

The Periodic Table

Mark Scheme 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Chemistry
Exam Board	AQA
Topic	5.1 Atomic Structure and the Periodic Table
Sub-Topic	The Periodic Table
Difficulty Level	Silver Level
Booklet	Mark Scheme 1

Time Allowed: 59 minutes

Score: /58

Percentage: /100

Grade Boundaries:

M1.(a)	408 kg	1
(b)	all points correct $\pm \frac{1}{2}$ small square <i>allow 1 mark if 5 points correct</i> best fit line	2 1
(c)	$\frac{1989}{36} \times 100$	1
	5525 dm ³	1
(d)	relative formula mass of TiCl ₄ is 190	1
	25.26 %	1
	Answer given to 3 significant figures = 25.3 %	1
	<i>25.23% with or without working gains 3 marks</i>	
(e)	argon is unreactive	1

water (vapour) would react with sodium

allow water (vapour) would react with titanium(IV) chloride

1

and air contains oxygen that would react with reactants

allow and air contains oxygen that would react with products

1

- (f) (titanium conducts electricity) because electrons in the outer shell of the metal atoms are delocalised

1

and so electrons are free to move

allow the delocalised electrons in the metal carry electrical charge through the metal

1

through the whole structure

1

[15]

M2.(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]

- M3.(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]

M4.(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]

M5.(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]

M6.(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)

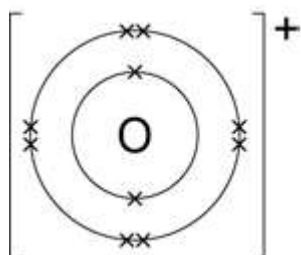


diagram showing electron configuration of ion is 2,8

1

charge on ion is +

Bracket not necessary

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

1

[11]

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]