Version No.			

ROLL NUMBER						

Answer Sheet No._____

Sign. of Candidate _____

Sign. of Invigilator _____

CHEMISTRY SSC–I (2nd Set Solution)

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) If the pressure of a gas, initially at 760mmHg, is increased to 1520 mmHg then volume of the gas will change from $2dm^3$ to:

A. $1dm^3$ ● B. $2dm^3$ ○
C. $3dm^3$ ○ D. $4dm^3$ ○

(2) The temperature at which vapor pressure of a liquid becomes equal to atmospheric pressure is called boiling point. The boiling point of water on the top of Mount Everest is:

A. 70˚C ● B. 100˚C ○
C. 130˚C ○ D. 150˚C ○

(3) Identify from the following solvents which one is polar and can dissolve compounds having hydrogen bonding.

A. benzene ○ B. ether ○
C. water ● D. petrol ○

(4) Molarity of a solution of NaOH is 1M. How many numbers of moles of NaOH will be present in $250cm^3$ of this solution?

A. 0.25 ● B. 0.5 ○
C. 0.75 ○ D. 1.0 ○

(5) Oxidizing agent is a substance which

A. Reduces itself and oxidizes other substance ●
B. Reduces itself and also reduces other substance ○
C. Oxidizes itself and reduces other substance ○
D. Oxidizes itself and also oxidizes other substance ○

(6) Electrons are filled in four shells, K, L, M and N. L shell has sub-shells

A. 1s ○ B. 2s, 2p ●
C. 3s, 3p, 3d ○ D. 4s, 4p, 4d, 4f ○

(7) Isotopes have same atomic number and different mass numbers. Which radioisotope is used for the diagnosis of tumor in the body?

A. Cobalt-60 ● B. Iodine-131 ○
C. Strontium-90 ○ D. Phosphorus-30 ○

(8) Covalent bonds are formed by sharing of electron. Identify the covalent compound:

A. CS_2 ● B. Na_2S ○
C. $CaCl_2$ ○ D. LiBr ○

(9) Predict the group and period that shows electric configuration of X is $3s^2$, $3p^4$.

A. IIIA, 6^{th} ○ B. IVA, 3^{rd} ○
C. VA, 4^{th} ○ D. VIA, 3^{rd} ●

(10) Atoms react with each other. The following statements are correct **EXCEPT**:

A. They want to complete valance shell ○
B. They are short of electrons ○
C. They want to attain stability ○
D. They want to disperse ●

(11) Non-metals do not lose electrons easily. Predict which statement is correct about non-metals?

A. They are malleable. ○
B. They are good conductor of heat. ○
C. They are poor conductor of electricity. ●
D. They are ductile. ○

(12) A chemist performed an experiment to check the percent purity of a glucose $C_6H_{12}O_6$ sample. Identify the branch of chemistry:

A. Biochemistry ○ B. Analytical chemistry ●
C. Industrial chemistry ○ D. Organic chemistry ○

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

Time allowed: 2.40 hours Total Marks: 53

Note: Answer any eleven parts from Section 'B' and attempt any two questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly.

SECTION – B (Marks 33)

Q.2 Attempt any **ELEVEN** parts from the following. All parts carry equal marks. $(11 \times 3 = 33)$

i. Calculate the number of H atoms in 20g of glucose ($C_6H_{12}O_6$).

Ans.
Given Data
Mass of glucose given = 20g
Molar Mass of Glucose $C_6H_{12}O_6$ = 12 x 6 + 1 x 12 + 16 x 6 = 180g/mol
Number of H atoms =?
Number of molecules = mass in grams/ molar mass x N_A
Number of molecules = 20 g / 180 g/mol x 6.022 x 10^{23}
Number of molecules = 0.668x 10^{23}
1 molecule of glucose contains = 12 hydrogen atom
0.668 x 10^{23}molecules of glucose contains = 12x 0.668 x 10^{23} =8.02 x 10^{23}atoms of hydrogen

ii. Describe relative atomic mass? Give an example.

Ans. The relative atomic mass of an element is defined as the average masses of the atom, as compared to 1/12th the mass of one-carbon atom.
The relative atomic masses of all the elements have been found with respect to the mass of an atom of C-12 isotope, which has been assigned a mass of exactly 12 (amu/atom or g/mol) by the International Union of Chemists as a standard. Relative atomic mass is a dimensionless physical quantity.
For example, relative atomic masses of some elements are following:

1	Be	Beryllium	9.01218
2	N	Nitrogen	14.0067

iii. Rutherford's atomic theory explains the atomic structure. What are the limitations of Rutherford's atomic theory?

