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 **ten** of the following:		**20**
	a)	**State number of subshells in K, L, M, N shell.**		2
		Shell | **Number of Subshells** K | 1 L | 2 M | 3 N | 4	½ mark each	
	b)	**Define Atomic number, Atomic mass number.**		2
		Atomic number: The number of protons in the nucleus, which exactly balances the number of planetary electrons, is called the atomic number of an element.	1	
		Atomic mass number: It is defined as the sum of the number of protons & neutrons present in the nucleus of an atom of the element.	1	
	c)	**State Faraday's 1 st law of electrolysis.** This law states that the weight of a substance liberated or deposited at the electrode is directly proportional to the quantity of electricity passed through the electrolyte solution.	2	2
	d)	**Difference between atom and ion.** **(Any two)**		2
		Atom | **Ion** 1. It carries no electrical charge i.e. neutral particle. | 1. It carries electrical charge either +ve or –ve. 2. The outermost shell is incomplete. | 2. Outermost shell is complete. 3. Atoms react with solvent. | 3. Ions do not react with solvent. 4. Atoms take part in molecular reaction. e.g. Na, Ca etc | 4. Ions take part in ionic reaction. e.g. Na^{+}, Ca^{2+}, NH^{4+}, Cl^{-} etc	1 mark each	
	e)	**Define the term mineral and ore.**		2
		i] **Mineral: -** A naturally occurring substance present in earth's crust which contains metal either in free or combined state is known as mineral.	1	
		ii] **Ore: -** A mineral from which the metal can be extracted economically & profitably is known as ore.	1	

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
1.	f)	**Write the difference between natural rubber and synthetic rubber.** (Any two)	1 mark each	2

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 non-resistant of oxidation.	It has oxidation resistance.
iii) It is soft & sticky at higher temperature.	It does not become soft & sticky at higher temperature.
iv) It is soluble in organic solvent.	It is insoluble in organic solvent.
v) Tack property is high.	Tack property is low.
vi) It has capacity to absorb large quantity of water.	It is water resistant.

	g)	**Write the composition and properties of duralumin alloy.** **Composition :** Al= 95% ii) Cu=4% Mg=0.5% iv) Mn = 0.5 % **Properties:** (Any two) i) It is Light, tough ii) Highly ductile iii) Castable iv) Good conductor of heat & electricity.	1 1	2
	h)	**Define addition polymerization with one example.** **Addition polymerization**: It is a process in which the monomers of same type undergo repeated addition resulting in the formation of long chain polymer without elimination of simple molecules like H_2O, HCl, NH_3 etc. **Example:** Polythene (Polythene), PVC etc.	1 1	2
	i)	**Define Pollution. Name the types of pollution.** **Pollution:** Excesses discharge or addition of undesirable substances or unwanted foreign matters into the environment thereby adversely altering the natural quality of the environment and causing damage to human plants or animal life. **Types of pollution: (any two)** i) Air pollution ii) Water pollution iii) Soil pollution iv) Noise pollution iv) Radioactive pollution v) Thermal pollution	1 1	2

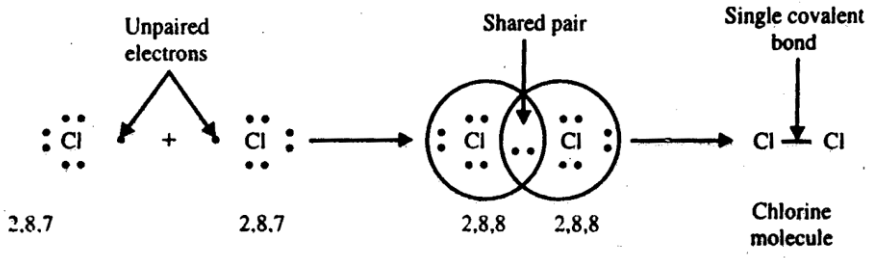
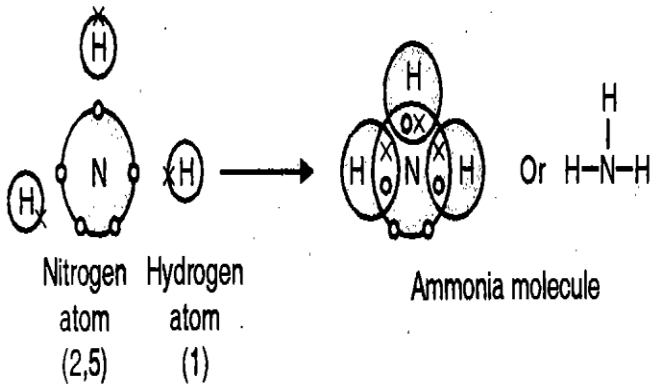
Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
	j)	**What is E-waste?** E-waste means Electronic waste. E- Waste includes computers, entertainment electronics, mobile phones and other items that have been discarded by their original users.	2	2
	k)	**Mention two properties & two uses of Copper.** **Properties:** i) Reddish brown in colour ii) Soft, malleable, ductile iii) Very good conductor of heat & electricity. iv) Tough & resistant to corrosion **Uses :** i) Used in making electrical wires & cables ii) In heating utensils, pans. iii) In making coins, ornaments. iv) In making alloys iv) In electroplating	1 1	2
	l)	**State any two causes of pollution.** i) Uncontrolled growth in population ii) Rapid industrialization iii) Rapid urbanization iv) exploitation of Nature i.e. Cutting trees v) Natural phenomena like Radioactivity, Volcanic eruptions , Strong winds	1 mark each	2
2.		**Attempt any four of the following.**		**16**
	a.	**Give the comparison between electrons, proton and neutrons w.r.to their symbol, charge, mass & location within an atom.**		4

