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Answer Sheet No._____

Sign. of Candidate _____

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CHEMISTRY SSC–I

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) Which one of the following charged ions will be formed by an element of group IIA having electronic configuration $1s^2\ 2s^2\ 2p^6\ 3s^2$?

A. A^{+3} ◯ B. A^{+2} ◯

C. A^{+1} ◯ D. A^{-2} ◯

(2) Which one of the following pairs of subshell has the lowest energy as compared to other pairs of subshells?

A. 1s,2s ◯ B. 2s,2p ◯

C. 3s, 3p ◯ D. 3s, 4s ◯

(3) Which one of the following Isotopes is used in nuclear reactors?

A. U-234 ◯ B. U-238 ◯

C. U-235 ◯ D. U-233 ◯

(4) How many molecules of oxygen gas contains one mole of oxygen gas?

A. $8 \times 6.022 \times 10^{23}$ ◯

B. 6.022×10^{23} ◯

C. $32 \times 6.022 \times 10^{23}$ ◯

D. $16 \times 6.022 \times 10^{23}$ ◯

(5) The variable that is kept constant in Charles' Law is:

A. Temperature ◯ B. Volume ◯

C. Pressure ◯ D. Volume & Temperature ◯

(6) The most dilute solution amongst the following is:

A. 1M ◯ B. 0.5 M ◯

C. 0.02M ◯ D. 0.0005M ◯

(7) Pressure Cooker works on the principle of relationship of boiling point with:

A. External Pressure ◯ B. Evaporation ◯
C. Boyle's law ◯ D. Volume ◯

(8) 17g of NH_3 is dissolved in 1 dm^3 of solution, its molarity will be:

A. 1 ◯ B. 2 ◯
C. 3 ◯ D. 4 ◯

(9) In H_2S, the oxidation state of Sulphur is:

A. +1 ◯ B. + 2 ◯
C. - 1 ◯ D. -2 ◯

(10) The compound having Hydrogen bonding among its molecule is:

A. C_6H_6 ◯ B. MgO ◯
C. CH_4 ◯ D. H_2O ◯

(11) Metallic Character increases down the group, which one of the following is the most metallic:

A. Rb ◯ B. Cs ◯
C. Na ◯ D. K ◯

(12) The most electronegative element in the group VIIA is:

A. F ◯ B. Cl ◯
C. Br ◯ D. I ◯

MCQ'S KEY

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

Federal Board SSC-I Examination
Chemistry Model Question Paper
(Curriculum 2006)

SECTION – B (Marks 33)

Q. 2

i. Calculate the number of molecules in 4.5 moles of Carbon dioxide.

Ans. **Data:**

Number of moles of CO_2 = 4.5

Number of molecules = ?

Number of molecules = Number of moles × Avogadro's number

Number of molecules = $4.5 \times 6.022 \times 10^{23}$

= 2.71×10^{29}molecules

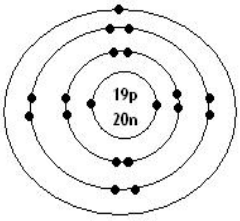
ii. Draw Bohr's Atomic Model for Potassium $_{19}K^{39}$ indicating the location of electrons, protons and neutrons.

Ans. **Bohr's Model of Potassium:**

Number of electrons = 19

Number of protons = 19

Number of neutrons = 20



iii. Calculate the mass of one Hydrogen atom in gram.

Ans. **Mass of one Hydrogen atom in grams:**

Number of atoms = 1

Avogadro's number = 6.022×10^{23}

Atomic/Molar mass = 1.0 g/mol

Mass in "g" = $\frac{\text{Number of atoms} \times \text{MOlar Mass}}{\text{Avogadro's Number}}$

= $\frac{1 \times 1}{6.022 \times 10^{23}}$

= 1.66×10^{-24}g

iv. Why is an atom always electrically neutral? Give reason.

Ans. Protons have a positive charge and electrons have negative charge.A neutral atom has same number of electrons and protons in it. Therefore, the net charge in a atom is equal to zero. This makes an atom electrically neutral.

v. Write electronic configuration of Aluminium $_{13}Al^{27}$. Identify its group and period.

