



## Mark schemes

1

- (a) (i) argon **and** potassium **or** tellurium **and** iodine **or** cobalt **and** nickel

*accept correct symbols  
allow argon **and** calcium*

1

- (ii) it would place them in incorrect groups (owtte)

*idea of not being placed with elements which have similar properties **or** converse argument*

*accept would not have same number of electrons in outer shell  
allow it would put them in wrong period if linked to argon and potassium / calcium*

*do **not** accept reasons based just on protons  
do **not** accept metals and non-metals mixed up*

1

- (b) any **two** from:

- each successive atom has one more electron
- atoms in the same group have the same number of electrons in their outer shells / energy levels  
*number of electrons in outer shell = group number*
- across a period an energy level / shell is being filled
- in the next period the next energy level / shell is being filled  
*accept period number = shell number*

2

[4]

2

- (a) react with oxygen / oxidise / burn in oxygen / burning / combustion **or** tungsten to tungsten oxide **or** makes an oxide

*key idea is oxidation  
ignore breaking ignore fire / flames / exothermic  
ignore react with air*

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]****3**

- (a) F

*accept indium / In*

1

- (b) C

*accept sodium / Na*

1

- (c) A

*accept hydrogen / H / H<sub>2</sub>*

1

**[3]****4**

- (a) (i) melting point increases as atomic number increases

*accept 'increase' / higher / bigger / larger*

1

- (ii) 200 to 350 °C

1

exactly on  $85 \pm \frac{1}{2}$  square

*up to their value  $\pm \frac{1}{2}$  square*

1

- (b) (i) chlorine **or** fluorine

*accept if both chlorine and fluorine ticked, otherwise list principle*

1

- (ii) chlorine / fluorine are more reactive (than bromine)  
*accept chlorine / fluorine are higher (up group 7)*  
*accept a more reactive halogen will displace a less reactive halogen*

1

- (iii) 500 (litres)

1

**[6]****5**

- (i) any **two** sensible ideas such as:

- (why) put in order of mass  
*accept other equally valid orders, eg alphabetical*
- he left gaps **or** table not complete
- no evidence for undiscovered elements  
**or** they believed all the elements had been discovered  
*accept predictions could not be backed by evidence*  
*accept why change previous ideas*
- he changed the order of some elements  
**or** there were exceptions to the rule(s)
- he put metals and non-metals together  
*accept they didn't like his groupings / groups*
- he did not explain his ideas clearly (owtte)  
*do **not** accept modern explanations, eg proton number etc*

2

- (ii) (the properties of gallium) fitted the predictions (owtte) **or** predictions were correct **or** (properties) would make it fit in the gap **or** (properties) would make it fit in group 3  
*do **not** accept gallium fitted his theory*  
*accept finding gallium proved there were new elements to be discovered*

1

**[3]**

6

- (a) (i) all points plotted to  $\pm \frac{1}{2}$  square 1

sensible line of best fit extended

*could be curve*

*must **not** join dots, ie zig zag*

*if they draw 2 lines then lose second mark,*

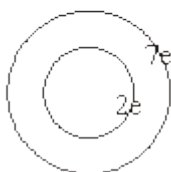
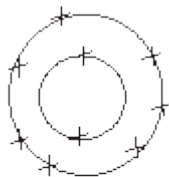
*but can still gain marks in (a)(ii)*

1

- (ii) as read from their graph  $\pm \frac{1}{2}$  square 1

- (iii) iodine **and** astatine/ $I_2$  At/At<sub>2</sub> 1  
*must give **both***

- (b) (i)



*ignore symbol*

*ignore nucleus / lack of nucleus*

*accept dots / crosses etc / e / e<sup>-</sup>*

***not** 2.7 alone*

1

- (ii) same number of electrons in **outer** shell **or** seven electrons in **outer** shell (owtte) 1  
*accept missing one electron in outer shell / energy level / orbit*  
*accept trying to gain one electron*  
*accept they all form 1<sup>-</sup> ions*  
*do **not** accept orbital / rings*

- (c) (i) 8 electrons in outer shell **or** full outer shell / energy level 1

does not need to lose / gain / share electrons **or** don't need to form bonds

*accept don't bond ionically or covalently*

*they do not react is **not** enough*

1

- (ii) fluorine atom is smaller / fewer shells (owtte) **or** outer shell closer to nucleus

*accept answers argued in terms of iodine*

1

- more strongly attracted (to nucleus) **or** less shielding

*accept holds electrons tighter (to the nucleus)*

1

- gains electron(s) more easily

*accept easier to gain electrons*

1

[11]

