InkChemistry

QUESTION WORKBOOK

Protons, neutrons, electrons and isotopes

Atomic structure · Unit C01

AQA 3.1.1.1, 3.1.1.2 · OCR A 2.1.1

16 questions · 58 marks

NAVY SCREEN EDITION

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SECTION A · Short, 1 to 2 marks

A1 PNE-Q11

Suggest why the discovery of the neutron in 1932 was needed to explain the mass of a helium atom. [2]

SECTION B · Standard, 3 to 5 marks

B1 PNE-Q2

Deduce the numbers of protons, neutrons and electrons in one $^{39}K^{+}$ ion and in one $^{127}I^{-}$ ion. Potassium is element 19 and iodine is element 53. [4]

B2 PNE-Q5

Explain what is meant by the term isotopes, and why chlorine-35 and chlorine-37 have the same chemical properties. [4]

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B3 PNE-Q8 Describe the gold foil experiment carried out by Geiger and Marsden, and the observations it produced. [4]

B4 PNE-Q9 Explain how the results of the gold foil experiment led to the nuclear model of the atom and ruled out the plum pudding model. [4]

B5 PNE-Q13 Compare the atoms ^{35}Cl and ^{37}Cl and the ion $^{35}Cl^-$ in terms of their numbers of protons, neutrons and electrons. [4]

B6 PNE-Q14 Deduce the identity, the mass number and the charge of a species that has 16 protons, 18 neutrons and 18 electrons, and write its symbol. [4]

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B7 PNE-Q16 Evaluate the claim that isotopes are the radioactive forms of an element. [4]

B8 PNE-Q19 Explain why beams of protons, neutrons and electrons, entering the same electric field at the same speed, behave differently between two charged plates. [4]

B9 PNE-Q1 State the relative mass and the relative charge of a proton, a neutron and an electron. [3]

B10 PNE-Q4 Calculate the percentage of the mass of a ^{1}H atom that is due to its electron, using relative masses of 1 for the proton and 1/1840 for the electron. [3]

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B11 PNE-Q7 Explain why heavy water, D_2O, has a higher density than ordinary water, H_2O, although the two take part in the same chemical reactions. [3]

B12 PNE-Q10 Explain how the line spectrum of hydrogen led Bohr to propose that electrons occupy fixed energy levels. [3]

B13 PNE-Q12 Suggest why a sample of chlorine made only of chlorine-37 diffuses through a small hole more slowly than natural chlorine at the same temperature, although its chemical reactions are the same. [3]

B14 PNE-Q21 Calculate the angle through which a beam of $^{4}He^{2+}$ ions is deflected in an electric field that deflects a beam of $^{1}H^{+}$ ions, entering at the same speed, through 3.0°, and state its direction. [3]

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SECTION C · Long, 6 marks or more

C1 PNE-Q17 Explain how experimental evidence changed the model of the atom from Dalton's solid sphere to Bohr's energy levels. [6]

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