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233/1

CHEMISTRY PAPER 1

THEORY

2 HOURS

JULY / AUGUST 2010

## BELGUT/AINAMOI JOINT EXAMINATION

### Kenya Certificate of Secondary Education 2010

233 / 1

CHEMISTRY

PAPER 1

JULY / AUGUST 2010

#### INSTRUCTIONS TO CANDIDATES

- ❖ Answer **ALL** the questions in the spaces provided.
- ❖ Mathematical tables may be used
- ❖ Electronic calculators may be used where necessary
- ❖ All workings **MUST** be shown clearly where necessary

#### For examiners use only

Questions	Maximum score	Candidate's score
1 - 32	80	

CANDIDATES SHOULD CHECK THE QUESTION PAPER TO ENSURE THAT ALL THE PAGES ARE PRINTED AND NO QUESTIONS ARE MISSING.

1. a) Write an ionic equation to show how washing removes permanent hardness water. (1mk)

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b) Give **one** advantage of drinking hard water by humans. (1mk)

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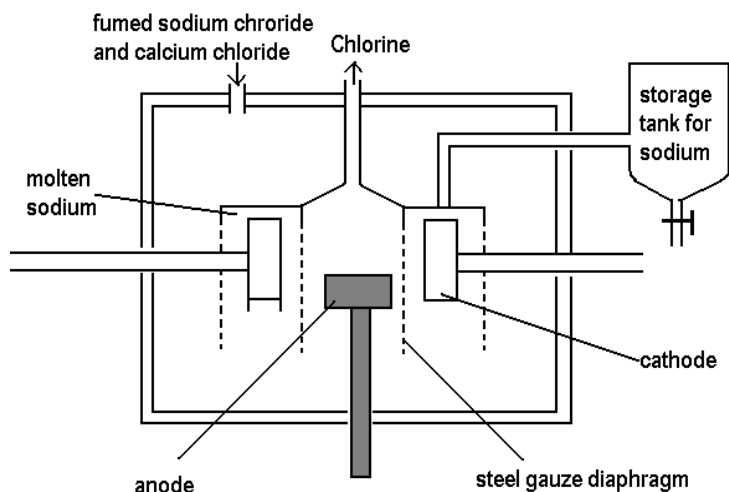
2. a) Define half – life of radio isotopes. (1mk)

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b) X grammes of a radioactive isotope take 100 days to decay to 20gms. If they half – life of element is 25 days. **Calculate** the initial mass of x of the radio-isotope. (2mks)

3. 18.24gms of gaseous compound M contain 16gms of silicon while the rest is hydrogen. Determine the Empirical formula of the compound M. (*Si = 28, H=1*) (2mks)

4. The diagram below shows Down's cell used to extract sodium metal.



a) Anode is made of graphite instead of steel. Give reason. (1mk)

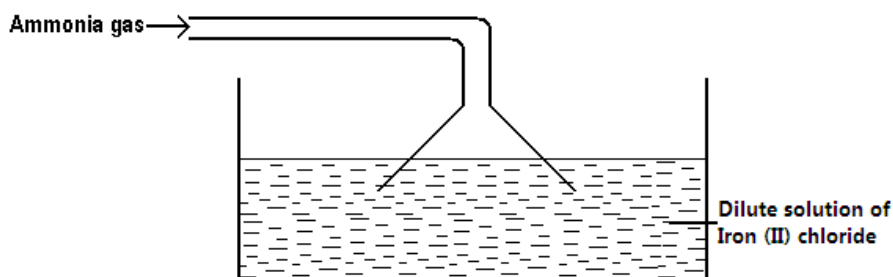
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b) What is the function of steel gauze? (1mk)

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5. Methanol ( $\text{CH}_3\text{OH}$ ) has heat of combustion 70 KJ/Mol. What will be the temperature rise if 4gms of methanol is used to heat 800gms of water assuming that no heat is lost to the surroundings. ( $C= 12, H= 1.0, O= 16, \text{specific heat capacity of water is } 4.2 \text{ J/s/K}$ ) (3mks)

6. Below is set up of apparatus used to react ammonia gas with iron (II) chloride.



a) State observation made in the beaker. (1mk)

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b) Give a reason for using a funnel to deliver ammonia into the beaker. (1mk)

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7. Distinguish between a strong acid and concentrated acid. (2mks)

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8. When chlorine gas is mixed with excess ammonia gas white fumes and a spark of light are observed. Using equations where necessary, explain the above observations. (2mks)

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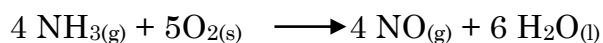
9. A current of 0.75 A passes through 300 cm<sup>3</sup> of 0.5M CuSO<sub>4</sub> solution.

a) Determine the mass of copper in 300 cm<sup>3</sup> of 0.5M CuSO<sub>4</sub> (2mks)

b) Determine the time taken in seconds to deposit all the copper on the cathode.