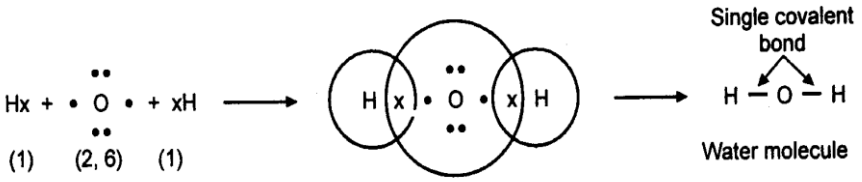
Description	**Electron**	**Proton**	**Neutron**	
Symbol	e^-	p^+	n	1
Charge	-1	+1	0	1
Mass in amu.	0.000555	1.007825	1.008665	1
Location	Extra nuclear part (outside)	Inside the nucleus	Inside the nucleus	1

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
2.	b)	**Give the difference between Isotopes & Isobars.** **(Any Four)**	1 mark each	4

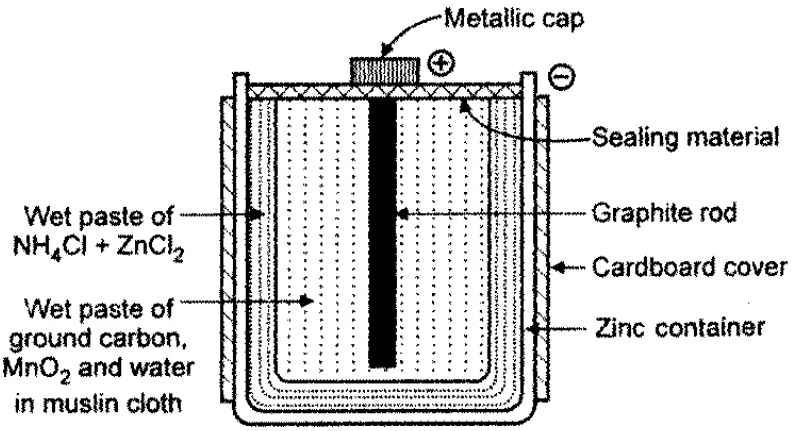
Isotopes	**Isobars**
i) They have same atomic number but different mass numbers.	They have same mass number but different atomic numbers.
ii) They have identical electronic configuration.	They have different electronic configuration.
iii) Chemical properties are identical	Chemical properties are different
iv) They occupy the same place in the periodic table	They occupy different place in periodic table
v) Different atoms of same element. e.g. $_{1}^{1}H$, $_{1}^{2}H$, $_{1}^{3}T$ or $_{1}^{3}H$	Different atoms of different element. e.g. $_{18}^{40}Ar$, $_{19}^{40}K$, $_{20}^{40}Ca$

	c)	**Write the orbital electronic configuration of following:** **$_{7}N^{14}$, $_{20}Ca^{40}$, $_{11}Na^{23}$, $_{29}Cu^{63}$**		4
		$_{7}N^{14}$ = $1s^2$ $2s^2$ $2p^3$	1	
		$_{20}Ca^{40}$ = $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $4s^2$	1	
		$_{11}Na^{23}$ = $1s^2$ $2s^2$ $2p^6$ $3s^1$	1	
		$_{29}Cu^{63}$ = $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $4s^1$ $3d^{10}$	1	
	d)	**Explain the formation of single covalent compound with an example.** **(Consider any one relavant example such as Cl_2, H_2O, NH_3, CH_4)** **1) Example:** Chlorine (Cl_2) **Explanation:** **Electronic configuration:** Cl (17) = **2, 8, 7** In the formation of chlorine molecule each atom of chlorine contains 7 valency electrons. So each chlorine atom is in short of one electron to complete the octet. Hence one electron each is mutually shared between two Chlorine atoms. Thus a molecule of chlorine is formed by single co-valent bond.	2	4

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
2.	d)	 **2) Formation of Ammonia Molecule (NH_3)** N (7) = (2,5) H (1) = (1) In the formation of ammonia molecule, three atoms of hydrogen (1) combine with one atom of nitrogen (2,5). Each hydrogen atom contributes one electron with an atom of nitrogen so that a pair of electrons is shared by each hydrogen atom with nitrogen atom. Thus, nitrogen atom acquires an octet & hydrogen atoms acquire duplets, hence the molecule of ammonia becomes stable.  **3) Formation of Water Molecule (H_2O) :-** H (1) = (1) O (8) = (2, 6) Water molecule (H_2O) contains two atoms of hydrogen & one atom of oxygen. Each hydrogen atom is in short of 1 electron of complete its duplet & oxygen atoms are in short of 2 electrons to complete its octet. In the formation of water molecule, oxygen atom completes its octet by sharing two electrons with two hydrogen atoms. Similarly, hydrogen atoms complete their duplet by sharing one electron each with oxygen atom. Thus, two separate single co-valent bonds are formed between hydrogen & oxygen atoms.	2	

