

Chemistry exam

ch.1, 2 and 3

Answer all the questions of the following: -

First question :-(15 degrees)

First, choose the answer between brackets (6 degrees)

1 - The Scientist who devised the relationship between the amount of electricity and the amount of material deposited at the electrodes is.....

A - Daniel

B - Galvani

C - Faraday

d - Volta

2 - Reactions of the relatively slow reaction.....

A - Silver nitrate solution with sodium chloride solution.

B - Alcohols with carboxylic acids to form ester and water.

C- Put a strip of magnesium in the hydrochloric acid solution.

D - Sodium hydroxide solution with hydrochloric acid solution.

3 - Reddish color of Phenolphthalein reagent in solution of.....

A - Sodium chloride

B- Sodium carbonates

C- Ammonium acetate

D - Ammonium chloride

4- Molecular mass of Gas when the density of 1.52 g / L at S.T.P. is.....

A - 34 g / mol

C- 81 g / mol

B - 1 g / mol

D - 8.1 g / mol

5- The electrolytic cell the Anode pole is

A -Positive, at which oxidation occur.

B - Positive, at which reduction occur.

C -Negative, at which reduction occur.

D -Negative, at which oxidation occur.

6- 10.5 g of caryolite equal..... Atoms [Na = 23, F =19, Al = 27]

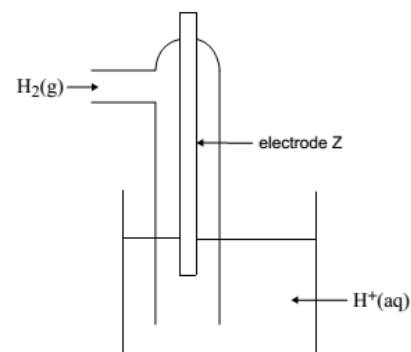
A – Avogadro's number

C - ½ Avogadro's number

B - Double the Avogadro's number

D - ¼ Avogadro's number

Second: A: The following diagram represents a $\text{H}^+(\text{aq})/\text{H}_2(\text{g})$ half-cell for the reaction $2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$



- For this half-cell, identify an appropriate material for electrode Z.....(1)
- For this half-cell to be a standard half-cell, state the pressure at which it must operate.....(1)
- the required pH of the solution of $\text{H}^+(\text{aq})$ ions.....(2)

B: A galvanic cell consists of the following half cells which have been set up under standard conditions. (3)

- Half-cell 1: the $\text{H}^+(\text{aq})/\text{H}_2(\text{g})$ half-cell described in part A.
- Half-cell 2: a cadmium (Cd) electrode in a solution containing $\text{Cu}^{2+}(\text{aq})$
After some time, the pH in half cell 1 has decreased. Use this information to identify the species in this galvanic cell which is **the strong reducing agent** and **explain how you reached this conclusion**.

C: Calculate the concentration of hydronium ion in 0.1 M sulphuric acid solution. (2)

Second question :-(15 degrees)

First:-Mention scientific term indicative of the following phrases : - (5 degrees)

- Volumes of gases involved in the reaction and the resulting reaction of the specific proportions.
- Adding a given volume of known concentration material to unknown concentration solution.
- The indicator, which can't be used in an acid medium.
- Product multiplication of hydrogen concentration ions and hydroxyl ion resulting from the ionization of water.
- Material reduces the activation energy without change or change equilibrium position.

Second: - A- State how to get the 99.95 % purity copper with the drawing. (2)

B- One mole of hydrogen reacts with one mole of nitrogen to give ammonia as the following equation $3\text{H}_2 + \text{N}_2 \rightleftharpoons 2\text{NH}_3$, the remaining nitrogen at 400C was 0.8 moles and at 600 C the remaining nitrogen was 0.9 moles, **Explain, this reaction is exothermic or endothermic** (2)

C - Compare between each of the following:

- Alkaline cadmium nickel cell and dry cell. (2)
- The pH of aqueous solution of sodium carbonate and ammonium chloride with equations. (2)

D – Draw the possible isomers of saturated open chain hydrocarbon its molar mass is 72 g/mol . (1)

E-How many moles of solid $\text{Ba}(\text{NO}_3)_2$ should be added to 300. Milliliters of 0.20-molar $\text{Fe}(\text{NO}_3)_3$ to increase the concentration of the NO_3^- ion to 1.0-molar? (Assume that the volume of the solution remains constant.) (1)

The third question (15 degrees)

First: - Give scientific reason:

(6 degrees)

- 1 – Ammonia gas density less than the density of Nitrogen [O = 16. H = 1. N = 14]
- 2 – Recently, using a mixture of fluoride salts of aluminum, sodium and calcium instead of cryolite containing a little amount of fluorspar in the extraction of aluminum from bauxite. .
- 3 - When preparing Ammonia gas in industry it is required to increase the pressure.
- 4 - The acidic solution is not used to distinguish between litmus paper and methyl orange.
- 5 - Number of atoms in 22.4 liters of Oxygen is different from that number of atoms of the same volume of carbon dioxide.
- 6 – Lead acid battery is called lead storage battery.

