

NAME..... INDEX NO.....

SCHOOL..... CANDIDATE'S SIGNATURE.....

DATE.....

233/1
CHEMISTRY
(THEORY)
PAPER 1
JULY/AUGUST 2013
TIME: 2 HOURS

KIRINYAGA CENTRAL DISTRICT JOINT EXAMINATION - 2013

Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 1
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

- Write your **name** and **index number** 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.
- Mathematics tables and electronic calculators may be used.
- All working must be clearly shown where necessary.

FOR EXAMINER'S USE ONLY:

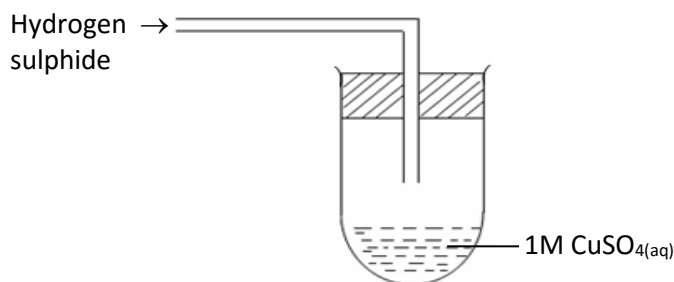
Question	Maximum Score	Candidates Score
1 - 30	80	

This paper consists of **12** printed pages.
Candidates should check to ascertain that all the pages are printed
as indicated and that no questions are missing.

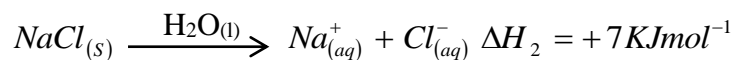
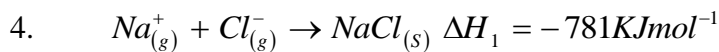
- 1 A certain element Y has atomic number 15 and mass number of 31.
- (a) Calculate the number of neutrons in the element. (1mk)
-
- (b) Write the electron arrangement of the ion formed by element Y. (1mk)
-
- (c) How would the atomic size of the above element compare with another atom X whose atomic number is 11 and mass number 23? Explain. (1mk)
-
-
-

2. Explain why the pH of 1.0M hydrochloric acid is 1.0M while that of 1.0M ethanoic acid is 5.0. (2mks)
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-
-
-

3. In an experiment hydrogen sulphide was passed through 1m $\text{CuSO}_{4(\text{aq})}$ in a boiling tube as shown in the diagram.



- (a) State the observation made in the boiling tube. (1mk)
-
-
- (b) Write the ionic equation for the above reaction. (1mk)
- (c) What precaution should be taken in carrying out this experiment? Give a reason? (1mk)
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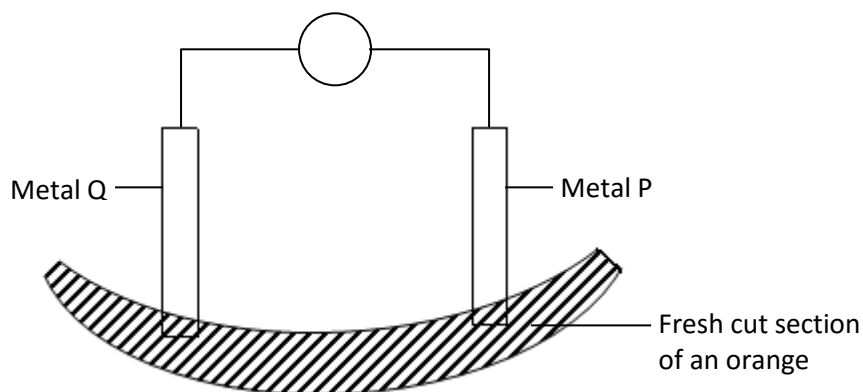


(a) What is the name of ΔH_1 ? (1mk)