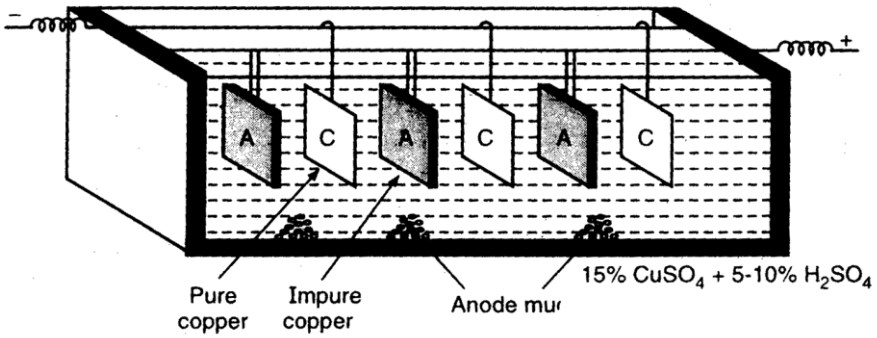
Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
2.	d)			
	e)	**Give the difference between electrovalent and covalent compound.** **(Any Four)**	1 mark each	4

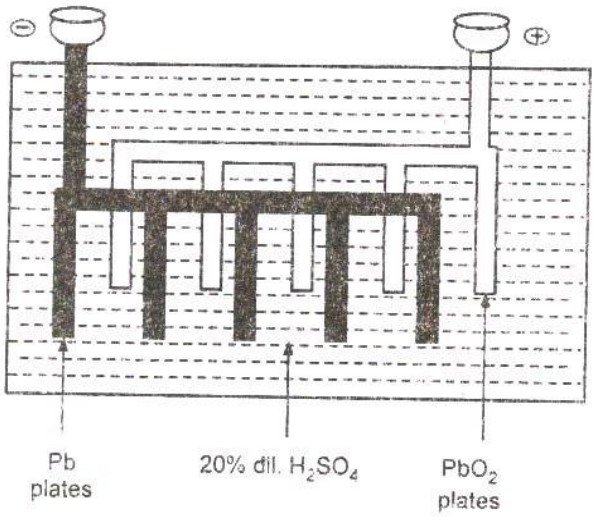
Electrovalent Compounds	Covalent Compounds
1. These are formed by loss & gain of electrons between dissimilar atoms.	1. These are formed by mutual sharing of electrons between similar or dissimilar atoms.
2. They exist in the form of ions even in the solid state.	2. They do not exist in the form of ions in the solid or liquid state.
3.They are polar compounds	3. They are non-polar compounds.
4. Melting & boiling points are higher.	4. Melting & boiling point are lower.
5. They are non-volatile.	5. They are volatile.
6. They are insoluble in organic solvents. e.g. $CaCl_2$, NaCl, $FeCl_3$	6. They are soluble in organic solvents. e.g. NH_3, C_2H_4, C_2H_5OH

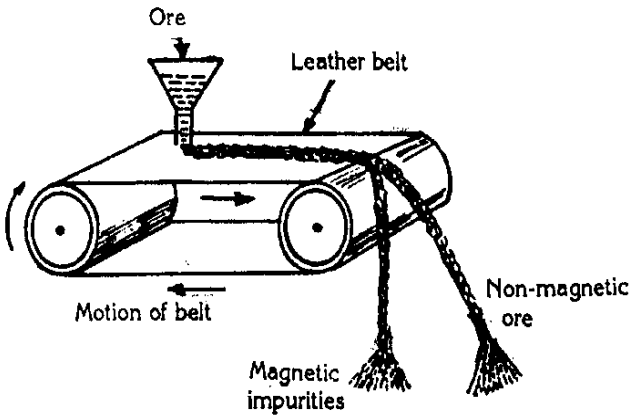
	f)	**Draw diagram & explain the working of dry cell with application.** 	2	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
2.	f)	**Working :-** At Zinc Anode $Zn \longrightarrow Zn^{++} + 2e^-$ (oxidation) Dissolution of zinc electrode to form zinc ions. Ammonia combines with Zn^{++} ions to form complex. $Zn^{2+} + 4\ NH_3 \rightarrow Zn(NH_3)_4^{2+}$ At the Graphite Cathode Manganese dioxide (MnO_2) reacts with NH_4^+ (ammonium) ions to liberate ammonia. $2NH_4^+ + 2\ MnO_2 + 2\ e^- \rightarrow Mn_2O_3 + H_2O + 2NH_3 \uparrow$ The cell develops a potential 1.5 volts. **Applications:** Dry cell useful for small amount of current required for short period of time. Dry cells are used in torches, transistors, tape records, door bells, gas – engine, ignition, wall clock, T. V. remote, calculator etc.	1 1	
3.		**Attempt any four of the following**:		**16**
	a)	**Write any four assumptions of Arrhenius theory of ionisation.** **Assumptions 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 . $NaCl \rightleftharpoons Na^+ + Cl^-$	4 1 mark each	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
3	b)	**Calculate the time in seconds in which 0.3 gms of copper is liberated from copper sulphate solution when a current of 0.5 ampere is passed (Eq. wt. of copper is 31.6)** i] E.C.E. of Copper = Eq.Wt. of Copper / 96500 = 31.6 / 96500 = **0.000327 gms /coulomb** ii] From I st law of Faraday, w = zct t = 0.3 / 0.000327 X 0.5 **t = 1832 seconds.**	2 2	4
	c)	**Explain the mechanism of electrolysis of aqueous copper sulphate solution by using platinum electrode.** **Mechanism:** 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. **Schematic representation of electrolysis of $CuSO_4$:-** Cathode process Ionisation Anode Process $CuSO_4 \uparrow\downarrow$ $Cu^{++} + 2e^- \rightarrow Cu \downarrow$ To cathode $\leftarrow$ $Cu^+ + SO_4^{--}$ To anode $\leftarrow$ $OH^- \rightarrow OH + e^-$ $H^+ + OH$ $4(OH) \rightarrow 2H_2O + O_2$ $\uparrow\downarrow$ H_2O **Net result of electrolysis is :-** 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 2 1	4

