EXAMINATION NUMBER_____ NAME _____

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DUC IN ALTUM (Aim Higher)

2021 FORM FOUR MOCK EXAMINATIONS

CHEMISTRY

PAPER I

Theory

100 marks

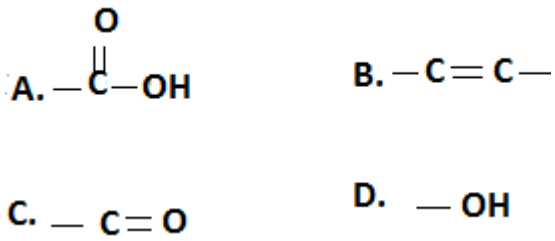
Time allowed: 2 hours

1. This paper has **16** pages. Please check.
2. Write your examination number on each top of each page.
3. This paper consists of two sections A and B. **Section A** carries **70 marks** and has short answer questions and **Section B** carries **30 marks** with descriptive questions.
4. The maximum number of marks for each answer is indicated against each question.
5. Write your answers in the spaces provided on the question paper.

SECTION A (70 marks)

Answer **all** the questions in this section

1. Figure 1 below shows different organic functional groups. Use it to answer questions that follow



a. Name the homologous with functional group C.

_____

1 mark

b. Which function group above has acidic properties?

_____

1 mark

c. Name the reaction which can make the following changes

i. C to A: _____

ii. D to B: _____

2 marks

d. i. What type of polymerization would occur if the monomer(s) involved are?

- B compounds only : _____
- Compounds of A and D : _____

2 marks

` ii. State any two differences between thermoplastics and thermosoftenings.

_____

_____

2 marks

2. When carbon monoxide (CO) reacts with hydrogen gas (H_2), methanol (CH_3OH) is produced. The chemical equation is as shown below

$$CO(g) + 2H_2(g) \rightarrow CH_3OH(l)$$

a. If 10ml of carbon dioxide were given what volume of hydrogen gas would be required to react completely at rtp?

3 marks

b. Given that 16g of carbon monoxide and 4g of hydrogen gas were available for the reaction. Determine the limiting reagent in the reaction.

3 marks

3. a. State the group number of an element whose atomic number is 20.

_____

(1 mark)

b. Draw a dot and cross diagram of a dative bond present in a hydronium ion.

2 marks

c. Explain why water H_2O is in a liquid form at room temperature while sulphur dioxide SO_2 is a gas at room temperature but sulphur dioxide has bigger molecular mass than water.

_____

_____

_____

2 marks

4. The chemical equation below shows how ammonia is produced. Use it to answer the questions that follows;

$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)} \quad \Delta = -92kJ/mol$$

a. Name the process above

_____

1 mark

b. According to the Le Chateliers Principle what will happen to the reaction when

i. Pressure is increased

_____

_____

ii. Temperature is increased

_____

_____

2 marks

c. Draw an energy level diagram to represent the chemical reaction above.

3 marks

5. a. Define an acid according to Arrhenius theory.

_____

1 mark

b. Two solution of same concentrations have pH 2 and 6 respectively

i. Which solution has a high concentration of OH^- ions

_____

1 mark

ii. Which solution is a strong acid? Give a reason for your answer.

Solution: _____

Reason:

_____

_____

2 marks

c. Write the conjugate acid of water H_2O.

_____

1 mark

6. a. i. Define temporary water hardness.

_____

_____

1 mark

ii. Explain how you can easily identify hard water from soft water using soap.

_____

_____

_____

2 marks

b. Indicate how the following activities lead to water pollution

i. Agricultural practices:

_____

_____

ii. Deforestation:

_____

_____

2 marks

c. Using relevant chemical equations, explain how the ozone layer is depleted in the stratosphere.

_____

_____

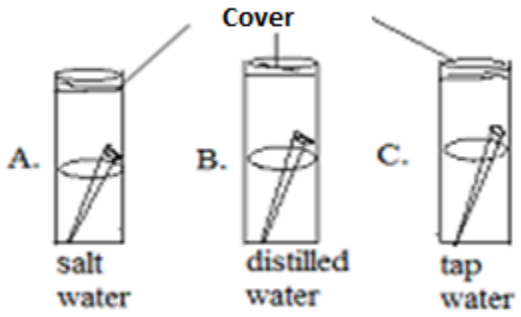
_____

_____

_____

3marks

d. The diagram below shows the setup of an experiment to investigate factors that affect rusting.



The set up was left for one week

i. State why rusting will take place in all the test tubes.

_____

_____

1 mark

ii. Indicate where rusting will be more pronounced. Give a reason for your answer.

_____

_____

_____

2 marks

iii. Explain how air pollution facilitates rusting process.

