WINTER–2017 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 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.

Q. No.	Sub Q. N.	Answer	Marking Scheme
1		**Attempt any NINE of the following:**	**18**
	(a)	**Compare proton, neutron and electron with respect to mass, charge and location.**	**2**

Sr.No.	Characteristics	Electron	Proton	Neutron	
1)	Location	Extra nuclear part (outside)	Inside the nucleus	Inside the nucleus	½
2)	Charge	-1	+1	0	½
3)	Mass	0.000555	1.007825	1.008665	1

	(b)	**Define electrovalency. What are types of electrovalency?**	**2**
		Definition: The number of electrons that an atom of an element gains or loses to complete its last orbit is called electrovalency.	1
		Types of Electrovalency:-	½ mark each
		1) Positive Electrovalency	
		2) Negative Electrovalency	

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<table>
<tr><th>Q. No.</th><th>Sub Q. N.</th><th>Answer</th><th>Marking Scheme</th></tr>
<tr><td>1</td><td>(c)</td><td>Differentiate between orbit and orbital. (any two)
<table>
<tr><th>Sr. No.</th><th>Orbit</th><th>Orbital</th></tr>
<tr><td>1)</td><td>It is fixed path along which the electrons revolve around the nucleus.</td><td>It is the region in the space where the probability of finding an electron is maximum.</td></tr>
<tr><td>2)</td><td>Orbits are designated by letters K, L, M, N, O, P.</td><td>Orbitals are designated by letters s, p, d, f,</td></tr>
<tr><td>3)</td><td>Orbit is circular paths or elliptical in shape.</td><td>The orbitals have different geometrical shapes. e.g. s-Spherical, p-dumb bell shaped.</td></tr>
<tr><td>4)</td><td>The maximum number of electrons in an orbit is given by $2n^2$ rule.</td><td>Orbital can contain maximum two electrons with opposite spins (↑↓)</td></tr>
<tr><td>5)</td><td>The number of orbits from the nucleus are n=1, 2, 3, 4, 5, 6 etc.</td><td>The number of orbitals relative to energy level are n^2=1, 4, 9, 16 etc.</td></tr>
</table></td><td>2
1 mark each</td></tr>
<tr><td></td><td>d)</td><td>State factors affecting degree of ionization. (Any Two)
1. Nature of Solute: - Ionic compounds such as acids, bases & salts are highly ionized in solution.
e.g. strong acids like HCl, H_2SO_4 & strong bases like NaOH, KOH are highly ionized in solution. Weak acids like CH_3COOH & weak bases NH_4OH are weakly ionized in solution.
2. Nature of Solvent: - In polar solvents like water & ammonia, degree of ionization is more. In non-polar solvents degree of ionization is less.
3. Concentration of the solution: - If concentration of solution is more, then degree of ionization is less. On the other hand in dilute solution degree of ionization is more.
4. Temperature: - At higher temperature, molecules acquire thermal energy hence degree of ionization increases with increase in temperature</td><td>2
1mark each</td></tr>
</table>

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Q. No.	Sub Q. N.	Answer	Marking Scheme
1	(e)	**Calculate pH value of solution having Hydrogen ion concentration of 1×10^{-3} gm ions per liter.**	2
		$pH = - \log [H^+]$ $= - \log [1 \times 10^{-3}]$ $= - [(\log 1) + (\log 10^{-3})]$ $= - [(0) + (-3)]$ $= 3$	½ mark for each step
		pH = 3	
	(f)	**Explain Faraday's second law of electrolysis and give its expression.**	2
		Statement: This law states that, "when the same quantity of electricity is passed through the different electrolyte solutions which are connected is series, the amount of the substance deposited or liberated at the electrodes are directly proportional to their chemical equivalents."	1
		$\frac{W_1}{W_2} = \frac{E_1}{E_2}$	1
	(g)	**Define electroplating. Give its two purposes**	2
		Definition: - The process of producing metallic coating of more resistant metals (like Ag, Au, Ni, Cr etc.) on an article with the help of electric current is called electroplating.	1
		Purposes of electroplating: Electroplating is done to achieve the following objectives **a) Decoration**: - Electroplating of superior metal over an inferior metal is done in order to have attractive & beautiful appearance. e. g. Ornaments, Picture frames are electroplated with Ag, Au, Ni & Cr etc. It increases the commercial & decorative value of an article in the market. **b) Protection:** - A coating of more resistant metal like Ag, Sn, Ni, Cr etc. is applied on the base metal like iron by electroplating in order to save the latter from rusting, corrosion & atmospheric actions. c**) Repairs:** - Sometimes, broken pieces or worn out parts of machinery are repaired by electro deposition of metal in between the broken or at the defective part of the metal.	½ mark each

