# KCSE MOCKS CHEMISTRY PAPER 2

# Consists 3 KCSE Mock set Exams. (Class of KCSE March 2021)

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### **PRE-MOCK 1**

Name......Class.....

Signature.....

Date.....

#### CHEMISTRY 233/2 2 hours

#### **KCSE PRE-MOCK 1**

#### (Kenya Certificate of Secondary Education)

#### **Instructions**

- ✓ Write your name, admission number and class in the spaces provided above.
- ✓ *Sign and write the date of examination in the spaces provided above.*
- ✓ Answer **all** the questions in the spaces provided in the question paper.
- ✓ All working **must** be clearly shown where necessary.
- ✓ This paper consists of 11 printed pages. Confirm this and that no questions are missing.

	FOI Examinel's Use Only				
Question	Maximum Score	Candidate's score			
1					
	10				
2					
	11				
3					
	12				
4					
	12				
5					
	11				
6					
	13				
7					
	11				
Total	80				

#### For Examiner's Use Only

1.i) The setup below was used to investigate the reaction between metals and water.



iv) When the reaction is complete, hydrogen gas is passed through the apparatus until it cools down. Explain. (2 marks)
v) What property of hydrogen is being investigated? (1 mark)
vi) What observation confirms the property stated in (v) above? (1 mark)
vii) Why is zinc oxide not used to investigate this property of hydrogen gas?(1 mark)

2. I. The diagram below represents an incomplete set-up of apparatus that can be used to prepare and collect dry carbon (iv) oxide gas. Complete the diagram and answer the questions that follow.



II. The diagram below is used to investigate the effect of carbon (II) oxide on lead (II) oxide. Study it and answer the questions that follow.



a) Write an equation for the laboratory preparation of carbon (II) oxide. (1 mark)

b) State and explain the observation in the combustion tube M.	(2 marks)
c) Identify liquid K and state its function.	(1 mark)
d) Why is it necessary burn excess gas at L.	(1 mark)
3. (a) Name the following organic compounds. i) CH <sub>3</sub> COOCH <sub>2</sub> CH <sub>3</sub>	(1mark)
ii) CH <sub>3</sub> CH <sub>2</sub> CHCCHCH <sub>2</sub> CH <sub>3</sub>	(1mark)

(b) Study the flow diagram below and use it to answer the questions that follow.



(i)	Name the compounds;	
	U	(½ mark)
	Gas X	(½ mark)
	Intermediate Y	(½ mark)
(ii) N	ame the process which leads to the formation of substance Z from t	he
inter	mediate Y.	(1 mark)
(iii) I	dentify the reagent and the condition for step 1	
Reag	ent	(1 mark)
Cond	lition	(1 mark)
iv) St	ate one disadvantage for the continued use of items made from com	npound
forme	ed in step 3.	(1 mark)
•••••		
v) Wi	rite a balanced equation for the reaction taking place in step 2.	(1 mark)
•••••		

c) Below are structures of two cleaning agents



iii) Name the cleaning agent A.  $(\frac{1}{2} \text{ mark})$ d) Ethanol is an important organic solvent. It can be prepared by the fermentation of glucose,  $C_6H_{12}O_6$ . Give two conditions necessary or the reaction to take place.

(1 mark)

.....

.....

4. The grid below represents part of the periodic table. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

			F	G	Η	Ι	
C							K
D	Е						
						J	

i) Identify the most reactive non-metal. Explain.

(2 marks)

ii) What is the name given to the family of elements of which I and J belong?
 . (<sup>1</sup>/<sub>2</sub> mark)
 iii) Using dots (•) and crosses (×) to represent electrons, show bonding in the compound formed between C and H. (2 marks)

iv) How does the atomic radius of F compare with that of I. Explain. (2 marks)

.....

b) Study the table below and answer the questions that follow.

