S3 Chemistry Practice Paper: Separation Techniques, Atomic Structure and the Periodic Table, Ionic and Covalent Bonding, Chemical Equations, Acids and Alkalis, Metals and Redox (100 marks)

S3 | Chemistry | Time: 75 minutes | Total: 100 marks | 24 questions

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Section A Classification and Separation

Part A: 4 marks each, 16 marks in total.

1. Explain the difference between a compound and a mixture, and give one example of each. [4]

2. In the laboratory, sand is separated from salt solution in two steps. Name the two steps and state the principle of each. [4]

3. Why can simple distillation separate water from ethanol? Describe the distillate collected. [4]

4. State two experimental methods that can show whether a solid is pure. [4]

Section B Atomic Structure and Periodic Table

Part B: 4 marks each, 16 marks in total.

5. Name the three subatomic particles in an atom and state the relative charge and location of each. [4]

6. The atomic number of sodium is 11. Write the electron arrangement of a sodium atom and state its period and group in the periodic table. [4]

7. Magnesium has three isotopes: Mg-24 79%, Mg-25 10% and Mg-26 11%. Calculate the relative atomic mass of magnesium. [4]

8. The atomic number of magnesium is 12. Write the symbol and electron arrangement of a magnesium ion and explain why it is formed. [4]

Section C Ionic and Covalent Bonding

Part C: 4 marks each, 16 marks in total.

9. Compare how ionic bonds and covalent bonds are formed, giving one example of a compound for each. [4]

10. Write the chemical formulae of magnesium chloride and aluminium oxide, and explain briefly how the ionic charges lead to these formulae. [4]

11. Sodium chloride melts at 801 °C, does not conduct when solid, but conducts when molten or dissolved. Explain these observations. [4]

12. Compare the structure and melting point of carbon dioxide and diamond, and explain the difference. [4]

Section D Chemical Reactions and Equations

Part D: 4 marks each, 16 marks in total.

13. Calcium carbonate reacts with dilute hydrochloric acid. Write a balanced equation and name the gas produced. [4]

14. 12 g of carbon burns completely in 32 g of oxygen to give 44 g of carbon dioxide. If only 24 g of oxygen is available, calculate the mass of carbon left unburnt and the mass of carbon dioxide formed. [4]

15. What is the role of a catalyst in a chemical reaction, and is it used up? [4]

16. Classify each reaction as combination, decomposition, displacement or neutralisation, giving one example of each: (a) iron with copper(II) sulphate solution; (b) heating calcium carbonate. [4]

Section E Acids, Alkalis and Neutralisation

Part E: 4 marks each, 16 marks in total.

17. Define an acid and an alkali, giving one common example of each and the pH range of each. [4]

18. State the colour of phenolphthalein and methyl orange in acidic, neutral and alkaline solutions. [4]

19. What volume of 0.050 mol/dm3 hydrochloric acid is needed to neutralise 25.0 cm3 of 0.100 mol/dm3 sodium hydroxide solution? [4]

20. When dilute hydrochloric acid is added to calcium carbonate, state two observations and name the type of reaction. [4]

Section F Metals and Redox

Part F: 5 marks each, 20 marks in total.

21. A zinc strip is placed in copper(II) sulphate solution. State the observations, write the equation and name the type of reaction. [5]

22. Explain why some metals can be extracted by reducing their oxides with carbon, while others must be extracted by electrolysis. [5]

23. State the two conditions needed for iron to rust, and describe three methods of preventing rusting. [5]

24. Using Zn + Cu2+ -> Zn2+ + Cu, explain oxidation and reduction in terms of electron transfer, and identify the oxidising and reducing agents. [5]
