Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
		Important Instructions to examiners: 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme. 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate. 3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills). 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn. 5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer. 6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding. 7) For programming language papers, credit may be given to any other program based on equivalent concept.		

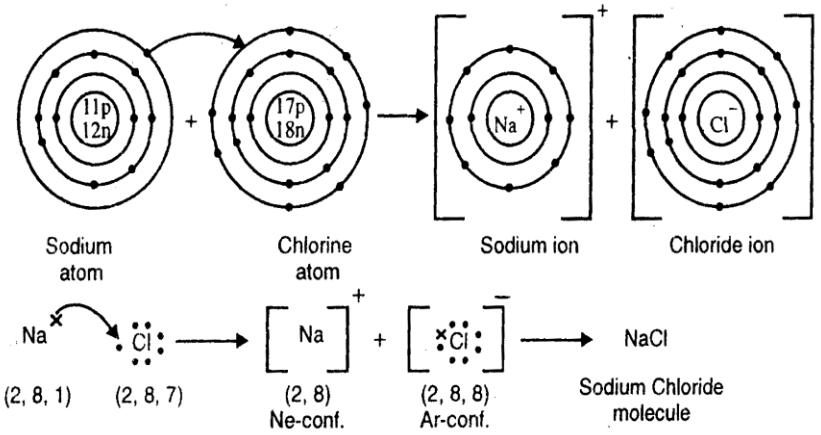
Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
1		**Attempt any NINE of the following**.		**18**
	a)	**Why is an atom electrically neutral?** Atom contains equal number of positively charged proton and negatively charged electron, which exactly balance to each other.Hence atom is electrically neutral.	2	2
	b)	**Calculate the atomic number and mass number of an atom containing 20 electrons and 20 neutrons.** I] Atomic number, Z = p = e **Atomic number: Z = 20** II] Atomic mass number A = p + n Atomic mass number A = 20 + 20 **Atomic mass number: A =40**	1 1	2
	c)	**Why sodium is electropositive? Explain with electronic configuration?** Electronic configuration of Sodium (Na = 11) $1s^2$ $2s^2$ $2p^6$ $3s^1$ (2, 8, 1) Sodium is electropositive because sodium atom loses its one valency electron so as to complete its last shell and acquires a unit posiive charge.	1 1	2
	d)	**Distinguish between metallic and electrolytic conduction. (any two points)**	1 mark each	2

Metallic conduction	**Electrolytic conduction**
1. It involves flow of electrons in a conductor.	1. It involves the movement of ions in a solution.
2. There is no change in chemical properties of conductor.	2. The chemical reactions take place at the electrodes with the decomposition of an electrolyte.
3. It does not involve any transfer of matter.	3. It involves transfer of electrolyte in the form of ions.
4. It shows the increase in resistance as the temperature is increased.	4. It shows decrease in resistance as the temperature is increased.

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
1.	e)	**Write the two points of Arrhenius theory of ionisation.** **(any two points)** **Postulates of Arrhenius theory of ionization:** 1. When a molecule of electrolyte (acid/base/ salt) is dissolved in water, produces positive ions (cations) and negative ions (anions). e.g. $NaCl \longrightarrow Na^+ + Cl^-$ 2. Cations are obtained by the loss of electrons from metallic atoms. e.g. $Na \longrightarrow Na^+ + 1e^-$ Anions are obtained by the gain of electrons from non-metallic atoms. e.g. $Cl + 1e^- \longrightarrow Cl^-$ 3. In the solution, the total number of positive charges on cations is equal to the total number of negative charges on anions. Hence solution as a whole is electrically neutral. 4. The number of positive or negative charges on ions indicate the valency of an element from which the ion is derived. 5. Molecules of electrolyte constantly split into ions and the ions present in the solution constantly recombine to form electrolyte molecules. Thus all the molecules of an electrolyte in the solution are not dissociated. Hence the process of electrolytic dissociation is a reversible process. e.g . $NaCl \rightleftharpoons Na^+ + Cl^-$	1 mark each	2
	f)	**State the relation between chemical equivalent & electrochemical equivalent.** The quantity of electricity, 96500 coulombs required to liberate or deposit 1 gm equivalent of a substance. 1 coulomb liberates/deposits the quantity of same substance (in grams) equal to its electrochemical equivalent. Thus, equivalent weight of a substance is 96,500 times the electrochemical equivalent. $\therefore$ C.E. (Eq. Wt.) = 96,500 x E.C.E.	2	2
	g)	**Calculate the pH value of solution having hydrogen ion concentration $1x10^{-3}$ gm ions per litre.** $pH = - \log_{10}[H^+]$ $pH = - \log_{10}[1x10^{-3}]$ $pH = - [\log_{10}(1) + (-3) \log_{10}(10)]$ [but $\log_{10}(10) = 1$] $pH = 3$	½ mark for each step	2

