For control use only

Name: …….. Index No: …….

School: ……..… Centre No: ..…….

Subject: Chemistry

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Republic of South Sudan
South Sudan National Examinations Council
Certificate of Secondary Education
2023

For control use only

Subject: Chemistry **Time: 3 Hours**

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INSTRUCTIONS

Read the following instructions carefully before answering the questions

1. This paper consists of three sections A, B and C.
2. Section A consists of 20 multiple choice questions (20 marks). Section B consists of 10 structural questions (50 marks) and section C consists of 4 essay questions (30 marks).
3. A candidate is required to attempt all questions in sections A and B and any two questions in section C.
4. Answers to all questions must be written in the space provided.
5. Unnecessary crossing may lead to loss of marks.
6. Where necessary use the following. (Cu=63.5, C=12, O=16, Na=23, S=32, P=31, Al=27, N=14, standard temperature=273K, standard pressure=760mmHg. 1 mole of gas occupies 22.4dm^3 and specific heat capacity of solution is 4.2J/g/K).

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SECTION	QUESTION	Marks Obtained	Marked by	Checked by
A	**1-20**			
B	**21-30**			
C	**31-34**			
TOTAL				

Section A (20 Marks)

Indicate the most correct alternative in the box provided

1. What is the valence of M in the formula $M(SO_4)_3$?
   A. 2
   B. 4
   C. 3
   D. 2 or 3
2. Which of the following acids is a dibasic acid?
   A. Oxalic acid
   B. Nitric acid
   C. Phosphoric acid
   D. Hydrochloric acid
3. 21g of potassium nitrate was strongly heated until no further change .Which of the following is the mass of the reserve?
   A. $\frac{21.0\times85}{1o1}$
   B. $\frac{101\times85}{21.0}$
   C. $\frac{21.0\times1o1}{85}$
   D. $(101 \times 85 \times 21.0)$
4. Separation by separating funnel is possible based on
   A. Difference in boiling points of substance
   B. Difference in colour of substance
   C. Difference in densities of substance
   D. All of the above
5. An element has atomic number of 15 the electronic configuration of the ion of the element is …….
   A. 2:8:5
   B. 2:8
   C. 2:8:8:5
   D. 2:8:8
6. Which of the following hydrocarbons is unsaturated?
   A. C_3H_3
   B. C_4H8
   C. C_2H_6
   D. C_5H_{12}
7. An element has got 24 atomic masses and 12 neutron numbers. To which group and period in the periodic table does the element belong?
   A. Group II period 2

B. Group III period 2
C. Group II period 3
D. Group III period 3

8. 24g of magnesium powder reacted with 0.1 M hydrochloric acid. If 50 cm^3 of the solution of hydrochloric acid reacted the temperature rise was 8.0 ^0C . Calculate the enthalpy that occur when one mole of magnesium completely with react hydrochloric acid
   A. 168K/Mol
   B. 16.8KJ/Mol
   C. 1.68KJ/Mol
   D. 1.680KJ/Mol
9. How many electrons are present in sodium ion?
   A. 11
   B. 23
   C. 10
   D. 18
10. Nitrogen is considered almost inert (unreacted) in chemistry. This is because nitrogen
   A. Is the most abundant gas in air
   B. Has triple covalent bonds which are very
   C. Is not common gas in chemistry?
   D. Is not useful in chemistry
11. During electrolysis of copper (i) chloride using copper electrodes 0.4 amperes was passed through the electrolyte for one and a half hours. The mass of copper deposited at the cathode is
   A. 1.70g
   B. 0.17g
   C. 0.7g
   D. 710g
12. In the laboratory preparation of chlorine gas by S.4 students ,concentrated hydrochloric acid was heated 14ith substance Q and chlorine gas was evolved .Substance Q is likely to be
   A. Potassium permanganate
   B. Lead (IV) oxide
   C. Potassium chlorate
   D. Hydrogen peroxide
13. 15cm of 0.1M a basic acid with 10cm of 01.5cm sodium hydroxide solution. What is the basicity of the acid
   A. 1
   B. 10

C. 5
D. 15

14. Burning magnesium was lowered into a gas jar of carbon dioxide gas .Which one of the following was observed?
    A. White ash and black specks
    B. Magnesium and carbon dioxide gas
    C. Yellow substance formed
    D. Brown fumes observed in the gas-jar
15. Which one of the particles does not affect the final atomic mass of an element?
    A. Alpha particle
    B. Beta particle
    C. Proton
    D. Alpha and beta particle
16. The following metals are extracted by electrolysis except
    A. Calcium
    B. Silver
    C. Potassium
    D. Aluminium
17. A gaseous hydro carbon **W** contain 82.15% carbon. What could be the empirical formula of w?
    A. C_2H_5
    B. CH_3
    C. C_3H_2
    D. $C_{10}H_2O$
18. Which of the following properties of sulphur dioxide gas is useful to textile industries?
    A. Oxidizing property
    B. Reducing property
    C. Bleaching property
    D. All of the above
19. Ethanol reacts with ethanoic acid in the presence of concentrated sulphuric acid to from a sweet smelling compound. The type of reaction is known as
    A. Saponification
    B. Dehydration
    C. Esterification
    D. Hydration
20. Carbon dioxide of volume 400 cm^3 diffuse through a porous medium and 140 cm^3 of nitrogen gas diffuse through the same medium for 3.5 seconds. Find how long it took carbon dioxide gas to diffuse.
    A. 12.5 seconds

