Isotopes 2

GCSE P P P A Level P P P

Essential Pre-Uni Chemistry D4.2

	ISOTOPE	# PROTONS	# NEUTRONS
Part A	Carbon-12		6
Part B	Carbon-13		
Part C	Technetium-99	43	
Part D	Iodine-131		
Part E	Polonium-210		
Part F	Uranium-233		
Part G	Rutherfordium-260		

Complete the table to show the numbers of protons and neutrons in each isotope.

Part A Carbon-12

Number of protons

Part B Carbon-13

Number of protons

Number of neutrons

Part C Technetium-99

Number of neutrons

Part D Iodine-131

Number of protons

Number of neutrons

Part E Polonium-210

Number of protons

Number of neutrons

Part F Uranium-233

Number of protons

Number of neutrons

Part G Rutherfordium-260

Number of protons

Number of neutrons

Isotopes 3

GCSE C C C A Level P P P

Essential Pre-Uni Chemistry D4.3

	SYMBOL	# PROTONS	# NEUTRONS	# ELECTRONS
Part A	$^{23}_{11}\mathrm{Na}$		12	
Part B	$^{40}_{19}\mathrm{K}$			
Part C	$^{25}_{12}\mathrm{Mg}^{2+}$	12		
Part D	$^{81}_{35}\mathrm{Br}^{-}$			
Part E	$^{58}_{26}\mathrm{Fe}^{3+}$			
Part F	$^{18}_{8}\mathrm{O}^{2-}$			
Part G	$^{206}_{82}\mathbf{?}$			82
Part H	$^{239}_{93}\mathbf{?}$			93

Complete the table by filling any blank cell and any missing symbol indicated by a '**?**'.

Part A $^{23}_{11}\mathrm{Na}$

Number of protons

Number of electrons

Part B $^{40}_{19}\mathrm{K}$

Number of protons

Number of neutrons

Number of electrons

Part C $^{25}_{12}\mathrm{Mg}^{2+}$

Number of neutrons

Number of electrons

Part D $^{81}_{35}\mathrm{Br}^{-}$

Number of protons

Number of neutrons

Number of electrons

Part E $^{58}_{26}\mathrm{Fe}^{3+}$

Number of protons

Number of neutrons

Number of electrons

Part F $^{18}_{8}\mathrm{O}^{2-}$

Number of protons

Number of neutrons

Number of electrons

Part G $^{206}_{82}\mathbf{?}$

What is the element symbol corresponding to the question mark?

Number of protons

Number of neutrons

Part H $^{239}_{93}?$

What is the element symbol corresponding to the question mark?

Number of protons

Number of neutrons

Gameboard:

STEM SMART Chemistry Week 1

Electron Configurations (D1.1)

A Level

Complete the following ground state electron configurations.

Part A Be

What is the ground-state electron configuration of Be?

Items:

$1s$ $2s$ $3s$ $4s$ $2p$ $3p$ 1 2 3 4

Part B N

What is the ground-state electron configuration of N?

Items:

$1s$ $2s$ $3s$ $4s$ $2p$ $3p$ 1 2 3 4

Part C Ne

What is the ground-state electron configuration of Ne?

Items:

$1s$ $2s$ $3s$ $4s$ $2p$ $3p$ 1 2 3 4 5 6

Based on question D1.1 from Physical Chemistry book

Gameboard:

STEM SMART Chemistry Week 1

Electron Configurations (D1.4)

A Level

Complete the following ground state electron configurations.

Part A H^-

What is the ground-state electron configuration of H^-?

Items:

1s 2s 3s 2p 0 1 2 3

Part B O^{2-}

What is the ground-state electron configuration of O^{2-}?

Items:

1s 2s 3s 2p 3p 1 2 4 5 6

Part C Na^{+}

What is the ground-state electron configuration of Na^{+}?

Items:

$1s$ $2s$ $3s$ $2p$ $3p$ 1 2 4 5 6

Part D Al^{3+}

What is the ground-state electron configuration of Al^{3+}?

Items:

$1s$ $2s$ $3s$ $2p$ $3p$ 1 2 4 5 6

Based on question D1.4 from Physical Chemistry book

Gameboard:

STEM SMART Chemistry Week 1

Atomic Structure 7

A Level

Essential Pre-Uni Chemistry D1.7

Give the chemical symbols for the atoms with the following ground state electron configurations:

Part A $[\mathrm{Ne}]\ 3\mathrm{s}^1$

$[\mathrm{Ne}]\ 3\mathrm{s}^1$

Part B $[\mathrm{Ar}]\ 3\mathrm{d}^5\ 4\mathrm{s}^2$

$[\mathrm{Ar}]\ 3\mathrm{d}^5\ 4\mathrm{s}^2$

Part C $1\mathrm{s}^2\ 2\mathrm{s}^2\ 2\mathrm{p}^6\ 3\mathrm{s}^2\ 3\mathrm{p}^6\ 3\mathrm{d}^8\ 4\mathrm{s}^2$