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
1.	h)	**All minerals are not ore but all ores are minerals. Explain.** A naturally occurring substance present in earth's crust which contains metal in the free or combined state is known as mineral. But a mineral from which the metal can be extracted economically and profitably is known as ore. Thus, all ores are minerals, but all minerals are not ores.	2	2
	i)	**When Alloy is called amalgam? Give two examples.** When alloy contains mercury as one of the components then it is called as an amalgam. Examples: Sodium amalgam (Na-Hg), Aluminium amalgam (Al-Hg), Zinc amalgam (Zn-Hg)	1 1	2
	j)	**Why wood metal is used in electric fuses?** Woods metal is used in electric fuses because it is easily fusible alloy as it has low melting point i.e. 71^{o}C. When due to some reason high current flows through the circuit, it fuses and breaks the circuit. Thus it protects electrical system from hazard.	2	2
	k)	**Name the type of plastic with one example of each.** Types of Plastics with examples: **i) Thermoplastics / Thermo softening Plastics** Examples: Polyethylene, Polystyrene, PVC. **ii) Thermosetting Plastics** Examples: Bakelite, Polyesters, silicone Plastics	1 mark each	2
	l)	**State four characteristics of good thermal insulating material.** **Characteristics of an ideal thermal insulator (any four)** i. Its thermal conductivity should be low. ii. It should be fire proof. iii. It should be cheap. iv. Its density should be low. v. It should be water proof. vi. It should be chemically inert to water, surrounding atmosphereand high temperature. vii. It should be odourless during use. viii. It should withstand the effect of shock and vibrations. ix. It should be capable of bearing load in working operation. x. It should be physically & mechanically stable at working temperature.	½ mark each	2

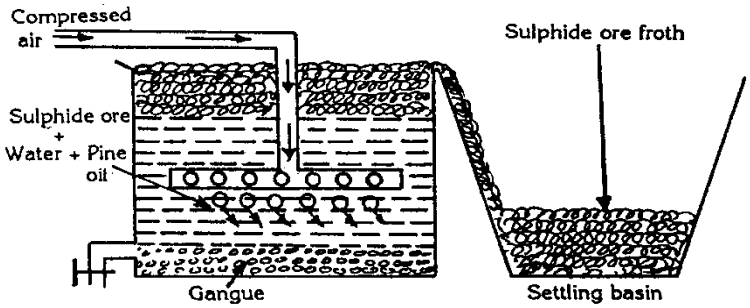
Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
2.		**Attempt any FOUR of the following:**		**16**
	a)	**Give four assumptions of Bohr's Atomic theory.** **Neils Bohr's proposed his Postulates or Assumptions as follows: - (any four points)** i) An atom consists of a dense positively charged central part called as 'Nucleus'. ii) Electrons revolve around the nucleus in fixed circular paths are called 'orbits' or 'shells'. The electrostatic force of attraction between nucleus & electron is balanced by the centrifugal force. Hence the electron does not fall into the nucleus and atom remains stable. iii) Out of the number of possible circular orbits around the nucleus, an electron can rotate only in certain permitted orbits known as 'stationary states'. iv) Each stationary state is associated with a definite amount of energy, hence are also called as 'energy levels.' v) Electrons in the energy level nearest to the nucleus have lower energy while those at greater distance from the nucleus have higher energy. vi) As long as the electron stays in the same energy level the energy remains constant.The energy of an electron can change only when it moves from one level to another. vii) An excited electron (when the energy supplied to the electrons it is said to be an excited or unstable state) can jump from lower to higher energy level by absorbing energy. On the other hand the excited electron jumps from higher to lower energy level by emitting or losing of the energy. viii) The angular momentum of electron (mvr) must be an integral multiple of $\frac{h}{2\pi}$. Therefore, $$mvr = \frac{nh}{2\pi}$$ Where, m = mass of electrons, r = radius of orbit v = Velocity of e^-s in its orbit, n = principle quantum number / orbit / shell h = plank's constant.	1 mark each	4