7

- (i) nucleus

1

- (ii) they both have seven electrons in the outer shell

*accept they both have the same number of electrons in the outer shell*

*both need one electron to make full outer shell*

1

[2]

8

- (a) group seven/7VII

*accept halogens*

1

- (b) (i) in light **bulbs**/lasers

*accept any other specified use as an inert atmosphere e.g. (argon) welding, storing explosives, fluorescent lights*

1

- (ii) 2.8.8/has a full/8 in/outer shell

1

electrons

*accept does not need to share/gain/lose electrons*

1

- (c) (i) any one from:
- disinfectant
  - bleaching agent
  - sterilising water/kills bacteria
  - manufacture of HCl
  - water treatment
- 1**
- not: cleaning/in pools*
- purification of water*
- kills germs*
- warfare*
- antiseptic*
- (ii) inner shells 2,8
- 1**
- outer shell 7
- 1**
- (iii) fluorine:
- accept the converse reasons for chlorine*
- gains **one**/an electron easier/is more
- strongly attracted
- not more strongly held*
- 1**
- less shielding of nucleus by inner electron shells
- 1**
- less distance from (attraction of)
- nucleus/less shells
- 1**

**[10]****9**

- (a) (i) **all correct two marks one or two correct one mark**
- electron
  - proton
  - neutron

**2**

- (ii) (argon has) a full outer shell (of electrons)  
*accept energy level for shell*  
*accept does not lose or gain electrons*  
*do **not** accept does not form bonds*  
***or** react **or** is a noble **or** inert gas*

1

- (b) oxygen would react (with metal)  
*accept oxygen is reactive*  
*do **not** accept metal would react (neutral)*

1

metal would burn

- accept metal would be 'destroyed'*  
***or** metal oxide formed **or** metal is oxidised*  
*do **not** accept it would explode **or***  
*would not last long*  
*accept filament for metal*

1

[5]

10

- (a) (i) low density  
*accept floats (on water)*
- (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]

11

- (a) atomic number or proton number

1

- (b) (i) sodium **or** potassium **must** be name  
*accept rubidium **or** caesium **or** francium*

1



(ii) silicon **or** phosphorus **or** sulphur **or** chlorine **or** argon **must** be name

1

**[3]****12**

(a) (i) number

1

periods

1

groups

1

(ii) some elements (**or** metals) had not been isolated

*accept some elements (**or** metals) had not been discovered (found)*

*do **not** accept matching properties*

*do **not** accept some elements were not known*

1

(b) (i) He **or** Ne **or** Ar

*accept Kr **or** Xe **or** Rn*

*accept correct names*

1

(ii) arrangement of electrons correct

*accept He 2*

*Ne 2 . 8*

*Ar 2 . 8 . 8*

*arrangement of electrons must match*

*correct answer if given in (i)*

*do **not** accept other elements*

1

(iii) (all) have one electron in the outer shell **or** energy level

*accept (all) have same number of electron(s) in the outer shell **or** energy level*

*accept all have to lose one electron*

*do **not** accept all in same group*

1

(iv) K Na Li

*accept names*

*accept correct indication of order of reactivity*

1

(v) H<sub>2</sub>*do not accept H*

1

correctly balanced → 2 + 1

*must have H<sub>2</sub> correct to get balancing mark*

1

**[10]****13**

(a) (i) green

*accept 'green-yellow' but not 'yellow' alone*

1

bromine or Br or Br<sub>2</sub>*do not accept bromide*

1

(ii) same number of electrons in outer energy level **or** *accept shell for energy level*

7 electrons in outer shell

*accept need to gain 1 electron*

1

(b) any **two** from:

- hydrogen **or** H<sub>2</sub>

*do not accept gas given off or fizzes*

- heat

*accept exothermic**do not accept flame*

- alkaline solution

*accept (metal) hydroxide or NaOH or OH<sup>-</sup>**do not accept dissolves or forms a solution or floating**accept balanced chemical equation for 2 marks*

2

**[5]****14**

(a) any (must be named)

1

(b) F<sub>2</sub>

1

(c) -/F<sup>-</sup>

- (d) (i) covalent 1
- (ii) made of molecules etc.  
type of bonding when non-metals react. 1

[5]

15

- (a) (i) 14 electrons =  
*gets 1 mark* 2
- 2.8.4 =  
*gets 2 marks* 2
- (ii) outer shell electrons 1
- (iii) same number of electrons in outer shell 1
- (b) (1) shiny  
conducts electricity
- (2) oxide neutralises alkalis  
covalent bonds 4