B. 125.0 seconds
C. 1.25 seconds
D. 1250 seconds

SECTION B (50 marks)

Attempt all questions in this section

21. Aqueous solution of hydrogen chloride gas was added into a mixture of sodium chloride and sodium carbonate in a beaker.

(a) State what was observed. (1 mark)

_____

_____

(b) Write the equation for the reaction which took place. (2 maks)

_____

_____

(c) Explain your observation in (a) above. (2 marks)

_____

_____

22. The table below shows a sketch of the periodic table of elements. Use it to answer the questions that follow.

X								He
	Y				V		O	
	Z		U				P	
W								

(a) Identify the element marked X. (0.5 mark)

_____

(b) What is the different between groups and periods as used in the periodic table? (2 marks)

_____

_____

(c) Which elements are in:

(i) Group II (0.5 mark)

_____

(ii) Period III (0.5 mark)__

(d) Write the electronic configuration of:

(i) Element W. (0.5 mark)

(ii) Ion of element U. (0.5 mark)__

(e) Draw the structure of the compounds formed when the following elements bond. (2 marks)

(i) Z and P

(ii) X and V

23. (a) Define the term electrolyte. (1 mark)

(b) Electrolysis of copper (II) sulphate was carried out using carbon electrodes and the resultant solution was treated using litmus solution.

(i) State what was observed. (1 mark)

(ii) Explain your observation in (b) (i) above. (2 marks)

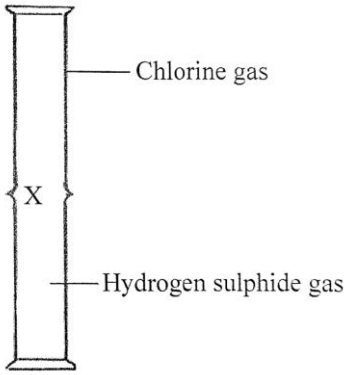
(c) Name any one application of electrolysis. (1 mark)

24. (i) What is global warming? (1 mark)

(ii) List any two greenhouse gases. (2 marks)

(iii) Explain how any of the gas you mention in (a) above can cause global warming. (2 marks)

25. A gas of chlorine was inverted over a gas jar containing hydrogen sulphide gas as shown below.



(a) (i) State what was observed at point marked X. (1 mark)

(ii) Write the equation leading to the observation in (a)(i) above. (2marks)

(iii) Name the property of chlorine gas being demonstrated above.(1 mark)

(b) Outline any two uses of chlorine gas. (1 mark)

26. (a) (i) Represent Boyle's law in a graph. (0.5 mark)

(ii) A fixed mass of a certain gas occupied a volume of 100 cm^3 at a pressure of 2.5 atm. Determine the new pressure of the gas when it expands to a volume of 400 cm^3. (1.5 marks)

(iii) Give any one application of Boyle's law in real life. (0.5 mark)

(b) It takes 35s for 140 cm^3 of nitrogen gas to diffuse through a porous membrane. How long will it take for 400 cm^3 of carbon dioxide to diffuse via the same membrane? (2.5 marks)

27. A certain organic compound was found to contain 40% carbon, 6.6% hydrogen and the rest being oxygen. Its vapour pressure was 90.

(a) Determine its empirical formula. (3 marks)

(b) (i) What is its molecular formula? (1.5 marks)

(ii) Name the organic compound above. (0.5 mark)

28.(a) Differentiate between molar solution and standard solution. (2 marks)

(c) 25 cm^3 of sodium carbonate solution required 15.85 cm^3 of 0.1 M sulphuric acid for complete reaction. Calculate the concentration of sodium carbonate in moles per litre. (3 marks)

29.(a) (i) What is rate of reaction? (1 mark)

(ii) Name any two factors that affect the rate of reaction. (2 marks)

(b) Briefly explain how temperature can influence the choice of chemical reaction. (2 marks)

30.(a) What do you mean by the following terms?

