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C-09, EE104/G09 CHPP104

BOARD DIPLOMA EXAM (C-09) Mar/April 2013

DEEG I yr Exam

Engineering Chemistry & Environmental Studies

Key & Scheme of Evaluation

Part A

Answer all questions. Marks for each question (10x3=30M)

1. Metallic bond: The electrostatic force of attraction between positively charged metal ions & negatively charged sea of electrons is called metallic bond. definition - 1M

Explanation 2M

Atoms in a Metal crystal lose valency electrons due to lower ionisation energy. These electrons form an electron pool/sea. These electrons move freely through the crystal. The positively charged metal ions (kernels) have definite positions in the crystal. The force that binds a metal ion to the mobile electrons within its sphere of influence is metallic bond.

2. Fundamental particles of atom are proton, electron, neutron.

charge in coulombs — $1\frac{1}{2}M$ $1\frac{1}{2}M$

proton	$+1.602 \times 10^{19}$
electron	-1.602×10^{19}
neutron	0

3. Solution:- Homogeneous mixture of 2 or more substances 1M

Solute:- Component present in smaller quantity in solution 1MSolvent:- Component present in larger quantity in solution 1M

4. The product of molar concentrations of Hydrogen ions and hydroxyl ions at a certain temperature 2M
units — $\text{mole}^2/\text{lit}^2$ — 1M

5. EMF - The force with which electrons are pushed from anode to cathode 1M

In this cell Mg is anode, Cd is cathode

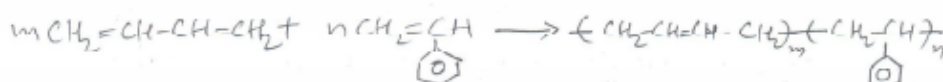
$$E_{\text{cell}}^{\circ} = E_{\text{cathode}}^{\circ} - E_{\text{anode}}^{\circ} = -0.4 - (-2.37) = 1.97V. \quad \left. \vphantom{E_{\text{cell}}^{\circ}} \right\} 2M$$

6. Osmosis:- The process of transfer of solvent from ~~to~~ dilute $1\frac{1}{2}M$ solution to concentrated solution when two solutions are separated by a semipermeable membrane.

Reverse Osmosis:- The process of transfer of solvent from $1\frac{1}{2}M$ concentrated solution to dilute solution when 2 solutions are separated by a semipermeable membrane.

7. preparation:- It is prepared by copolymerisation of butadiene $2M$ with styrene.

The butadiene (3 parts), styrene (1 part), soap water & catalyst (potassium persulfate) are heated to $55^\circ C$ & stirred for about to 12-14 hours to form Buna-S rubber.



Uses: To make motor tyres, floor tiles, shoe soles $1M$ gaskets & footwear components.

8. Acetylene gas composition $\approx 92\% C$, $8\% H$ Hydrogen $1M$

Uses: 1) Used in oxyacetylene torch along with O_2 for $1\frac{1}{2}M$ cutting & welding of metals 2) Used as illuminant in lighthouse etc. 3) Used in manufacture of $AcOH$, CH_3CHO etc (Any 2 uses may be considered)

producer gas:- Composition CO 22-30%, N_2 - 52-55% $1M$
 H_2 - 8-12%, CO_2 - 3% & a small amount of CH_4 .

uses:- used as fuel in steel & glass industry $1\frac{1}{2}M$

used as fuel in gas engines.

used in manufacture of NH_3 .

(Any 2 uses may be considered)

9. a) Air pollution:- Any solid, liquid or gaseous substance present $1\frac{1}{2}M$ in atmosphere that may tend to be injurious to humans or other living creatures or property or plants or enjoyment.

b) Aerosols:- Solid or liquid particles of microscopic size dispersed $1\frac{1}{2}M$ in air. Ex. dust, smoke, fog, fumes, pollens etc.

② of 5

10. Increase in temperature of atmosphere is called green house effect. The gases responsible are mainly CO_2 & water vapour.

