually and their algebraic sum is zero. For example, In $KClO_3$.
   Using formula:
   $KClO_3$
   $+1 + x -2 \times 3 = 0$
   $X = 5$
   Hence, oxidation state of Cl is +5. And of $KClO_3$ is zero.

x. List three uses of electrolytic cells.

Answer:
Uses of electrolytic cell

a. Electrolysis is used in the extraction of metals from their ores.
b. It is used for refining certain metals such as copper and zinc.
c. Electrolysis is used for the manufacture of chlorine gas.
d. Electrolysis is used for electroplating many things we use every day.

xi. Write down the oxidation and reduction reaction in voltaic cell at Anode and Cathode.

Answer:
Reactions in Voltaic Cell
Reaction at the Anode:

$Zn/ZnSO_4$ half cell, oxidation reaction occurs at the anode.

$$Zn^{\circ} \longrightarrow Zn^{2+} + 2e^{-} \quad \text{(oxidation)}$$

Reaction at the Cathode

Cu/CuSO4 half-cell, reduction reaction occurs at the cathode.

$$Cu^{2+} + 2e^{-} \longrightarrow Cu^{\circ} \quad \text{(reduction)}$$

xii. Show how cations and anions are related to term metals and nonmetals.

Answer:
Metals have least number of valence electrons. Therefore, they always tend to lose electron forming cations. For example, Na has only one electron in its valence shell, so it will lose only one electron.

$$Na \longrightarrow Na^{+} + 1e^{-}$$

However, non-metals require least number of electrons to fill their valence shell, therefore, when they acquire electron (s), they form anions.

$$Cl + 1e^{-} \longrightarrow Cl^{-}$$

xiii. Briefly describe why alkali metals are not found in free state in nature.

Answer: Alkali metals are highly reactive because of single valence electron with least ionization energy value. For example, if sodium metal is exposed to air, it reacts violently with the oxygen present in the air forming sodium oxide. That is the reason that Na is preserved in Kerosene oil to avoid contact with the air. Thus it is clear that all alkali metals form bonds with other elements to acquire stability and are not found in free state naturally.

xiv. Tabulate soft and hard metals with suitable examples.

Answer:

Soft Metals	Hard Metals
Soft metals are those metals which can be cut and easy to dent, work, or cut without shattering and affecting its malleability. Sodium metal is soft enough to be cut with a knife. Potassium is also a soft metal. The cohesive forces between atoms of these metals are very weak. Thus the metals have a soft texture. Other examples of soft metal include gold, silver, aluminum, lead etc.	Hard metals are those which cannot be easily cut. Since hardness is the resistance to deformation. They exhibit signs of high density and a tolerance of high temperatures. Therefore, these metals have stable physical formation. Metallic bond in such metals is stronger as compare to the soft metals. Examples of hard metals are Tungsten, Iridium, Chromium, Osmium.

xv. List the commercial value of silver, gold and platinum.

Answer:
Uses of Gold
It is used as an ornamental metal, gold coins etc.

Uses of Silver
Alloys of silver with copper are widely used in making coins, silver-ware and ornaments.

Uses of Platinum
An alloy of platinum, palladium and rhodium is used as catalyst in automobiles as catalytic convertor.

SECTION - C

Q.3 a. Differentiate between oxidation and reduction in term of oxygen and hydrogen with equations.

Answer:

Oxidation	Reduction
Oxidation can be defined as addition of Oxygen. $2Cu + O_2 \rightarrow 2CuO$ Copper is oxidized in above reaction.	Reduction can be defined as addition of Hydrogen. $Cl_2 + H_2 \rightarrow 2HCl$ Chlorine is reduced in above reaction.
Oxidation can also be defined as removal of Hydrogen. $CH_4 + H_2 \rightarrow CO_2 + H_2O$ Carbon is oxidized in above reaction.	Reduction can also be defined as removal of Oxygen. $CuO + H_2 \rightarrow Cu + H_2O$ Copper is reduced in above reaction.