_____

_____

_____

2 marks

7. a. The reaction below shows the formation of a salt by precipitation.

$$AlCl_{3(aq)} + 3NaOH_{(aq)} \longrightarrow Al(OH)_{3(s)} + 3NaCl_{(aq)}$$

i. Write the net ionic equation for the reaction above

2 marks

ii. Identify any spectator ion present in the reaction.

_____

1 mark

b. i. Define the term ***standard electrode***

_____

_____

1 mark

ii. Briefly indicate how a half cell is formed.

_____

1 mark

iii. The electro-motive force of a cell involving zinc and copper is shown by line notation as illustrated bellow.

$$Zn_{(s)}\,l\,Zn^{2+}_{(aq)}\,ll\,Cu^{2+}_{(aq)}\,l\,Cu_{(s)}$$

- Draw the electrochemical cell for the line notation above.

4 marks

- Calculate the e.m.f. of the cell given that electrode potential for zinc = -0.76 and copper = +0.34

2 marks

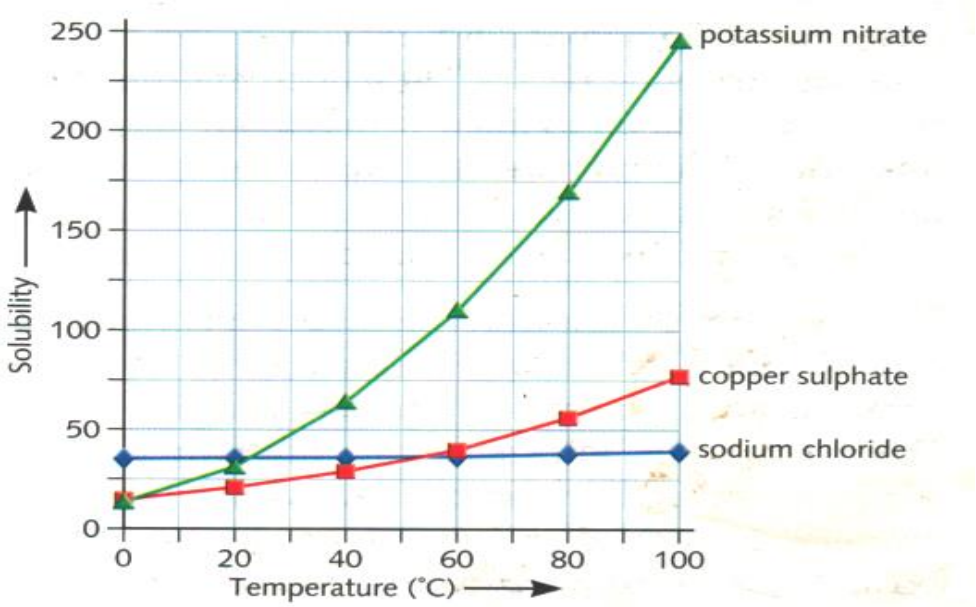
iv. State any two applications of redox reactions.

_____

_____

2 marks

8. a. An experiment was carried out to investigate the effect of temperature on the solubility of certain salts. Below are solubility curves of the three salts.



i. Which salt

Is very soluble at 30^{o}C : _____

Has a more constant solubility : _____

2 marks

ii. From the experiment indicate

Dependent variable: _____

Independent variable: _____

Any control variable: _____

3 marks

iii. It temperature of Potassium nitrate solution falls from 65 ^{o}C to 45 ^{o}C some solids will fall out of the solution.

- What name is given to the solids that fall out?

1 mark

- How much solid will fall out?

1 mark

9. a. Give any two physical properties of alkali metals.

_____

_____

2 marks

b. Explain the following

i. Reactivity of halogens decrease as we go down the group

_____

_____

_____

2 marks

iii. Ionization energy decreases as we go down the group

_____

_____

_____

2 marks

c. Give any one use of the following elements

i. Sodium:

_____

ii. Argon:

_____

2 marks

SECTION B (30 marks)

Answer **all** the questions in this section.

10. a. Explain how acid rains are formed and any three ways how they affect the environment.

_____

_____

_____

_____

_____

_____

_____

_____

_____

6 marks

b. State the meaning of activation energy in a reaction and explain any two factors in a chemical reaction and how they affect activation energy of a reaction.

_____

_____

_____

_____

_____

4 marks

11. a. Describe the process of separating air using fractional distillation.

(6 marks)

b. Describe how native sulphur is extracted.

4 marks

12. a. Sketch a graph showing how conductivity of an acid changes as a bases is being added. Explain the graph shows neutralization process.

_____

_____

_____

_____

_____

_____

_____

7 marks

b. Explain how purity of a substance can be identified using boiling point.

_____

_____

_____

3 marks

END OF QUESTION PAPER