Substance	Μ	N	0	Р	Q	R
M.Pt. °C	801	1356	-101	26	-39	113
B.Pt °C	1410	2850	-36	154	457	445
Electrical conductivity in solid state	Poor	Poor	Poor	Poor	Good	Poor
Electrical conductivity in molten state	Good	Poor	Poor	Poor	Good	Poor

i) Explain why substance M is a good conductor in molten state and not in solid state. (2 marks)

.....

.....

ii) What is the most likely structure of substance N. Explain. (1 ½ marks)

.....

iii) Identify, with reasons, a substance that exists as a liquid at room temperature. . (2 marks)

.....

5. The flow chart below shows a sequence of reaction involving a mixture of **two** salts, mixture **M**. Study it and answer the questions that follow.



T	a)	write	the	formu	la of	the	folle	win	o
1.	a)	write	une	Iorinu	1a  or	une	10110	JWIII	g.

<ul><li>(i) Anion in solid Q</li><li>(ii) The two salts present in mixture M.</li></ul>	(1 mark) (2 marks)

b) Write an ionic equation for the reaction in step VI.	(1 mark)
c) State and explain two observations made in step V.	(3 marks)
II. a) You are provided with copper solid, sodium carbonate solid, dilute hydrochloric acid, distilled water and dilute nitric (v) acid. Describe how prepare crystals of copper (II) carbonate.	you can (3 marks)
(b) Name the industrial process by which the sodium carbonate used in can be obtained.	II (a) above (1 mark)
6. (a) From an experiment, 25.0cm <sup>3</sup> of hydrochloric acid required 20.0cm sodium carbonate for a complete reaction. Calculate:	${ m m}^3$ of $0.02{ m M}$
(i) The number of moles of sodium carbonate used.	(1 mark)
(ii) The number of moles of hydrochloric acid used.	(1 mark)

(iii) The molarity of the acid. (1 mark)..... ..... (b) A solution of sodium hydroxide was found to contain 12.4g/dm<sup>3</sup> of sodium hydroxide. 25cm<sup>3</sup> of this solution reacted with 15cm<sup>3</sup> of a solution of sulphuric (VI) acid. (Na=23.0, H=1.0, S=32.0, O=16.0) (i) Find the molarity of the sodium hydroxide solution. (1 mark)..... ..... (ii) Calculate the number of moles of sodium hydroxide solution used. (1 mark)..... (iii) Calculate the number of moles of the acid used. (2 marks)\_\_\_\_\_ (iv) Determine the concentration of the sulphuric (VI) acid solution in g/dm<sup>3</sup>. (3marks) ..... ..... (b). (i) State the Charles law. (1 mark)(ii) A certain mass of gas occupies 146 dm<sup>3</sup> at 291K and 98.31 kPa. What will be its temperature if its volume is reduced to 133dm<sup>3</sup> at 101.325 kPa? (2 marks) ..... .....

7. (a) Define a saturated solution.

.....

(b) The table below represent the solubilities of sodium nitrate and Sulphur (IV) oxide at different temperatures.

Temperature ( °C)	10	18	26	34	42
Solubility of sodium nitrate					
(g/ 100g of water)	20	29	40	53	68
Solubility of sulphur ( IV) oxide	78	55	45	40	36
(g/ 100g of water)					

On the grid provided below, plot a graph of solubilities of sodium nitrate and Sulphur (IV) oxide against temperature. (4 marks)



Using the graph;

i.	Determine the solubility of Sulphur (IV) oxide at 16°C.	(½ mark)
 ii.	The concentration, in moles per litre, of sodium nitrate at density of solution is 1 g/cm <sup>3</sup> ) (Na=23, 0=16, N=14).	16 °C. (assume (3 marks)
iii.	Mass of crystals formed when a solution of sodium hydrox from 40°C to 26°C.	ide is cooled (2 marks)
iv.	What is the relationship between solubility of sodium nitr temperature?	ate and (1 mark)
(c) G	ive one advantage of hard water.	(½ mark)
(d) E hydr etha	Explain why the reaction between 1g of sodium carbonate with ochloric acid is faster than between 1g of sodium carbonate noic acid.	th 2M with 2M (1 mark)

### MOCK 1

NAME..... INDEX NUMBER..... CANDIDATE SIGN ...... DATE .....