Q3 (b) Identify the relationship between electronic configuration and the position of an element in the periodic table. $_{19}K^{39}$,$_{17}Cl^{35}$and $_{16}S^{32.}$

Answer:

$_{19}K^{39}$

Electronic Configuration: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$
Total No. of Shells = 4
It belongs to period 4.
Total No. of Electrons in valance shell = 1
It belongs to group I-A.

$_{17}Cl^{35}$

Electronic Configuration: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$
Total No. of Shells = 3
It belongs to period 3.
Total No. of Electrons in valance shell = 7
It belongs to group VII-A.

$_{16}S^{32}$

Electronic Configuration: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$
Total No. of Shells = 3
It belongs to period 3.
Total No. of Electrons in valance shell = 6
It belongs to group VI-A.

Q4 (a) Define empirical and molecular formula. Show the formation of empirical formula from molecular formula of the given compounds: $C_6H_{12}O_6$, $C_8H_{16}O_2$ and $C_{12}H_{22}O_{11}$.

Answer:

Empirical Formula:

Formula showing simple whole number ratio of atoms in the compound is called empirical formula.
Molecular Formula:

Formula showing actual number of atoms in any compound is called molecular formula.

i) Molecular Formula: $C_6\,H_{12}\,O_6$
C : H : O
6 : 12 : 6
1 : 2 : 1
Empirical Formula: $C\,H_2\,O$

ii) Molecular Formula: $C_8\,H_{16}\,O_2$

C : H : O
8 : 16 : 2
4 : 8 : 1

Empirical Formula: $C_4 H_8 O$

iii) Molecular Formula: $C_{12} H_{22} O_{11}$

C : H : O
12 : 22 : 11
(Cannot be simplified any further)

Empirical Formula: $C_{12} H_{22} O_{11}$

Q4 (b) Compare the physical state of matter with regards to intermolecular forces between them.

Answer:

SOLID	**LIQUID**	**GAS**
Particles have strong intermolecular forces.	Particles have intermediate intermolecular forces.	Particles have weak intermolecular forces.
Due to strong intermolecular forces, particles are very close.	Due to intermediate intermolecular forces, particles are little far.	Due to weak intermolecular forces, particles are far away.
Due to strong intermolecular forces, particles have fixed position.	Due to intermediate intermolecular forces, particles do not have fixed positions.	Due to weak intermolecular forces, particles move randomly in all directions.

Q5 (a) Use the rule that "like dissolves like" Describe dissolution of KCl in water with the help of diagram.

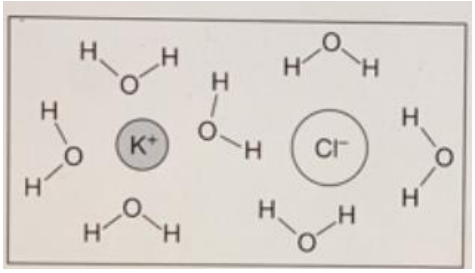
Answer:

When KCl is put in water, it immediately splits into K^+ and Cl^- .

$$KCl \rightleftharpoons K^+ + Cl^-$$

Water, H_2O, is a polar molecule, and has partial positive $^+\delta$ and negative charges $^-\delta$. The hydrogens on water are partially positive, and the oxygen on water is partially negative.

Since opposite charges attract each other. So the oxygen of the water molecules are attracted to the K^+, and the hydrogens are attracted to the Cl^-. The water actually surrounds the K^+ and Cl^- so that the opposite charges are allowed to be close together to form hydrate and process is called hydration (solvation). That is why KCl is dissolved in water.



Q5 (b) How will you discuss the reactivity of halogens by using following reactions:

i) $KI + Br_2 \longrightarrow 2KBr + I_2$

ii) $KBr + Cl_2 \longrightarrow 2KCl + Br_2$

Answer:

$F_2 > Cl_2 > Br_2 > I_2$

Oxidizing power of F_2 is highest and that of I_2 is lowest.

$KI + Br_2 \rightarrow 2KBr + I_2$

I_2 cannot oxidize any of halide ion whereas Br_2 can oxidize I^{-1} ion.

$KBr + Cl_2 \rightarrow 2KCl + Br_2$

Cl_2 is a better oxidizing agent than Br_2. It can oxidize both Br^{-1} and I^{-1}.