[8]

16

- (a) (i) 2.7 1
- (ii) 2.8.8 1
- (iii) gains an electron  
more easily than Cl  
because the higher the energy level  
the less easily an electron is gained  
*each for 1 mark* 4
- (b) (i) very unreactive **or** give reactivity trend 1
- (ii) fluorine reacted with silicon from glass  
*each for 1 mark* 2

- (iii) Reactivity increases down the group  
 radon likely to react because lower in group than xenon  
 more reactive than xenon  
 Kr may or may not react  
 higher in group than xenon  
 less reactive than xenon  
*any 5 for 1 mark each*

5

**[14]****17**

- (a) (i) same number of shells/2 full shells/3 shells/same number of energy levels  
*any 1 for 1 mark*

increasing number of electrons/different number of electrons/  
 number of electrons same as group  
 number  
*(if electrons not specifically mentioned assume they are referring to electrons)*

*any 1 for 1 mark*

2

- (ii) all have 7 electrons in outer shell/same number in outer shell/  
 each has one electron missing from outer shell  
 each can accept one electron  
*any 1 for 1 mark*

number of shells/energy levels increases  
 increasing number of electrons  
*any 1 for 1 mark*

2

- (b) (i) increases down group/decreases up  
*for 1 mark*

1

- (ii) down group atoms get bigger/larger/have more shells/  
 more energy levels  
*for 1 mark*

electrons further away from nucleus/more  
 shielding down group  
*for 1 mark*

outer electron more easily lost/less  
 firmly held  
*for 1 mark*

3

- (c)  $H^+$  or has positive ions/one electron in outer shell/can lose one electron/ $H^+$  ions discharged at negative electrode (max 2)  
covalent bonds or compounds/forms diatomic mols. or example/  
ability to form  $H^-$  ions/non-conductor/  
low Mt.Pt or low B.P. (max 2)  
*(overall max 3)*

3

[11]

18

- (a) three from:  
high mp/melts above  $60\text{ }^\circ\text{C}$   
conducts (electricity)  
basic oxide /alkaline oxide  
chloride has high mp  
molten chloride conducts electricity  
form positive ions/form ionic compound with non-metals  
solid at room temperature  
*any 3 for 1 mark each*

3

- (b) group 2  
formula of oxide is  $XO$ /ion is  $X^{2+}$ /  
oxide forms alkaline solution  
*for 1 mark each*

2

- (c)  $XCl_2$ /  $X^{2+}(Cl^-)_2(X^{2+})(Cl^-)_2$   
Symbol of any group 2 element instead of X  
(b)  $\rightarrow$  (c) error carried forward accepted.  
e.g. Group 1  $\rightarrow XCl$   
Group 3  $\rightarrow XCl_3$   
*for 1 mark*

1

[6]

19

- (a) same number of electrons in outer shell/highest energy level  
**or** they all form  $1+$  ions  
If number of electrons is given it must be correct  
Allow loss of same number of electrons to give full shell  
**not** gain of electrons  
*for 1 mark*

1

- (b) electrons are lost more readily/more easily  
further from nucleus/bigger atom/more shielding/more energy levels/  
**not** just more electrons  
**not** just reduced attraction  
*for 1 mark each*

2

**[3]****20**

- (a) Group 2 / Alkaline Earth Metals  
*for 1 mark*

1

- (b) (i)  $\text{MgCl}_2/\text{Mg}^{2+} (\text{Cl}^-)_2$   
(or equation with correct answer)  
*for 1 mark*

1

- (ii) ionic / electrovalent  
*for 1 mark*

1

**[3]****21**

- (a) gas  
*for 1 mark*

1

- (b)  $\text{AlX}_3$   
*for 1 mark*

1

- (c) 7 / halogens  
*for 1 mark*

1

**[3]****22**

- (a) same number of electrons in outer shell / 1 / an electron in outer shell / lose one electron  
*for 1 mark*

1

- (b) (i) C  
*for 1 mark* 1
- (ii) E  
*for 1 mark* 1
- (c) (i)  $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$   
symbols must be correct  
correct multiples / fractions accepted  
Balancing mark is independent  
*formulae gains 1 mark*  
*balancing gains 1 mark* 2
- (ii) Assume 'it' means potassium  
potassium more reactive / vigorous / faster reaction / violent (can be awarded in either section)  
potassium atom larger than sodium / higher outer energy level /  
outer shell further from nucleus / more shells (not just more electrons)  
electron in outer shell is less strongly attracted / greater shielding  
outer electron more easily lost  
*for 1 mark each* 4

