M1.(a) 13 (protons)

The answers must be in the correct order.

*if no other marks awarded, award **1** mark if number of protons and electrons are equal*

1

14 (neutrons)

1

13 (electrons)

1

(b) has three electrons in outer energy level / shell

allow electronic structure is 2.8.3

1

(c) **Level 3 (5–6 marks):**
A detailed and coherent comparison is given, which demonstrates a broad knowledge and understanding of the key scientific ideas. The response makes logical links between the points raised and uses sufficient examples to support these links.

Level 2 (3–4 marks):
A description is given which demonstrates a reasonable knowledge and understanding of the key scientific ideas. Comparisons are made but may not be fully articulated and / or precise.

Level 1 (1–2 marks):
Simple statements are made which demonstrate a basic knowledge of some of the relevant ideas. The response may fail to make comparisons between the points raised.

0 marks:
No relevant content.

Indicative content

Physical
Transition elements

- high melting points
- high densities
- strong
- hard

Group 1

- low melting points
- low densities
- soft

Chemical
Transition elements

- low reactivity / react slowly (with water or oxygen)
- used as catalysts
- ions with different charges
- coloured compounds

Group 1

- very reactive / react (quickly) with water / non-metals
- not used as catalysts
- white / colourless compounds
- only forms a +1 ion

6

[10]

M2.(a) The forces between iodine molecules are stronger

1

(b) anything in range +30 to +120

1

(c) Brown

1

(d) $2\ I^- + Cl_2 \rightarrow I_2 + 2\ Cl^-$

1

(e) It contains ions which can move

1

(f) hydrogen iodine

1

[6]

M3.(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]

M4.(a) (iron) is a metal

accept transition element

allow (iron) had different properties (to oxygen and sulfur)

ignore electrons

1

(b) so that elements with similar properties could be placed together

allow to make the pattern fit

ignore undiscovered elements

1

(c) atomic number(s)

allow proton number(s)

1

(d) all have one electron in the outer shell (highest energy level)

allow same number of electrons in the outer shell (highest energy level)

1

(so they) have similar properties

or

react in the same way

allow specific reactions e.g. with water

1

[5]

M5.(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, Cl_2, Br and Br_2

allow chlorine / it is more reactive

*do **not** allow chloride **or** bromide*

1

(iv) fluorine

allow F / F_2

*do **not** allow fluoride.*

1

[5]

M6.(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]

M7.(a) similar properties

allow same properties

allow correct example of property

ignore answers in terms of atomic structure

1

(b) (i) in order of atomic / *proton* number

allow increasing number (of protons)

1

(ii) elements in same group have same number (*of electrons*) in outer shell **or** *highest energy level*

allow number (of electrons) increases across a period

1

(c) any **two** from:

statements must be comparative

- stronger / harder

ignore higher densities

- less reactive
- higher melting points

ignore boiling point

2

(d) *reactivity increases down group*

allow converse throughout

*for next three marks, outer electron needs to be mentioned once otherwise max = **2***

1

outer electron is further from nucleus

allow more energy levels / shells

allow larger atoms

1

less attraction between outer electron and nucleus

allow more shielding

1

therefore outer electron lost more easily

1

[9]

M8.(a) (i) hydrogen

accept H_2

allow H

1

(ii) hydroxide

accept OH^-

allow OH

*do **not** accept lithium hydroxide*

1

*(b) any **two** from:*

'it' = potassium

potassium:

accept converse for lithium

- *reacts / dissolves faster*

  allow reacts more vigorously / quickly / violently / explodesignore reacts more

- *bubbles / fizzes faster*

  allow fizzes more

  allow more gas

- *moves faster (on the surface)*

  allow moves more

- *melts*

  allow forms a sphere

- *produces (lilac / purple) flame*

  allow catches fire / ignites

  *do **not** accept other colours*

2

[4]

M9. *(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]