233/2

**CHEMISTRY PAPER 2** 

#### **TIME: 2 HOURS**

#### **INSTRUCTIONS TO CANDIDATES**

- a) Write your name and index number in the spaces provided above
- b) Answer <u>all</u> the questions in the spaces provided
- c) KNEC mathematical tables and silent electronic calculators may be used
- d) All workings must be clearly shown where necessary
- e) Candidates should answer all questions in ENGLISH

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1	12	
2	14	
3	12	
4	12	
5	10	
6	10	
7	10	
Total score	80 marks	

#### FOR EXAMINER'S USE ONLY

1. A student set-up the following apparatus to prepare carbon (II) oxide from charcoal in the laboratory.



- i) State the purpose of potassium hydroxide solution (1mk)
- ii) Identify gas B (1mk)
- iii) Name<u>two</u> substances that react together to produce gas B (2mks)
- iv) Write balanced equations for reactions in i) Combustion tube (1mk)
  - ii) Flask L (1mk)

- v) Describe <u>two</u> simple test that you would use to distinguish between Carbon (IV) oxide and Carbon (II) oxide. (2mks)
- vi) In another experiment, the student reacted charcoal with excess hot concentrated nitric (v) acid.
  - i) State one observation made (1mk)
  - ii) Write balanced equation for the reaction (1mk)
- vii) State two use of Carbon (II) oxide (1mk)
- 2. Use the information in the table below to answer the questions that follow. The letters are not the actual symbols of the elements.

Element	Atomic Number	$M.P(^{0}c)$
А	11	97.8
В	13	660
С	14	1410
D	17	-95
Е	20	839

a) Write the electronic arrangement for the ions formed by elements D and A (2mks)

b)	Select an	n element	which is :	
- /				

i) A poor conductor of electric current (1mk)

ii)	The strongest reducing agent	(1mk)	
iii)	Has a giant covalent structure		(1mk)

- iv) In which state will element B exists at  $661^{\circ}$ c Explain. (1mk)
- c) Compare the electrical conductivity of element A and B. Give a reason (1mk)
- d) Using dots (.) and crosses (x) to represent the outermost electrons, show the bonding in the compound formed between elements C and D. (2mks)

e) Explain the difference in melting points in elements B and A (2mks)

- f) Write an equation for the reaction that takes place between element E and steam. (1mk)
- g) Describe how a solid mixture of the Chloride of E and lead (II) Sulphate can be separated into solid sample. (2mks)

3. Study the flow chart below and answer the questions that follow.

H <sub>2</sub> O]	I Step	J Step II,	CH3CH2CH2CI HCI
STUPIN	Stop III X	CH3CH=CH2 Bro	Mine M
CH3CH Noto	K2C4207/H+	Step V	
T + gas P	à	TCH3 HJ	
	la defense - finisjon es -		

(a) Name substance J and draw its structural formula: (2mks) Name

(b) What reagents and conditions are necessary for:

i) Step (III): Reagent (1mk)

Condition

ii) Step II: Reagent (1mk)

Condition

c) Name the following

i) L (1mk)

- ii) Gas P (1mk)
- iii) Q (1mk)
- iv) M (1mk)

d) Write the equation of the reaction that occur in step (IV) (1mk)

e) Give the name of process in step (V) (1mk)

6

f) If the relative Molecular Mass of R is 21,000, determine the value of n. (C = 12.0, H = 1.0) (2mks)

4. a) Define an electrolyte (1mk)

b) Explain why the following substances conduct an electric current (2mks) i) Magnesium metal

ii) Molten magnesium Chloride

c) Study the reaction scheme below and answer the questions that follow.

