

GCSE CHEMISTRY

Topic Paper: 1.2 The periodic table and Trends (Group 0, 1 and 7)
Part 1 & 2 Mark Scheme

MARK SCHEME



72 Marks



- M1.** (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]
- M2.** (a) (i) gas 1
- (ii) Increases 1
- (b) (i) -1
allow Cl⁻
allow -
allow negative 1



(ii) sodium + chlorine → sodium chloride
allow correct symbol equation

1

(c) reduce microbes

accept sterilise

accept prevent diseases

allow disinfect

allow kill bacteria / germs / microbes / micro-organisms

allow to make it safe to drink

ignore get rid of bacteria

1

(d) any **one** from:

no freedom of choice

allow unethical

fluoride in toothpaste

too much can cause fluorosis

allow too much can cause damage to teeth

1

[6]

M3.

(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 / explodes

ignore 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]

M4. (a) any **two** from:

do not react with water

do not react with air

*allow unreactive **or** stay shiny **or** do not tarnish **or** do not corrode*

for either of first two points for 1 mark

ignore rusts

ignore durable

malleable

ignore hard / strong

high melting point

ignore boiling point

ignore other correct properties

2

(b) (transition elements have) same number / two electrons in outer shell / energy level / fourth shell

ignore references to (metallic) structure / bonding

1



any **one** from:

because lower energy level / inner shell being filled

because third energy level can hold up to eighteen electrons

1

[4]

M5. (a) Group 0 / 8

accept transition elements / metals

or noble / rare / inert gases

apply list principle

1

(b) (chemically) similar elements (now) in the same group / column

accept iodine has properties of Group 7 / halogens

or *iodine does not have group 6 properties*

or *converse for tellurium*

ignore 'it fits the pattern' or any reference to proton / atomic numbers / atomic structure

1

(c) any **three** from:

*ignore not enough evidence / proof **or** Mendeleev not respected*

(some) boxes had two elements

allow two correctly identified elements together (in the same box)

Group 1: copper / silver unreactive (not like the others)

allow copper / silver not alkali metals / Group 1

there are non-metals and metals in the same group / box

accept named examples

Mendeleev left spaces / gaps

accept (some chemists thought) there were no more elements to discover

Mendeleev reversed the order (for some elements)

3



(d) any **two** from:

ignore mass number / atomic weight / neutrons throughout

elements arranged in proton / atomic number order

allow number of protons / electrons increases across period

group: elements in same group / column have same number of outer electrons

elements in same period / row have same number of (electron) shells / energy levels

allow number of (electron) shells / energy level increase down group

allow electron rings

allow orbits

2

[7]

M6.

(a) (i) low density

accept floats (on water)

1

(ii) forms an alkaline solution with water

*accept alkali (metal) **or** basic*

*do **not** accept group 1 metal*

1

(b) **3 or** three (protons)

1

3 or three (electrons)

1

4 or four (neutrons)

1

[5]

M7.

(a) if placed consecutively, then elements would be in wrong group / have wrong properties

allow some elements didn't fit pattern

1

left gaps

1

(b) (elements placed in) atomic / proton number order

1

(elements in) same group have same number of outer electrons

1



any **one** from:

number of protons = number of electrons

reactions/(chemical) properties depend on the (outer) electrons

number of shells gives the period

allow number of shells increases down the group

1

- (c) (i) (transition elements usually) have same / similar number of outer / 4th shell electrons

allow 2 electrons in outer shell

1

(because) inner (3rd) shell / energy level is being filled

ignore shells overlap

1

- (ii) 2nd shell / energy level can (only) have maximum of 8 electrons

accept no d-orbitals

or

2nd shell / energy level cannot have 18 electrons

1

[8]

- M8.** (a) all have seven electrons in their outer shell / energy level

1

- (b) *must be comparative in all points or converse*

chlorine atom is smaller than bromine atom

or

chlorine atom has fewer shells than bromine atom

1

outer shell / energy level of chlorine has stronger (electrostatic) attraction to the nucleus than bromine

or

outer shell of chlorine is less shielded from the nucleus than bromine

1

so chlorine more readily gains an extra electron

1

[4]

- M9.** (a) acts as barrier between sodium and air / oxygen / water (vapour)

accept because they are reactive

ignore oil will not react

1



(b) $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$
allow multiples / fractions 1

(c) these metals react with water producing an alkaline solution
or
 produce solution with pH greater than 7 / high pH
owtte
allow produce OH. ions
***not** these metals are / form alkalis*
ignore 'strong' pH 1

(d) *it = potassium*
outer electron must be mentioned once for all 3 marks
 bigger atom
or
 outer shell electron further from nucleus
or
 more shells
or
converse argument for sodium less reactive provided sodium is specified 1

less attraction to nucleus
or
 more shielding
***not** less magnetic attraction* 1

outer electron more easily lost
***ignore** potassium reacts more easily* 1

[6]

M10. (a) $40 (\text{Ca}) + 137 (\text{Ba}) \div 2 = 88.5$
accept a recognition that the average is near 88
***or** it is the average of the other two*
accept Sr is midway between Ca and Ba 1

(b) eg newly discovered elements / atoms didn't fit (into triads) **or** didn't apply to all elements / atoms **or** lot of exceptions
he = Döbereiner
*ignore Mendeleev left spaces **or** not enough evidence* 1



(c) any **two** from:

fizzes / bubbles / gas

hydrogen alone is insufficient

ignore incorrect name if 'gas' stated

violent / vigorous / explodes / very fast reaction

accept container explodes

ignore strong reaction

floats / on surface

ignore sinks

moves (very quickly)

melts (into a ball)

bursts into flame

accept (bright) light

ignore colour / glow

gets smaller / (reacts to) form a solution / dissolves / disappears etc

steam / gets hot (owtte)

*ignore alkaline solutions **or** change in colour etc*

2

(d) (i) same number of electrons in outer shell

accept energy level for shell

accept a correct reference to a specific group

*eg (all) have one electron in outershell / (all) lose one electron
(when they react)*

1

(ii) electrons fill an inner / 3rd shell

accept energy level for shell

accept d-level being filled

accept specific reference to 3rd shell

accept descriptions in terms of 3d & 4s etc

1

(usually) same number of outer / 4th shell electrons

1



(iii)

it = lithium

accept energy level for shell or converse reasoning for potassium

outer shell electron closer to nucleus

accept fewer shells / smaller atom

1

more (electrostatic) attraction (to nucleus) / electrons

less likely to be lost

accept less shielding / isn't much shielding

ignore nucleus has more influence but accept nucleus has more influence over the outer electron(s)

do not accept magnetic / gravitational attraction

1

[9]

M11. (a) 6 or 16

or transition metal or F block element or actinide

1

(b) (elements in group 6 have) six (electrons)
in the outer shell or needs 2 electrons to gain a full shell

accept has 98 electrons

1

[2]

M12. (a) bubble slowly/quickly/vigorously
neodymium hydroxide
hydrogen

(b) oxidise slowly in air
neodymium oxide

(c) violent/very vigorous/rapid bubbles
neodymium chloride
hydrogen

1 mark for each point

[8]