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Q. No.	Sub Q. N.	Answer	Marking Scheme
1	(h)	**Define the terms: (i) Mineral (ii) ore**	**2**
		i) Mineral: A naturally occurring substance present in earth's crust which contains metal in the free or combined state is known as mineral.	1
		ii) Ore: The mineral from which the metal is conveniently and economically extracted is known as **ore**.	1
	(i)		2
		Define: i)Tensile strength ii) Machinability **i) Tensile strength:** It is the ability or capacity of a metal to carry the load without breaking. **Or** A tensile strength of a metal is its ability to resist pull without breaking.	1
		ii) Machinability: - It 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
	(j)	**Write any two purposes of making an alloy with one example each.** **a) To improve the hardness of metal: -** E.g. Pure gold & silver are soft, hence they are hardened by the addition of a small amount of copper in them. **b) To lower the melting point: -** Pure metals are having high melting point can be lowered by of alloying elements. E.g. Wood's 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. **c) To increase the tensile strength: -** E.g. The addition of 1% carbon increase the tensile strength of pure iron by about 10 times. **d)To increase corrosion resistance:-** E.g. Pure iron is corroded fastly but its alloy stainless steel resist corrosion. **e) To get good castings:-** E.g. Bronze (an alloy of Cu & Zn) possess good casting property. **f) To modify color: -** E.g. Brass is an alloy of copper (red) and Zinc (Silvery white) and is yellow in color. **g) To reduce malleability and ductility :**- E.g. a small amount of copper is added to gold and silver to reduce their malleability and ductility. **h) To change (alter) chemical reactivity:** E.g Sodium is highly reactive metal but when it is alloyed with mercury to form an alloy called sodium – amalgam (Na-Hg), it becomes less reactive.	**2** 1 mark each

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Q. No.	Sub Q. N.	Answer	Marking Scheme
1.	k)	**State any four characteristics of a thermal insulator.** **Characteristics of thermal insulator:** 1) Its thermal conductivity should be low 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 9) It should be light in weight 10) It should be capable of bearing load in working operation.	2 ½ mark each
	l)	**Which property of rubber is used in tyres? Name and explain the property.** **Property: Abrasion resistance** **Explanation:** The property of resisting wearing away of surface by friction is known as abrasion resistance. It is measured by machines in which an abrasive material is rubbed against the surface of the rubber. The loss in volume in a definite period denotes the loss on abrasion. The greater the loss, less is the abrasion resistance. **Or** **Property: Tack** **Explanation:** Tack is the special property of rubber due to which two or more surfaces can stick or adhere to each other. Tack can be increased by making the surfaces fresh by treating it with suitable solvent. It is an important property in manufacturing of tyres**.** **(consider any one)**	**2** 1 1