(i) Radioactivity (1 mark)

(ii) Half-life (1 mark)

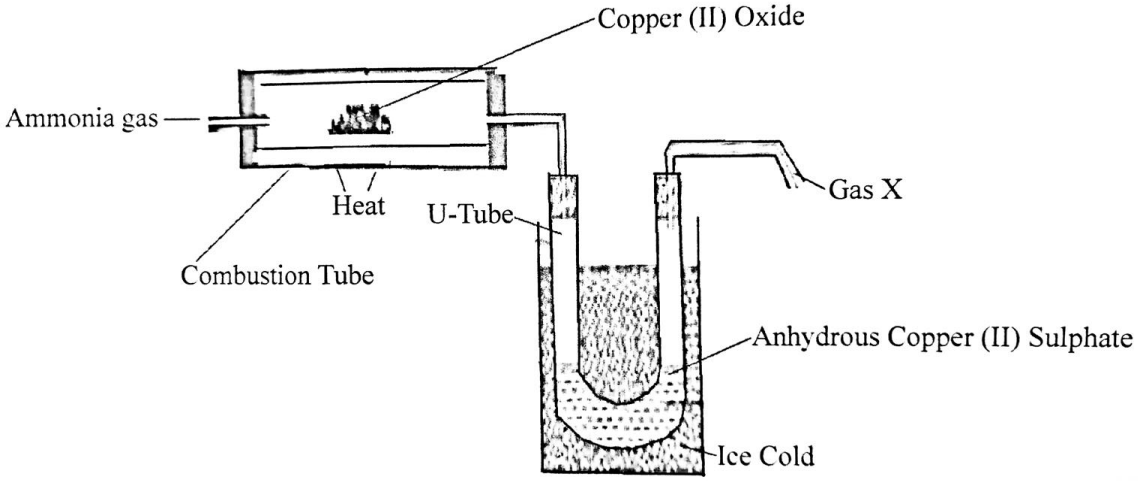
(c) A radioactive isotope of mass 64g, decayed after 96 days to 4g. Calculate the half-life of the isotope. (3 marks)

SECTION "C" (30 MARKS)

Attempt any **two** questions only

31. (a) Describe laboratory preparation of ammonia gas with the aid of a well-labelled diagram. (Include equations where necessary). (8 marks)

(b) The diagram below shows the experiment to demonstrate certain property of ammonia gas. Study it and answer the questions that follow.



(i) State what is observed in combustion tube and U-tube. (2 marks)

U-tube

Combustion tube

(ii) Explain your observation in the U-tube. (2 marks)

(iii) Write the equation for the reaction which took place in the combustion tube. (2 marks)

(iv) Name gas X. (1 mark)

32.(a) Differentiate between the following terms.

(i) Lattice energy and hydration energy (2 marks)

(ii) Enthalpy of combustion and enthalpy of formation. (2 marks)

(b) With the help of a well-labelled diagram, describe a simple experiment that can be used to determine the enthalpy of combustion of ethanol. (7 marks)

(c) (i) Give any two reasons why the experiment value of heat of combustion is always less than the actual value. (2 marks)

(iii) 8.2g of propanol was burnt completely and 210kj of heat recorded. Calculate the enthalpy of combustion of propanol. (2 marks)

33. (a) Differentiate between oxidation and reduction in terms of electron transfer or oxidation numbers. (1 marks)

(b) State whether the following reactions are oxidation, reduction or redox reactions. (1.5 marks)

(i) $Fe^{2+}(aq) + Zn(s) \longrightarrow Zn^{2+}(aq) + Fe(s)$

(ii) $2Cl^{-}(aq) \longrightarrow Cl_2(g) + 2e$

(iii) $H_2O_2(l) + 2H^{+}(aq) + 2e \longrightarrow 2H_2O(l)$

(c) An electrochemical cell is represented as follows:

$Zn(s)/Zn^{2+}(aq)//Cu^{2+}/Cu(s)$

$E_1 = -0.77V$

$E_2 = +0.33V$

(i) Draw the above electrochemical cell. (2.5 marks)

(ii) Write the anode and cathode reactions. (1 mark)

(iii) Calculate the electromotive force, ***e.m.f*** of the above cell. (1 mark)

(d) During the electrolysis of copernecium, 2.24g of the metal was deposited when a current of 2.0A was passed via its solution for 32 minutes and 10 seconds. Answer the following questions.

(i) Which electrode gained mass? (1.5 marks)

(ii) How may charge is required to produce 1 mole of the metal?(2 marks)

(iii) What is the charge on copernecium? (0.5 marks)

(iv) Write the cathode reaction. (0.5 marks)

(v) Give any two applications of electrolysis. (1 mark)

(e) Briefly describe how you would extract aluminium from aluminium oxide. (3 marks)

34.(a) What is fermentation? (1 mark)

(b) Describe how crude ethanol can be prepared locally in your society.
(diagram is not required) (5 marks)

(c) Ethanol can react with sulphuric acid to produce ethane.

(i) Name the two conditions necessary for the reaction to occur.(2 marks)

(ii) Write the equation for the reaction which occurred. (1 mark)

(iii) Name the type of reaction that took place above in (c)(i). (1 mark)

(d) Outline any four uses of ethanol you know. (4 marks)