

MARK SCHEME

GCSE

CHEMISTRY

AQA - TRIPLE SCIENCE

C1 - TEST 3

ATOMIC STRUCTURE

Intermediate

Mark schemes

- 1.** (a) because this lithium atom has
3 protons 1
and 4 neutrons 1
mass number is total of neutrons and protons
accept protons and neutrons have a mass of 1
accept number of neutrons = 7 - 3(protons)
ignore mass of electron is negligible 1
- (b) grams
accept g 1
 ^{12}C
allow carbon-12 or C-12
ignore hydrogen or H 1
- (c) any **three** from:
max 2 if no numbers given
numbers if given must be correct
- both have 8 protons
accept same number of protons
 - ^{18}O has 10 neutrons
 - ^{16}O has 8 neutrons
accept different number of neutrons or ^{18}O has two more neutrons for 1 mark
 - both have 8 electrons.
accept same number of electrons 3
- [8]**
- 2.** (a) **J** 1
(b) **M and Q**
either order 1
(c) **Q** 1
(d) **M** 1

(e) L

1

(f) **Level 3 (5-6 marks):**

A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

Level 2 (3-4 marks):

Some logically linked reasons are given. There may also be a simple judgement.

Level 1 (1-2 marks):

Relevant points are made. They are not logically linked.

Level 0

No relevant content

Indicative content

comparative points

- both tables have more than one element in a box
- both have similar elements in the same column
- both are missing the noble gases
- both arranged elements in order of atomic weight

advantages of Mendeleev / disadvantages of Newlands

- Newlands did not leave gaps for undiscovered elements
- Newlands had many more dissimilar elements in a column
- Mendeleev left gaps for undiscovered elements
- Mendeleev changed the order of some elements (e.g. Te and I)

points which led to the acceptance of Mendeleev's table

- Mendeleev predicted properties of missing elements
- elements with properties predicted by Mendeleev were discovered
- Mendeleev's predictions turned out to be correct
- elements were discovered which fitted the gaps

6

[11]

3.

(a) (i) a correct link between any two named elements eg same group / column
same properties / number of outer electrons

allow some link between any two elements in the same group (in both Newlands and or the modern periodic table)

1

(ii) any **two** from:

ignore statements about lack of evidence / proof

- elements still being discovered

or

no gaps for undiscovered elements

- some boxes have 2 elements in them
- metals and non-metals in same column / mixed up
*accept some elements in same column have different properties.
allow any sensible suggestion about misplaced elements eg
copper in group 1 elements*
- pattern for first 16 or so elements only
allow did not work for all elements

2

(b) (i) $\text{Cl} > \text{Br} > \text{I}$

accept reactivity / it decreases down the group

or

$\text{I} < \text{Br} < \text{Cl}$

1

Cl has 2 reactions, Br has 1 reaction, I doesn't react

owtte

*allow Cl has most / more reactions and I has least / less reactions
(must be clear about where Br fits in)*

1

(ii) Br_2

allow multiples / fractions if correctly completed and balanced

1

(iii) (they) have 7 outer electrons

allow (they) have 7 electrons in highest occupied (energy) level / shells / rings

1

- (c) *outer / last / final must be mentioned once in correct context,
otherwise max 2 marks comparative required on all three points
accept converse ie less reactive up group*

down group (atom / elements) bigger

or

outer electrons (level / shell /ring) further from nucleus / centre
ignore more electrons

or

more shells / level / rings

*do **not** accept more outer shells for this mark*

1

force(s) / attraction(s) are weaker

allow electron(s) attracted less easily

allow electron(s) less under influence (of nucleus)

or

more shielding

or

1

attracts less

*do **not** accept magnetic / gravitational / intermolecular forces*

electron(s) lost more easily

allow electron(s) more likely to be lost

allow easier to give away

1

[10]

4.

- (a) any **one** from:

- heat
- stir

1

- (b) filter

accept use a centrifuge

accept leave longer (to settle)

1

- (c) any **one** from:

- wear safety spectacles
- wear an apron

1

- (d) evaporation at **A** 1
condensation at **B** 1

- (e) 100 1

[6]

5.

- (a) (i) atomic weights
allow atomic masses 1

- (ii) proton
allow proton number 1

- (b) (i) F/fluorine
allow F₂ 1

- (ii) any **one** from:
• copper has a higher density
• copper is stronger
• copper is harder
• copper is less reactive
allow named property
ignore colour, conductivity, melting point and boiling point
allow converse for potassium 1

- (iii) relative distance from nucleus
allow more / fewer energy levels / shells or larger / smaller atom 1

relative attraction to nucleus
allow more / less shielding 1

relative ease of gain or loss of electron 1

opposite explanation of ease of gain or loss of electron for other group 1
max 3 marks if 'outer' not mentioned

[8]

6.

- (a) increase 1

- (b) (i) Na⁺ and Br⁻
both required 1

- (ii) sodium chloride
allow NaCl
do not allow sodium chlorine 1
- (iii) chlorine is more reactive than bromine
allow converse argument
allow symbols Cl, Cl₂, Br and Br₂
allow chlorine / it is more reactive
do not allow chloride or bromide 1
- (iv) fluorine
allow F / F₂.
do not allow fluoride. 1

[5]

7.

- (a) (i) protons
allow "protons or electrons", but do not allow "protons and electrons" 1
- (ii) protons plus / and neutrons 1
- (b) (because the relative electrical charges are) $-(1)$ for an electron and $+(1)$ for a proton
allow electrons are negative and protons are positive 1
- and the number of electrons is equal to the number of protons
if no other mark awarded, allow 1 mark for the charges cancel out 1
- (c) (the electronic structure of) fluorine is 2,7 and chlorine is 2,8,7
allow diagrams for the first marking point 1
- (so fluorine and chlorine are in the same group) because they have the same number of or 7 electrons in their highest energy level or outer shell
if no other mark awarded, allow 1 mark for have the same / similar properties 1
- (d) S 1
- (e) (i) ions 1
- (ii) molecules 1

[9]