Ans. **Electronic configuration of Aluminium:**

$_{13}Al^{27}$ = $1s^2$, $2s^2$, $2p^6$, $3s^2$, $3p^1$

Group: We can find group by calculating electrons in valence shell. There are three electrons. So, group is IIIA.

Period: 3rd Period

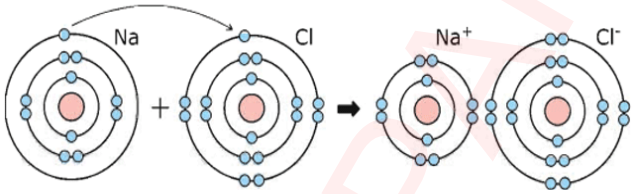
Period can be identified from value of valence shell. Al has 3rd valence shell.

vi. Define ionic bond. Give one example of two elements forming an ionic bond between them.

Ans. **Definition of ionic bond:**

The forces of attraction that bind oppositely charged ions are called ionic bonds.

Example:



$Na + Cl \longrightarrow Na^+Cl^- \xrightarrow{OR} NaCl$

vii. Write two similarities and two differences between isotopes.

Ans. **Two similarities between isotopes:**

i. They have same number of protons.

ii. They have same chemical properties.

Differences:

i. Isotopes have different number of neutrons.

ii. They have different mass numbers.

viii. Elements are unstable in Free State except noble gases. Explain how elements attain stability?

Ans. Atoms attain stability by completing their octet or duplet. They gain or lose electrons to attain stability. They obey octet or duplet rule. Either they tend to acquire two electrons in their valence shell or they tend to acquire eight electrons in their valence shell to attain stability.

ix. State Charles's Law. Derive its mathematical expression.

Ans. **Charles's Law:**

Charles's Law states that volume of given mass of a gas is directly proportional to absolute temperature when pressure is kept constant.

Mathematical Expression:

$V \times T$

$V = KT$

$\frac{V}{T} = K$

$\frac{V_1}{T_1} = K \quad , \quad \frac{V_2}{T_2} = K$

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

x. How does the change in temperature affect the Vapour Pressure of a liquid? Show with the help of graph.

Ans. Vapour Pressure is directly related to temperature Vapour Pressure is increased by increasing temperature as evaporation increases with temperature.

xi. How will you prepare 250 cm^3 of 0.025M Na_2SO_4 solution from a stock solution of 2M Na_2SO_4?

Ans. **Data:**

Volume of stock solution = V_1

Molarity of stock solution = 2M (M_1)

V_2 = 250 cm^3 = 0.25 dm^3

$M_1V_1 = M_2V_2$

$V_1 = \frac{M_2V_2}{M_1}$

$V_1 = \frac{0.025 \times 0.25}{2}$

V_1 = 0.00312 dm^3 = 3.12 cm^3

So, we will 3.12 cm^3 of stock solution and will dilute up to 250 cm^3.

xii. Identify the oxidizing and reducing agents in the following reaction with reason:

(a) $H_2S + Cl_2 \longrightarrow 2HCl + S$

(b) $Mg + 2HCl \longrightarrow MgCl_2 + H_2$

Ans. **(a)** $\overset{+1\times2}{H_2}S^{-2} + Cl_2^0 \rightarrow 2H^{+1}Cl^{-1} + S^0$

Oxidizing agent = Cl_2

Reducing agent = H_2S

H_2S loses it hydrogen and electrons and gives to Cl_2 to reduce Cl_2. So, H_2S is reducing and Cl_2 gain electrons. So, it is oxidizing agent.

(b) $Mg^0 + 2\overset{+1}{H}Cl^{-1} \rightarrow \overset{+2}{Mg}\overset{-1\times2}{Cl}_2 + H_2^0$

Oxidizing agent = HCl ⟶ because HCl gains electrons from Mg to oxidize it.

Reducing agent = Mg

Mg loses electrons to HCl to reduce it. So, it is reducing agent.

xiii. Define corrosion. How is corrosion prevented by cathodic protection?

