TOPIC 1 TEST MARK SCHEME

1. (a) (i) 1.6734×10^{-24} (g)

Only.

1.6734×10^{-27} kg

Not 1.67×10^{-24} (g).

1

(ii) **B**

1

[2]

2. (a)

Particle	Relative charge	Relative mass	
Proton	+1 **or** 1+	1	**(1)**
Neutron	0 **or** no charge/neutral/zero	1 (not – 1)	**(1)**
Electron	–1 or 1–	1/1800 to 1/2000	**(1)**

or negligible
or zero
or 5.0×10^{-4} to 5.6×10^{-4}

if 'g' in mass column - wrong
penalise once

3

(b) $^{38}_{18}Ar$ **(1)(1)**

Allow numbers before or after Ar

2

(c) *S*: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$ **(1)**

Allow upper case letters

S^{2-}*:* $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$ **(1)**

If use subscript penalise once

2

(d) *Block*: p **(1)**
Explanation: Highest energy or outer orbital is (3) p

OR outer electron, valency electron in (3) p
NOT 2p etc.

2

[9]

3. (a) (i) Atoms with the same number of protons / proton number **(1)**

NOT same atomic number

with different numbers of neutrons **(1)**

***NOT** different mass number / fewer neutrons*

(ii) Chemical properties depend on the number or amount of (outer) electrons **(1)** OR, isotopes have the same electron configuration / same number of e^-

3

(b) $1s^2\ 2s^2\ 2p^6\ 3s^1$ **(1)**

accept subscripted figures

1

(c) Highest energy e^- / outer e^-s / last e^- in (3)d sub-shell **(1)**

OR d sub-shell being filled / is incomplete
OR highest energy sub-shell is (3)d
NOT transition element / e^- configuration ends at 3d
Q of L

1

(d) $^{15}_{7}N$ N correct symbol **(1)**

allow N^{15}_{7}

Mass number = 15 AND atomic number = 7 **(1)**

2

[7]

4. (a) $\frac{(82\times2)+(83\times2)+(84\times10)+(86\times3)}{17}$ $\frac{(1428)}{(17\quad)}$

M1 for the top line
M2 is for division by 17

1
1

= 84.0

Not 84
No consequential marking from M1 or M2
Ignore units

1

The A_r in the Periodic table takes account of the other isotopes /different amounts of isotopes (or words to that effect regarding isotopes)

Award independently
Comparison implied
Isotope(s) alone, M4 = 0

1

(b) Dissolved in volatile solvent and forced through needle

1

Connected to positive terminal of high voltage supply

1

$Kr(g) \rightarrow Kr^{+}(g) + e(^{-})$

State symbols must clearly be (g)

1

The ^{84}Kr isotope

One mark for identifying the 84 isotope

1

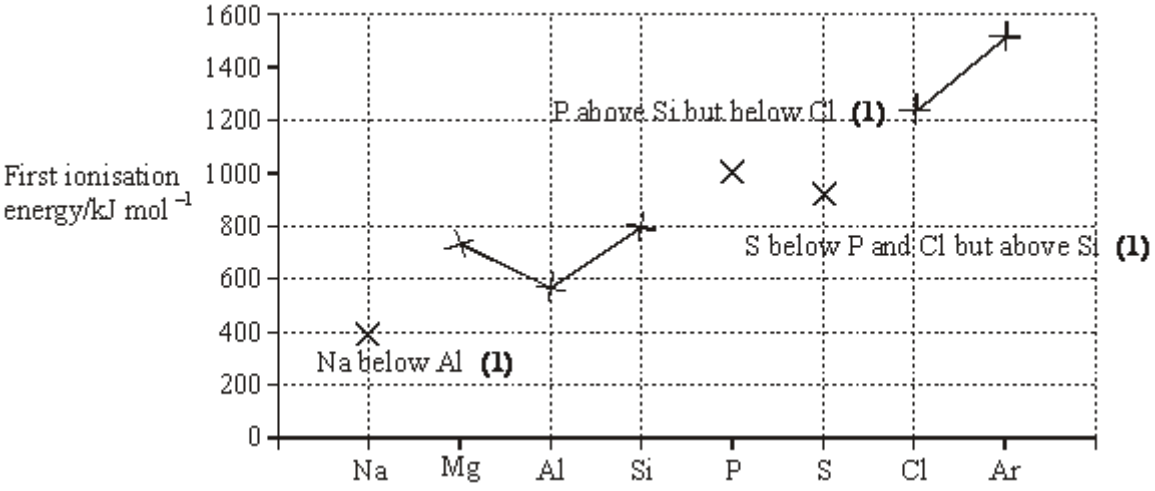
gets a 2+ charge

One mark for the idea of losing 2 electrons (from this isotope)

1

[9]

5. (a)



(b) Increased nuclear charge / proton number **(1)**

NOT increased atomic number

Electrons enter same shell / energy level OR atoms get smaller OR same shielding **(1)**

Stronger attraction between nucleus and (outer) electrons **(1)**

Q of L

3

(c) *Explanation for aluminium*: (third) electron in (3)p sub-shell **(1)**
Sub-shell further away from nucleus OR of higher energy **(1)**
OR extra shielding from (3)s

Explanation for sulphur: Pair of electrons in (3)p orbital **(1)**
Repulsion between electrons **(1)**

tied to reference to e⁻ pair in M3

Penalise '2p' once only

4

[10]

6. (a) $Li(g) \rightarrow Li^{+}(g) + e^{-}(g)$

$Li(g) - e^{-}(g) \rightarrow Li^{+}(g)$

$Li(g) + e^{-}(g) \rightarrow Li^{+}(g) + 2e^{-}$

One mark for balanced equation with state symbols
Charge and state on electron need not be shown

1

(b) Increases

If trend wrong then CE = 0/3 for (b). If blank mark on.

1

Increasing nuclear charge / increasing no of protons

Ignore effective with regard to nuclear charge

1

Same or similar shielding / same no of shells / electron (taken) from same (sub)shell / electron closer to the nucleus / smaller atomic radius

1

(c) Lower

If not lower then CE = 0/3

1

Paired electrons in a (4) p orbital

If incorrect p orbital then M2 = 0

1

(Paired electrons) repel

If shared pair of electrons M2 + M3 = 0

1

(d) Kr is a bigger atom / has more shells / more shielding in Kr / electron removed further from nucleus/ electron removed from a higher (principal or main) energy level

CE if molecule mentioned
Must be comparative answer
QWC

1

(e) 2 / two / II

1

(f) Arsenic / As

1

[10]

7. A

[1]

8. D

[1]

9. B

[1]