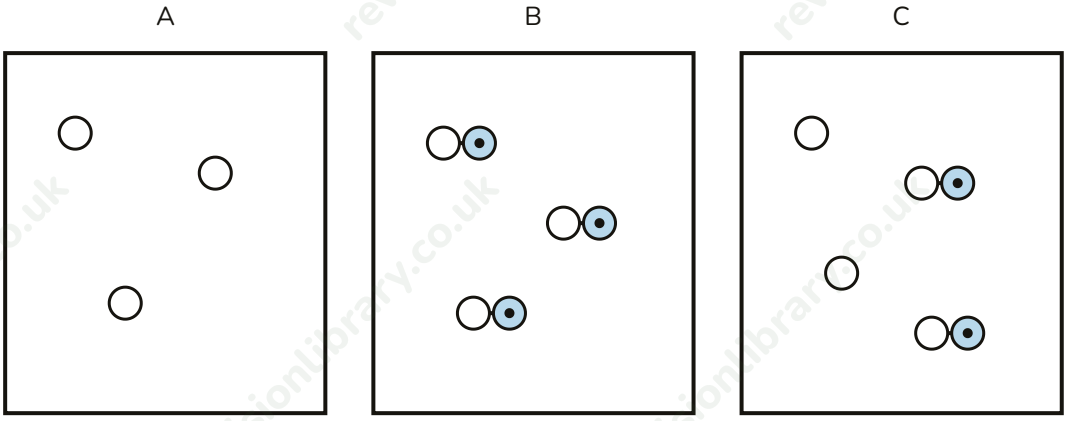
2.2 Atoms, Elements and Compounds: 30-minute Pack

Calculator allowed · about 30 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Three particle diagrams show small circles representing atoms. Diagram A shows many identical single circles scattered randomly. Diagram B shows pairs of two different-coloured circles joined together, repeated throughout, with no single circles present. Diagram C shows a mixture of single identical circles and joined pairs of two different-coloured circles, all scattered together.



Counts and positions are schematic.

(a) Identify which diagram represents an element. **(1)**

(b) Identify which diagram represents a compound. **(1)**

(c) Identify which diagram represents a mixture, and explain your answer. **(2)**

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2 Metals and non-metals have different physical properties.

(a) State two physical properties of metals. **(2)**

(b) State two physical properties of non-metals. **(2)**

(c) Classify the following elements as a metal or a non-metal: sodium, sulfur, iron, oxygen, copper, chlorine. **(3)**

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3 Atoms of the same element can have different numbers of neutrons. These are called isotopes.

(a) Explain what is meant by the term isotope, using chlorine-35 and chlorine-37 as examples. **(3)**

(b) Calculate the number of neutrons in an atom of chlorine-37. **(1)**

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4 Each subatomic particle has a relative charge and a relative mass.

(a) State the relative electric charge of a proton, a neutron and an electron. **(3)**

(b) State the relative mass of a proton and of a neutron, compared with the relative mass of an electron. **(2)**

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5 The atomic number of an element equals its number of protons. The mass number equals the number of protons plus neutrons. Use this for the three elements below.

(a) Sodium has atomic number 11 and mass number 23. State the number of protons and electrons, and calculate the number of neutrons. **(2)**

.....

(b) Aluminium has atomic number 13 and mass number 27. State the number of protons and electrons, and calculate the number of neutrons. **(2)**

.....

(c) Chlorine has atomic number 17 and mass number 35. State the number of protons and electrons, and calculate the number of neutrons. **(2)**

.....

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Mark scheme · 2.2 Atoms, Elements and Compounds: 30-minute Pack

Question 1

(a) Diagram A **B1**

(a) Answer: **Diagram A.**

(b) Diagram B **B1**

(b) Answer: **Diagram B.**

(c) Diagram C **B1**

(c) it contains both single particles of one substance (an element) and joined pairs (a compound), not chemically bonded to each other, so it is a mixture oe **B1**

(c) Answer: **Diagram C, because it contains an element and a compound mixed together but not chemically joined to each other.**

Question 2

(a) any one from: good conductor of electricity/heat, shiny (lustrous), malleable, ductile, high melting/boiling point, high density, sonorous **B1**

(a) any second correct property from the list above **B1**

(a) Answer: **Any two of: good electrical/thermal conductor, shiny, malleable, ductile, high melting/boiling point, high density, sonorous.**

(b) any one from: poor conductor of electricity/heat (insulator), dull appearance, brittle when solid, low melting/boiling point, low density **B1**

(b) any second correct property from the list above **B1**

(b) Answer: **Any two of: poor electrical/thermal conductor, dull, brittle when solid, low melting/boiling point, low density.**

(c) sodium = metal AND iron = metal both correct **B1**

(c) copper = metal AND oxygen = non-metal both correct **B1**

(c) sulfur = non-metal AND chlorine = non-metal both correct **B1**

(c) Answer: **Sodium: metal. Sulfur: non-metal. Iron: metal. Oxygen: non-metal. Copper: metal. Chlorine: non-metal.**

Question 3

(a) both are atoms of chlorine with the same number of protons (17), i.e. the same atomic number **B1**

(a) they have different numbers of neutrons **B1**

(a) this gives them different mass numbers (35 and 37) oe **B1**

(a) Answer: **Isotopes are atoms of the same element (same number of protons) with different numbers of neutrons, and therefore different mass numbers. Chlorine-35 and chlorine-37 both have 17 protons but different neutron numbers.**

(b) = 20 cao (ft candidate's own atomic number of chlorine from (a) if consistent) **B1**

(b) Answer: **20 neutrons.**

Question 4

(a) proton = +1 **B1**

(a) neutron = 0 **B1**

(a) electron = -1 **B1**

(a) Answer: **Proton = +1, neutron = 0, electron = -1.**

(b) proton and neutron each have a relative mass of 1 **B1**

(b) electron has a very small (negligible) relative mass, about 1/2000 of a proton oe **B1**

(b) Answer: **Proton = 1, neutron = 1, electron = very small/negligible (about 1/2000 of a proton).**

Question 5

(a) protons = 11, electrons = 11 (equal to atomic number) **B1**

(a) neutrons = mass number - atomic number = 23 - 11 = 12 cao (ft own atomic number if misread but used consistently) **B1**

(a) Answer: **Protons = 11, electrons = 11, neutrons = 12.**

(b) protons = 13, electrons = 13 **B1**

(b) neutrons = 27 - 13 = 14 cao **B1**

(b) Answer: **Protons = 13, electrons = 13, neutrons = 14.**

(c) protons = 17, electrons = 17 **B1**

(c) neutrons = 35 - 17 = 18 cao **B1**

(c) Answer: **Protons = 17, electrons = 17, neutrons = 18.**

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