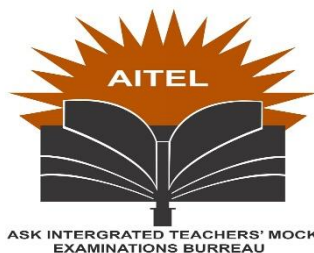


Candidate's Name: .....

School: ..... Signature: .....

545/2  
CHEMISTRY  
Paper 2  
July/Aug. 2020  
2 hours



# AITEL JOINT MOCK EXAMINATIONS

Uganda Certificate of Education

CHEMISTRY

Paper 2

2 hours

## INSTRUCTIONS TO CANDIDATES

Section A consists of 10 structured questions Answer

*all* questions in this section.

All answers must be written in the spaces provided herein.

Section B consists of 4 semi-structured questions Answer

*any 2* questions from this section.

Answers to this section must be written in fullscaps provided.

In both sections all working **must** be clearly shown

[H = 1, C = 12, O = 16, N = 14, Zn = 65, P = 31, S = 32, Mg = 24]

1 mole of a gas occupies 24cm<sup>3</sup> at room temperature

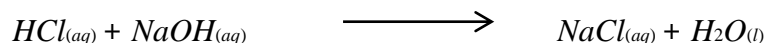
1 mole of a gas occupies 22.4cm<sup>3</sup> or 22,400cm<sup>3</sup> at s.t.p

For Examiner's Use only														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total

## SECTION A

Attempt **all** questions in this section in the spaces provided

1. Dilute sodium hydroxide solution reacts with dilute hydrochloric acid and according to the equation below;



25 cm<sup>3</sup> of 0.05M sodium hydroxide solution needed 25 cm<sup>3</sup> of 0.2M hydrochloric acid for complete reaction. Calculate the;

- a) (i) Number of moles of hydrochloric acid that reacted? ( 1 ½ marks)

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- (ii) Number of moles of sodium hydroxide that reacted with hydrochloric acid? (1 ½ marks)

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- b) Determine the value D of sodium hydroxide (1 ½ marks)

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2. a) Ammonium hydroxide solution was added dropwise to an aqueous aluminium nitrate solution until in excess.

(i) State what was observed. (  $\frac{1}{2}$  mark)

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(ii) Write the equation for the reaction that took place? (1  $\frac{1}{2}$  marks)

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.....

- b) If dilute sodium hydroxide solution was then added dropwise until excess to product in (a) above.

(i) State the likely observation (1mark)

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.....

(ii) Give a brief explanation for your observation in b(i) above. (2marks)

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3. a) Write;

(i) structural formula of **ethene**? (  $\frac{1}{2}$  mark)

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.....

(ii) the name of a compound W, having a molecular formula of  $C_2H_6$ ? ( ½ mark)

.....  
.....

b) State what would be observed if bromine liquid was added separately to a sample of ;

(i) Ethene (1 mark)

.....  
.....

(ii) Compound W (1 mark)

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.....

c) Briefly explain your observation in (b) above? (1 mark)

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4. A mixture of **Sulphur** and **Iron filings** is warmed separately in carbon disulphide and dilute sulphuric acid.

a) State what is observed;

(i) in carbon disulphide. (1mark)

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.....  
.....  
.....

ii) In dilute sulphuric acid. (2marks)

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.....

b) If a mixture of iron filings and Sulphur is heated strongly

(i) identify the product formed. (  $\frac{1}{2}$  mark)

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.....

(ii) Write the possible equation for the reaction between the product identified in (b) (i) above and dilute hydrochloric acid. (1  $\frac{1}{2}$  marks)

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5. A sample of air was bubbled into two wash bottles containing soda lime and concentrated sulphuric acid respectively, and finely collected in a gas syringe.

a) (i) State the role of soda lime in this experimental set up. (  $\frac{1}{2}$  mark)

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.....

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(ii) Suggest a reason for passing the air sample through concentrated sulphuric acid.

(  $\frac{1}{2}$  mark)

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b) 80cm<sup>3</sup> of the gas was collected in the syringe and it was passed over heated copper filings in a combustion tube very many times until no further change occurred. On cooling to initial temperature, the volume of the gas did reduce to 63.2cm<sup>3</sup>.

(i) State what is observed in combustion tube. (1 mark)

.....

.....

.....

(ii) What is the purpose of copper fillings? ( ½ mark)

.....

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(iii) Calculate the volume change of air in the syringe. (1 mark)

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(iv) Determine the percentage change of the air? (1 ½ marks)

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c) What is the composition of residual air in the syringe? ( ½ mark)

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6. A colourless gas Z was passed over heated Lead II oxide in a combustion tube. A gaseous product formed has no effect on lime water.

a) (i) Name gas Z ( ½ mark)

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(ii) State what is observed in the combustion tube upon passage of Z over hot Lead (II) oxide.