(b) Calculate the heat change for the process



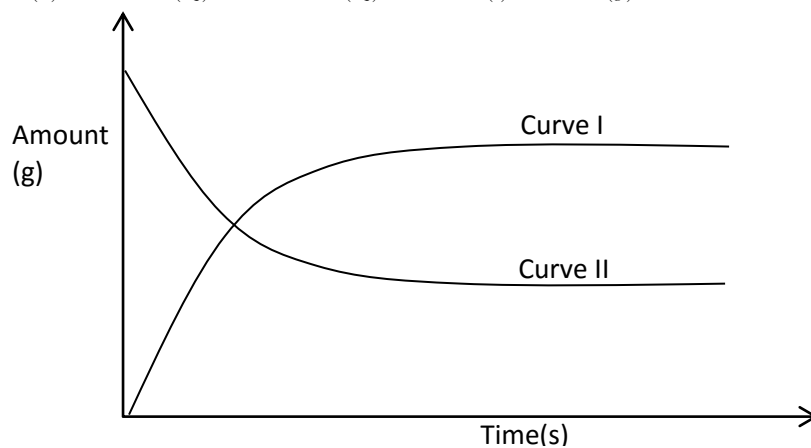
5. The set up **below** was used to show that metal **P** is more reactive than **Q**.



(a) Show the direction of flow of electrons on the diagram using an arrow. (1mk)

(b) Explain your answer in (a) above. (1mk)

6. The graph **below** shows the amount of calcium carbonate and calcium chloride varying with time in the reaction.

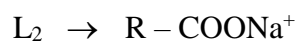
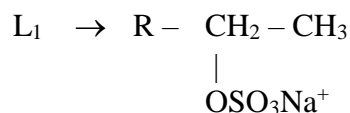


(a) Which curve shows the amount of calcium chloride varying with time? (1mk)

(b) Explain why the two curves become horizontal after a given period of time. (1mk)

(c) Sketch on the graph how curve II would appear if the experiment was repeated using a more dilute hydrochloric acid solution. (1mk)

7. The structure below represents two cleansing agents, L₁ and L₂.



(i) Identify each of the two cleansing agents, L₁ and L₂.

L₁ _____ (½mk)

L₂ _____ (½mk)

(ii) State a disadvantage of each of the above cleansing agents.

L₁ _____ (1mk)

L₂ _____ (1mk)

8. 22.2cm³ of sodium hydroxide solution, containing 4.0g per litre of sodium hydroxide were required for complete neutralization of 0.1g of a dibasic acid. Calculate the relative formula mass of the dibasic acid (Na = 23.0, O = 16.0, H = 1.0). (3mks)

9. Magnesium was burnt in air forming a white residue T. When put in a boiling tube with water effervescence was noticed and a colourless gas D with a characteristic pungent smell was evolved. The gas turned a wet red litmus paper blue.

(a) Identify

(i) Residue T. (1mk)

(ii) Gas D. (1mk)

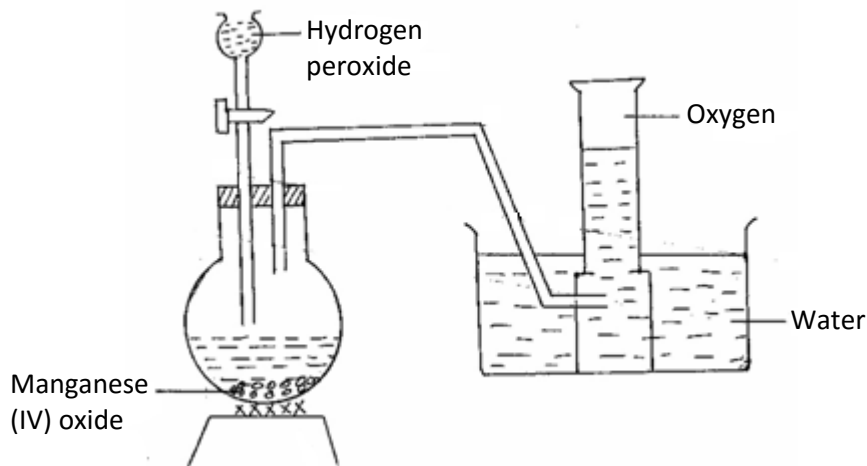
(b) Write an equation for the liberation of gas D. (1mk)

10. (a) Define half life of radioisotopes. (1mk)

(b) X grammes of a radioactive isotope take 100 days to decay to 20g. If half life of the element is 25 days, calculate the initial mass X of the radioisotope. (2mks)