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
2.	b)	**With the help of figure, explain the formation of NaCl.** **Formation of Sodium Chloride (NaC1) :-** **Explanation :-** Sodium atom contains one electron in the last orbit, it losses one valency electron & acquires a unit positive charge (Na^+) and attains a stable configuration (2, 8) as that of Ne (2, 8). Chlorine atom contains seven electrons in last. It takes / gained one electron from sodium atom and acquires a unit negative charge ($C1^-$) & attains a stable configuration (2, 8, 8) as that of Ar (2, 8, 8). These oppositively charged ions (Na^+ & $C1^-$) attract with each other due to electrostatic force & sodium chloride molecule (NaC1) is formed as shown in figure.  	2 2	4
	c)	**Write orbital configuration of following elements.** **$_{13}Al^{27}$, $_{20}Ca^{40}$, $_{7}N^{14}$, $_{16}S^{32}$** **Orbital Electronic configuration**:		4

Sr.No.	Elements	Orbital Electronic configuration	
1	$_{13}Al^{27}$	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$	1
2	$_{20}Ca^{40}$	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$	1
3	$_{7}N^{14}$	$1s^2\ 2s^2\ 2p^3$	1
4	$_{16}S^{32}$	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$	1

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
2.	d)	**Explain the mechanism of electrolysis of $CuSO_4$ by using platinum electrode. Write the products of electrolysis.**		4
		Mechanism of electrolysis of $CuSO_4$ by using platinum electrode: An aqueous solution of $CuSO_4$ contains $Cu^{++}, SO_4^{--}, H^+, OH^-$ ions present in solution. According to the activity series, Cu^{++} ions are discharged in preference to H^+ ions & Cu deposited at cathode. At anode, OH^- ions are discharged in preference to SO_4^{--} ions & oxygen gas is liberated at anode.	1	
		Schematic representation of electrolysis of $CuSO_4$:-		
		Cathode process Ionisation Anode Process		
		$Cu^{++} + 2e^- \rightarrow Cu \downarrow$ $\xleftarrow[\text{cathode}]{\text{To}}$ $CuSO_4 \uparrow\downarrow Cu^+ + SO_4^{--} \uparrow\downarrow H^+ + OH \uparrow\downarrow H_2O$ $\xleftarrow[\text{anode}]{\text{To}}$ $OH^- \rightarrow OH + e^-$ $4(OH) \rightarrow 2H_2O + O_2$	2	
		Products of electrolysis are :-		
		i) The deposition of Cu metal at cathode electrode ii) The liberation of O_2 at anode electrode. iii) The remaining ions (H^+ & SO_4^{--}) increased in the soln. These ions combined to form H_2SO_4	1	
	e)	**Define degree of ionsation. Explain factros affecting degree of ionisation**.		
		Degree of ionization: - "The fraction of the total number of molecules of an electrolyte that ionizes in solution called the degree of ionization".	1	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
2.		**Factors affecting the degree of ionisation: (any three)** **1. Nature of Solute:** Strong electrolytes have higher degree of ionisation as they are highly ionised in solution.. For e. g. acids like HCl, HNO_3, H_2SO_4 and strong bases like NaOH, KOH and soluble salts like NaCl, KNO_3 etc. **2. Nature of solvent:** The nature of solvent has a marked effect on ionization. Polar solvents like water and ammonia have a great tendency to separate the ions in solution, hence it ionizes electrovalent compounds to a great extent and it acts as a strong ionizing solvent. **3. Concentration of Solution:** The degree of ionization is inversely proportional concentration of solution. The salts ionise more in the dilute solutions than in the concentrated solutions. So degree of ionization increases with the dilution. **4. Temperature:** The higher the temperature, the greater is the ionisation. Because at high temperature, the molecular velocities are increased and they overcome the forces of attraction between the ions. Hence there is more ionisation.	1 mark each	
	f)	**A current of 0.4 amperes was passed through a solution of $CuSO_4$ for 1 hour. Find out the weight of copper deposited on the cathode.(Electrochemical equivalent of copper = 0.000326)** **Given :** C= 0.4 amperes t = 1 hour= 60 x 60 = 3600 seconds z = 0.000326 To calculate: w = ? w = z c t w= 0.000326 x 0.4 x 3600 **w= 0.469 g**	1 1 1 1	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
3.		**Attempt any FOUR of the following:**		**16**
	a)	**Define the term Ductility, Tensile Strength, Weldability and Machinability.** **Ductility**: Ductility is the property of the metal by which it can be streched in length without breaking & drawn into wires. **Tensile strength**: Tensile strength is the ability of metal to carry a load without breaking **Weldability**: It is the process of uniting two pieces of metal by means of heat, by bringing their ends together in the molten state. **Machinability**: Is the property due to which a material can be easily cut by cutting tools to produce a desired shape & surface finish on its surface.	1 mark each	4
	b)	**Explain with diagram the method used for the concentration of sulphide ore.** **Froth Floatation Process: -** This process is especially suitable for the concentration of sulphide ores. This process is based on the principle of different wetting characteristics of the ore & gangue particles with water & oil. The ore is preferentially wetted by oil & the gangue particles by water. e.g. galena PbS (galena), Cu-pyrites [$CuFeS_2$]	1	4
			1 ½	
		In this process, the powdered sulphide ore is mixed with water & pine oil. The whole mixture is then stirred vigorously by passing compressed air. The oil forms froth with air bubbles. The sulphide ore particles get attached with the Froth & floats on the surface, while the gangue or earthy impurities are wetted by water & sink to the bottom of the tank. The Floating froth is then skimmed off into settling basins from where by filter press a concentrated ore is recovered.	1 ½	