(1 mark)

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b) Write equation of reaction between Z and

(i) Lead (II) oxide

(1 1/2 marks)

.....  
.....

(ii) identify the gaseous product.

( 1/2 mark)

.....

(iii) Name one other metal oxide that can be used in place of Lead (II) oxide. ( 1/2 mark)

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.....

(iv) Write equation of reaction between gas Z and the metal oxide you have named in b(iii).

(1 1/2 marks)

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.....

7. Briefly describe a simple chemical test or physical test that can be used to distinguish between the ions in each of the following pairs.

a)  $K^+_{(aq)}$  and  $Na^+_{(aq)}$

(2 marks)

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.....  
.....  
.....

b)  $NH_4^+_{(aq)}$  and  $Mg^{2+}_{(aq)}$

(2 marks)

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.....  
.....  
.....  
.....

c)  $SO_4^{2-}_{(aq)}$  and  $CO_3^{2-}_{(aq)}$

(2marks)

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8. A mixture of copper (II) carbonate and copper (II) sulphate was added into plenty of water and the mixture shaken thoroughly but later was filtered.

a) (i) Identify the residue. **(1 mark)**

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(ii) If the dry residue is heated strongly, state what can be observed. **(1 mark)**

.....

.....

(iii) Write the equation for the reaction that occurs. **(1 ½ marks)**

.....

.....

b) (i) What reagent can be used to identify the anion in the filtrate? **(1mark)**

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(ii) Write an ionic equation for the reaction between the anion and the reagent you have named in (b) (i) above? **(1 ½ marks)**

.....

.....

9. A aqueous solution of sodium hydroxide was added in excess to a solution containing a mixture of Zinc (II) sulphate and copper (II) nitrate and the mixture filtered. a) State the colour of;

(i) Filtrate

.....( **½ mark**)

(ii) Residue

.....( **½ mark**)



b) Write an ionic equation leading to the formation of the residue.

(1 ½ marks)

.....  
.....

c) If the residue was dried, and heated strongly in a test tube;

(i) state what is observed?

(1 mark)

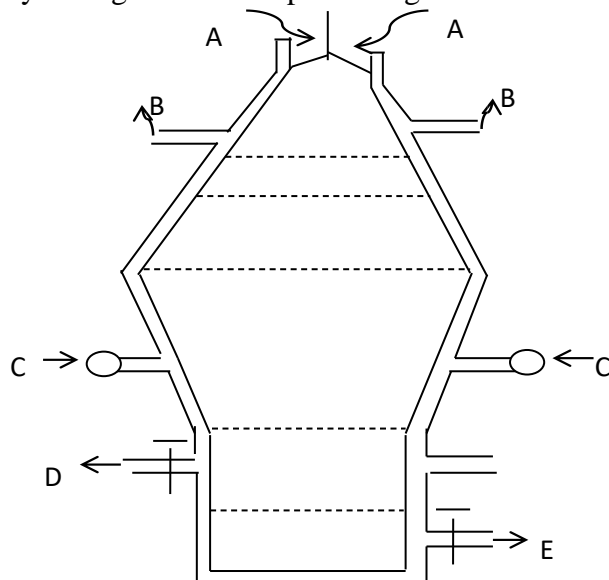
.....  
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(ii) Write equation for the reaction when the residue is being heated.

(1 ½ marks)

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.....

10. Study the figure below representing blast- furnace



a) Identify the metal extracted using the blast furnace?

( ½ mark)

.....

b) (i) Name one ore from which the metal you have identified in (a) above can be extracted.

( ½ mark)

.....

(ii) Write the formula of the ore you have named in b(i).

(1 mark)

.....

.....  
c) Name the substances let into the furnace at;

(i) A .....  
(1 ½ marks)

(ii) C .....  
( ½ marks)

d) Name the substances let out of the furnace at;

(i) B .....  
( ½ marks)

(ii) D .....  
( ½ marks)

(iii) E .....  
(1 ½ marks)

e) Name one impurity in Pig-iron ( ½ mark)

.....

### SECTION B (30MARKS)

*Attempt any two questions*

*Answers to this section should be written on the answer sheet provided*

11. Explain the following observation;

(a) when zinc powder is added to a solution of copper (II) sulphate, the colour of the solution turns from blue to colourless and the temperature of the solution rises. (4 ½ marks)

(b) Moist blue litmus dropped in a gas jar full of dry chlorine turns red and finally into white. (6 ½ marks)

(a) Burning magnesium lowered into a gas jar full of dry carbon dioxide burns with a bright white flame and a mixture of black solid and white ash formed. (4marks)

12. (a) Briefly explain how nitric acid can be prepared in the laboratory (7marks)

*(No diagram needed.)*

(b) Concentrated nitric acid was added onto copper turnings in a boiling tube.

