KCSE PREDICTIONS 2020

CHEMISTRY PAPER 1

1 . Gas X was found to decolorize moist litmus paper. A colorless solution of potassium Bromide turned red-brown when gas X was passed through it.

a) What is observed when gas x is passed through potassium iodide solution**.** **(1mark)**

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b) Write an equation to accompany the observation in (a) above. **(1 mark)**

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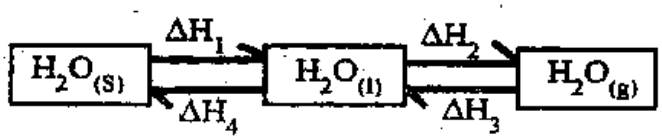
2. An organic compound J has the following percentage by mass, carbon, 64.86%, hydrogen, 13.51% and the rest oxygen. The relative molecular mass of the compound is 74. Work out the molecular formula of compound J. [C=12. H=1 O=16] **(3 marks)**

3. The scheme below shows the energy changes that are involved between ice, water and steam. Study it then answer the questions that follow



(a) What name is given to the process represented by energy change ΔH_4? **(1 mark)**

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(b) What is the sign of ΔH_3? Give a reason **(2 marks)**

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4. A fixed mass of a gas has a volume of 250cm^3 at a temperature 27°C and 750mmHg pressure. Calculate the volume the gas would occupy at 42°C and 750mmHg pressure. (0°C = 273K) **(3 marks)**
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5. Complete the table below to show the number of the sub-atomic particles of the given nuclides. X and Y are not actual chemical symbols. **{3 marks}**

	Number of		
Particle	Protons	Neutrons	Electrons
$^{34}_{16}X^{-2}$			
$^{56}_{26}Y^{+3}$			

6. 100cm³ of 2M nitric acid reacted with 12.5g of a carbonate of metal M. (MCO_3) according to the following equation

$$2HNO_{3(g)} + MCO_{3(S)} \rightarrow M(NO_3)_{2(aq)} + CO_{2(g)} + H_2O_{(l)}$$

a) Calculate the number of moles of MCO_3 that reacted with nitric acid. **(2 marks)**

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b) Calculate the relative molecular mass of MCO_3 **(2 marks)**

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7. (a) Name the substance formed when soap is used to wash in hard water **(1 mark)**

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(b) Give one advantage of drinking hard water **(1 mark)**

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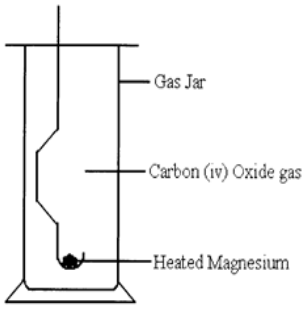
8. The diagram below a heated magnesium metal lowered inside a gas jar of carbon (IV) oxide.



Study it and answer the questions that follow.

(i) State **two** observations that can be made during and after the experiment **(2 marks)**

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(ii) Write a balanced chemical equation for that reaction. **(1 mark)**

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9. The pH values of some solutions labeled **E** to I are given in the table **below**. Use the information to answer the questions that follow.

pH	14.0	1.0	8.0	6.5	7.0
Solution	E	F	G	H	I

(a) Identify the solution with the highest concentration of hydroxide ions **(1 mark)**

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(b). Which solution can be used as a remedy for acid indigestion in the stomach? **(1 mark)**

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(c) Which solution would react most vigorously with magnesium metal? **(1 mark)**

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10. 120cm^3 of nitrogen gas diffuses through a membrane in forty seconds. How long will it take 240cm^3 of carbon (IV) oxide to diffuse through the same membrane (C=12,N=14,O=16) **(3 marks)**

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11. The table below shows the relative atomic masses and the percentage abundance of the isotopes **L_1** and **L_2** of element **L**.

