GCSE AQA Chemistry: Topic 1

Atomic structure and the periodic table.

Exam Questions/Mock Exam Questions

Questions For Foundation, Higher, and Triple Science (scroll down for questions for higher and triple science only):
(It would still be recommended to answer the foundation tier questions for triple science and higher tier to ensure you have good understanding).

Q1. Atoms contain sub-atomic particles.

(a) Name the three sub-atomic particles found in an atom.

_____

_____

_____

[3]

(b) State the charge of a proton.

_____

[1]

[Total: 4 marks]

Q2. The nucleus of an atom contains protons and neutrons.

(a) What is the relative mass of a proton?

_____

[1]

(b) What is the relative charge of a neutron?

_____

[1]

[Total: 2 marks]

Q3. The periodic table is used to organise elements.

(a) How are elements arranged in the modern periodic table?

[2]

(b) What is the name given to the vertical columns in the periodic table?

[1]

[Total: 3 marks]

Q4. Electronic structure describes how electrons are arranged.

(a) State the maximum number of electrons in the first shell.

[1]

(b) Write the electronic structure of oxygen (atomic number 8).

[1]

[Total: 2 marks]

Q5. Isotopes are atoms of the same element with different numbers of neutrons.

(a) State one similarity between isotopes of the same element.

[1]

(b) State one difference between isotopes of the same element.

[1]

[Total: 2 marks]

Q6. The atomic number and mass number are important in describing atoms.

(a) Define the atomic number.

[1]

(b) Define the mass number.

[1]

[Total: 2 marks]

Q7. The periodic table was developed over time.

(a) State one way in which Mendeleev improved earlier versions of the periodic table.

[2]

(b) Why was Mendeleev's periodic table accepted by other scientists?

[2]

[Total: 4 marks]

Q8. Group 1 metals are called the alkali metals.

(a) Describe the trend in reactivity of Group 1 metals as you go down the group.

[1]

(b) Give one observation when sodium reacts with water.

[1]

[Total: 2 marks]

Q9. Group 7 elements are called the halogens.

(a) Describe the trend in reactivity of Group 7 elements as you go down the group.

[1]

(b) Explain why fluorine is more reactive than chlorine.

[2]

[Total: 3 marks]

Q10. Transition metals have different properties to Group 1 metals.

(a) State one property of transition metals.

[1]

(b) Give one difference in reactivity between transition metals and Group 1 metals.

[2]

[Total: 3 marks]

Q11. Atomic structure can be represented using nuclear symbols.

The nuclear symbol for sodium is:
$^{23}_{11}Na$

(a) How many protons does sodium have?

---

[1]

(b) How many neutrons does sodium have?

---

[1]

[Total: 2 marks]

Q12. The noble gases are found in Group 0.

(a) Why are noble gases unreactive?

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[2]

(b) State one use of a noble gas.

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[1]

[Total: 3 marks]

Q13. Early models of the atom have been replaced.

(a) Name the model of the atom proposed by J. J. Thomson.

[1]

(b) Explain how Rutherford's experiment changed the model of the atom.

[2]

[Total: 3 marks]

Q14. Metals and non-metals are found on different sides of the periodic table.

(a) Give one property of metals.

[1]

(b) Give one property of non-metals.

[1]

[Total: 2 marks]

Q15. Elements in the same group of the periodic table have similar properties.

(a) Explain why elements in the same group have similar chemical properties.

[2]

(b) Give one example of two elements in the same group that have similar properties.

[1]

[Total: 3 marks]

Higher Tier

Q16. Atoms contain sub-atomic particles.

(a) State the relative mass and relative charge of a proton.

[2]

(b) Compare the properties of protons and neutrons.

[2]

[Total: 4 marks]

Q17. Isotopes are important in chemistry.

(a) Define the term isotope.

[2]

(b) Chlorine has two isotopes, chlorine-35 and chlorine-37. The relative abundances are 75% and 25%.
Calculate the relative atomic mass (Ar) of chlorine.

