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233/1

TRIAL 1

Kenya Certificate of Secondary Education

CHEMISTRY

PAPER 1 (THEORY)

2 HOURS

INSTRUCTIONS TO THE CANDIDATE

- ✓ *Answer all questions in the spaces provided.*
- ✓ *Additional papers must not be inserted*
- ✓ *All working must be clearly shown where necessary.*

For examiners use only

Questions	Maximum score	Candidates score
1 - 31	80	

1. An element A has atomic number 20 while element B has atomic number 8.

(a) Write the electronic configuration for each element.

(2 marks)

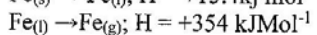
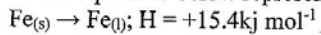
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(b) What type of bond would be formed when A and B react.

(1 mark)

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2. The equations below represents changes in the physical states for iron metal.



Calculate the amount of heat required to change 11.2g of iron solid to gaseous iron. (Fe = 56)

(2 marks)

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3. The information below is on four elements represented by letters P, Q, R and S. Study it and answer the questions that follow.

Q reacts with dilute acids but not with cold water. R does not react with dilute acids. S displaces P from its oxide and P reacts with cold water. Arrange the elements in order of decreasing reactivity.

(2 marks)

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4. Given that the lattice energy of $\text{NaCl}_{(s)}$ is $+771 \text{ kJ mol}^{-1}$ and hydration energies of $\text{Na}^+_{(g)}$ and $\text{Cl}^-_{(g)}$ are -406 kJ mol^{-1} respectively. Calculate the heat of solution, ΔH_{soln} for one mole of $\text{NaCl}_{(s)}$.

(3 marks)

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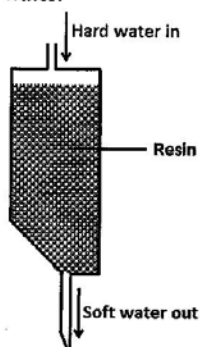
5. Identify the oxidizing agent in the following equation: $\text{Mn}_{(s)} + 2\text{H}^+_{(aq)} \rightarrow \text{Mn}^{2+}_{(aq)} + \text{H}_{2(g)}$.

Explain your answer.

(2 marks)

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6. The column below was used to soften hard water.



(a) Explain how the hard water was softened as it passed through the column. (1mark)

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(b) If the material in the column is not able to soften hard water, how could it be activated? (1mark)

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(c) Give **one** advantage of using soft water. (1mark)

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7. Determine the empirical formula of a compound made up of carbon and hydrogen given that the percentage of carbon in the compound is 79.9%. (C = 12.0, H = 1.0) (3 marks)

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8. Write an equation for the reaction that occurs when butane is reacted with hydrogen gas in the presence of nickel catalyst. (1mark)

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9. 22.2 cm³ 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). (3 marks)

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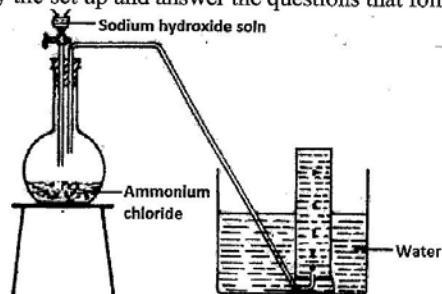
10. Nitrogen and oxygen react according to the equation: $N_{2(g)} + O_{2(g)} = 2NO_{(g)}$; $\Delta H = +180\text{kJ}$.
 If the reaction was allowed to reach equilibrium, explain the effect on the yield of $NO_{(g)}$ if the temperature was increased. (2 marks)

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11. A student set up the apparatus to prepare and collect a sample of ammonia gas as shown in the diagram below. Study the set up and answer the questions that follow.



Identify **two** mistakes in the set up represented by the diagram. (2 marks)

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12. When excess ammonia solution is added to a solution of copper (II) ions a deep blue solution forms. Write the formula of the complex ion formed. (1mark)

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13. In terms of structure and bonding explain graphite conducts electricity while diamond does not. (2 marks)

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14. 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. (1mark)