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<tr><th>Que. No.</th><th>Sub. Que.</th><th>Model Answer</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td>3.</td><td>c)</td><td>

Give the composition, properties and uses of Duralumin.

Duralumin :
Composition :

Al=95% Cu=4% Mg=0.5% Mn=0.5%

Properties : (any two)

i) Light, tough, highly ductile, easily castable,corrosion resistance and good conductor of heat & electricity
ii) It is strong as mild steel, tough its density is 1/3rd that of steel.
iii) Its tensile strength can be raised by heat treatment up to 2000kg/cm^2 without affecting ductility.
iv) It can be easily worked and possesses high machinability.

Uses: (any two)

i) For making aeroplane, automobile & locomotive parts from ‘alcad’ sheets.
ii) In making cables, surgical instruments and fluorescent tube caps.
iii) For making rivets, bars, body of vehicles and housing cases etc.

</td><td>2

1

1</td><td>4</td></tr>
<tr><td></td><td>d)</td><td>

Write four properties and related applications of plastic.

(any four)

Sr. No.	Properties	Applications / Uses
1)	Low specific gravity & high tensile strength.	In aircrafts, motorcars & structural industries.
2)	Combination with metals.	Wheels of automobiles plastics cover dash boards.
3)	Resistance to wear & tear & abrasion resistance.	For making machinery parts such as gears pulleys.
4)	Poor electrical conductivity.	In electronic industry.
5)	High Chemical resistance & corrosion resistance.	In Chemical industries PVC plastic used in place of stainless steel.

</td><td>1 mark each</td><td>4</td></tr>
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Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
3.	d)	6) Bad conductor of Heat — Handles of electric irons, kettles, pressure cookers, frying pan etc. 7) Hard & shock absorbing capacity. — In machinery to reduce noise & vibrations. 8) Clear, transparent, translucent, opaque nature. — Decorative knobs for radio, automobile & house hold appliances, wind screens for automobiles, aircrafts ,optical lenses etc.		
	e)	**Give the difference between natural and synthetic rubber.** **(any four)**	1 mark each	4

Sr.No.	Natural Rubber	Synthetic Rubber
i)	It is obtained from latex of rubber tree.	These are rubber like products obtained by chemical reactions.
ii)	It is isoprene polymer.	It is polymer of unsaturated carbon chains.
iii)	It is non-resistant of oxidation.	It is oxidation resistance.
iv)	It is soft & sticky at higher temp.	It does not become soft & sticky at higher temp.
v)	It is soluble in organic solvent.	It is insoluble in organic solvent.
vi)	Tack property is high.	Tack property is low.
vii)	It is plastic in nature.	It is elastic in nature.

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
3.		viii) Capacity to absorb large quantity of water. — It is water resistant. xi) It is weak in nature so can not be used for heavy duty operations. — It is strong in nature can be used for heavy duty operations.		
	f)	**What is glass wool? Write two uses of glass wool based on its properties.** **Glass wool**: It is fibrous wool like material, which is made up of fine filament of glass like ordinary wool is known as glass wool. **Uses :- (any two)** i) As it is heat proof, fire proof, flexible and even insect proof so it is widely used thermal insulating material in domestic and industrial appliances such as motors, ovens, refrigators, wall and roofs of houses. ii) It is resistance to chemicals so it is used as filtering materials for corrosive liquids like acids. iii) It is also used in air filters as dust filtering material. iv) It is also used for sound and electrical insulation. v) It is also used in manufacturing fiber glass by reinforcing with plastic resins.	1 1 ½ Mark each	4