



QUESTION WORKBOOK

Constituents of the atom

Particles · Year 12

AQA 3.2.1.1 · CIE 11.1 · OCR A 6.4.1

10 questions · 29 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

A1 State the charge and the relative mass of the proton, the neutron and the electron. [2]

A2 Calculate the specific charge of a proton ($e = 1.60 \times 10^{-19} \text{ C}$, $m_p = 1.67 \times 10^{-27} \text{ kg}$). [2]

A3 Explain what is meant by two isotopes of an element. [2]

SECTION B · Standard

B1 Calculate the specific charge of an electron ($m_e = 9.11 \times 10^{-31} \text{ kg}$), and comment on how it compares with that of a proton. [3]

- B2** A nucleus is written $^{14}_6\text{C}$. State the number of protons and neutrons it contains, and the number of electrons in the neutral atom. [3]

- B3** Calculate the specific charge of an alpha particle (a helium-4 nucleus: charge $+2e$, mass $\approx 4m_p$). [3]

- B4** An oxygen-16 atom loses two electrons to become an ion of charge $+2e$. Calculate the specific charge of this ion (mass $\approx 16m_p$). [3]

SECTION C · Stretch

- C1** A uranium nucleus is written $^{238}_{92}\text{U}$. State the number of protons and neutrons, and calculate the specific charge of the nucleus (mass $\approx 238m_p$). [4]

- C2** Compare the specific charge of a single proton (a hydrogen-1 nucleus) with that of an alpha particle by calculating both, and state which is greater. [4]

- C3** Explain why the electron has by far the largest specific charge of the three sub-atomic particles. [3]