Ans. **Corrosion:**

Corrosion is slow and continuous eating away of a metal by the surrounding medium. Corrosion is general term and corrosion of iron is called Rusting.

Prevention by cathodic protection:

Cathodic protection is the process in which metal that is to be protected from corrosion is made cathode and is connected to metals such as magnesium and aluminium.

xiv. What is the composition of Aqua Regia? Write its importance.

Ans. Composition of Aqua Regia:

Aqua Regia is composed of 3:1 mixture of HCl and HNO3.

Importance:

- It is used to dissolve gold and platinum.
- It is also used in labs to clean glassware.
- It is used to produce chloroauric acid.

xv. Discuss why is sugar soluble in water but petrol is not?

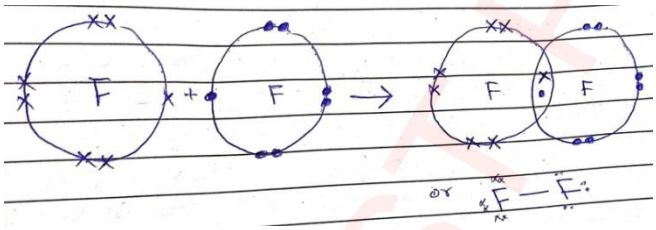
Ans. Sugar is polar and water is also polar. So, sugar is dissolved in water because like dissolve like. Whereas, petrol is non-polar. Polar cannot be dissolved in non-polar. Hence, petrol is not soluble in water.

SECTION – C (Marks 20)

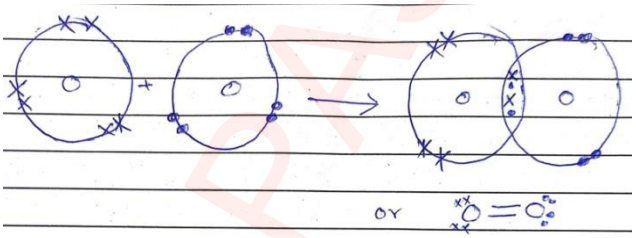
Q. 3 a. What are type of bonds responsible for the formation of F_2, O_2 and N_2? Explain the formation of bond with the help of structures. (2+2+2)

Ans. Covalent bonds are responsible for the formation of F_2, O_2 and N_2. There are non-metals and have high ionization energies. So, they do not gain or lose electrons. They share their electrons to form covalent bonds.

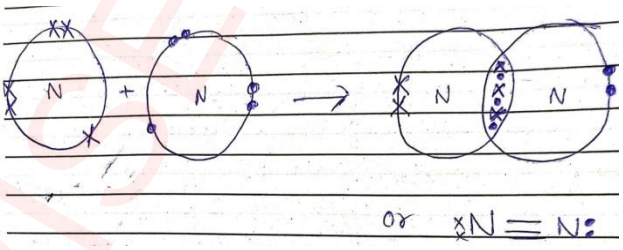
Formation of F_2:



Formation of O_2:



Formation of N_2:



b. Give importance of intermolecular forces in our life. Mention any four points.

Ans. Importance of intermolecular force in daily life (four points):

1. Intermolecular forces are extremely important in determining properties, biological molecules such as proteins, DNA etc. and synthetic materials such as glue, paints, resins etc.
2. The adhesive action of paints and dyes is developed due to hydrogen bonding.
3. Synthetic resins bind two surfaces together by hydrogen bonding or dipole-dipole interactions.

4. Solubility of many materials like salt and sugar in water depends on intermolecular forces of attraction.

Q. 4 a. Explain the principle, working and construction of Daniel Cell with the help of a labelled diagram.

Ans. The principle behind the Daniel Cell is redox reaction. Oxidation and reduction reactions occur in this process.

Working:

The Zn metal has tendency to lose electrons more readily than copper. As a result oxidation takes place at Zn-electrode. The electrons flow from Zn-electrode through the external wire in a circuit to copper electrode.