[3]

[Total: 5 marks]

Q18. The development of the atomic model.

(a) Describe the main features of the plum pudding model of the atom.

[2]

(b) Explain how Rutherford's experiment led to the nuclear model of the atom.

[3]

[Total: 5 marks]

Q19. Electronic structure is important for explaining the periodic table.

(a) Write the electronic configuration of an atom of phosphorus (atomic number 15).

[1]

(b) Explain how the electronic configuration of phosphorus shows it is in Group 5 and Period 3.

[2]

[Total: 3 marks]

Q20. The periodic table was developed by Mendeleev.

(a) Explain how Mendeleev arranged the elements in his periodic table.

[2]

(b) Give one reason why Mendeleev's periodic table was accepted by other scientists.

[2]

[Total: 4 marks]

Q21. Group 1 metals are reactive.

(a) Describe the trend in reactivity as you go down Group 1.

[2]

(b) Explain why this trend occurs in terms of electronic structure.

[2]

[Total: 4 marks]

Q22. The halogens are found in Group 7.

(a) State the trend in boiling point down Group 7.

[1]

(b) Explain the trend in reactivity of the halogens.

[2]

(c) Write a balanced symbol equation for the reaction of chlorine with potassium bromide solution.

[2]

[Total: 5 marks]

Q23. The transition metals are found in the centre of the periodic table.

(a) State two properties of transition metals that are different from Group 1 metals.

[2]

(b) Give one industrial use of transition metal compounds.

[1]

[Total: 3 marks]

Q24. Relative atomic mass can be calculated using isotopic data.

A sample of magnesium contains 79% magnesium-24, 10% magnesium-25, and 11% magnesium-26.

(a) Calculate the relative atomic mass (Ar) of magnesium.

[3]

(b) Suggest why the relative atomic mass is not a whole number.

[1]

[Total: 4 marks]

Q25. The noble gases are found in Group 0.

(a) Explain why noble gases are chemically unreactive.

[2]

(b) State and explain the trend in boiling points of the noble gases.

[2]

[Total: 4 marks]

Q26. Atomic structure can be represented using nuclear symbols.

An atom of aluminium has the symbol $^{27}_{13}Al$.

(a) How many protons, neutrons and electrons are in this atom?

[2]

(b) An aluminium ion has the formula Al^{3+}. Explain why this ion has fewer electrons than the atom.

[2]

[Total: 4 marks]

Q27. The discovery of the neutron improved the atomic model.

(a) State the name of the scientist who discovered the neutron.

[1]

(b) Explain why the discovery of the neutron was important for understanding isotopes.

[2]

[Total: 3 marks]

Q28. Group 7 displacement reactions.

A student adds chlorine water to potassium iodide solution.

(a) Write the ionic equation for this reaction.

[2]

(b) Explain why this reaction occurs.

[2]

[Total: 4 marks]

Q29. The periodic table shows trends in elements.

(a) Explain why elements in the same group have similar chemical properties.

[2]

(b) Compare the reactivity of Group 1 and Group 7 elements.

[3]

[Total: 5 marks]

Q30. Electronic configurations.

(a) Write the electronic configuration of calcium (atomic number 20).

[1]

(b) Explain how the electronic structure of calcium shows it will form an ion with a 2+ charge.

[2]

[Total: 3 marks]

Q31. Development of the periodic table.

(a) Describe two problems with early periodic tables before Mendeleev.

[2]

(b) Explain how Mendeleev overcame these problems.

[2]

[Total: 4 marks]

Q32. The structure of the atom.

(a) Describe the size of the nucleus compared to the size of the atom.

[1]

(b) Explain why most of the alpha particles passed straight through the foil in Rutherford's experiment.

[2]

(c) Explain why a few alpha particles were deflected back.

[2]

[Total: 5 marks]

Q33. Group 1 and transition metals.

(a) State two differences in physical properties between Group 1 metals and transition metals.

[2]

(b) Transition metals form coloured compounds. Give one example of a coloured transition metal compound and state its colour.