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

(ii) write equation to represent the reaction that occurred in the boiling tube. (1 ½ mark)

(c) Write equations to show effect of heat on;

- (i) potassium nitrate  
(ii) Ammonium nitrate

(1 ½ marks)  
(1 ½ marks)

(d) Zinc (II) nitrate undergoes thermal decomposition according to the equation below.



Determine the mass of Zinc (II) nitrate that is heated to produce 1.4dm<sup>3</sup> of the nitrogen dioxide gas at s.t.p? (Formular mass of  $\text{Zn}(\text{NO}_3)_2 = 189$ )

13. (a) What do you understand by the term **Enthalpy of Combustion**?

(2marks)

(b) Briefly describe a simple experiment to determine enthalpy of combustion of ethanol in the laboratory. (Include a well labelled diagram)

(9marks)

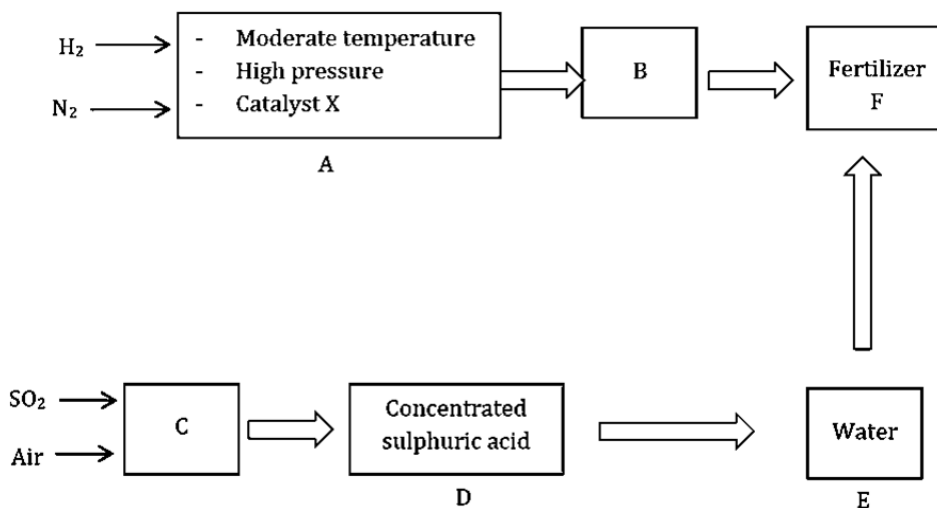
(c) 0.54 grams of ethanol was burnt in a calorimeter and the heat energy released caused the temperature of 215cm<sup>3</sup> of water to rise by 24.5°C.

- NB:
- Molar mass of Ethanol = 46
  - Density of water = 1gcm<sup>-3</sup>
  - Specific Heat capacity of water = 4.2J<sup>-1</sup>K<sup>-1</sup>

Using the values above determine the enthalpy of combustion of ethanol.

(4marks)

14.



The flow chart shows events leading to manufacture of a fertilizer. The steps are represented by letters A, B, C, D, E and F

(1mark)

- (a) (i) Name the catalyst used in step A and state the status of the catalyst.  
(ii) write an equation leading to the formation of product B?

(1 ½ marks)

(b) (i) State the 3 conditions for the reaction in step C.

(1 ½ marks)

- (ii) Identify the product at step C. ( $\frac{1}{2}$  mark)
- (iii) Write equation of reaction leading to the formation of a product at step C? ( $1\frac{1}{2}$  marks)
- (iv) Write equation of reaction leading to the formation of a product at step D. ( $1\frac{1}{2}$  marks)
- (v) Name the product at step D. ( $\frac{1}{2}$  mark)
- (c) c (i) Write equation of reaction leading to formation of a product at step E. ( $1\frac{1}{2}$  marks)
- (ii) What is the role of water in step E? ( $\frac{1}{2}$  mark)
- (iii) Name the product formed at step E. ( $\frac{1}{2}$  mark)
- (d) (i) Write equation leading to formation of a fertilizer at step F. ( $1\frac{1}{2}$  marks)
- (ii) Calculate the percentage of nitrogen content in fertilizer F and Ammonium phosphate.
- [NB: H = 1, N = 14, O = 16, P = 31, S = 32]

**END**