MEGA LECTURE

TOPIC 1 TEST MARK SCHEME

1. (a) (i) 1.6734×10^{24} (g)

Only.

1.6734×10^{27} <u>kg</u>

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 (<u>not</u> – 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.

1

MEGA LECTURE

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 <u>number</u> or <u>amount</u> of (outer) electrons **(1)** <u>OR</u>, 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)**
<u>OR</u> *d sub-shell being filled / is incomplete*
<u>OR</u> *highest energy sub-shell is (3)d*
<u>NOT</u> *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 <u>AND</u> atomic number = 7 **(1)**

2

[7]

4. (a)
$$\frac{(82 \times 2) + (83 \times 2) + (84 \times 10) + (86 \times 3)}{17} \qquad \frac{(1428)}{(17\ \ )}$$

M1 for the top line
M2 is for division by 17

1
1

2

MEGA LECTURE

= <u>84.0</u>

> *Not 84*
> *No consequential marking from M1 or M2*
> *Ignore units*

1

The A_r in the Periodic table takes account of the <u>other isotopes</u> /<u>different amounts of isotopes</u> (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

$Kr(g) \quad Kr^+(g) + e(^-)$

> *State symbols must clearly be (g)*

1

The ^{84}Kr isotope

> *One mark for identifying the 84 isotope*
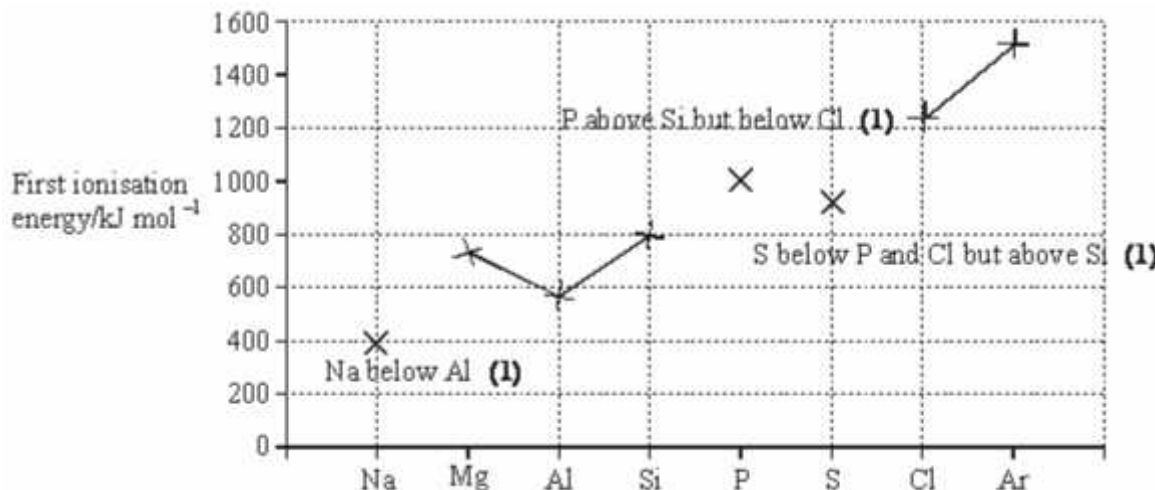
1

gets a 2+ charge

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

1

[9]

5.   (a)

● ● ●
MEGA LECTURE

(b)   Increased nuclear charge / proton number **(1)**
              NOT increased atomic number

Electrons enter same shell / energy level <u>OR</u> atoms get smaller
<u>OR</u> 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 <u>OR</u> of higher energy **(1)**
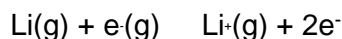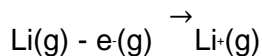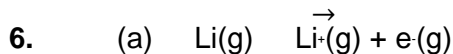   <u>OR</u> extra shielding from (3)s

       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) $\overset{\rightarrow}{}$ Li⁺(g) + e⁻(g)

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

         Li(g) + e⁻(g)   Li⁺(g) + 2e⁻
                     *One mark for balanced equation with state
                     symbols*
                     *Charge and state on electron need not be
                     shown*

                                                                            1

                                      4

(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]

5