Lead (11) nitrate	Magnesium Sulphati	White PPt
Process Dillute (11) HCI	process (1)	Solution Q
White PPt	shaak win war	IN CO INVITE
Process (111)		The still
Colourless	1	

i) Write the formula of P and Q (2mks)

ii) Write an ionic equation for the formation of P (1mk)

iii) Name process (i) (1mk)

iv) Write a balanced equation for the formation of white precipitate K (1mk)

v) State the condition required for process (III) (1mk)

vi) Which physical property is exhibited in process (III) (1mk)

vii) State one use of magnesium hydroxide (2mks) Give one reason

5 a) At  $25^{\circ}$ c, 50g of potassium nitrate were added to 100g of water to make a saturated solution. What is meant by a saturated solution? (1mk)

b) The table below gives the solubilities of potassium nitrate at different temperatures.

Temperature ( <sup>0</sup> c)	12	20	28	36	44	52
Solubility g/100g of water	22	31	42	55	70	90

i) Plot a graph of the solubility of potassium nitrate (vertical axis) against temperature (3mks)



ii) Using the graph

i) Determine the solubility of potassium nitrate at  $15^{\circ}$ c. (1mk)

ii) Determine the mass of potassium nitrate that remained undissolved given that 80g of potassium nitrate were added to  $100 \text{cm}^3$  of water and water to  $40^0 \text{c}$ . (2mks)

c) Determine the molar Concentration of potassium nitrate at  $15^{\circ}$ c.

(Assume there is no change in density of water at this temperature)  $(V_{12} = 20.0 \text{ N} + 14.0 \text{ G} = 16.0 \text{ M} + 14.0 \text{ M} + 14.0 \text{ G} = 16.0 \text{ M} + 14.0 \text{ M} + 14.$ 

(K = 39.0, N = 14.0, O = 16.0) (3mks)

6 a) Aluminium oxide reacts with both acids and basesi) Write an equation for the reaction between aluminium oxide and hydrochloric acid (1mk)

ii) Using the equation in (a) above, calculate the number of moles of hydrochloric acid that would react completely with 153.0g of aluminium oxide (Al = 27.0, O = 16.0) (3mks)

b) Sodium hydroxide pellet were accidentally mixed with sodium chloride, 8.8g of the mixture were dissolved in water to make one litre of solution. 50cm<sup>3</sup> of the solution was neutralized by 20.0cm<sup>3</sup> of 0.25M Sulphuric (vi) acid.

i) Write the equation for the reaction that took place. (1mk)

ii) Calculate the:

i) Number of moles of the substance that reacted with Sulphuric (vi) acid (2mks)

ii) Number of moles of the substance that would react with Sulphuric (vi) acid in the one litre solution. (1mk)

iii)The percentage of sodium chloride in the mixture. (2mks)

7. The flow chart below illustrates the industrial extraction of lead metal. Study it and answer the questions that follow.



- a) i) Name the ore that is commonly used in the process (1mk)
  - ii) Explain what takes place in the roasting furnace (1mk)

- iii) Identify gas P (1mk)
- iv) Write the equation for the main reaction that takes place in the smelting furnace. (1mk)
- v) What is the purpose of adding iron in the smelting furnace? (1mk)
- vi) Give two environmental hazards likely to be associated with extraction of lead. (2mks)
- b) Explain why hard water flowing in lead pipes may be safer for drinking than soft water flowing in the same. (2mks)
- c) State one use of lead other than the making of lead pipes (1mk)

### **POST MOCK 1**

.....Adm No:..... Name.....

233/2 **CHEMISTRY** PAPER2 THEORY **TIME: 2 HOURS**  Candidate's Signature Date: .....

# **KCSE POST MOCK 1**

Kenya Certificate of Secondary Education (K.C.S.E.)