Ans. Although the Rutherford atomic model was based on experimental observations, it failed to explain certain things which are mentioned as follows:

a. Rutherford proposed a planetary model of atom in which the electrons revolve around the nucleus in fixed paths called orbits. This is against the modern theories of Physics.

b. This model of the atom also failed to explain the existence of discontinuous/ line spectrum in the atomic spectrum of hydrogen.

c. Rutherford model did not address the arrangement of electrons in an atom which made his theory incomplete.

iv. An element has atomic number 17. Predict the position of it in Periodic Table.

Ans. Atomic Number = 17

Electronic Configuration of the Element = $1s^2\ \ 2s^2\ 2p^6\ \ 3s^2\ 3p^5$

Period = 3^{rd} , Group = VIIA

v. Define shielding effect. Among (Li, Na) and (N, P) pairs which one has higher shielding effect?

Ans. Shielding effect is the phenomenon exhibited by the inner shell electrons by shielding the valence electrons from the attraction towards the nucleus of the atom.

Li and Na both are the elements of the same group, Na has higher shielding effect as compare to Li.

Similarly, in the pair of N and P, phosphorus has higher shielding effect as compare to N.

vi. Noble metals show very low reactivity.Enlist three properties of their inertness.

Ans.

i. Noble metals are those metals that resist corrosion and oxidation unlike other metals. Noble metals include gold, silver, palladium and platinum.

ii. Noble metals are the least reactive, so they are highly stable. They react only with Aqua Regia.

iii. They have least tendency to gain or lose electrons in order to fill their valence shells.

vii. Atoms are joined together by ionic or covalent bonds. Differentiate between ionic bond and covalent bond.

Ans.

Ionic Bond	**Covalent Bond**
Ionic bond is the bond which is formed between a metal and a non-metal by complete transfer of valence electrons from metals to the non-metal.	Covalent bond is the bond which is formed by the mutual sharing valence electrons between two non-metals.
It is a very strong bond.	Covalent bond is also a strong bond but weaker than ionic bond.
Ionic compounds react fast due to the ionic nature of the reactions.	Covalent compounds react slowly due to the molecular nature of the reactions.
Examples of ionic compounds: NaCl, $MgSO_4$,	Examples of Covalent compound: H_2O, NH_3,

viii. Differentiate between shell and subshell with an example.

Ans.

1. Shells:

i. A shell is the pathway followed by electrons to revolve around the atomic nucleus.

ii. Each shell has a definite (fixed) energy; therefore, a shell is also called energy levels. The energy of the shell increases with increase in distance from the nucleus.

iii. Shells are based on the principle quantum numbers (n). Each shell has a fixed principle quantum number which is represented by 'n'. Thus, a shell may also be defined as a collection of subshells having n value = 1, 2, 3, 4, 5, 6 and 7.

The maximum number of electrons possible in the first four energy levels is as under:

Principle Quantum number (n=)	Shell	Maximum Number of Electrons
1	1st Shell (K Shell)	2
2	2nd Shell (L Shell)	8
3	3rd Shell (M Shell)	18
4	4th Shell (N Shell)	32

2. Subshell:

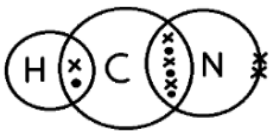
i. A subshell is the area in which electron moves within a shell. These are named according to the angular momentum quantum number. There are 4 major types of subshells that can be found in a shell. They are named as s, p, d, f.

ii. Subshells are also arranged according to the energy. At lower shells, the ascending order of the energy of subshells is as s<p<d<f.

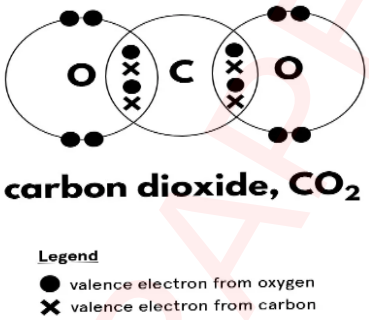
Sub-shells	Number of electrons
s	2
p	6
d	10
f	14

ix. The forces that bind the atoms together in a molecule are called chemical bonds. Show covalent bonding with the help of dot and cross structure of HCN and CO_2.

Ans. **Representation of Covalent Bonding in HCN Molecule by cross and dot structures**



Representation of Covalent Bonding in CO_2 Molecule by cross and dot structures



x. Differentiate between amorphous solids and crystalline solids.

Ans.