Isotope	Relative atomic mass	% abundance
L_1	62.93	69.09
L_2	64.93	30.91

Calculate the relative atomic mass of element **L** **(3 marks)**

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12. Use the information in the table about group 1 elements to answer the questions that follow

Element	Atomic radius(nm)
Lithium	0.123
Sodium	0.157

Potassium	0.203

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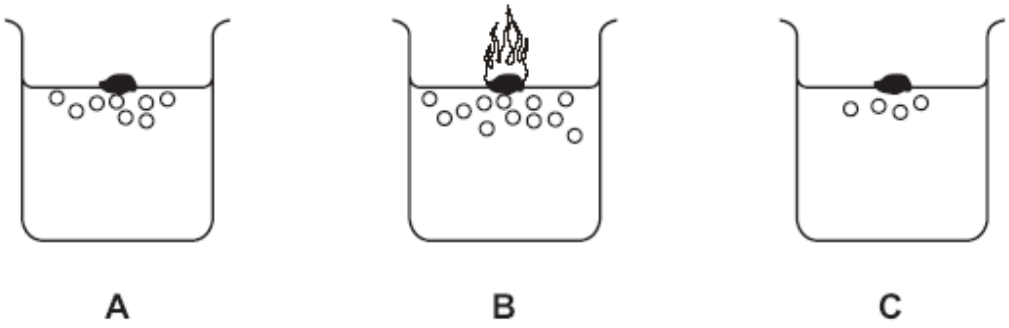
When the group 1 elements react with water, hydrogen gas is given off. The diagram shows the reaction of the above three elements with water



(a) What is the general name of the group one elements **(1 mark)**

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(b) Which one of these elements A, B or C is Lithium? **(1 mark)**

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(c) Apart from fizzing describe **two** things that you would see when sodium reacts with water. **(2 marks)**

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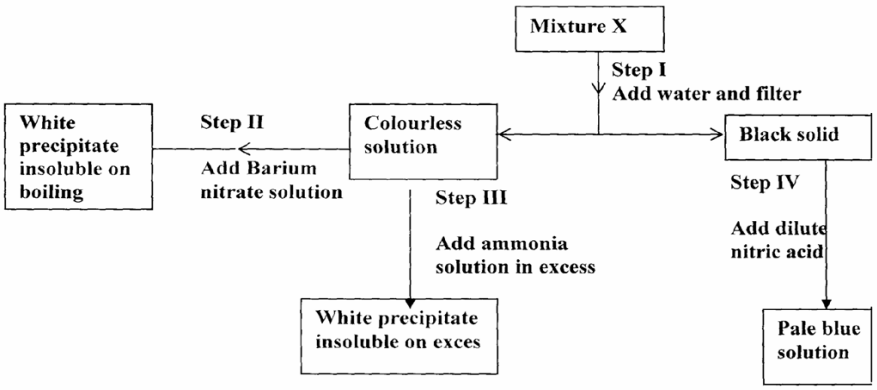
13. Study the chart below and answer the questions that follow.



(a) Name:

(i) Cations present in mixture X. **(1 mark)**

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(ii) Anions present in the solution. **(1mark)**

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(b) Write an equation to show how the white precipitate in step III dissolves. **(1 mark)**

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(c) Name the process outlined in step IV above. **(1 mark)**

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14. Use the information in the table below to answer the questions that follow

Element	Sodium	Magnesium	Phosphorus	Chlorine
Electric conductivity	Good	Good	Poor	Poor
M.P (^oC)	98	660	44/115	-173

(a) Explain why both Sodium and Magnesium conducts electricity while phosphorus and chlorine do not.

(1 mark)

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(b) Suggest a reason why phosphorus has been assigned two melting point values **(1 mark)**

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c) Explain why atomic radii of elements in period 3 decreases generally from left to right in the periodic table

(1 mark)

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15. In an experiment, soap solution was added to three samples of water. The results below shows the volume of soap solution required to lather with $500cm^3$ of each water sample before and after boiling.

	Sample 1	Sample 2	Sample 3
Volume of soap used before water boiled	26.0	14.0	4.0
Volume of soap after water boiled	26.0	4.0	4.0

(i). Which water samples are likely to be soft **(1 mark)**

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(ii) Explain the change in volume of soap solution used in sample 2 **(1 mark)**

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16. Describe how the following reagents can be used to prepare lead sulphate. Solid potassium sulphate, solid lead carbonate, dilute nitric acid and distilled water. **(3 marks)**

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17. Using dots (.) and crosses(x) to represent -electrons show the bonding between oxygen and carbon to form carbon (ii) oxide. **(1 mark)**

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18. 10g of ethanol (C_2H_5OH) were completely burnt in air. The heat evolved caused the temperature of $400cm^3$ of water to change from 20^0C to 85^0C. Calculate the molar enthalpy of combustion of ethanol.