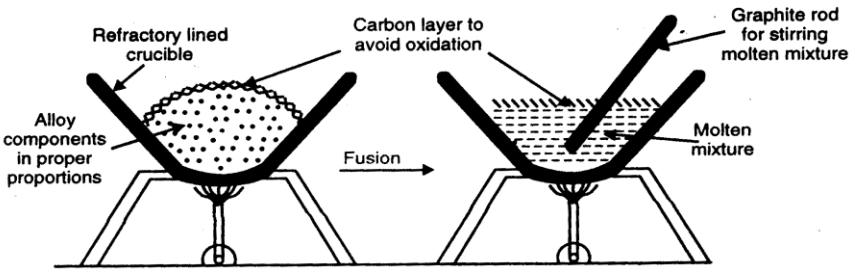
Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
3.	d)	**Why Blister copper is electro-refined? Describe the process of electro refining of Copper.** Blister copper contains about 3-5% impurities like Zn, S, As, Ni, Au etc. such impure copper is not fit to be used as an electrical conductor Copper with 100% purity is required for electrical conductivity. Hence, Blister (impure) copper is refined by the process of electro – refining. **Process of Electro – refining of Copper :-** Anode :- Impure copper Cathode : pure copper Electrolyte :- 15% $CuSO_4$ + 5-10% H_2SO_4	1	4
			1	
		Reaction at anode: Blister Copper anode being active electrode dissolves in the solution liberating Cu^{++} ions. Those Cu^{++} ions migrate towards the cathode and electrons flow from anode to cathode. $Cu \longrightarrow Cu^{++} + 2e^-$	1	
		Reaction at cathode: Cu^{++} ions are discharged at the cathode by receiving two electrons each. 99.99 % copper metal gets deposited on the cathode. $Cu^{++} + 2e^- \longrightarrow Cu$	1	
	e)	**Explain construction & working of Lead acid storage cell during charging and discharging.** **Construction:** In this cell, one electrode is made of lead known as anode or –ve electrode & the other electrode is made of lead dioxide (PbO_2) or a paste of PbO_2 is pressed into a grid, made of lead known as cathode or +ve electrode. A number of lead plates (-ve plates) are connected in parallel & a number of lead dioxide plates (+ve plates) are also connected in parallel. The lead plates fit in between the lead dioxide plates. This entire combination is then immersed in approximately 20% dil. H_2SO_4 (electrolyte).	1	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
3.	e)		1	
		Working:- **A] Discharging**: - While discharging chemical energy gets converted into electrical energy. **At anode:** - $Pb \rightarrow Pb^{2+} + 2e^{-}$ The Pb^{2+} ions then attach to sulphate SO_4^{2-} ions. $Pb^{2+} + SO_4^{2-} \rightarrow PbSO_4\downarrow + 2e^-$ **At cathode:-** $PbO_2 + 4H^+ + 2e^- \rightarrow Pb^{2+} + 2H_2O$ $Pb^{2+} + SO_4^{2-} \rightarrow PbSO_4\downarrow$ Net reaction during Discharging: - $Pb + PbO_2 + 4H^+ + 2SO_4^{2-} \rightarrow 2PbSO_4\downarrow + 2H_2O$ + Energy	1	
		B] Charging: - **At anode:** $PbSO_4 + 2e^- \rightarrow Pb + SO_4^{2-}$ **At cathode :** $PbSO_4 + 2H_2O + 2e^- \rightarrow PbO_2 + 4H^+ + 2SO_4^{2-}$ **Net reaction during Charging:** $2PbSO_4 + 2H_2O \rightarrow Pb + PbO_2 + 4H^+ + 2SO_4^{2-}$	1	
	f)	**Which of the following substance will conduct electric current? Give reasons.** i) SolidNaCl, Fused NaCl ii) Solid $ZnSO_4$, Solution of $ZnSO_4$ iii) Solid $CuSO_4$, Solution of $CuSO_4$ iv) Benzene, Alcohol.		4
		i) **Solid NaCl, Fused NaCl** : Solid NaCl will not conduct electric current because it does not produces ions but fused NaCl will conduct electric current as it gives Na^+ and Cl^- ions on dissociation.	1	

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
3.	f)	ii) **Solid $ZnSO_4$, Solution of $ZnSO_4$** : Solid $ZnSO_4$ will not conduct electric current because it does not produces ions but solution of $ZnSO_4$ will conduct electric current as it gives Zn^{++} and SO_4^{--} ions on dissociation.	1	
		iii) **Solid $CuSO_4$, Solution of $CuSO_4$** : Solid $CuSO_4$ will not conduct electric current because it does not produces ions but solution of $CuSO_4$ will conduct electric current as it gives Cu^{++} and SO_4^{--} ions on dissociation.	1	
		iv) **Benzene, Alcohol:** Benzene and alcohol will not conduct electric current because both are non polar solvents (does not undergo dissociation / ionisation).	1	
4.	a)	**Attempt any four of the following:**		**16**
		Explain electromagnetic separation with diagram.		4
		The process used for separating magnetic impurities from non-magnetic ore particles is **Electro - magnetic separation.** **Tinstone ore** is ore of tin in which tinstone (SnO_2) is non-magnetic, while the impurities like tungstates of iron & manganese are magnetic. The powdered ore is made to fall through the hopper on a non - magnetic belt of leather or rubber moving over the electromagnetic roller. The magnetic impurities fall from the belt in a heap near the roller, due to attraction; while the non - magnetic concentrated ore falls in a separate heap away from the roller.	2	
			2	

