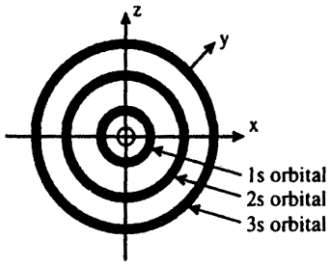
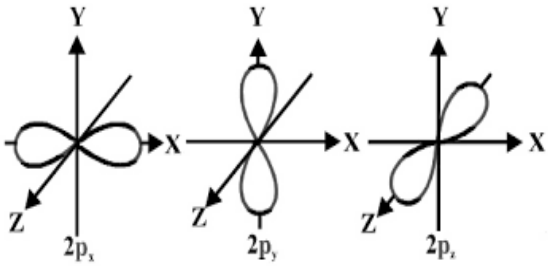
WINTER– 16 EXAMINATION
Model Answer Subject Code: 17103

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in themodel answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may tryto assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given moreImportance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in thefigure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constantvalues 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.

Q. No.	Sub Q.N.	Answer	Marking Scheme
1		**Attempt any NINE of Following:**	**18**
	a)	**Draw shapes of s and p orbitals.**   s orbital p orbitals (1 mark for s orbital and 1 mark for p orbital) ----------	**2** 1 mark each
	b)	**If atomic number and atomic mass number of an element are 11 and 23 respectively, write number of protons, neutrons and electrons in it.** **Given**: Atomic number (Z) : 11 Atomic mass number (A) : 23 1) Number of protons (p): Z = p = 11 2) Number of neutrons (n): A – Z = 23-11 =12 3) Number of electrons (e): Z = p = e =11 ----------	**2** ½ mark each step

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1	**c)**	**Give two postulates of Bohr's Theory.** 1. An atom consists of a dense positively charged central part called as **Nucleus.** 2. The electrons revolve around the nucleus in fixed circular paths are called **orbit or shell**. The electrostatic force of attraction between nucleus & electron balanced by the centrifugal force. Hence the electrons do not fall into the nucleus and therefore atom remains stable. 3. Electron can rotate only in certain permitted orbits known as **stationary state.** 4. Each stationary state is having definite amount of energy hence called as **energy level.** 5. Electrons in the energy level nearest to the nucleus have **lower** energy while those are at **greater** distance from the nucleus have **higher** energy. 6. 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. 7. When the excited electron jumps from **lower to higher** energy level, it **absorbs or gain** energy.When the excited electron jumps from **higher to lower** energy level, it **emits or loses** energy. 8. The angular momentum of an electron (mvr) must be an itegral multiple of h/2π. Hence **mvr = nh/2π**	**2** 1 mark each
	d)	**List the factors affecting on degree of ionization.** Factors affecting degree of ionization:- 1. Nature of Solute. 2. Nature of Solvent. 3. Concentration of the solution. 4. Temperature.	**2** ½ mark each
	e)	**Establish the relation between chemical equivalence and electrochemical equivalence.** 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. **C.E. (Eq. Wt.) = 96,500 x E.C.E.**	**2** 2
	f)	**State Faraday's second law of electrolysis.** **Faraday's Second Law of Electrolysis:** This law states that, when the same quantity of electricity is passed through the different electrolyte solutions which are connected in series, the amount of the substance deposited or liberated at the electrodes are directly proportional to their chemical equivalents.	**2** 2

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Q. No.	Sub Q.N.	Answer	Marking Scheme
1	g)	**Calculate pH of 0.1 molar sulphuricacid. Assume complete dissociation.** As Sulphuric acid is dibasic acid Concentration of H_2SO_4 = 0.1M = 0.05N = 5×10^{-2} moles /litre pH = - $\log_{10}[H^+]$ pH = - $\log_{10}[5\times10^{-2}]$ pH = - [$\log_{10}(5)$ +(-2) $\log_{10}(10)$] [but $\log_{10}(10) = 1$] pH = - [0.6989-2] pH = 1.3	**2** ½ ½ 1
	h)	**Give two uses of Duralumin.** **Uses**: 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.	**2** 1 mark each
	i)	**Differentiate between mineral and ore. (Any Two)** **Sr. No.** / **Mineral** / **Ore** 1 / It is a naturally occurring substance which contains metal either in free state or in combined state. / Ore is a mineral from which metal can be extracted economically and profitably. 2 / All minerals are ores. / All ores are not minerals. 3 / Example: Clay : $Al_2O_3.2SiO_2.2H_2O$ / Example : Bauxite: $Al_2O_3.2H_2O$	**2** 1 mark each
	j)	**Give the principle of Gravity Separation Method.** **Principle:** This method of concentration of ore is based on the difference in densities of the ore and impurities.	**2** 2
	k)	**Name the organic compound present in natural rubber. Give its structure.** The organic compound present in natural rubber is **Isoprene.** **Structure of isoprene:** $CH_2 = \overset{\overset{CH_3}{\vert}}{C} - CH = CH_2$	**2** 1 1