**(Cu = 63.5, 1F = 96500 Coulombs)** (2mks)

10. One stage in the manufacture of nitric acid involves the catalytic oxidation of ammonia by the reaction.



a) State **two** conditions under which this reaction is carried. (2mks)

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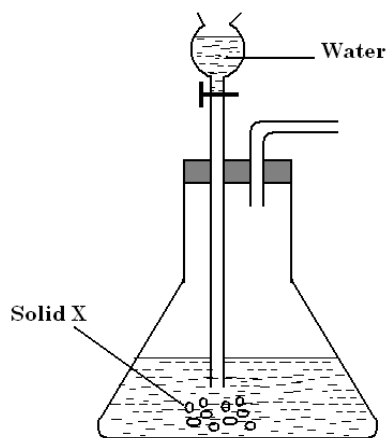
- b) State **two** conditions under which nitric acid would react with magnesium metal to produce hydrogen gas. (1mk)

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11. The set up below was used to prepare a sample of oxygen gas . Study it and answer the questions that follow.



- a) Complete the diagram to show how oxygen is collected. (2mks)
- b) Identify solid X..... (1mk)
- c) Write equation to the reaction between solid X and water. (1mk)

12.  $240\text{cm}^3$  of nitrogen I oxide gas takes 16 seconds to diffuse through a certain porous pot.  $300\text{cm}^3$  of gas X takes 12 seconds to diffuse through the same plug. **Calculate** the relative molecular mass of gas X. ( $N = 14, O = 16$ ) (3mks)

13. Use the table below to answer the question that follow.

Ions	$\text{Na}^+$	$\text{Mg}^{2+}$	$\text{Al}^{3+}$
Ionic radius (nm)	0.086	0.073	0.064

Sodium, magnesium and Aluminium belong to the same period in the periodic table. Explain the trend in their ionic radius. (2mks)

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14. **Explain** briefly why water is not used to put off oil fires. (2mks)

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15. Consider the following equilibrium reaction



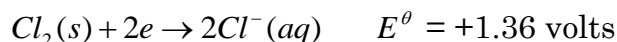
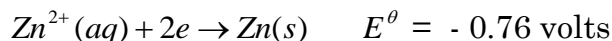
What will be the effect of increasing the temperature on the yield of sulphur VI oxide? (2mks)

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16. Use the following standard electrode potentials to answer the questions that follow.



Calculate the e.m.f of the following cell:



b) Write down the overall equation for the reaction. (1mk)

17. Below is a table of the first five numbers of the alkanes and their boiling points

Name	Boiling point ( <sup>0</sup> c)
Methane	- 161.5
Ethane	- 88.6
Propane	- 42.1
Butane	- 0.5
Pentane	36.1

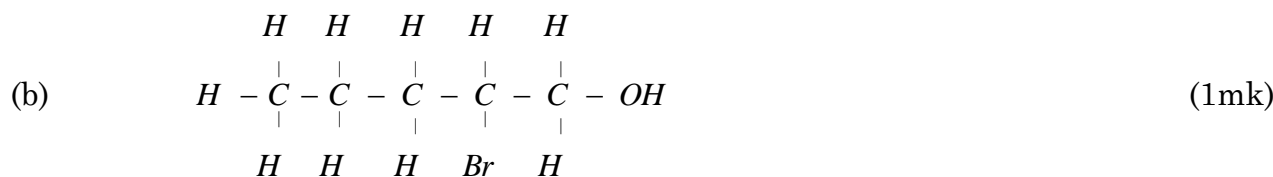
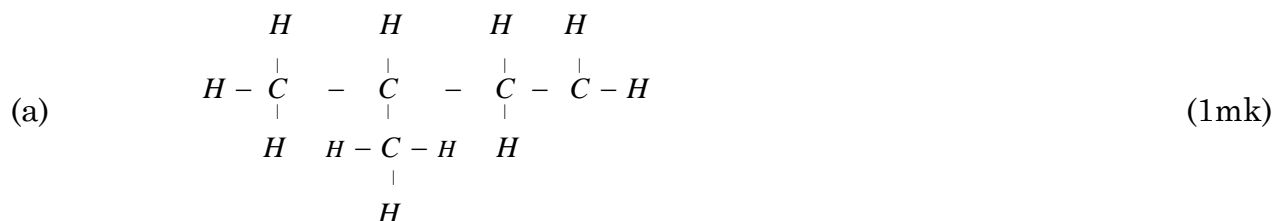
a) What is the state of pentane at room temperature (25<sup>0</sup>C) (1mk)

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b) Why do the boiling point increases from methane to pentane? (2mks)

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18. Give the systematic names of the following compounds.



