

MARK SCHEME

GCSE

CHEMISTRY

AQA - TRIPLE SCIENCE

C1 - TEST 4

ATOMIC STRUCTURE

Intermediate

Mark schemes

1.

(a) (i) Na

allow sodium / phonetic spelling
if more than one answer is given apply list principle

1

(ii) Fe

allow iron / phonetic spelling
if more than one answer is given apply list principle

1

(iii) Na **or** S

allow sodium or sulfur / sulphur / phonetic spelling
if more than one answer is given apply list principle

1

(iv) S

allow sulfur / sulphur / phonetic spelling
if more than one answer is given apply list principle

1

(v) Na

allow sodium / phonetic spelling
if more than one answer is given apply list principle

1

(b) (i) any **three** from:

- effervescence / fizzing **or** bubbles **or** gas produced
do not allow incorrectly named gas
- sodium melts **or** turns into a ball
- sodium moves (on the surface)
- steam / mist / vapour is produced
ignore heat / temperature / flame / spark
- sodium gets smaller / disappears
allow dissolves
- colour of indicator is darker / more intense near the sodium
Must be linked to near the sodium.

3

(ii) hydroxide **or** OH⁻

allow OH without a charge
do not allow OH⁺

1

(c)

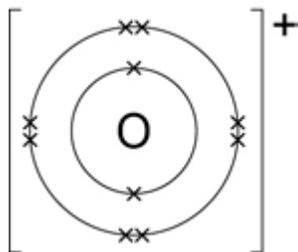


diagram showing electron configuration of ion is 2,8

1

charge on ion is +

Bracket not necessary

[2,8]⁺ is worth 1 mark as there is no diagram

1

[11]

2.

(a) hydrogen has one proton whereas helium has two protons

accept numbers for words

accept hydrogen only has one proton

ignore references to groups

1

hydrogen has one electron whereas helium has two electrons

accept hydrogen only has one electron

allow helium has a full outer shell (of electrons)

1

hydrogen has no neutrons **or** helium has two neutrons

if no other mark awarded, allow helium has more electrons / protons / neutrons for 1 mark

1

(b) (i) 2 electrons on first shell **and**

8 electrons on outer shell

1

(ii) they have a stable arrangement of electrons

accept they have full outer energy level / shell of electrons

*do **not** accept they have the same number of electrons in their outer energy level / shell*

allow they are noble gases

ignore they are in group 0

1

[5]

3.

(a) kills bacteria / sterilises (water)

allow kills microorganisms / microbes / germs

*allow 'makes (water) safe (to drink)' **or** disinfectant*

*ignore cleans water **or** removes impurities / bacteria*

1

- (b) goes colourless / decolourised (from red / red-brown / brown / yellow / orange)
allow colour disappears
ignore 'goes clear' or discoloured
*do **not** accept incorrect initial colour*
*do **not** accept precipitate* 1
- (c) (i) Br_2 and 2Cl^-
allow multiples / fractions if whole equation balanced 1
- (ii) changes to red / red-brown / brown / yellow / orange
*do **not** accept effervescence / fizzing / precipitate / gas given off*
ignore vapour / temperature changes / ignore initial colour 1
- (d) (i) 7 outer electrons **or**
 same number of outer electrons
allow last / final shell for outer
allow energy level / orbit / ring for shell
allow 'need to gain 1 e⁻ to have a full outer shell'
ignore 'similar number of outer electrons' 1
- (ii) bromine / it (atom) is bigger **or**
must be a comparison
 outer electrons (level / shell) further from nucleus **or** more shells
*do **not** accept more outer shells*
ignore more electrons
 forces / attractions are weaker **or** more shielding **or** attracts less
*do **not** accept magnetic / gravitational / intermolecular forces*
allow 'electron(s) attracted less easily'
 electron(s) gained less easily
"outer / last / final" must be mentioned once, otherwise max 2 marks.
accept converse for chlorine throughout where clearly stated 3
- (e) (i) white precipitate **or** white solid
ignore names of chemicals 1
- (ii) cream precipitate **or** cream solid
allow pale yellow / off-white precipitate / solid
ignore names of chemicals 1