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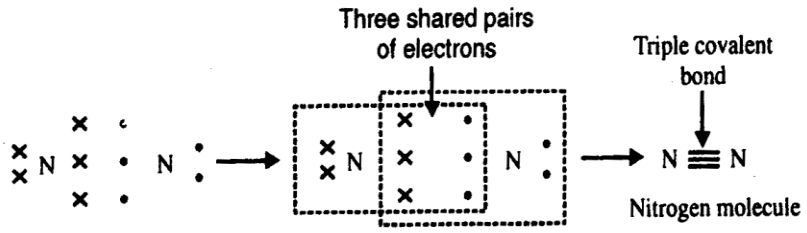
Q. No.	Sub Q.N.	Answer	Marking Scheme
	l)	**Why the use of thermal Insulator is very important in various industries**. The loss of heat takes place by conduction, convection and radiation. Thermal insulators prevent this loss of heat. They act as barriers or retarders in the passage of heat. Due to this property thermal insulator is very important in various industries.	**2** 2
2		**Attempt any FOUR of following:**	**16**
	a)	**Write electronic configuration of following element.** **$_{11}Na^{23}$, $_{14}Si^{28}$, $_{18}Ar^{40}$, $_{24}Cr^{52}$.** Electronic configuration of above elements are as follow: $_{11}Na^{23}$ - $1s^2, 2s^2, 2p^6, 3s^1$. $_{14}Si^{28}$ - $1s^2, 2s^2, 2p^6, 3s^2, 3p^2$. $_{18}Ar^{40}$ - $1s^2, 2s^2, 2p^6, 3s^2, 3p^6$. $_{24}Cr^{52}$ - $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^1, 3d^5$.	**4** 1 mark each
	b)	**Explain formation of N_2 molecule.**  Nitrogen molecule is diatomic. Each nitrogen atom (2, 5) is in short of 3 electrons to complete the octet. So each nitrogen atom contributes 3 electrons for sharing. Thus, nitrogen molecule is formed by sharing three pairs of electrons between two atoms of nitrogen & hence completing the octet of each. Three shared pairs form a triple covalent bond.	**4** 2 2