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
4.	b)	**Differentiate between roasting and calcination.**	1 mark each	4

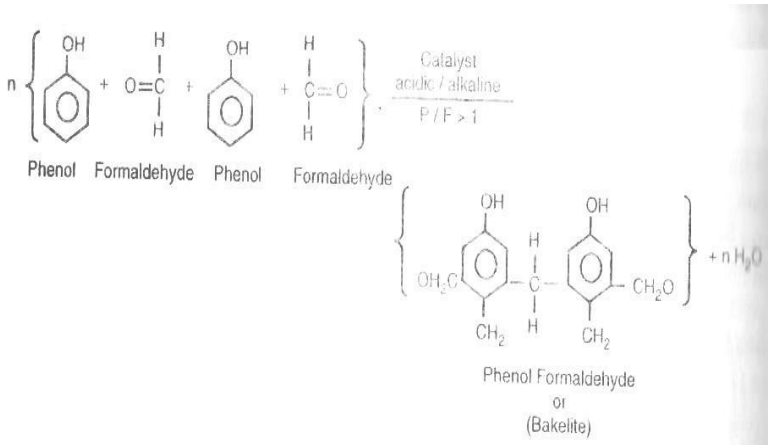
Calcinations	Roasting
1. Process of heating the ore strongly in absence of air below its melting point.	1. Process of heating the ore strongly in excess of air below its melting point.
2. This process is used to convert carbonate & hydroxide into their oxides.	2. This process is used to convert sulphide into oxide & sulphate.
3. Purpose is to remove the moisture & volatile impurities from the ore	3. Purpose is to remove moisture & oxidation of ore & the impurities like S, P, As etc.
4. In calcinations, the mass becomes porous, so that it can be easily reduced to metallic state.	4. In roasting, the sulphide ore chemically changed into suitable form (oxides & sulphates) can be reduced to metallic state.

	c)	**Define alloys. Explain fusion method for preparation of alloy.** **Alloy:** It is defined as a homogeneous mixture of two or more than two elements one of which must be a metal. **Fusion Method: -** The component metal having higher M.P. is melted first & the other having lower melting points are added to it in required quantity.  	1 1 ½	4

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
4.		The molten metals are at high temp & hence react with atmospheric oxygen to form oxide. To prevent oxidation the molten mass is covered with charcoal powder. The molten mixture is stirred using graphite rods to get uniform alloy. The specific gravities of metals also be considered. Generally the heavy metals are added at the end to avoid its setting due to its gravity the molten mass is allowed to cool to get required alloy.	1 ½	
	d)	**Explain four purposes of alloying the metal**. **Purposes of alloying the metal:-** **I) To improve the hardness of metal:-**An alloy is harder than its component metals. **Example**: 1) Pure gold & silver are hardened by the addition of a small amount of copper in them. 2) Pure iron is soft and cannot be used as such for making machinery parts. Hence the iron is converted to steel by the addition of small quantity of carbon. 3) Brass (Alloy of Cu and Zn) and bronze (Alloy of Cu and Sn) both are harder than the base metal Copper. 4) Lead is soft metal but its hardness can be improved by the addition of 0.5% arsenic to it. **II) To lower the melting point: -** Pure metals have high melting point can be lowered by adding alloying elements. **Example:** 1) Woods metal is an alloy of Bi, Pb, Sn, Cd. It has the M.P. 71^0C which is much lower than those of its constituents. 2) Rose metal is an alloy of Bi, Pb and Sn having the melting point 100^0 C. **III) To increase the tensile strength: -** When metal is alloyed with proper elements, the elasticity and tensile strength is adjusted to the requirement i.e. tensile strength of pure metal is increased by alloying. **Example:** 1) The addition of 1% carbon increases the tensile strength of pure iron by about ten times. IV) **To increase corrosion resistance:** Alloys are more resistant to corrosion than pure metals. **Example:** 1) Bronze is more corrosion resistant than copper. 2) The alloys of copper such as Naval brass and German silver are non-corrosive.	1 mark each	4