[10]

4. (a) Li **and** K
either order
*allow lithium **and** potassium* 1
- (b) Fe
allow iron 1
- (c) N **and** As
either order
*allow nitrogen **and** arsenic* 1
- (d) Cu
allow copper 1
- [4]**

5. (a) (i) UI / solution turns blue / purple
allow violet / lilac 1

any **two** from:

- floats
- melts / forms a sphere
- moves
note: moves on surface = 2 marks (points 1 and 3)
- effervescence / fizz / bubbles / gas
ignore the name of the gas
- (yellow) flame
ignore sparks / ignites / burns
allow dissolves
- reduces in size
ignore 'reacts violently' unqualified
ignore reference to exothermic / heat evolved

2

- (ii) $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$
correct equation = 2 marks
allow correct multiples / fractions
if this equation is unbalanced,
allow 1 mark for NaOH

2

- (b) *it = francium*
outer electron / shell / energy level must be mentioned once for all 3 marks

biggest atom **or** (outer) shell / energy level / electron furthest from nucleus **or** most (number of) shells

1

least attraction (to nucleus) **or** most shielding

allow the attraction is very weak

*do **not** allow less magnetic / gravitational attraction*

1

(outer) electron more easily lost / taken

ignore francium reacts more easily / vigorously

1

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

ignore other properties / specific reactions

they / it = transition elements

transition elements:

allow if state group 1 elements

- high melting point **or** high boiling point
 - *low melting point or low boiling point*
- high density
 - *low density*
- strong / hard
 - *weak / soft*
- not very reactive
 - *reactive*
- catalysts
 - *not catalysts*
- ions have different charges
 - *+1 ions*
- coloured compounds
 - *white compounds*

2

[10]

6.

- (a) protons **(and)** neutrons

both needed for 1 mark

ignore p / + and n / 0

*do **not** accept electrons*

1

- (b) because the number of protons is equal to the number of electrons

allow protons and electrons balance / cancel out

allow positive / + and negative / - balance / cancel out

1

- (c) *it = atom A*

because atom A has a full highest energy level **or** full outer shell

*allow all the shells are full **or** no incomplete shell*

or because atom A has a stable arrangement of electrons

allow because atom A is in Group 0 / a noble gas

1

- (d) (atom) B / lithium / Li **(and)**

(atom) C / sodium / Na

both needed for 1 mark

1

because they have the same number/one outer electron(s)

linked to answer for first mark

accept because both need to lose one / an electron

allow because (atoms) B and C are in Group 1 / the same group / are alkali metals

1

[5]

7.

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

- react with water **or** very reactive
- (react with water) releasing gas / hydrogen / fizzing
- (react with water) to form an alkaline / hydroxide solution
- form ions with a 1+ charge

allow lose one electron from the outer shell

ignore other references to electronic structure

ignore physical properties

2

(b) any **three** from:

- some boxes contain two elements
allow specific examples:
Co, Ni or Ce, La or Di, Mo or Ro, Ru or Ba, V or Pt, Ir
- groups / columns contain elements with different properties
allow groups / columns contain both metals and non-metals
ignore examples
- Newlands not a well-known / respected scientist
ignore references to sugar factory
- new idea (not readily accepted by other scientists)
allow musical scales thought to be silly by some scientists

3

(c) one for improvement **and** one for explanation from:

- left gaps (for undiscovered elements) (1)
 - so that elements were in their correct group (1)
allow so the elements fitted the pattern of properties
- or**
- did not always follow order of relative atomic weights / masses (1)
ignore references to atomic number / electronic structure
 - so that elements were in their correct group (1)
allow so the elements fitted the pattern of properties

2

[7]