1. Amorphous Solids

The solids in which the constituent particles of matter are arranged in a random manner are called amorphous solids. It is a non-crystalline solid with no proper arrangement of atoms in the solid lattice. In other words, amorphous solids don't have certain organized arrangement of atoms and molecules. **Examples:** Plastics, Glass, Rubber, Metallic Glass, Polymers, Gel etc.

2. Crystalline Solids

The solids in which the constituent particles of matter are arranged and organized in a specific manner are called Crystalline Solids. They have regular three dimensional arrangements of particles. **Examples:** Quartz, Calcite, Sugar, Mica, Diamonds etc.

xi. Define allotropy and give two examples.

Ans. Allotropy is the phenomenon of existence of the same element in more than one different physical (structural) form with same physical state.
The term allotropy refers to the elements which exhibit this property; for example carbon has two crystalline allotropic forms diamond and graphite.
Allotropes show different physical properties but almost similar chemical properties.
Swedish chemist Jons Jakob Berzelius proposed the concept of allotropy in 1841. The word **"allotropy"** comes from the Greek word *allotropia*, which means changeableness.
Examples of Allotropes
Carbon Allotropes: a. Diamond b. Graphite
Phosphorus Allotropes: a. White phosphorus b. Red phosphorus

xii. Electroplating is the process in which one metal is coated on another by electrolytic process. Briefly explain electroplating of chromium with reactions.

Ans. Since chromium does not adhere to surface of steel strongly hence steel is first plated with copper or nickel and then with chromium.
For electroplating of chromium, chromium metal is used as anode and chromium sulfate as an electrolyte in the electrolytic cell. A few drops of diluted sulfuric acid are added in the solution to prevent hydrolysis.
Reactions: The basic redox reaction which takes place during chromium plating is as under, in which Chromium atoms **Cr^0** present in the anode get oxidized to Chromium ions while the Chromium ions Cr^{+3} from the solution of chromium Sulphate get reduced by gaining three electrons from the cathode and deposit at the cathode.

At Anode: $\mathbf{Cr^0 \rightarrow Cr^{+3} + 3e^-}$

At Cathode: $\mathbf{Cr^{+3} + 3e^- \rightarrow Cr^0}$

xiii. Define sublimation. Briefly explain with the help of example.

Ans. Sublimation is defined as the transition of a substance from its solid phase to the gaseous phase without changing into the liquid phase. This process is endothermic (heat absorbing). The phenomenon of sublimation is exhibited by a few solids only.

Examples: Ammonium chloride, Iodine, are sublime compounds.

xiv. Differentiate between electron affinity and electronegativity.

Ans.

Electronegativity:

The relative tendency of an atom in a molecule to attract the mutually shared pair of electrons (in a covalent bond) towards itself is known as electronegativity. It has no unit; it is measured in Pauling Scale.

Electron Affinity:

Electron affinity is defined as the energy change that occurs when an electron is added in the valence shell of an atom in its gaseous state. It is measured in KJ/mole.

xv. Identify oxidizing and reducing agents from the following equations.

$2NH_3+3CuO \rightarrow 3Cu+N_2+3H_2O$

$WO_3+3H_2 \rightarrow W+3H_2O$

Ans. $2NH_3+3CuO \rightarrow 3Cu+N_2+3H_2O$

Since NH_3 is losing H, so it is getting oxidized, therefore, it is reducing agent.
CuO is losing oxygen and it is getting reduced, so it is the oxidizing agent.

$WO_3 + 3H_2 \rightarrow W + 3H_2O$

WO_3 is losing oxygen, therefore, it is getting reduced, hence it is oxidizing agent.
H_2 is gaining oxygen and hence is oxidized and acts as reducing agent.

SECTION – C (Marks 20)

Note: Attempt any **TWO** questions. All questions carry equal marks. (2×10 = 20)

Q.3 a. What is vapour pressure of liquid? How does vapour pressure vary with temperature at constant pressure? Show by graph. (3+2)

Ans.

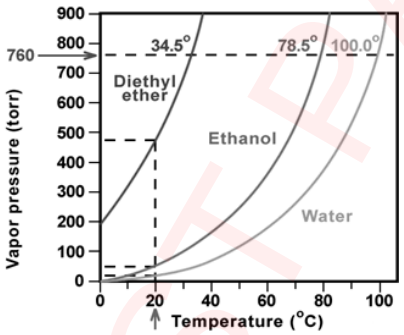
Vapour pressure:

The vapor pressure of a liquid is the equilibrium pressure of a vapor above its liquid at a particular temperature.

Relation of Vapour Pressure with Temperature:

Vapour Pressure of a liquid increases with increase in temperature at constant pressure. This is because with increase in temperature liquid molecules gain kinetic energy and vaporize more quickly and hence number of vapours over the surface of liquid increase. As a result vapour pressure of liquid increases.