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
4.		V) **To get good casting:** In order to get good castings, metals have to be alloyed, because alloys expand on solidification. **Example:** 1) Bronze and duralumin possess good casting properties. 2) The casting property of aluminium can be improved by the addition of small amount of copper or magnesium to it. VI) **To modify colour:** Alloy can be prepared having colour quite different from the colour of the base metal. **Example:** 1) Both aluminium and tin are silvery white in colour, but their alloy, aluminium bronze has a beautiful golden colour. 2) Brass is an alloy of the copper (red) and zinc (silvery white) yellow in colour. VII) **To reduce malleability and ductility:** To increase resistance of metal to such forces i.e. to make it tough it is necessary to reduce its malleability or ductility which is affected by alloying with some suitable metal. **Example:** A small amount of copper is added to gold and silver to reduce their malleability and ductility. VIII) **To modify chemical activity:** The chemical reactivity of a metal can be changed by alloying it with other metal. This does not affect the products of reaction but changes the rate of reaction. **Example:** 1) Sodium is highly reactive element, but when it is alloyed with mercury to form an alloy called sodium- amalgam, it becomes less reactive. 2) The chemical reactivity of aluminium increases when it is alloyed with mercury to form aluminium- amalgam. **(Note: Students are required to write any four purposes with any one example, each carries 1 mark. Examples may vary.)**		
	e)	**Give the composition, properties and uses of Alnico.** **Alnico:** **Composition:** Al = 20%, Ni = 20%, CO = 10%, Steel = 50% **Properties:** It is highly magnetic in propertis. It lifts 4450 times of its own weight. **Uses:** For making small powerful permanent magnetic for magneto loudspeakers, radio and TV sets. In transformer cores, dynamos, and motorsetc.	2 1 1	4

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
4.	f)	**Write four constituents of plastic. State one example and one function of each constituent**. **Constituents: (any four)** 1) **Resins (or binders) :-** **Function**: It holds the different constituents together. **Examples:** PVC, bakelite, polystyrene, polyethylene, teflon, nylon, urea-formaldehide, polyester etc. 2) **Fillers :-** **Function:** a) It increases hardness, tensile strength, opacity, finish and workability of plastic. b) It reduces the cost, shrinkage on setting and brittleness of plastics. c) Asbestos provides heat and corrosion resistance to the plastic material. **Examples:** Quartz, mica, asbestos, paper pulp, cotton, graphite etc. 3) **Plasticizers** :- **Function:** It increases plasticity & flexibility of plastics. **Examples:** Camphor, tributy phosphate, oleic acid, stearic acid etc. 4) **Accelerators / Catalysts :-** **Function:** These are used in moulding of thermosetting plastics. It decreases the time required for moulding. **Examples:** H_2O_2 (hydrogen peroxide), benzoyl peroxide etc. 5) **Colouring Matter (or Pigments) :-** **Function:** The colouring matter used in plastics to impart beautiful shade of colours. **Examples:** organic dyestuffs & inorganic pigments like red lead, cobalt blue, chrome green etc.	1 mark each	4

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
5.		**Attempt any four of the following:**		**16**
	a)	**Explain with example condensation polymerisation.**		4
		Condensation Polymerisation :- It is a process in which the monomers of different types joined together by the condensation forming a large polymer with the elimination of simple molecules like H_2O, HCl, CH_3OH etc.	1	
		Formation of Bakelite: It is prepared by condensing phenol & formaldehyde in presence of acidic / alkaline catalyst.	1	
		Diagram:  	2	
	b)	**Write preparation, properties and application of thermocole.**		
		Preparation: "Thermocole is a foamed plastic obtained by blowing compressed air into molten polystyrene or polyurethane is known as thermocole" .	1	4
		Properties :- (any three) 1) It is spongy, porous and has foam like structure. 2) It has low density. 3) It has low thermal conductivity. 4) It has low electrical conductivity. 5) It is quite shock - proof. 6) It is quite strong, though extremely light. 7) It is chemically inert & resists ageing. 8) It can be used upto 55^0C	1 ½	

<table>
<tr><th>Que. No.</th><th>Sub. Que.</th><th>Model answers</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td>5.</td><td>b)</td><td>Applications: (any three)
1. It is used as heat insulator in refrigeration, cold-storage, ice-boxes, air conditioning etc.
2. It is used as ideal packing material for delicate electrical & electronic equipment.
3. It is used for decorative purposes.
4. It is used for protecting screen in radars.
5. It is used for floats in water</td><td>1 ½</td><td rowspan="2">4</td></tr>
<tr><td></td><td>c)</td><td>Differentiate between thermosetting and thermosoftening plastics.

(any four points)

<table>
<tr><th>Thermoplastics</th><th>Thermosetting Plastics</th></tr>
<tr><td>i) They are formed by addition polymerization.</td><td>i) They are formed by condensation polymerization.</td></tr>
<tr><td>ii) Linear long chain polymers with limited cross links.</td><td>ii) Three dimensional structure.</td></tr>
<tr><td>iii) Smaller molecular weight.</td><td>iii) Higher molecular weight.</td></tr>
<tr><td>iv) Softened on heating & reshaped & reused.</td><td>iv) Do not soften on heating & reshaped & reused.</td></tr>
<tr><td>v) Reclaimed from wastes.</td><td>v) Can not be reclaimed from wastes.</td></tr>
<tr><td>vi) Intermolecular bonds are weaker.</td><td>vi) Strong covalent bonds are joined.</td></tr>
<tr><td>vii) Softer, weaker, less brittle.</td><td>vii) Harder, stronger & more brittle.</td></tr>
<tr><td>viii) Soluble in organic solvents.</td><td>viii) Insoluble in organic solvents.</td></tr>
<tr><td>xi) Polyethylene, Polystyrene PVC.</td><td>xi) Bakelite, Polyesters, silicone Plastics.</td></tr>
</table>
</td><td>1 mark each</td></tr>
</table>

<table>
<tr><th>Que. No.</th><th>Sub. Que.</th><th>Model answers</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td>5.</td><td>d)</td><td>Give four application of rubber based on its proporties.

