Agriculture Past Papers.

SIR ARTHUR LEWIS COMMUNITY COLLEGE

DIVISION OF AGRICULTURE

ASSOCIATE DEGREE IN GENERAL AGRICULTURE

May 2009/2010 ACADEMIC YEAR

#C40

END OF 2ND SEMESTER EXAMS

COURSE: **CHEMISTRY (CHM 102)** **TIME: 2 ½ HRS**

Instructions: Answer any five (5) questions. Each question is worth 20 marks.

1. a) Copy and complete the following table.

Element	No. of protons	No. of electrons	No. of Neutrons	Mass No. (A)	Atomic No. (Z)
X			7	14	
Y	8		10		

[3]

b) Using the Pauli's Exclusion Principle represent the electronic configurations of the following atoms of the following elements: Nitrogen and Oxygen. [4]

c) Tom and John are year one chemistry students. They have been given the task to analyze the information in the table below.

	Element A	Element B
No. of protons	11	12
No. of Electrons	11	12
No. of Neutrons	12	12

Tom says they are isotopes John says they are not.

i) Which of the students is correct? Explain why? [3]

ii) Would the chemical properties of these elements (A and B) are the same or different. Why? [4]

d) The following list contains the names of two compounds.

- Calcium Sulphate
- Carbon monoxide

i) Using chemical symbols state their formula [2]

ii) State the type of bonds in each compound above. [2]

iii) Which compound would most likely have the highest melting point and why? [2]

Total 20 marks

2. a) Differentiate between the following:

i) β- Particles and γ - Rays [2]

b) Complete the equation below. [1]

$$^{238}_{92}U \longrightarrow Th + {}^{4}_{2}He^{2+}$$

i) State the type of decay is demonstrated in the equation above? [1]

ii) Work out the new atomic number and mass number for the element Thorium in the equation above? [2]

c) Explain two ways in which radioactive Isotopes are used in agriculture. [4]

d) Using Dot and Cross diagram represent the following compounds.

I. Sodium chloride (NaCl) [3]

II. Carbon dioxide (SiO_2) [3]

Element	**No. of Electrons**
Sodium	11
Chlorine	17
Silicon	14
Oxygen	8

e) If the half-life of iodine-131 is 8.10 days, how long will it take a 50.00 g sample to decay to 6.25 g? [4]

Total 20 marks

3. Hydrogen Fluoride is one of the most important fluoride compounds. It can be prepared by reacting Calcium Fluoride (CaF_2) with Sulphuric Acid (H_2SO_4).

Element	**Relative Atomic Mass**
Ca	40
F	19
H	1
S	32
O	16

a) Write a balanced equation for the reaction. [2]

ii) State the type of reaction [1]

b) What is the mass of 0.5 moles of sulphuric acid? [2]

c) How many particles are in 0.5 moles of sulphuric acid? [2]

NOTE: Take the Avogadros constant to be 6.0 x10^{23}

d) If 0.5 moles of sulphuric acid is used in the reaction calculate the mass of hydrogen fluoride produced in the reaction. [4]

e) i) Calculate the limiting reagent if 9.8 grams of sulphuric acid and 9.5 grams of calcium fluoride are used in the reaction instead. [5]

f) Copper is chosen for almost all-electrical use.

i) With the aid of a diagram explain why it is possible for metals to conduct electricity. [2]

How do you account for the high melting and boiling point of metals? [2]

Total 20 marks

4. a) Define the term 'mole'. [2]

b) In a titration, 25 cm^3 of solution of Sulphuric Acid are required for Neutralization of 40 cm^3 of 0,035 mol/dm^3 potassium hydroxide.

i) Write a balance the equation for the reaction, state symbols must be shown clearly. [6]

ii) State the names of the products formed from the reaction [2]

iii) Calculate the mass of each product that was formed. [4]

iv) Calculate the mass of sulphuric acid used. [4]

c) What are catalysts? [2]

Total 20 marks

5. The dissociation of hydrogen iodide can be represented by the equation below:

$$H_{2\,(g)} + I_{2\,(g)} \rightleftharpoons 2\,HI_{(g)}$$

a) Using the reaction as an example explain what is meant by:

i) A reversible reaction

ii) A dynamic equilibrium [4]

b) For this endothermic reaction state the effects on equilibrium:

i) Of increasing the temperature whilst keeping pressure constant. [3]

ii) Of increasing the pressure whilst keeping the temperature constant. [3]

c) State the effects of adding a catalyst on equilibrium whilst keeping temperature and pressure constant. [3]

d) At 520°C the equilibrium mixture in a three cubic decimeter container ($3dm^3$) consists of 0.2 moles of H_2 and 0.2 moles of I_2, if the equilibrium constant (k_c) is 0.016, calculate the concentration of hydrogen iodide at equilibrium (HI). [4]

e) State the Le Chatelier's principle [2]

f) List one application of The Haber Process in agriculture. [1]

Total 20 marks

6. a) Define the term 'Ideal Gas.' [2]

b) A 50L cylinder is filled with argon gas to a pressure of 10130.0kPa at 30°C. Using the formula PV = nRT calculate how many moles of argon gas are in the cylinder.

$$R = 8.314\ J\ K^{-1}\ mol^{-1}$$ [3]

d) 5.98 mL of an unknown gas weighs 0.081 g at Standard Temperature and Pressure. Calculate the molar mass of the gas. Can you determine the identity of this unknown gas?

At Standard Temperature and Pressure: pressure = (101.3 kPa) and Volume = (22.4 L)

$$R = 8.314 \text{ kPaL } K^{-1} \cdot mol^{-1}$$ [4]

e) In an experiment between hydrogen and iodine gas to produce hydrogen iodide:

$$H_{2\,(g)} + I_{2\,(g)} \rightleftharpoons 2\,HI_{(g)}$$

The following data were obtained for equilibrium concentrations of H_2, I_2 and HI,

Determine the value of equilibrium constant in each experiment.

	Trial	[HI]	[H_2]	[I_2]	K_{eq}
A	1	0.156	0.0220	0.0220	
B	2	0.750	0.106	0.106	
C	3	1.00	0.820	0.0242	
D	4	1.00	0.0242	0.820	
E	5	1.56	0.220	0.220	

[10]

f) What does the acronym pH stand for? [1]

Total 20 marks