$1\mathrm{s}^2\ 2\mathrm{s}^2\ 2\mathrm{p}^6\ 3\mathrm{s}^2\ 3\mathrm{p}^6\ 3\mathrm{d}^8\ 4\mathrm{s}^2$

Part D $[\mathrm{Ar}]\ 3\mathrm{d}^{10}\ 4\mathrm{s}^2$

$[\mathrm{Ar}]\ 3\mathrm{d}^{10}\ 4\mathrm{s}^2$

Part E $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6\ 4d^{10}\ 4f^{14}\ 5s^2\ 5p^6\ 5d^{10}\ 6s^2\ 6p^5$

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6\ 4d^{10}\ 4f^{14}\ 5s^2\ 5p^6\ 5d^{10}\ 6s^2\ 6p^5$

Gameboard:

STEM SMART Chemistry Week 1

Atomic Structure 8

A Level

Essential Pre-Uni Chemistry D1.8

An ion of nickel is found to have the ground state electron configuration $1\mathrm{s}^2\ 2\mathrm{s}^2\ 2\mathrm{p}^6\ 3\mathrm{s}^2\ 3\mathrm{p}^6\ 3\mathrm{d}^7$ in the gas phase.

Give the numerical charge on the ion as an integer. Remember to include the appropriate sign in your answer (as $+N$ or $-N$ and **not** $N\pm$).

Gameboard:

STEM SMART Chemistry Week 1

Electron Configuration

A Level

A species Z has the following electron configuration:

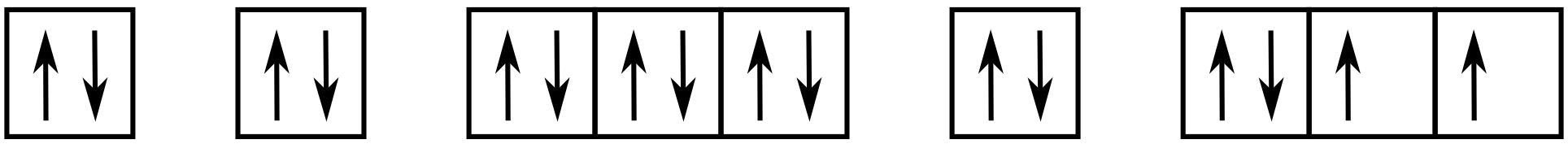

Figure 1: Electron configuration of Z

What could Z be?

1	2	3
Cl^{+} ion	S atom	Ar^{2-} ion

- **1** only is possible
- **2** only is possible
- **3** only is possible
- **1** and **2** only are possible
- **1** and **3** only are possible
- **2** and **3** only are possible
- **1**, **2** and **3** are possible
- None are possible

Adapted with permission from UCLES, A Level Chemistry, November 1996, Paper 4, Question 31

Gameboard:

STEM SMART Chemistry Week 1

Periodic Table

A Level

Part A Tin

Which block of the periodic table contains the element tin?

- s
- p
- d
- f

Part B Ytterbium

Which block of the periodic table contains the element ytterbium?

- s
- p
- d
- f

Part C Lithium

Select the correct statement about lithium.

- Lithium is in period 2 of the periodic table.
- Lithium is in group 2 of the periodic table.
- Lithium has an atomic number of 2.
- Lithium has two protons in its nucleus.

Part D Phosphorus and antimony

Select the correct statement.

- Phosphorus and antimony are both in the same group and in the same period as each other.
- Phosphorus and antimony are in the same period as each other.
- Phosphorus and antimony are in the same group as each other.
- Phosphorus and antimony are neither in the same group nor in the same period as each other.

Part E Groups

Select the correct general statement.

- Elements in the same group do not have the same number of valence electrons.
- Elements in the same group have the same number of valence electrons and therefore have the same atomic radius.
- Elements in the same group have the same number of valence electrons and are therefore equally reactive.
- Elements in the same group have the same number of valence electrons, but can have different reactivities and atomic radii.

Super-heavy Water

A Level

C C C

Hydrogen exists as a mixture of three isotopes: normal hydrogen, deuterium (which can be represented by the symbol D), and tritium, T.

- The relative isotopic mass of D is 2.0
- The relative isotopic mass of T is 3.0

Assuming that molecules of the tritiated water pack as densely as those in normal water, which has a density of $1.00\,\mathrm{g\ cm^{-3}}$, calculate the density of liquid $\mathrm{T_2O}$. Use the masses given above and any relative atomic masses from the periodic table, as appropriate, and give your answer to 3 significant figures.

Adapted with permission from UCLES, Chemistry STEP 1998, Question 2