233/2 Chemistry Paper 2 2 Hours

### **INSTRUCTIONS TO CANDIDATES**

- Write your name and Index number in spaces provided above.
- Sign and write the date of examination in the spaces provided above
- Answer all the questions in the spaces provided above. •
- KNEC Mathematical tables and silent electronic calculators may be used.
- All working must be clearly shown where necessary.
- Candidates should answer the questions in English. •

FOR Examiners Use Only				
Question	Maximum score	Candidate's		
		score		
1	12			
2	13			
3	12			
4	12			
5	10			
6	13			
7	08			
Total score	80			

#### For Evominors Uso Only

This paper consists of 10printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

1. (a) Define the following terms:

i)	Strong bases	(1mk)
ii)	Amphoterism	(1mk)
iii)	Solubility	(1mk)

b) Using the equation below, identify the species that acts as the base in the forward reaction. Give a reason. (2mks)

 $NH_{3(g)} + H_2O_{(1)}$   $NH_4^+(aq) + OH^-(aq)$ 

c) A solution of ammonia gas in water causes a greater deflection of the ammeter while a solution of ammonia gas in methylbenzene does not cause deflection. Explain this observation. (1mk)

d) Write a well-balanced chemical equation for the reaction between sodium hydroxide solution and zinc oxide. (1mk)

e) Explain how hard water is softened by ion exchange method. (2mks)

f) The table below gives the solubilities of sodium chloride and sodium sulphate at 0°C and 40 °C.

Substance	Solubility in g/100g of water		
	0°C	40 °C	
Sodium chloride	55	75	
Sodium sulphate	10	12	

When an aqueous mixture containing 60g of sodium chloride and 7g of sodium sulphate in 100g of

water at 80°	°C was o	cooled to 0 °C, some crystals were observed.	
i)	Iden	tify the crystals and determine the mass of the crystals formed.	(2mks)
ii)	Nam	he the method used to obtain the crystals.	(1mk)
	afin a		
2. a) D	i)	Molar heat of combustion.	(1mk)
	ii)	Heating value of a fuel.	(1mk)

b) In an experiment to determine the heat of combustion of ethanol. CH<sub>3</sub>CH<sub>2</sub>OH, a student set up apparatus as shown in the diagram below. Study the set up and the data and answer the questions that follow.



Volume of water	=	$100 \text{cm}^3$
Final temperature of water	=	36.0 <sup>0</sup> c
Initial temperature of water	=	22.0 <sup>0</sup> c
Final mass of lamp an ethanol	=	84.75g
Initial mass of lamp and ethanol	=	85.10g
Density of water	=	$1 \text{ g/cm}^3$
	4 01-112	112-1

(Specific heat capacity of water = 4.2kJKg<sup>-1</sup>K<sup>-1</sup>)

i) Calculate:

	II)	The amount of heat given outin this experiment.	(2mks)	
	III)	The heat of combustion per mole of ethanol.	(1 mk)	
ii)	Write a th	nermochemical equation for the combustion of ethanol.	(1	l mk)
iii)	Explain 1 theoretic	how the molar heat of combustion for ethanol obtained above d al value.	iffers with th (2mks)	e
iv)	State one	e precaution that should be adhered to when carrying out this ex	periment.	(1mk)
v)	In this ex	speriment an assumption that links ethanol and water is made. S	State the assume (1 mk)	mption.
vi)	Draw an	n energy level diagram for the combustion of ethanol.		(2mks)

3. The figure below represents a section of the periodic table. Study it and answer the questions that follow. Note that the letters do not represent the actual symbols of the elements.

A					D	
В		G	J	F	Н	E
С	<i>[[]                      </i>				Ι	

(a) Consider elements H and I.