Second: -

- 1- If the reduction potential of copper and silver is 0.34, 0.8 volt respectively, write the symbol of the cell, and then calculate the E.M.F. (2 degrees)
- 2 – Anhydrous Calcium chloride (CaCl_2) as desiccant. A hydrated sample of calcium hydride ($\text{CaCl}_2 \cdot x \text{H}_2\text{O}$) is 1.47 g mass was strongly heated several times until constant mass 1.11 g mass
Calculate the water of crystallization and write down the molecular formula. (2 degrees)
- 3 –What is the contribution of the following scientist in chemistry? (3 degrees)
i – Wohler. ii – Avogadro's. iii – Wagg and Goldberg.
- 4 –How many minutes are necessary for the following to happen: (2degrees)
a – production of 10500 coulombs for a current of 25 A strength.
b – Deposition of 21.9 g of silver from a solution of silver nitrate by passing a current of 10 A strength.
Ag = 108

Fourth question : -(15 degrees)

First: -1. Calculate the mass of copper deposited with reducing the copper ions II through passing electric current of intensity 2.5 A in Copper II chloride solution for 41 minutes note that the cathode reaction is $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}^0$. If you know, that the volume of the solution $\frac{1}{2}$ liter calculate the concentration of CuCl_2 before electrolysis knowing that the all copper ppt. (Cl = 35.5, Cu = 63.5). **(3)**

Second: Draw the cell used to extract aluminum from its ore bauxite with writing the electrode reactions, and then explain why the anode usually exchanged periodically? **(3 degrees)**

Third:- 1 - The following equation describes the ionization of a weak base ammonium hydroxide (solution of ammonia) its concentration C_b is 0.1 Molar and ionization constant is $(K_b) = 1.6 \times 10^{-5}$



Calculate each of the following:

- A - The degree of ionization of the base B - Hydroxyl ion concentration in the alkaline solution
C - pOH of the solution D - the pH of the solution (4 degrees)

2. Mention the experiments that explain the following: (3-degree)

- a- The effect of temperature on the rate of chemical reaction
b- Preparation of 0.2 M of 250 ml of sodium sulphate.
c- Degree of ionization (α) is directly proportion with the dilution.

3- Calculate the pH of the following mixture (200 ml of 0.2 M HCl and 500 ml of 0.3 M NaOH). (2)

Fifth question : -(15 degrees)

First: -1 – 0.1 g mixture of solid substance contains Sodium hydroxide and Sodium Chloride by titration 10 ml of 0.1 M hydrochloric acid was consumed; calculate the % of sodium hydroxide in the mixture. (O = 16, H = 1 Na = 23). (2 degrees)

2- Lead acid battery accumulator Consists of the retina of the lead plates and lead dioxide (immersed in sulfuric acid).

A – Sketch the cell, explaining the positive and Negative pole.

B - What is meant by discharge process? Writ down the reaction? (2 degrees)

3 - Calculate the number of molecules of 0.25 g vitamin (C) it's chemical formula in a tablet

is $(\text{C}_6\text{H}_8\text{O}_6)$. (C = 12, O = 16, H = 1) (2 degrees)

Second: - 1- Calculate the equilibrium constant for the following reaction. (2 degrees)

$\text{N}_2 (\text{g}) + 3 \text{H}_2 (\text{g}) \rightleftharpoons 2\text{NH}_3 (\text{g})$. $\Delta H = -94 \text{ kJ/mol}$ Knowing that the equilibrium concentration of reactant and products at 400 C are $\text{NH}_3 (\text{g}) = 0.28 \text{ mol / L}$ $\text{H}_2 (\text{g}) = 0.8 \text{ mol / L}$ $\text{N}_2 (\text{g}) = 1.2 \text{ mol / L}$.

Then commented on the value of K_c and explain how you can increase the amount of Ammonia.

2- Write on the following: (4 degrees)

- 1 . Gravimetric analysis. 2 . 5 ppm. of sodium carbonate.
3 . Faraday's second law and its verification. 4. Salt bridge in the galvanic cell.

3- Explain an experiment to detect that organic compound contains carbon and hydrogen. (3 degrees)