Of the radiation emitted by Sun some of it is absorbed & rest will get reflected. The IR rays in the reflected radiation absorbed by green house gases give it back to earth increasing its temperature. CO_2 is liberated due to respiration, burning of fuels etc.

Consequences:- The ice caps of polar regions melt thereby increasing sea water levels. Hence low lying areas are submerged.

The rate of evaporation of water from hydrosphere increases resulting in cyclones, unseasonal rains etc. (Any other relevant matter may be considered)

PART B

Answer any 5 questions. (5X10=50M).

- 11a. There are seven horizontal rows and 18 vertical columns in the periodic table.

A horizontal row is called a period.

A vertical column is called a group. Each group is divided into 2 sub-groups A & B.

Periods:- Valence electrons vary from 1-8.

— 3M

Atomic size decreases from left to right.

Non-metallic character increases from left to right.

Ionisation potential increases from left to right.

Acidic nature of oxides increases from left to right.

Electronegativity and electron affinity increases from left to right.

Groups:- Number of valence electrons in elements of group same-2

Atomic size increases from top to bottom.

Metallic character increases from top to bottom.

Ionisation potential decreases from top to bottom.

Basic nature of oxides increases from top to bottom.

Electronegativity and electron affinity decreases from top to bottom.

11b. Oxidation - The reaction which involves the addition of oxygen (or) removal of hydrogen.

Ex 1. Oxidation of Carbon



2. Oxidation of H_2S



Reaction which involves loss of electrons is called oxidation.



Reduction - gain of electrons is reduction. - 1M



12a. Mineral: Compound of a metal which occurs in nature. - 1M

Ore - A mineral from which a metal can be extracted profitably. - 1M

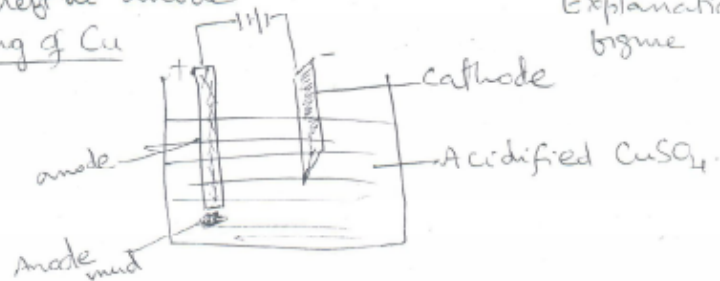
Gangue: The unwanted impurities e.g., Earthy particles, rocky matter, sand, lime stone etc present in ore. - 1M

Flux - The substance added to ore to remove gangue. - 1M

Slag: Combination of flux and gangue. - 1M

12b. Electrolytic refining - In this process blocks of Crude metal is used as anode, thin sheets of pure metal used as cathode. Acidified metal salt solution taken as electrolyte. On passing current through cell pure metal from anode deposits on cathode. Impurities called anode mud is left at anode.

Ex Refining of Cu



Explanation 3M
figure 2M

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13a. Electrolyte: It is a substance which allows current

to pass through it in molten state or in solution.

Conductivity of electrolyte is due to movement of ions.

Ex Acids, bases, aqueous salt solutions of salts

definition - 1M, ex - $\frac{1}{2}$ M

Non electrolyte - substance which does not allow current to pass through it either in fused state or in solution state

Ex urea, glucose, sugar etc - $\frac{1}{2}$ M.

13b. Faraday's I law - The weight of a chemical substance

deposited or liberated at an electrode is directly proportional to the quantity of electricity passed through the electrolyte. $w = e \cdot c \cdot t$ where e = electrochemical equivalent.

II law - When the same quantity of electricity is passed through different electrolytes connected in series, the amount of substances deposited or liberated at the electrodes are proportional to their chemical equivalents.

$$\frac{w_1}{w_2} = \frac{E_1}{E_2}$$

13c. chemical equivalent - Amount of substance

liberated at electrode when 1 Faraday of electricity is passed through electrolyte.

Electrochemical equivalent - The amount of substance deposited when 1 ampere current is passed for 1 second through electrolyte.

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