(H = 1, C = 12, O = 16. Specific heat capacity of water = 4.2 $Jkg^{-1}k^{-1}$) **(3 marks)**

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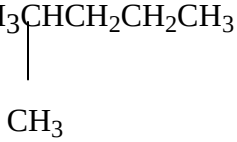
19. The structures below represent two cleansing agents where R is along hydrocarbon chain. Which of the two cleansing agents is suitable for washing in water containing Calcium ions. Give a reason

(2 marks)

20. Give the IUPAC name of the following organic compounds; **(2 marks)**

a) $CH_3CH_2CH_2CH_2CH_3$

b)



$CH_3CHCH_2CH_2CH_3$

CH_3

21 . The products formed by action of heat on nitrates of element A, B and C are shown below

Nitrate	Products formed
A	Metal oxide +Nitrogen (IV) Oxide + Oxygen
B	Metal +Oxygen (IV) Oxide

C	Metal nitrate + oxygen

(a) Arrange the metals in order of reactivity **(1 mark)**

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……

(b) Which element forms a soluble carbonate **(1 mark)**

……

Give an example of B **(1 mark)**

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……

22. Propane C_3H_8 and Carbon(IV)oxide diffuses at the same rate under the same conditions. Explain

(1 mark)

23. Although there are large reserves of iron and aluminium ores in the world, both metals are recycled.

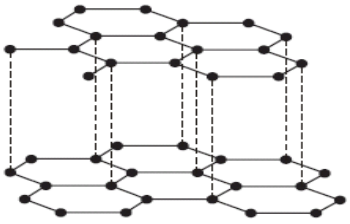
I. State one social benefit of recycling **{1 mark}**

II. Why is it particularly easy to separate iron from other scrap metals? **{1mark}**

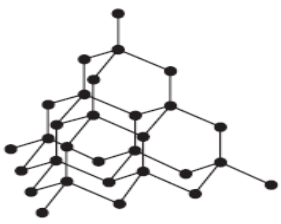
III. It is cheaper to recycle aluminum than it is to extract the metal from its ore. Give a reason. **{1 mark}**

24. The diagrams show the structures of two forms, P and Q, of a solid element.

P



Q



What are suitable uses of P and Q, based on their structures? **(2 marks)**

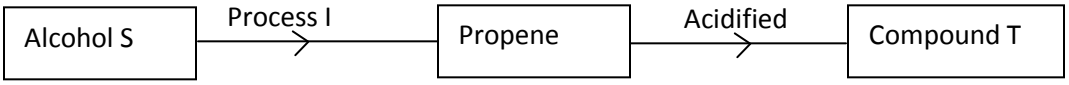
25. Fertilizers are added to the soil to improve crop yields. A farmer has a choice of two fertilizers, ammonium nitrate NH_4NO_3 or diammonium hydrogen phosphate $(NH_4)_2HPO_4$

(i) Show by calculation which of these fertilizers contains the greater percentage of nitrogen by mass **(3 marks)**

(N=14, H=1, O=16,P=31)

(ii) State one major problem caused when the nitrates from fertilizers leach from the soil into streams and rivers **(1 mark)**

26. Study the flow chart below.



(a). Write the structural formula of alcohol **S**. **(1 mark)**

(b) Name

(i) compound **T** **(1 mark)**

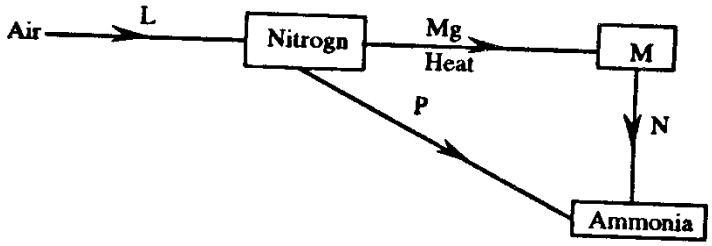
(ii) process **I** **(1 mark)**

27. Students are advised to use a non-luminous flame for heating in the laboratory.

(a) How does a Bunsen burner produce a non-luminous flame? **(1 mark)**

(b) Give one reason why the advice is given to students. **(1 mark)**

28. Study the diagram below and answer the questions



(i) What is the process involved in step L **(1 mark)**

(ii) Explain how process N and P can be affected **(2marks)**

N

29. In an experiment to determine the solubility of solid Y in water at 30^0Cthe following results were obtained.

Mass of empty evaporating dish	=	26.2g
Mass of evaporating dish + saturated solution	=	42.4g
Mass of evaporating dish + dry solid	=	30.4g

Use the data to calculate the solubility of Y at 30^0_C grams of Y per 100g water. **(3 marks)**