19. An atom P contains 90% of Isotope  $^{16}_8P$  and 10% of isotope  $^{17}_8P$ . Calculate the relative atomic mass of P. (2mks)

20. How would you distinguish the following compounds; (CH<sub>3</sub>COOH) and CH<sub>3</sub>CH<sub>2</sub>OH? (2mks)

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21. At room temperature silicon IV oxide is a solid whereas carbon IV oxide is a gas although silicon is next to carbon in group IV of the periodic table. **Explain.** (2mks)

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22. Describe how you would prepare a dry sample of Zinc carbonate in the laboratory starting with zinc chloride solid. (3mks)

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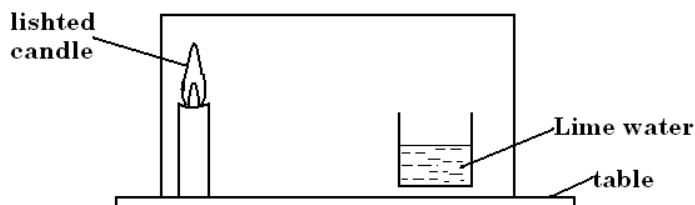
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23. Study the arrangement below and answer the question that follow. (3mks)



Explain what will be observed after sometime.

24. A white solid dissolves in water to form a colourless solution. The colourless solution forms a white precipitate with ammonia solution but becomes soluble in excess of alkali. The colourless solution forms a white precipitate with silver nitrate and the precipitate dissolves in excess ammonia. What ions are present in the white solid? (2mks)

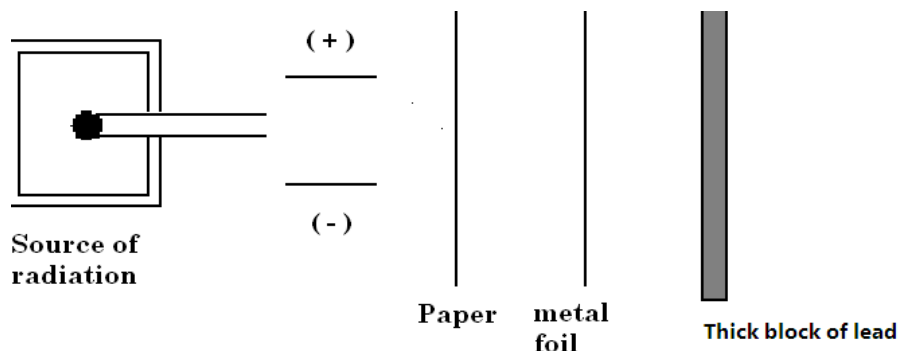
25. Draw a dot (•) and cross (x) diagram to show the bonding in Cl<sub>2</sub>O.

(Cl=17, O=18)

(2mks)



26. Complete the diagram below to show how particles from a radioactive source can be distinguished from each other. Label your diagram clearly. (3mks)



27. Boilers used for boiling hard water are normally covered with a boiler scale after sometime.

a) What is the chemical name for boiler scale? (1mk)

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b) How is boiler scale removed? (1mk)

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28. In the manufacture of sodium carbonate by the Solvay process, ammonia cal brine trickles down the carbonator while carbon IV oxide rises up the same tower

a) What is ammoniacal brine? (1mk)

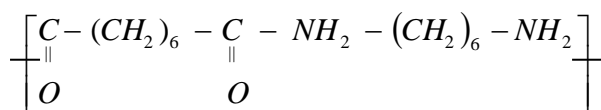
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b) Write **two** equations taking place in they carbonator.

I..... (1mk)

II..... (2mks)

29. Nylon polymer has the structure below.



i) Determine the structures of the monomers. (2mks)

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ii) State the type of polymerization. (1mk)

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30. **Name** and **give** the formulae of two ores from which iron is extracted. (2mks)

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31. A student was asked to determine the percentage of zinc metal in a mixture of zinc metal and zinc oxide. He reacted the mixture with excess hydrochloric acid and accurately collected the gas evolved, which was then used to calculate the amount of zinc in the mixture.

a) Name the gas evolved? (1mk)

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b) Write a balanced equation for reaction that took place. (1mk)

c) Why would dilute nitric acid not suitable for this reaction? (1mk)

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32. Ethanedioic acid (COOH)<sub>2</sub> is used instead of methanoic acid (HCOOH) to prepare Carbon (II)Oxide and Carbon (IV) Oxide in the laboratory as it is easily dehydrated by Sulphuric (IV) acid to give equal volumes of the two gases.

a) Write an equation for the dehydration of ethanedioic acid. (1mk)

b) Explain how dry Carbon (II) Oxide can be got from the mixture of the two gases. (2mks)

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