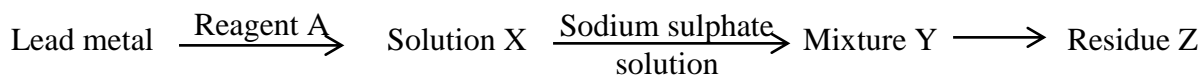
11. Element X contains isotopes with mass number 16 and 18 respectively existing in the ratio 1: 3, calculate the relative atomic mass of X. (2mks)

12. The diagram **below** represent a set up that can be used to prepare and collect oxygen gas.



- (a) Write an equation for the reaction that takes place. (1mk)
- (b) What property of oxygen makes it possible for its collection as indicated in the diagram. (1mk)
-
- (c) Explain why it is important not to collect any gas for the first few seconds of the experiment. (1mk)
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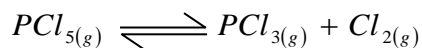
13. The reaction **below** refers to the preparation of lead (II) sulphate starting with lead metal.



- (a) Name the type of reaction between solution X and sodium sulphate solution. (1mk)
-
- (b) Write an ionic equation for the reaction in (a) above. (1mk)

- (c) Explain why it is not possible to prepare residue Z using lead metal and dilute sulphuric acid. (1mk)

14. Consider the following reaction at equilibrium.



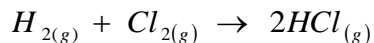
Complete the table **below** to show the effect of different factors on the position of equilibrium. (2mks)

	Factor	Effect on equilibrium position
(i)	Decrease in pressure	
(ii)	Removing chlorine	
(iii)	Adding helium to the mixture	

15. Study the information in the table below then answer the questions that follows.

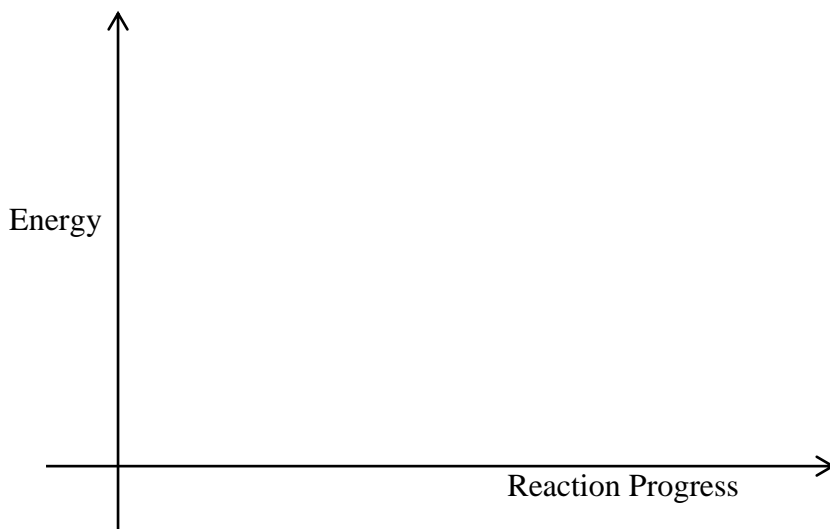
Bond	Bond energy (kJmol ⁻¹)
H – H	435
Cl – Cl	243
H - Cl	431

- (a) Calculate the enthalpy change for the reaction.

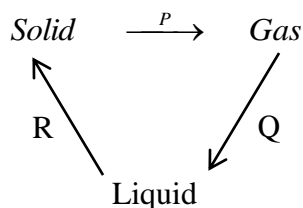


(2mks)

- (b) On the axis given **below** draw an energy level diagram for the reaction above. (1mk)



16. Matter exists in three states which can be related as shown in the diagram **below**.



(a) Name processes:

P: _____ (1mk)

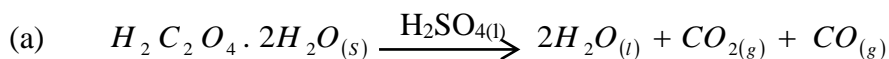
R: _____ (1mk)

(b) Explain whether process **Q** is exothermic or endothermic. (1mk)

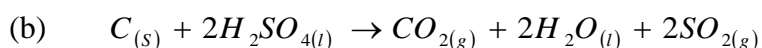
17. (a) State the Graham's law of diffusion. (1mk)