[9]

23

Mendeleev's table  
contains only elements  
divides metals and non-metals  
contains far more elements which were discovered later  
groups elements according to chemical properties

puts elements in order of atomic number / atomic mass / table  
includes these numbers

can use to work out / linked to electronic structures

left gaps for missing elements which had not been discovered

*other sensible answers*

*any two for 1 mark each*

[2]

- |           |  |   |            |
|-----------|--|---|------------|
| <b>24</b> | <p>(i) B or 2, 8, 1<br/><i>for one mark</i></p>  | 1 |            |
|           | <p>(ii) A or 2, 8<br/><i>for one mark</i></p>  | 1 | <b>[2]</b> |
|           |  |   |            |
| <b>25</b> | <p>(a) (i) H, Cu, Ag (rules of upper and lower case to be applied here)<br/><i>both for one mark</i></p>   | 1 |            |
|           | <p>(ii) hydrogen<br/>copper<br/>silver<br/><i>any two for 1 mark</i></p>   | 2 |            |
|           | <p>(b) Group 0 / Noble gases / Group 8 / Group 18 / Inert gases /<br/>Rare gases / Transition elements / Metals<br/><i>for one mark</i></p>  | 1 |            |
|           | <p>(c) sensible suggestions based on their knowledge of the periodic table<br/>left spaces for elements which had not been discovered<br/>left gaps so that elements could be placed in columns with other<br/>elements which had similar properties<br/><i>for one mark</i></p> | 1 |            |
|           | <p>(d) proton (atomic)<br/><i>for one mark</i></p>   | 1 |            |
|           | <p>(e) they react with water to give alkaline solutions<br/>they form an ion with a 1+ charge<br/>they are metals<br/><i>for 1 mark each</i></p>   | 3 |            |



- (f) maximum of 1 mark for description  
 floats / surface  
 may melt (*not* gets hot)  
 moves around  
 bubbles / steam / fumes / smoke / fizz  
 dissolves / disappeared / gets smaller  
 flame

(*ignore* sounds / heat)

*any one for 1 mark*

2 marks for correct product

sodium hydroxide or a solution containing sodium and hydroxide ions)

NaOH / caustic soda hydrogen / H<sub>2</sub>

(*if more than 2 products given subtract one for each incorrect to maximum -2*)

*three for 1 mark each*

3

[12]

26

- (a) Copper  
 Silver  
 Hydrogen

*two correct symbols gains one mark. (√x)*

*any two for 1 mark each*

2

- (b) Group 0 / Noble gases / Group 8 / Group 18 / Inert gases / Rare gases  
 / Transition elements / metals

*for one mark*

1

- (c) sensible suggestions based on their knowledge of the Periodic Table  
 left spaces for elements which had not been discovered  
 left gaps so that elements could be placed in columns with other  
 elements which had similar properties

*any one for 1 mark*

1

- (d) atomic (proton)

*for one mark*

1

[5]

- 27** (a) transition / transitional metals / elements / d-block  
*for one mark* 1
- (b) coloured catalyst  
  
(accept high melting point)  
*for 1 mark each* 2
- [3]**

**28** chlorine atom smaller than bromine atom / has fewer shells / chlorine is higher in the group than bromine so it is more reactive

the outer electron / extra electron is more strongly attracted with chlorine than bromine / bromide (owtte) / more shielding with bromine / less shielding with chlorine

an extra electron is more easily gained by chlorine **or** chlorine can take an electron from bromide ion (*not* bromine)

*for 1 mark each*

**[3]**

- 29** (a)  $-220(^{\circ}\text{C})$   
*accept without unit*  
*do **not** credit if no minus sign*  
*no tolerance allowed* 1

- (b) iodine  
*allow I or I<sub>2</sub>* 1

- (c) increase down (*the groups*)  
*N.B. must be **one** comparative or superlative for either position in group or melting point to obtain 2 marks*  
*e.g. accept lowest in group has highest melting point for 2 marks*  
*accept highest in group has lowest melting point for 2 marks*  
*accept highest mass numbers or proton numbers or atomic numbers have highest melting point for 2 marks*  
*allow F has lower **or** lowest melting point for 1 mark*

allow 'Increase from F to 1',  
 i.e. referring to graph rather than  
 periodic table for 1 mark  
 F has a low melting point no marks