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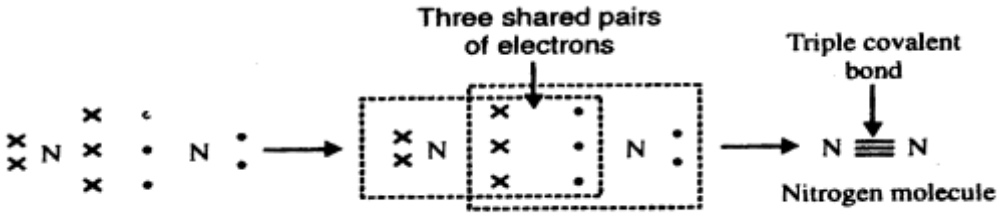
Q. No.	Sub Q. N.	Answer	Marking Scheme
2		**Attempt any FOUR of the following:**	**16**
	a)	**Write orbital electronic configuration of** **$_8O^{16}$, $_{11}Na^{23}$, $_{17}Cl^{35}$, $_{24}Cr^{52}$**	**4**
		$_8O^{16}$ = $1s^2$ $2s^2$ $2p^4$	1
		$_{11}Na^{23}$ = $1s^2$ $2s^2$ $2p^6$ $3s^1$	1
		$_{17}Cl^{35}$ = $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^5$	1
		$_{24}Cr^{52}$ = $1s^2$ $2s^2$ $2p^6$ $3s^2$ $3p^6$ $4s^1$ $3d^5$	1
	b)	**Describe the formation of N_2 molecule. Which type of bond is present in N_2 molecule.**	**4**
			1
		Nitrogen (Z-7) = $1s^2$, $2s^2$, $2p^3$	
		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.	2
		Type of bond: Triple covalent bond	1

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<table>
<tr><th>Q. No.</th><th>Sub Q. N.</th><th>Answer</th><th>Marking Scheme</th></tr>
<tr><td>2.</td><td>c)</td><td>Differentiate between isotopes and isobars. (4 points)
<table>
<tr><th>Sr. No.</th><th>Isotopes</th><th>Isobars</th></tr>
<tr><td>1)</td><td>These are the atoms of same element having same atomic number but different atomic mass number.</td><td>These are the atoms of different elements having different atomic number but same atomic mass number.</td></tr>
<tr><td>2)</td><td>They have same electronic configuration.</td><td>They have different electronic configuration.</td></tr>
<tr><td>3)</td><td>They occupy the same place in the periodic table</td><td>They occupy different place in the periodic table.</td></tr>
<tr><td>4)</td><td>Chemical properties are identical</td><td>Chemical properties are different</td></tr>
<tr><td>5)</td><td>e.g. $^{1}_{1}H$, $^{2}_{1}H$, $^{3}_{1}H$</td><td>e.g. $^{40}_{18}Ar$, $^{40}_{19}K$, $^{40}_{20}Ca$</td></tr>
</table></td><td>4

1 Mark Each</td></tr>
<tr><td></td><td>d)</td><td>State Arrhenius theory of ionization. (4 points)
1) The molecule of an electrolyte when dissolved in water split up into two kinds of charged particles. One carrying a positive (+ve) charge called cation and the other carrying negative (-ve) charge called anion.
2) Cations are generally metallic radicals obtained by loss of electrons from the metallic atoms while anions are non-metallic atoms or radicals obtained by gain of electrons by non-metallic atoms or non-metals.
3) In solution, the total number of cations (+ve charge) is equal to the total number of anions (-ve charge) and hence the solution as a whole is electrically neutral.
4) The number of positive charges & negative charges on the cations or anions corresponds to the valency of the elements.
5) The ions present in solution are constantly reuniting to form un-dissociated molecules. Hence the process of electrolytic dissociation is reversible.
e.g. $HCl \rightleftarrows H^{+} + Cl^{-}$
$NaOH \rightleftarrows Na^{+} + OH^{-}$</td><td>4

1 Mark Each</td></tr>
</table>

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Q. No.	Sub Q. N.	Answer	Marking Scheme
2.	**e)**	**A current of 3 amperes passing through silver nitrate solution for 20 minutes deposit 4.09 gms of silver. What is E.C.E. and C.E. of silver?**	**4**

Solution –

Given :

t = 20 minutes
= 20 x 60 seconds
= 1200 seconds
c = 3 amperes
W = 4.09 gms

To Find: E.C.E. (z) = ?
C.E. = ?

