

MARK SCHEME

GCSE

CHEMISTRY

AQA - TRIPLE SCIENCE

C1 - TEST 6

ATOMIC STRUCTURE

Advanced

Mark schemes

1.	(a) (i) W and Z (allow oxygen and sulphur) <i>for 1 mark</i>		
	(ii) Group 6 <i>for 1 mark</i>		2
	(b) W and Y (allow oxygen and nitrogen or correct symbol for any 2 gaseous elements) <i>for 1 mark</i>		1
	(c) (i) (S) • produce an alkali/hydroxide <i>each</i> • produce hydrogen <u>or</u> idea of effervescence (D) • (alkali is) <u>sodium</u> hydroxide • the reaction is faster/more vigorous <i>any 3 • for 1 mark</i>		3
(ii) <i>ideas that</i> potassium is further down the group <u>or</u> more electron shells <i>gains 1 mark</i> but because the electrons in potassium are further from the nucleus/in a more outer shell / in a higher energy level <i>gains 2 marks</i> so they are most easily lost or less strongly pulled/held by nucleus <i>for 1 mark</i>		3	
2.	fluorine has fewer shells / less shielding than iodine	1	[9]
	gains electrons more easily / more pull	1	[2]
3.	(a) react with oxygen / oxidise / burn in oxygen / burning / combustion or tungsten to tungsten oxide or makes an oxide <i>key idea is oxidation</i> <i>ignore breaking ignore fire / flames / exothermic</i> <i>ignore react with air</i>	1	

- (b) it is (very) unreactive / not reactive / inert / does not react with tungsten
 or it is a noble gas or it is in group 0 or 8 or 18

do not accept unreactive / inert metal or argon is not very reactive

1

full outer shell (of electrons) / 8 electrons in outer shell

1

does not need to gain / lose / swap / transfer / share electrons or does not need to form bonds

does not bond ionically / covalently

1

[4]

4.

- (a) mass number

allow the number of protons + neutrons

1

- (b) 6.02×10^{23}

1

- (c) **Level 2 (3-4 marks):**

Scientifically relevant features are identified; the ways in which they are similar / different is made clear.

Level 1 (1-2 marks):

Relevant features are identified and differences noted.

Level 0

No relevant content.

Indicative content

similarities

- both have positive charges
- both have (negative) electrons
- neither has neutrons

differences

plum pudding model	nuclear model
ball of positive charge (spread throughout)	positive charge concentrated at the centre
electrons spread throughout (embedded in the ball of positive charge)	electrons outside the nucleus
no empty space in the atom	most of the atom is empty space
mass spread throughout	mass concentrated at the centre

4

(d)
$$\frac{(24 \times 78.6) + (25 \times 0.1) + (26 \times 11.3)}{100}$$

or

$$(24 \times 0.786) + (25 \times 0.101) + (26 \times 0.113)$$

$$= 24.3$$

1

1

an answer of 24.3 scores 2 marks

[8]

5.

- (a) (i) same number of electrons
allow all have 7 electrons

1

in outermost shell

1

- (ii) fluorine has fewer shells than iodine / less shielding

1

gains electrons more easily / more pull

1

- (b) outermost shell full

1

no tendency to lose / gain electrons

1

[6]

6.

- (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]

- 7.** (a) B 1
- (b) eg link between Li, Na, K, (Rb, Cs)
or Mg, Ca, (Sr, Ba)
or F, Cl, Br, I
*allow any **two** elements in the same group (in both Newland's **and** the modern periodic table)* 1
- linked appropriate comment about that link eg similar physical / chemical properties **or** similar specific reactions **or** same number of outer electrons
*if no elements identified, allow **1** mark for a general comment about elements **in the same column** having similar properties*
*"every eighth element has similar properties" = **1** mark* 1
- (c) any **two** from:
- no gaps for undiscovered elements **or** elements still being discovered
 - some boxes have 2 elements
 - metals and non-metals in same column / mixed up / some elements in the same column had different properties
 - pattern for first 16 or so elements only
 - any sensible suggestion about misplaced elements eg copper in group 1 metals
- 2
- (d) alkanes are not elements **or** alkanes are compounds
ignore molecule / molecular 1
- [6]**

- 8.** (a) add yeast 1
- and ferment **or** by fermentation
*allow in a warm place **or** temperatures within the range 20-45°C **or** with an airlock / absence of air* 1

(b) heat (the mixture)

1

ethanol has a lower boiling point than water **or** more ethanol than water vaporises **or** ethanol evaporates first or when the temperature reaches 78°C

allow ethanol and water boil at different temperatures

1

condense (the vapour)

allow condense at different temperatures for the last two marking points

if no other mark is awarded, allow repeat distillation or use fractional distillation apparatus for 1 mark

1

[5]

9.

(a) comment + relevant example gets **1 + 1** marks
third marking point can be **either** a comment **or** an example unrelated to first comment i.e. 3 comments would be max **2** marks

max 3

(could be many answers)

ignore references to music

e.g. many elements in the groups have very dissimilar properties e.g. Cu + K
(= 2 marks)

two elements in one place on the table e.g. Ce or La
(= 2 marks)

no clear division between metals and non-metals **or** metals and non-metals jumbled / mixed up (could give example from table)

Newlands didn't allow spaces for new elements

(b) any **two** from:

elements with dissimilar properties are separated **or** grouped elements with similar properties

gaps left for elements to be added when discovered

relative atomic mass order not followed in all cases (so that elements go in groups with other similar elements) **or** Mendeleev in proton number order

groups related to electronic structure **or**
group number equals number of outer electrons

new groups created **or** iron, cobalt nickel
in a group **or** eight groups instead of seven

correct elements in periods 2 and 3

reactivity trends in groups **or** reactivity trends across periods

separates metals and non-metals

2

[5]

10.

(a) chlorine is toxic

allow carbon monoxide is toxic
allow poisonous for toxic
ignore harmful / deadly / dangerous
allow a poisonous gas is used / produced
allow titanium chloride is corrosive

1

(b) any **one** from:

- very exothermic reaction
allow explosive
allow violent reaction
ignore vigorous reaction
ignore sodium is very reactive
- produces a corrosive solution
allow caustic for corrosive
ignore alkaline
- produces hydrogen, which is explosive / flammable
allow flames produced
ignore sodium burns

1

(c) argon is unreactive / inert

allow argon will not react (with reactants / products / elements)

1

oxygen (from air) would react with sodium / titanium

or

water vapour (from air) would react with sodium / titanium

allow elements / reactants / products for sodium / titanium

1