<table>
<tr><th>Properties</th><th>Uses / Applications of Rubber</th></tr>
<tr><td>Elasticity</td><td>i) Manufacture of rubber bands, tubes for automobiles, golf balls, surgical goods.</td></tr>
<tr><td>Abrasion Resistance</td><td>i) Tyre tubes, shoe sales & heels, conveyor belts, V-belts.</td></tr>
<tr><td>Electrical Resistance</td><td>i) Electrical industry as insulating coating for wires & cables electrical power transmission. Plugs, sockets, switch board panels, telephone receivers.</td></tr>
<tr><td>Resistance to penetration of air & water</td><td>i) Making cushions, air pillows, rain coats, mattresses, under carpet.</td></tr>
<tr><td>Tack</td><td>i) Making composite rubber articles like tyres.</td></tr>
<tr><td>Shock absorber</td><td>vi) Good shock absorbing, sound & thermal insulating properties used in shock absorbing cards, bonds for helmets, goggles, toys, sports goods.</td></tr>
<tr><td>Hardness</td><td>vii) Rubber gaskets used for sealing equipments such as refrigerator, cabinet doors, cookers autoclaves etc.</td></tr>
</table></td><td>1 mark each</td><td>4</td></tr>
<tr><td></td><td>e)</td><td>Write characteristics of ideal insulating materials.

(Any Eight)

1) Its thermal conductivity should be low.
2) It should be fire proof.
3) It should be cheap.
4) Its density should be low.</td><td>½

Mark each</td><td>4</td></tr>
</table>

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
5.	e)	5) It should be water proof. 6) It should be chemically inert to water, surrounding atmosphere and high temperature. 7) It should be odourless during use. 8) It should withstand the effect of shock and vibrations. 9) It should be capable of bearing load in working operation. 10) It should be physically & mechanically stable at working temperature		
	f)	**Descibe PEM and its significance.** **Preventive Environmental management:** It includes all the measures taken by government, non-government and social organization for controlling pollution related problems. **Significance of PEM: (Any Six)** 1. To regulate the exploitation of natural resources. 2. To aware and educate the public about health and environmental issues. 3. To advice industries on ways to minimize solid and hazardous waste. 4. To monitor the quality of public water supplies. 5. To control tremendous growth in population. 6. To monitor emissions from industries. 7. To make all drainage systems and sewage storage tanks underground. 8. Preserving the biological diversity. **(Note: Consider any relevant answer)**	1 ½ Mark each	4

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
6.		**Attempt any four of the following.**		**16**
	a)	**Explain four major sources causing Air Pollution.** **Major sources causing Air Pollution are** **(A) Gases:** **Sulphur dioxide (SO_2):** Thermal power plants, Petroleum industry,Oil refineries,Sulphuric acid plants, Sulphide ore roasting plants. **Sulphur trioxide (SO_3):** SO_3 is formed by the oxidn of SO_2 under the influence of sunlight. **Carbon Monoxide(CO) :** Partial combustion of fuel in automobile, industries and oil refineries, cigarette and bidi, smoke and domestic heat appliances. **Carbon dioxide(CO_2):** It is released in the atmosphere in the form of smoke by burning of fuels eg coal gases, It is also released into air by the respiration, plants and animals, It also occurred by deforestration. B) **Particulates:** **Dust :-** Mines and quarries, Furnaces, Power houses, Vehicular traffics, House cleaning dust. Poultry and, Ceramic factory, Agricultural forest fires, Natural winds, Earth movements, Rubber tyre abrasions **Smoke :-** Rail roads, Locomotives domestic wood, coal grates, industrial power plants, open fires refuse, incinerator's, diesel engines, automobile, gasoline engines, furnaces, hearths etc. **Smog :-** Due to the action of sunlight on hydrocarbons coming largely from vegetable matter and the nitrogen oxides emitted by factories and car exhaust along with CO_2, CO, and unburnt hydrocarbon particles and also SO_2 **Lead dust :-** Automobile emissions, Lead smelters, Burning of coal or oil, Lead arsenate particles, Lead batteries, and paints and manufacture of lead based alloys. **(C) Deforestation :** Green plants use CO_2 for the manufacture of food by photosynthesis and give out O_2 there by purifying the atmospheric air plants also control H_2S,HNO_3 and chlorine.Thus plants help in controlling the air pollution. Excessive cutting of trees consequently causes indirectly air pollution. **(D) Radioactive gases:** The radio active elements which occur in rocks and soils are derivatives of uranium (U) thorium (Th) and actinium (Ac) series. They evolve radioactive gases which mainly consist of radon and thoron. These gases are harmful to human health. Define water pollution. What are causes of water pollution. **(Note: Give full marks to relevant answer)**	1 mark each	4

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
6.	b)	**Define water pollution. What are causes of water pollution?** **Water Pollution :-** Any alteration in the physical, chemical and biological properties of water as well as contamination with any foreign substance which would constitute a health hazardous or decrease the utility of water. **Causes of Water Pollution :- (Any three)** 1) **Industrial Waste**: - Water gets polluted by industrial effluents containing acids, alkalis, soaps, detergents, pesticides, insecticides, fungicides and metals like Cu, Zn, Pb, Hg etc. which are released from chemical industries. 2) **Domestic Sewage**: - It includes human and household waste waters, municipal waste etc. directly mix into canals and rivers causes pollution of river water. When sewage is discharged into a stream of water directly into river lakes. 3) **Suspended Particles** :- The surface water containing bacteria, algae, viruses make water unfit for domestic & industrial purposes. High concentration of organic and inorganic solids, sand, precipitates, insects, ores, fine particles of soil are added to river and cause water pollution. 4) **Spilling of Oil**: Pollution of oceans about one million tones of oil is spilled into the ocean each from shipping and drilling operations. Oil from oil mills and washing of automobiles pollute the rivers. 5) **Drain from land and fields**: Residual insecticides, pesticides and fungicides are washed down into lakes, streams, rivers etc. and pollute them. 6) **Fertilizer**: Wastes from fertilizer plants containing nitrates, phosphates, ammonia etc. are released in water and causes pollution. 7) **Atomic explosion**: Atomic explosion & processing of radioactive materials near the sources of water causes water pollution.	1 1 mark each	4