[1]

[Total: 3 marks]

Q34. Atomic number and relative atomic mass.

(a) Explain why elements are arranged in order of atomic number in the modern periodic table.

[2]

(b) Why did some elements appear in the wrong order when arranged by atomic mass alone?

[2]

[Total: 4 marks]

Q35. Group 0 elements.

(a) Explain why helium is used in balloons rather than hydrogen.

[2]

(b) Argon is used in filament lamps. Explain why argon is suitable for this use.

[2]

[Total: 4 marks]

Triple Science Tier

Q36. The structure of the atom.

(a) Compare the relative mass and charge of protons, neutrons, and electrons.

[3]

(b) Explain why atoms are electrically neutral.

[2]

[Total: 5 marks]

Q37. The development of atomic theory.

(a) Describe how Niels Bohr adapted Rutherford's nuclear model.

[2]

(b) Explain why new evidence from scattering experiments was important in developing atomic models.

[3]

[Total: 5 marks]

Q38. Isotopic calculations.

A sample of chlorine contains 75% chlorine-35 and 25% chlorine-37.

(a) Calculate the relative atomic mass (Ar) of chlorine.

[3]

(b) Explain why the Ar of chlorine is not a whole number.

[2]

[Total: 5 marks]

Q39. Electronic configurations.

(a) Write the electronic configuration of calcium (atomic number 20).

[1]

(b) Explain why calcium forms an ion with a 2+ charge.

[2]

[Total: 3 marks]

Q40. Periodic table trends.

(a) Explain why elements in the same group of the periodic table have similar chemical properties.

[2]

(b) Compare the reactivity of Group 1 and Group 7 elements, giving reasons.

[3]

[Total: 5 marks]

Q41. Transition metals.

(a) State two differences in physical properties between transition metals and Group 1 metals.

[2]

(b) Give two reasons why transition metals are useful as catalysts.

[2]

[Total: 4 marks]

Q42. Transition metal compounds.

(a) Copper(II) sulfate is a transition metal compound. State its colour.

[1]

(b) Explain why transition metals form compounds with different charges.

[2]

(c) Give one industrial use of transition metal compounds.

[1]

[Total: 4 marks]

Q43. Group 7 displacement reactions.

(a) Write the balanced chemical equation for the reaction of chlorine with potassium bromide solution.

[2]

(b) Explain why this reaction is a displacement reaction.

[2]

[Total: 4 marks]

Q44. Group 0 elements.

(a) Describe and explain the trend in boiling points of the noble gases.

[2]

(b) Argon is used in filament lamps. Explain why it is suitable for this use.

[2]

[Total: 4 marks]

Q45. Atomic models.

(a) State one problem with the plum pudding model.

[1]

(b) Explain how the results of Rutherford's alpha particle scattering experiment disproved the plum pudding model.

[3]

[Total: 4 marks]

Q46. Nuclear symbols.

An atom of magnesium has the symbol $^{25}_{12}Mg$.

(a) How many protons are in this atom?

[1]

(b) How many neutrons are in this atom?

[1]

(c) How many electrons are in a Mg^{2+} ion?

[1]

[Total: 3 marks]

Q47. Group 1 trends.

(a) Explain why lithium reacts less vigorously with water than potassium.

[2]

(b) Give two observations you would see when potassium reacts with water.

[2]

[Total: 4 marks]

Q48. Predicting reactions.

(a) Predict the products when fluorine reacts with sodium bromide solution.

[2]

(b) Write a balanced chemical equation for this reaction.

[2]

[Total: 4 marks]

Q49. Properties of metals and non-metals.

(a) Explain why metals can conduct electricity.

[2]

(b) Explain why non-metals do not conduct electricity.

[2]

[Total: 4 marks]

Q50. The history of the periodic table

(a) Describe two problems with early periodic tables before Mendeleev.

[2]

(b) Explain how Mendeleev's periodic table overcame these problems.

[2]

(c) Explain why the discovery of isotopes provided support for Mendeleev's ideas.

[2]

[Total: 6 marks]