Vapour Pressure $\propto$ Temperature



b. Systematic arrangement of elements in a table is called periodic table.Describe its important features. (5)

Ans. **Main Features of Periodic Table:**

Groups: Each vertical column in the periodic table is called a group. Modern periodic table consists of 18 groups. Group IA to VIIIA are representative elements.

i. Group IA is called alkali metals.
ii. Group IIA is called alkaline earth metals.
iii. Group VIIA is called halogens.
iv. Group VIIIA is called noble gases.

Periods: The horizontal rows in the periodic table are called periods. There are seven periods in the periodic table.

First period is the smallest period which contains only two elements.

Second period and 3rd periods contain eight elements each.

Fourth and fifth periods contain eighteen elements each.

Sixth period is the largest period which contains 32 elements.

Seventh period is the incomplete period.

Blocks: Periodic Table is also divided into blocks.

s- Block: Elements having s-valence shell either completed or in the process of completion

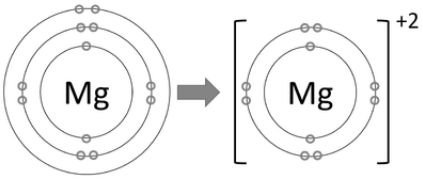
p- Block: Elements having p-valence shell either completed or in the process of completion

d- Block: Elements having d-valence shell either completed or in the process of completion

f- Block: Elements having f-valence shell either completed or in the process of completion

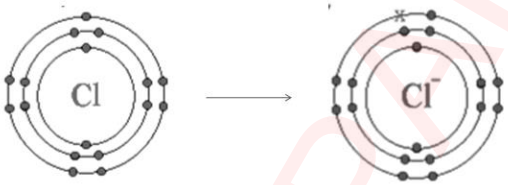
Q.4 a. Properties of compounds depend upon the nature of bond present in it.Illustrate the formation of ions in $_{12}Mg^{24}$and $_{17}Cl^{35}$ by complete shell diagram. (6)

Ans. For Mg:



$Mg \rightarrow Mg^{+2} + 2e^-$

For Cl:



$Cl + 1e^- \rightarrow Cl^-$

b. Differentiate between compound and mixture and give one example of each. (4)

Ans.

Compound	**Mixture**
Compound is a substance which can be formed by chemically combining two or more elements. Compounds are pure substances. The chemical composition of compounds is always fixed. The elements present in a compound lose their properties Example: Water.	Mixtures are substances that are formed by mixing of two or more substances. Mixtures are impure substances. A mixture can have a variable composition of the substances forming it. The substances forming mixture retain their properties. Example: sand and water

Q.5 a. A student obtained following data in an experiment at 20°C. (4)
Prove Boyle's law by using given data:

P (atm)	V (cm^3)	P (atm)	V (cm^3)
0.350	0.707	0.951	0.261
0.551	0.450	1.210	0.205
0.762	0.320	1.521	0.163

Ans.

According to Boyle's law

$P_1V_1 = P_2V_2$

$P_1V_1 = P_2V_2$

0.35 x 0.707 = 0.551 x 0.450

0.25 = 0.25 hence it proves that $P_1V_1 = P_2V_2$

Similarly for all other values:

0.762 x 0.320 = 0.951 x 0.261

0.25 = 0.25

1.210 x 0.205 = 1.521 x 0.163

0.25 = 0.25

This proves the Boyle's law.

b. Differentiate between solutions, suspensions and colloids. (6)

Ans.

Solutions	Suspensions	Colloids
It is a heterogeneous mixture	It is a heterogeneous mixture	It is a homogeneous mixture
Size of particles are very small (less than 1nm)	Size of particles are large (more than 100nm)	Size of particles is neither too small nor too large (1 - 100m)
Individual particles cannot be seen by the naked eyes	Particles of suspension can be seen by the naked eye	Particles of a colloid are too small to be seen by the naked eye
Particles are stable, they do not settle down when left undisturbed	Particles are not stable and they settle down after some time	Particles are stable and they do not settle down when left undisturbed
Particles of solution do not scatter light	Particles are large enough to scatter a beam of light	Particles are large enough to scatter a beam of light
Particles pass through filter paper, hence particles cannot be separated by filtration	Particles are large, they do no pass through filter paper, hence particles can be separated by filtration	Particles are small enough to pass through filter paper, hence particles cannot be separated by filtration
Examples:	Examples:	Examples:
Solution of Salt and Water. Sugar and Water	Mixture of chalk and water, sand and water	Milk, blood

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