(i) Explain why theatomic radius of element H is smaller than its ionic (1mk)

(ii) When element H was dissolved in water and blue litmus papers dipped, the colour of the litmus paper changed from blue to red to white. Explain. (2mks)

(iii) Explain what is likely to be observed when element H is bubbled through a solution containing the ions of element I. (2mks)

(b) Compare the atomic radius of elements G and J. Explain the difference. (2mks)

(c) Use dot and cross diagram to show bonding in a compound of B and H. (1mk)

(d) G chloride has an unexpected bond type and structure.State the type of bond and the structure.
 Bond type (lmk)
 Structure (lmk)

- (e) A piece of blue litmus paper is placed in a solution of B chloride and a solution of
  - G chloride. Explain what would be observed in each case.
  - (i) B chloride solution
  - (ii) G chloride solution (1mk)

(lmk)

(1mk)

(1mk)

4. In an experiment to study the rate of reaction, 2.5g of copper (II) sulphate crystals were added to a given mass of zinc granules and 100cm<sup>3</sup> dilute hydrochloric acid at 27°C. The volume of hydrogen released was measured at 10 second intervals. The results obtained are tabulated below.

Time (seconds)	0	10	20	30	40	50	60	70	80	90
Volume (cm <sup>3</sup> )	0	60	85	105	114	116	118	122	122	122

- a) Why were the following not used in the reaction?
  - i) Nitric (V) acid
  - ii) Iron powder
  - iii)
- b) On the grid below plot a graph of volume of gas against time and label it X (3mks)

	*****		 *****
	****		 +++++++++++++++++++++++++++++++++++++++
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]			
		1	

i) Use the graph to calculate the rate of reaction at t=25seconds	(2mks)
ii) Explain why the volume of gas produced does not exceed 122cm <sup>3</sup>	(1mk)
iii) Sketch graph Y on the same grid to show the results if the experiment is repeated at 20°C.	(1mk)
iv) How does the catalyst used (copper (II) sulphate) speed up the reaction?	(1mk)
c) i) State Le'Chatelier's principle.	(1mk)

ii) What is the effect on the position of equilibrium when dilute hydrochloric acid is added to the closed system of the reaction below (1mk)

 $NH_{3(g)} + H_2O_{(l)}$   $NH_4^+(aq) + OH^-(aq)$ 

5. (a) Give the IUPAC names of the following organic compounds. (2 mks)

(i) 
$$CH_3 - CH_2 - CH - CH_3$$
  
|  
 $CH - CH_3$   
|  
 $CH_3$ 

(ii) 
$$CH_3 - C \equiv C - CH_3$$

(b) Study the flow chart below and answer the questions that follow:



6. a) Draw a fully labeled diagram of the apparatus you would use to electrolyse an electrolyte in the aqueous state. (3mks)

b) Explain why crystals of sodium chloride are non-conductors of electricity butwhen melted they conducts electric current more readily. (2mk)

c) Answer the following questions in relation to the electrolysis of molten lead (II) iodide.

i) State what happens to molten lead (II) iodide when an electric current is passed through it.

(1mk)

ii) At what electrode is a metal formed? Write an equation to show how the metal is formed. (2mks)

iii)	Why is	it necessary to carry out this experiment in a fume chamber?	(1mk)
iv)	What is	s a binary electrolyte?	(1mk)
c)	Give tl	ne application of electrolysis in	
	i)	Chemical manufacturing industry	(1mk)
	ii)	Metal extraction industries	(1mk)
	iii)	Jewellery e.g. necklaces manufacturing industries	(1mk)

7. The diagram below represents the industrial manufacture of hydrochloric acid. Study it and answer the questions that follow.

![](_page_34_Figure_1.jpeg)

- a) Name the main source of hydrogen in this process. (1mk)
- b) The reaction between chlorine and hydrogen can be very explosive. How can this be avoided? (1mk)
- c) What is the role of glass beads in the absorption chamber? (1mk)
- d) Explain why the storage chamber for hydrochloric acid is made up of steel lined with rubber. (1mk)
- e) The acid obtained is 35% pure. Calculate its molarity, given that at 25°C, the density of the acid is 1.08g/cm<sup>3</sup> (H=1, Cl=35.5)
   (3mks)

f) Explain why hydrochloric acid is not used to acidify potassium manganate (VII) solution.(1mk)