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
6.	c)	**What is green house effect ? How it takes place?** The heat received from the sunlight heats up earth and some of it is radiated back into space after absorption but certain gases present in the lower atmosphere acting like a glass in a green house allow radiations in the range 300 – 2500 nm. While filtering u.v. rays in the range <300 nm. It however does not allow the earth to reradiate heat in to space.Thus a green house is that body which allows the short wavelength incoming solar radiation to come in but does not allow the long wave outgoing terrestrial infrared radiations to escape. A part of the heat so trapped in these atmospheric gases is re-emitted to the earths surface. The net result is the heating of earth's surface by this phenomenon called the green house effect. The four major green house gases which cause adverse effects are CO_2, methane, nitrous oxide (N_2O), chloro-fluoro carbons (ClFCs).	2 2	4
	d)	**What is biomedical waste? Give two techniques for its disposal.** Biomedical waste is hazardous and infections waste from hospitals and pathological laboratories. It contains discarded human blood, blood products, plasma, serum and body fluids. **A) Incineration of biomedical waste :-** Biomedical waste should be incinerated shall not be chemically treated with anychlorinated disinfections. Chlorinated plastic shall not be incinerated. Only low sulpher fuel like diesel shall be used as fuel in the incinerator. **B) Use of auto clave :-** The autoclave should be used for medical waste and indicator should indicate the required time, temp and pressure otherwise entire medical waste must be autoclaved again until the required parameters are achieved. **C) Effluent treatment :-** The effluent generated in hospitals should satisfy the permissible limits laid for various parameters. **D) Use of microwave :-** Microwaves kill the bacteria and other pathogenic organisms. **E) Deep burial of biomedical waste :-** A pit should be about 3 m deep and should be half filled with waste and then covered with lime with 50 cm of the surface before filling the rest of the pit with soil. Burial must be performed under close and dedicated supervision the site should be impermeable.	1 1 ½ Mark each	4

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
6.	e)	**Explain air pollution due to IC engine. Give the method of controlling to Auto Emission.** The internal combustion engine used for running motor car, buses, planes, trucks, auto-rickshaws, scooters etc.When fuel like kerosene, diesel, petrol is burnt a lot of smoke is released into the atmosphere. A major cause of air pollution is various type of auto vehicles. These fuels are all mixture of hydrocarbons of different molecular masses and out of these octane constituent major component of fuel. When it burns in IC engine reaction takes place. $2C_8H_{18} + 2SO_2 \longrightarrow 16\ CO_2 + 18H_2O$ + Heat. Besides the pollutant CO_2, CO, SO_2, hyrocarbons acids, alcohols, NO_2 etc. enter the atmosphere. These gases effects on human being. **Control methods for air pollution due to Auto Emission.** **(Any two)** **1) By using engine with better design** The extent of unbumt fuel, carbon, CO, hydrocarbons etc. In the exhaust to a great extent. **2) By using suitable catalyst** The complete oxidation of fuel takes place and pollution is controlled to a large extent. **3) By supplying more air for combustion** The lesser toxic exhaust gases will enter in the atmosphere. **4) By improving the quality of gasoline** Gasoline is mixed with Tetra-ethyl lead known as leaded gasoline emits less smoke and hence it causes less pollution.	2 1 mark each	4
	f)	**Write any four preventive measures of water pollution** **Preventive measures of water pollution :-** **1. Stabilization of the ecosystem:** Ecosystem stabilization is the most scientific method which involves reduction of waste at source, trapping nutrients, fish management, aeration, harvesting and removal of biomass. **2. Re-utilization and recycling of the waste:** Waste water is given sort of treatment before discharging into rivers, lakes, ponds etc. Such treated water can be recycled and reused to generate cheaper fuel, gas and electricity.	1 mark each	4

Que. No.	Sub. Que.	Model answers	Marks	Total Marks
6.	f)	**3. Oxidation method (or stabilization of ponds) :** waste water is stored in large and shallow ponds. In presence of sunlight and organic nutrients in waste, large number of bacteria grow very fast and digest organic matter to convert complex organic compounds into harmless simple compounds. This waste can be reused for irrigation of land without any danger of pollution. **4. Waste water reclamation:** The sewage water is given treatment and directly used for irrigation and fish farming. **5. Use of chemicals:** Sewage on effective filtration followed by chlorination provides water safe for drinking and domestic use. **6. Use of Bioreactors**: Organic dirty sewage and factory waste is pumped into the bioreactors which removes about 95% of impurities. Even corrosive acids, alkalies, and industrial effluents can be purified using bioreactors. They neither produce odorous smell nor toxic by-products during the reactions. 7. By avoiding washing clothes, utensils, cattle and vehicles directly in river/ canal water.		