#### **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)  $2 I^- + CI_2 \rightarrow I_2 + 2 CI^-$ 

1

(e) It contains ions which can move

1

1

(f) hydrogen iodine

[6]

<b>I3.</b> (a)	(i)	protons			
			allow "protons or electrons", but do not allow "protons and electrons"		
			(ii) protons plus / and neutrons	1	
				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]

<b>M4.</b> (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			

1

[5]

1

(b) (i) Na<sup>+</sup> and Br<sup>-</sup> 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<sub>2</sub>, Br and Br<sub>2</sub> 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

(b) Fe
allow iron

1

(c) N and As
either order
allow nitrogen and arsenic

1

1

[4]

(d)

Cu

allow copper

<b>M7.</b> (a)	similar	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 <b>two</b> from:					
		statements must be comparative					
		• stronger / harder					
		ignore higher densities					
		<ul><li>less reactive</li><li>higher melting points</li></ul>					
		ignore boiling point					
		ignore bonning point	2				
	(d)	reactivity increases down group					
	(u)	allow converse throughout					
		for next three marks, outer electron needs to be mentioned once					
		otherwise max = <b>2</b>					
			1				
		outer electron is furth <u>er</u> from nucleus					
		allow <u>more</u> energy levels / shells					
		allow larger atoms					
		<del>3_</del>	1				
		<u>less</u> attraction between outer electron and nucleus					
		allow <u>more</u> shielding					
			1				
		therefore outer electron lost more easily					
		therefore outer electron lost <u>more</u> easily	1				
			[9]				

# M8.(a) (i) hydrogen

accept H<sub>2</sub> allow H

1

(ii) hydroxide

accept OH<sup>-</sup> 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:

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