By using Faraday's First law,

$W = z \times c \times t$ — 1 ½

$z = \frac{W}{c \times t}$

$= \frac{4.09}{3 \times 1200}$

E.C.E. (z) = 0.001136 g/coulomb

Now, C.E. = 96500 x E.C.E. — 1 ½
= 96500 x 0.001136
= 109.62 g

E.C.E. (z) = 0.001136 g/coulomb
C.E. = 109.62 g

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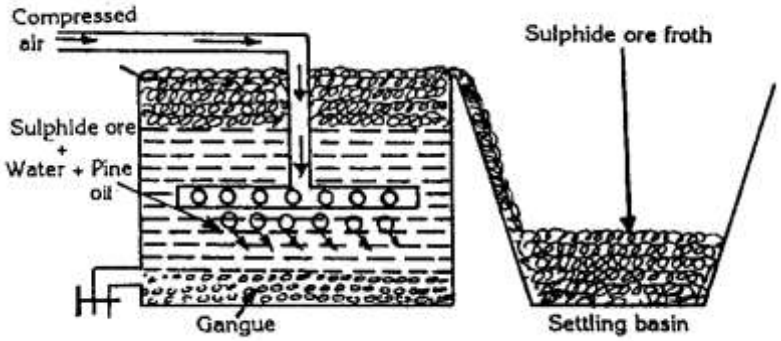
Q. No.	Sub Q. N.	Answer	Marking Scheme
3.		**Attempt any FOUR of the following:**	**16**
	a)	**Explain froth floatation method of concentration of ore with the help of diagram.**	**4**
		Froth floatation method– This process is based on the principle of different wetting characteristics of the ore & gangue particles with water & oil.	1
		 	1
		Process: 1) In this process powdered sulphide ore is mixed with water and pine oil. Whole mixture is then stirred vigorously by passing compressed air. The oil forms froth with air bubbles. 2) The sulphide ore particles get attached with the froth and floats on the surface while gangue or earthy impurities are wetted by water and sink to the bottom of the tank. 3) The floating froth is then skimmed off into settling basins from where by filter press ore is recovered. 4) This process is suitable for sulphide ores like galena, nickel sulphide, zinc blende, copper pyrite etc.	2

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3.	b)	**Differentiate between calcination and roasting. (4 points)**	4

Calcination	Roasting
1) Process of heating the ore strongly in absence of air below its M.P.	1) Process of heating the ore strongly in presence of air below its M.P.
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 calcination, the mass becomes highly porous.	4) In roasting, the mass becomes less porous.
5) Process done in hearth of a reverberatory furnace when the doors are kept closed.	5) Process done in hearth of a reverberatory furnace when the doors are kept opened.
6) Decomposition reaction takes place	6)Oxidation reaction takes place

1 mark each

	c)	**Give composition, properties and applications of Duralumin.**	4
		Duralumin –	
		Composition – Al=95%, Cu=4%, Mg=0.5%, Mn=0.5%	2
		Properties – (any two) 1) It is soft, light & tough. 2) It is ductile and easily castable. 3) It has good machinability. 4) It is good conductor of heat & electricity.	1
		Applications / Uses - (any two) 1) It is mainly used for making aeroplanes parts. 2) It is also used for making tubes and cables 3) It also used for making surgical instruments	1