(b) 200cm³ of nitrogen (I) oxide (N₂O) pass through a porous plug in 2 minutes 15 seconds. How long will it take the same volume of sulphur (IV) oxide (SO₂) gas to diffuse through the same plug under the same conditions. (N= 14, O = 16, S = 32). (3mks)

18. Write down the property of concentrated sulphuric (VI) acid shown in the following reactions. (2mks)

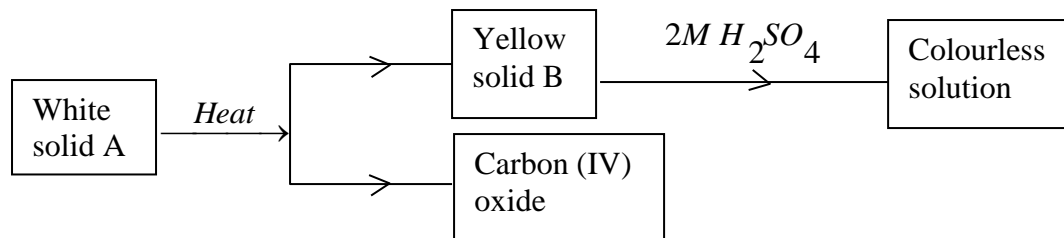


Property _____ (1mk)



Property _____ (1mk)

19. The scheme **below** represents some reactions starting with a white solid A.



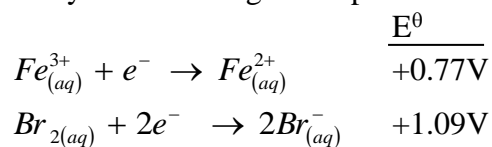
(a) Identify the solids **A** and **B**.

A _____ (1mk)

B _____ (1mk)

(b) Write an equation for the reaction between B and 2M sulphuric acid. (1mk)

20. Study the following redox potentials.



Using the values given above, predict whether the following reaction is possible.



21. (a) A saturated solution contains 7.5g of solute in 20cm³ of water. When the solution is cooled crystals begin to appear at 10°C. Calculate the solubility of the solute at 10°C. (2mks)

(b) What causes permanent water hardness? (1mk)

22. When excess chlorine gas is bubbled through dilute sodium hydroxide solution, the resulting solution acts as a bleaching agent.

(a) Write an equation for the reaction between chlorine gas and sodium hydroxide solution. (1mk)

(b) Explain how the resulting solution acts as a bleaching agent. (2mks)

23. A, B, C, D are dyes present in a mixture C is more soluble than B, A is more soluble than C and D is the least soluble in a given solvent. Draw around-paper chromatogram showing how they would appear when separated using the solvent. (2mks)

24. **Below** are PH values of some solutions.

Solution	Z	Y	X	W
PH	6.5	13.5	2.2	7.2

(i) Which solution is likely to be

I Acidic rain _____ (½mk)

II Potassium hydroxide _____ (½mk)

(ii) A basic substance V reacted with both solutions Y and X. What is the nature of V. (1mk)

(iii) Name **two** substances that show these characteristics in question (ii) above. (1mk)

25. Hydrogen gas was passed over hot copper (II) oxide in a combustion tube.

(a) Write an equation for the reaction which took place. (1mk)

(b) What observations were made in the combustion tube? (1mk)

(c) Name any other gas which could be used to reduce copper (II) oxide. (1mk)

26. (a) Element A and B have atomic numbers 6 and 1 respectively illustrate the type of bonding formed when the two elements combine. (2mks)

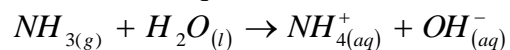
(b) Explain why solid sodium chloride does not conduct electricity while sodium chloride solution conducts. (1mk)

27. 'Dry ice' is preferred to ordinary ice as a refrigerant. Explain. (2mks)

28. State **one** use of argon which is also a use of nitrogen gas. (1mk)

29. An element P has a relative atomic mass of 88 when a current of 0.5 amperes was passed through the fused chloride for 32.16 minutes, 0.44g of P were deposited at the cathode. Determine the charge on an ion of P. (IF = 96500 coulombs). (3mks)

30. Consider the equation.



(a) Identify the acid and base in the above equation using Bronsted Lowry theory. (3mks)

Acid _____ (1mk)

Base _____ (1mk)

Reason _____ (1mk)