At anode:

Anode is negatively charged and oxidation of Zn takes place by loss of e^- to form Zn^{+2} ions.

$$Zn + Zn^{+2} \longrightarrow Zn^{+2} + 2e^-$$

At cathode:

Cathode is positively charged and reduction of Cu+2 takes place by gain of $e^-$to form Cu.

$$Cu^{+2} + 2e^- \longrightarrow Cu$$

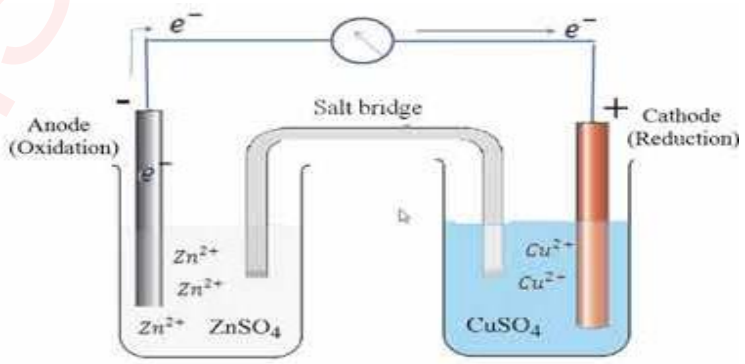
Redox reaction:

$$Zn + Cu^{+2} \longrightarrow Cu + Zn^{+2}$$

Construction:

It consists of two cells, each called as half cell connected externally by a salt bridge. In each of the half cell, an electrode is dipped in 1M solution of its own salt and connected through a wire to an external circuit.

The left half cell consists of an electrode of zinc metal dopped in 1M solution of $ZnSO_4$. The right half cell is a copper electrode dipped in 1M solution of $CuSO_4$. Salt bridge is a U-shaped glass tube. It consists of saturated solution of strong electrolyte (KCl) supported by a jelly type material the ends of the U-tube are sealed with a porous material like glass wool. The function of the salt bridge is to keep the solutions of two half cells neutral by providing a pathway for migration of ions.



b. Write down the trend of ionization energy in the Periodic Table. Explain with reasons.

Ans. Trend of period:

It we move from left to right in a period, the value of ionization energy increases. It is because the size of atoms reduces and valence electrons are held strongly by electrostatic force of nucleus. Therefore, elements on the left side of the periodic table have low ionization energy as compared to those on right side of the periodic table.

Trend in Group:

As we move down the group, more and more shells die between the valence shell and nucleus of the atom, those additional shells reduce the electrostatic force felt by the electrons present in the outermost shell. As a result, the valence shell electrons can be taken away easily. Therefore, ionization energy of elements decreases from top to bottom in a group.

Q. 5 a. Describe Rutherford's Experiment and its conclusions.

Ans. **Rutherford's Experiment:**

Rutherford bombarded a very thin gold foil about 0.00004 cm thickness with ∝-particles. He used ∝-particles obtained from the disintegration of polonium. ∝-particles are helium nuclei that are doubly positively charge (He^{++}). Most of these particles were slightly deflected but one in 01 million was deflected through an angle greater than 90^o from their straight paths. Rutherford preferred a series of experiments using thin foils of others elements. He observed similar results from these experiments.

Conclusions:

1. Since majority of the ∝-particles passed through the foil undeflected, most of the space occupied by the atom must be empty.
2. The deflection of a few ∝-particles through angles greater than 90^o shows that these particles are deflected by electrostatic repulsion between the positively charged ∝-particles and the positively charged part of the atom.
3. Massive ∝-particles are not deflected by electrons.

On the basis of conclusions drawn from these experiments, Rutherford proposed a new model of atom.

b. Why is the boiling point of water at the top of Mount Everest 70°C?

Ans. The boiling point is the temperature at which vapour pressures becomes equal to the atmospheric pressure.

Normally water boils at 100°C because at 100°C the vapour pressure of water becomes equal to atmospheric pressure, but at Mount Everest, atmospheric pressure is lower. The atmospheric pressure at Mount Everest is 34 kPa. So, water will take 70°C to make its vapour pressure equal to external pressure which is 34 kPa. That is the reason, water boils at 70°C at Mount Everest but boils at 100°C at sea level because atmospheric pressure at sea level is 101.325 kPa. So, water will take 100°C to bring its vapour pressure to 101.325 kPa.