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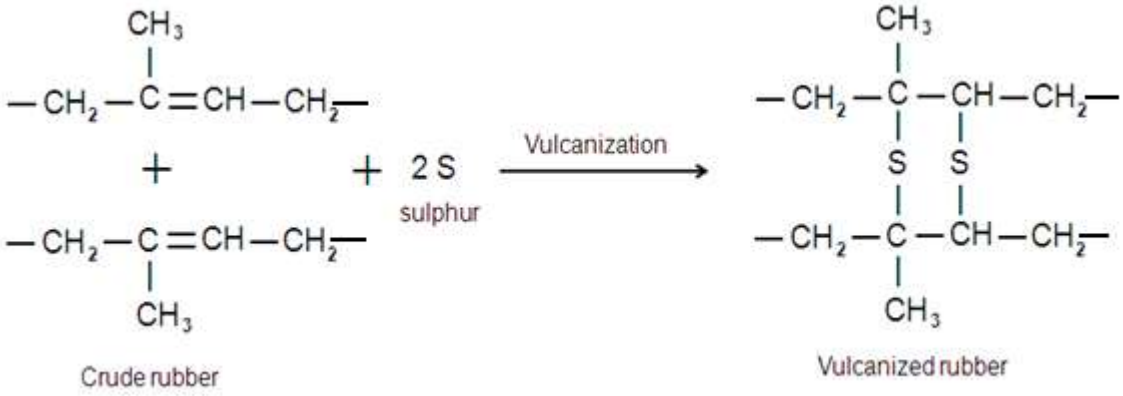
3.	d)	**Name and explain the process used to increase stiffness of rubber with chemical reaction.**	**4**
		Name: Vulcanization process is used to increase stiffness of rubber.	1
		Explanation: "The process which involves addition of Sulphur or H_2S to crude (raw) natural rubber at high temperature and pressure to improve properties of crude natural rubber is called vulcanization". Most of all processes of vulcanization is addition of 'sulphur'. Heating the raw rubber with sulphur to high temperature, sulphur combines chemically at double bonds in the rubber molecule of different rubber springs.	1 ½
		Chemical reaction (Mechanism):  	1 ½

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3	e)	**Write four properties of plastic and their related applications.**	4

Properties of Plastics –

Sr. No.	Properties	Applications
1.	Low specific gravity and high tensile strength.	Air-craft, motor car, structural purpose
2.	In combination with metals.	Steering wheels of automobiles plastic covered dash board
3.	Low electrical conductivity and good corrosion resistance.	Electrical insulator, for giving coating on printed circuit in electrical circuit.
4.	Bad conductor of heat.	Handles for electric irons, soldering iron, for pans, pressure cookers etc.
5.	Water repelling e.g.-polystyrene refined with glass fibers.	End sections of condensers in electricity generating stations Tarpaulin.
6.	Clear transparent, translucent or opaque & can take up wide range of colors & has high decorative value.	Safety glass, windscreens for automobiles knobs for radios automobiles & household applications.
7.	Good adhesive property.	Adhesive for laminated wood products, synthetic paints & varnishes.
8.	High optical clarity & smoothness	Optical lenses
9.	Greater strength per unit weight, greater resistance to wear & tear. Hard & high shock absorbing capacity.	Timing gears, self-lubricating bearings, pulleys, etc. Noise & vibrations are reduced.

1 Mark each

Q. No.	Sub Q. N.	Answer	Marking Scheme
3.	f)	**Give two properties and applications of (i) Glass wool (ii) Thermocole** **(i) Glass wool** **Properties :- (Any Two)** 1) Its thermal conductivity is low 2)It is fire proof & non-combustible. 3) It has low thermal & electrical conductivity. 4) It is resistant to chemicals. 5) It is soft, flexible, has low density. 6) It is waterproof. 7) Its tensile strength is very high. 8) It is light in weight. **Applications : (Any Two)** 1) It is used in air filters as a dust filtering material. 2) It is used as sound absorber (sound - proofing). 3) Being resistant to chemicals it is used for filtering hot, corrosive liquids like acids, alkali etc. 4) It is widely used as thermal insulating material in domestics & industrial appliances such as motors, ovens, refrigerators. 5) It is used in the manufacturing fiber glass by reinforcing with plastic resins. **(ii) Thermocole** **Properties:– (Any Two)** 1) It has spongy, porous and foam like structure 2) It is extremely light in weight 3) It is quite strong 4) Its density is low (22 kg/m^3) 5) It is quite shock-proof 6) It is chemically inert and resist aging 7) It has low electrical conductivity 8) It has extremely low thermal conductivity 9) It is used up to 55°C **Applications :– (Any Two)** 1) It is used for decorative purposes 2) It is used for Packaging the delicate instruments like T.V., radio, computers 3) It is also used in refrigerator, air conditioners and ovens. 4) It is also used in protective screen of radar 5) It is used as a core panel in sandwich panel	4 2 2