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) (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**Na + **2**H_2O → **2NaOH** + H_2

*correct equation = **2** marks*

allow correct multiples / fractions

if this equation is unbalanced,

*allow **1** mark for NaOH*

2

(b) *it = francium*

<u>outer</u> 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 <u>very</u> 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]

M3. (a) colour

1

(b) Fe_2O_3 or $(Fe^{3+})_2 (O^{2-})_3$

2 and 3 should be below halfway on Fe and O

1

(c) (i) 4 4

or correct multiples

1

(ii) any **two** from:

ignore references to malleable / ductile / conductivity / stiff / boiling point / density

- high melting point
  accept can withstand high temperatures
- strong / tough
  accept <u>not</u> brittle
- hard
  *do **not** accept flexible*
- not (very) reactive

2

[5]

##

(a) 75% Cu, 25% Ni

for 1 mark

1

(b) 70% segment shaded

for 1 mark

1

(c) (i) copper

for 1 mark

1

(ii) zinc

for 1 mark

1

(d) 1. hard so will not wear away/scratch

for 1 mark

1

2. unreactive
so does not corrode/dissolve/or other
acceptable reason
(not does not react unless acceptable reason)

(If given hard and unreactive allow 1 mark)

for 1 mark

1

[6]