. No.	Sub Q.N.	Answer	Marking Scheme
2	c)	**Define :** **i) Isotopes** **ii) Isobars** **iii) Orbit** **iv) Orbitals**	**4**
		i) Isotopes: The different atoms of the same elements having same atomic number but different atomic mass number are called isotopes.	1
		ii) Isobars: The atoms of the different elements having same atomic mass number but different atomic number are called isobars.	1
		iii) Orbit: Electrons revolve around the nucleus in fixed circular path called 'orbit'.	1
		iv) Orbitals: - The region in the space around the nucleus, where the probability of finding an electron is maximum, is known as orbitals.	1
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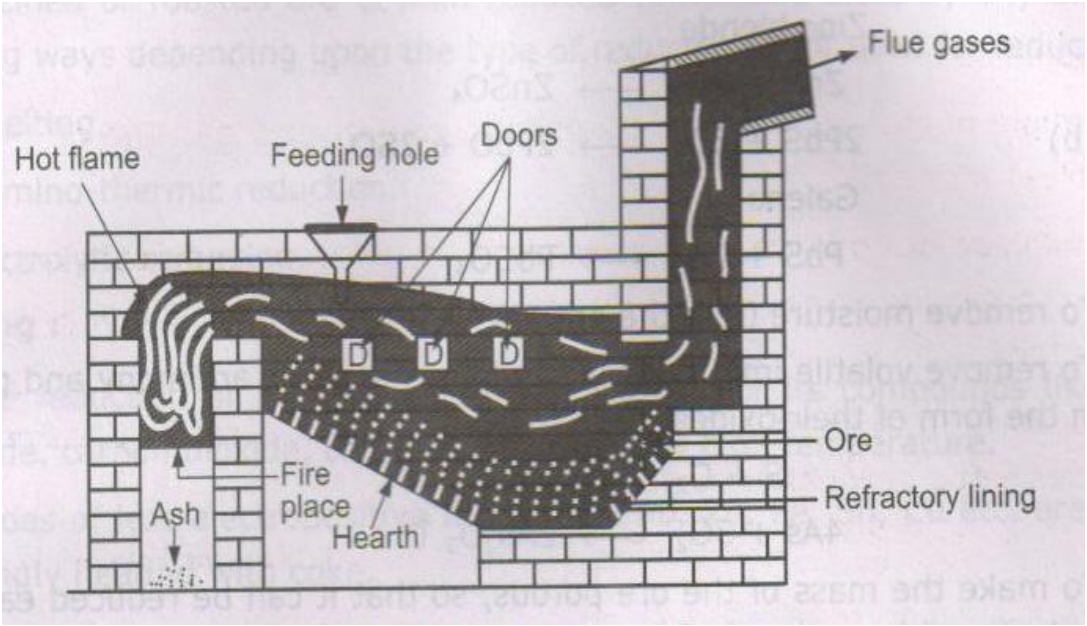
	d)	**Why blue colour of copper sulphate solution turns to colourless after its electrolysis using platinum electrodes?**	**4**
		1. The platinum electrodes are inert. Hence does not dissolve into the solution. 2. The Cu^{++} ions (blue in colour) present in the solution are discharged on the surface of cathode & OH^- are discharged on the surface of anode. 3. While H^+ and SO_4^{2-} ions remains in the solution. 4. As a result of this electrolysis, blue coloured $CuSO_4$ solution is slowly converted into colorless H_2SO_4 solution.	1 mark each
		---	
	e)	**Calculate pH of 2.5×10^{-3} N KOH / NaOH solution assuming complete ionization.**	**4**
		Given: $[OH^-] = 2.5 \times 10^{-3}$	½
		$pOH = -\log_{10}[OH^-]$ $= -\log_{10}[2.5 \times 10^{-3}]$ $= -[(\log 2.5) + (-3 \times \log 10)]$ $= -[(0.3979) + (-3)]$ $= [3 - 0.3979]$	½ 1½
		pOH = 2.60 **pH + pOH = 14** Therefore pH = 14 – pOH = 14-2.60 **pH = 11.4**	½ 1
		---	**4**
	f)	**Define oxidation potential and reduction potential.**	2
		Oxidation Potential: It is defined as the tendency of an electrode to lose electrons is a direct measure of its tendency to get oxidized and this tendency is called as oxidation potential.	2
		Reduction Potential: It is defined as the tendency of an electrode to gain electrons is a direct measure of its tendency to get reduced and this tendency is called as reduction potential	

Q. No.	Sub Q.N.	Answer	Marking Scheme
3.		**Attempt any FOUR of following:**	**16**
	a)	**Explain the process of calcination with labelled diagram.**	**4**
		Calcination:-'Calcination is the process of heating the ore strongly in the absence of air to a temperature insufficient to melt it.' It is done in the hearth of a reverberatory furnace when the doors are kept closed. (i.e. in absence of air). Generally, carbonate & hydroxide ores are concentrated by this method.	1
		Purposes of Calcination :- (consider any two points) 1. To convert carbonate & hydroxide ore into oxide. $CaCO_3 \rightarrow CaO + CO_2\uparrow$ Limestone $CuCO_3.Cu(OH)_2 \rightarrow 2CuO + CO_2\uparrow + H_2O\uparrow$ Malachite 2. To remove the moisture. $Fe_2O_3.\ 3H_2O \rightarrow Fe_2O_3 + 3H_2O$ Haematite 3. To remove the volatile impurities. 4. To make mass porous, so that it can be easily reduced to the metallic state.	2
			1