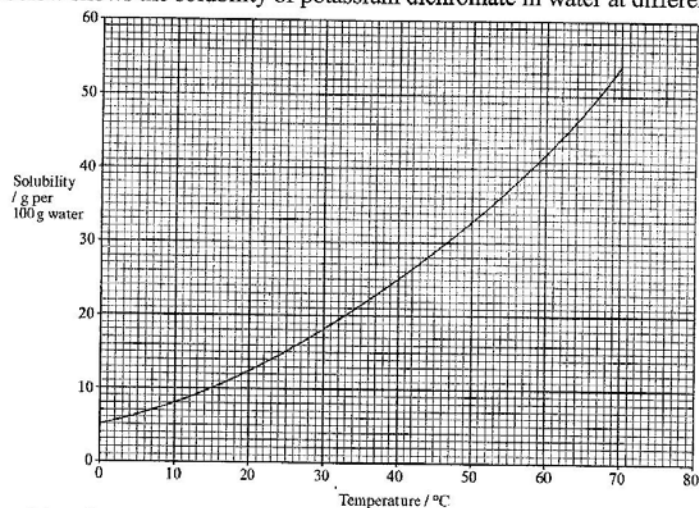
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(b) Explain how the solution acts as a bleaching agent. (2 marks)

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15. The graph below shows the solubility of potassium dichromate in water at different temperatures.



In an experiment 20g of a saturated solution of potassium dichromate (VI) was cooled from 60°C to 20°C. Calculate the mass of salt crystallized. (2 marks)

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16. Give **two** reasons why during the manufacture of sulphuric (VI) acid, sulphur (VI) oxide gas is dissolved in concentrated sulphuric (VI) acid, instead of dissolving it in water directly. (2 marks)

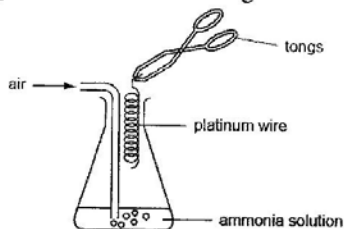
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17. Write an equation for the process that takes place at the anode during the electrolysis of aqueous sodium sulphate solution using platinum electrodes. (1 mark)

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18. The diagram shows the apparatus used for oxidizing ammonia in the laboratory.



(a) State the observations made. (1 mark)

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23. Write **two** equations to show that aluminum hydroxide is amphoteric.

(2 marks)

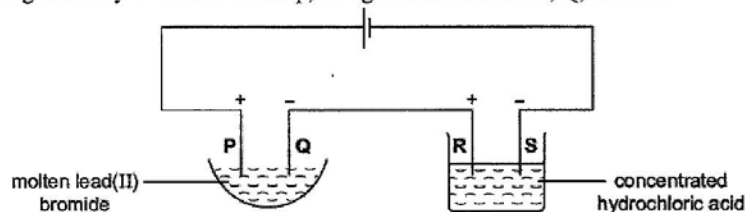
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24. Starting with aqueous magnesium sulphate explain how you would obtain a sample of magnesium oxide.

(3 marks)

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25. The following electrolysis circuit is set up, using inert electrodes P, Q, R and S.



(a) At which of the electrode(s) is a Group VII element produced?

(1mark)

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(b) Write the ionic equation for the reaction at electrode R.

(1mark)

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(c) A sample of silver contains impurities of gold. During purification by electrolysis, the impure silver is used as an electrode. Give the best choice of anode and cathode for this process?

(1mark)

Anode.....

Cathode.....

26. The table below shows the first ionization energies of elements A and B.

Element	Ionization energies (kJMol ⁻¹)
A	494
B	736

(a) What do these values suggest about the reactivity of B compared to that of A? Explain. (2 marks)

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(b) Compare the first and second ionization energies of element A. Explain. (2 marks)

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27. Explain why very high temperatures are required for nitrogen to react with oxygen. (1mark)

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28. Hydrogen combines with oxygen to form water. How many moles of hydrogen atoms does 3.6g of water contain? (H = 1.0; O = 16.0). (2 marks)

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29 (a) What is meant by the following terms:

(i) Valency (1mark)

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(ii) Electron affinity. (1mark)

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(b) (i) Why is air considered a mixture and not a compound? (1mark)

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(ii) Give **one** similarity between rusting and combustion. (1mark)

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30 (a) State the purpose of a pH scale. (1mark)

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(b) Hydrochloric acid is a strong acid. Explain?

(1mark)

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(c) State **two** disadvantages of washing clothes in hard water using soapy detergents. (2 marks)

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31 (a) Name the type of reaction that occurs when a solution of lead (II) nitrate is added to a solution of sodium sulphate in a test tube. (1mark)

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(b) Write a balanced equation for the reaction that occurs when crystals of sodium nitrate are heated in a test tube. (1mark)

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(c) Give the meaning of "an acid salt". (1mark)

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