Q. No.	Sub Q.N.	Answer	Marking Scheme
3	b)	**Give composition, properties and uses of Wood's metal.**	**4**
		Composition:- Bi=50% Pb = 25% Sn = 12.5% Cd = 12.5%	2
		Properties: i) It is an easily fusible alloy. ii) Its melting point is low, 71^0C	½ mark each
		Uses: It is used in- (any two) i) Safety plugs of pressure cookers ii) Safety plugs of Boilers iii) Fire alarms iv) Automatic water sprinklers v) Soft solder vi) For casting of dental work	½ mark each
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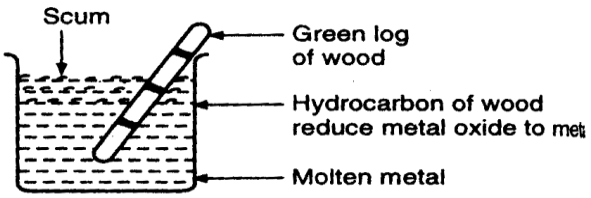
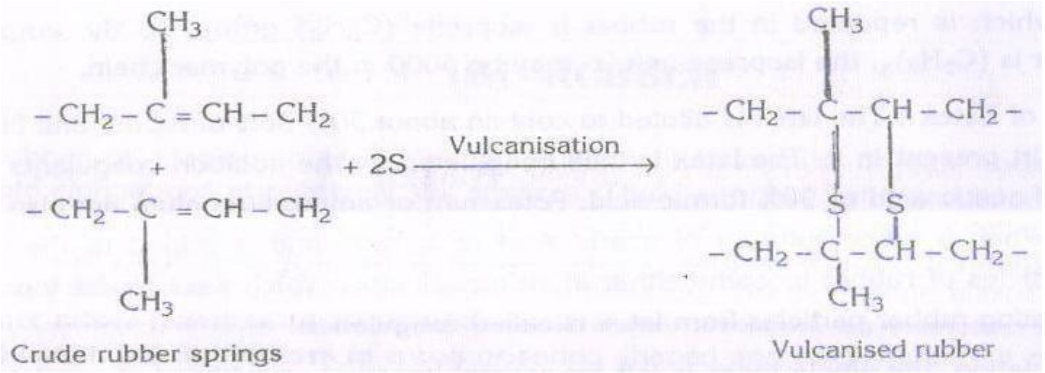
	c)	**Define Refining. Explain poling (oxidation) method.**	**4**
		Refining:- The process of purification of metal to get extra - pure metal is known as refining.	1
		Poling (oxidation of impurities): When the impurity has greater affinity for oxygen than the metal itself, then this method is used.	
		This method consists of stirring the hot crude molten metal with green logs of wood. The wood gases (Hydrocarbons like methane etc.) so produced reduce any metal oxide impurity present in the metallic form. Moreover, during stirring large quantity of air is absorbed by the molten metal and such absorbed air oxidizes the easily oxidisable impurities. The oxidized impurities escape either as vapour or form 'scum' over molten metal. The scum so formed is removed by perforated ladle.	2
			1

Q. No.	Sub Q.N.	Answer	Marking Scheme
3	d)	**Give characteristics of insulating material. (any eight)** 1) It should have very low thermal conductivity. 2) It should be fire proof. 3) It should be cheap. 4) It should be colourless. 5) Its density should be low. 6) It should be water proof. 7) It should be chemically inert to water, surrounding atmosphere and temperature. 8) It should be odourless during use. 9) It should be light in weight. 10) It should be stable at working operation. ----------	**4** ½ mark each
	e)	**Describe the vulcanization of rubber.** **Vulcanization of rubber:-**"The process which involves addition of sulphur or H_2S to crude (raw) natural rubber at high temperature & pressure to improve properties of crude natural rubber is called vulcanization." This process is used to improve the properties of natural rubber. It brings about a stiffening of rubber by a cross-linking and preventing intermolecular movement or sliding of rubber springs. Most of all the processes of vulcanization is addition of 'sulphur'. Heating the raw rubber with sulphur to a high temperature, sulphur combines chemically at double bonds in the rubber molecule of different rubber springs.  Crude rubber springs Vulcanised rubber ----------	**4** 2 2

Q. No.	Sub Q.N.	Answer	Marking Scheme
3	f)	**Differenciate between addition polymerization and condensation polymerization.**	**4**

Sr. No.	Addition Polymerisation	Condensation Polymerisation
1	It is a process in which the monomers undergo repeated addition resulting in the formation of long chain polymer without the elimination of simple molecules like H_2O, HCl, NH_3 etc.''	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.
2	Unsaturated monomers undergo this polymerization.	Functional monomers undergo this polymerization.
3	It is fast reaction.	It is slow reaction.
4	Reaction gives only main product.	Reaction gives only main product & subsidery product.
5	Reaction given product having linear or chain structures	Reaction gives product having three dimensional structures.
6	Reaction occurs without the elimination of simple molecules like H_2O, HCl, NH_3 etc.''	Reaction occurs with the elimination of simple molecules like H_2O, HCl, CH_3OH etc.
7	Polymers formed by addition polymerization are called as Thermosoftening plastics.	Polymers formed by condensation polymerization are called as Thermo setting plastics.
8	Polymers formed by addition polymerization are weak, soft and has low tensile strength.	Polymers formed by condensation polymerization are hard, tough & has high tensile strength.
9	The bonds formed by addition polymerization are weak covalent bond	The bonds formed by addition polymerization are strong covalent bond
10	e.g. Polyethene, Teflon, PVC, Polystyrene	e.g. Phenol formaldehyde, Nylon 6, 6

(Note: Consider any four points)

1 mark each