2

(d) brittle

1

poor conductor of electricity

maximum 1 mark if three boxes ticked  
 no marks if all four boxes ticked

1

**[6]****30**

low density

1

form hydroxides that dissolve in water

1

react quickly with water

four ticks – max 2 marks  
 five ticks – max 1 mark  
 all boxes ticked – 0 marks

1

**[3]****31**

(a) (i) Y or 2,8,8 or Argon or Ar

All correct gains 3 marks

(ii) W or 2,5

3 correct gains 1 mark

(iii) X or 2,7 or fluorine or F

2 or 1 correct gains 1 mark

(iv) Z or 2,8,8,1 or potassium or K

N.B. number of ticks on script must equal number of marks

3

- (b) 1 and 2 (both needed)

*do not credit if any other group listed**'transition metals' neutral**allow alkali metals and alkali earth metals*

1

**[4]****32**

- (a) same number of outer electrons / have 2 outer electrons

*do not accept inner electrons or 2Xs*

1

- (b) calcium (idea) outer electrons / shell
- 
- further from nucleus

*do **not** credit lower down group**do not credit larger / more shells*

1

more easily lost / attraction from nucleus less

*accept screening of inner electrons*

1

**[3]****33**

- (a) less dense than air

*no marks if four or five boxes*

1

very unreactive

*maximum 1 mark if three boxes ticked*

1

- (b) CO
- <sub>2</sub>

1

HCl

1

NH<sub>3</sub>*do not penalise upper / lower case or  
superscript*

1

**[5]**

- 34** (a) Mendeleev arranged known elements in order of mass or properties  
*reject explanation in terms of electrons and / or atomic number* 1
- gaps in Periodic Table / group 1 1
- (b) does not last long enough to experiment / very little of it  
*allow it has a short half-life* 1
- (c) (i) (much) more violent  
*accept more reactive* 1
- (ii) since outer electron / or shell further from nucleus  
*do not credit lower down group larger / more shells neutral* 1
- therefore more easily lost  
*accept screening by inner electrons* 1
- [6]**

- 35** (a) He 1
- (b) carbon / silicon / germanium / tin / lead  
*accept correctly written symbols C / Si / Ge / Sn / Pb* 1
- (c) copper  
*accept Cu* 1
- (d) iodine  
*accept I or I<sub>2</sub>* 1
- [4]**

- 36**
- (a) **A** – electron 1
- B** – nucleus 1
- C** – proton 1
- D** – neutron 1
- (b) Group 1 / alkali metals 1
- has one electron in outer shell
- accept 3 protons / 3 electrons / atomic number 3  
therefore lithium (so Group 1 / alkali metals)* 1
- (c) lithium
- accept Li* 1
- [7]**

- 37**
- (a) (i) liquid
- allow l* 1
- (ii) solid
- allow s  
allow responses written in table* 1
- (b) fluorine
- accept F, reject fluoride* 1
- (c) hydrogen bromide
- reject hydrogen bromine  
accept HBr/BrH  
allow responses written in table* 1
- [4]**

- 38** fluorine has fewer shells / less shielding than iodine  
gains electrons more easily / more pull
- 1  
1  
[2]
- 39** (a) 2 and 3  
*both needed*
- 1
- (b) (i) atomic number / proton number  
*electrons neutral*
- 1
- (ii) argon has more neutrons  
*accept more particles in nucleus*
- 1
- (iii) increases  
by one with each element
- 1  
1  
[5]
- 40** (a) conducts electricity
- 1
- density low
- 1
- (b) any **two** from:
- unreactive (with water)
- forms compounds with  
covalent bonds
- high melting point
- 2  
[4]

- 41** (a) He 1
- (b) carbon / silicon / germanium / tin / lead  
*accept correctly written symbols*  
*C / Si / Ge / Sn / Pb* 1
- (c) copper  
*accept Cu* 1
- (d) iodine  
*accept I or I<sub>2</sub>* 1
- [4]**

- 42** (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]**

- 43** (a) C 1
- (b) (i) C1 immediately below F  
*do not credit C below F* 1
- (ii) iodine or I or I<sub>2</sub>  
*do not credit iodide* 1



- (c) K **or** accept word potassium  
*do not credit word potassium* 1
- (d) Li **or** K **or** Rb **or** Cs **or** Fr  
*do not credit lithium **or** potassium  
**or** rubidium **or** caesium **or**  
francium* 1

[5]

44

- (a) (i) sodium  
*do not credit Na* 1
- (ii) chlorine  
*do not credit Cl* 1
- (iii) helium  
*do not credit He* 1
- (b) (i) any **one** from  
react with water  
*do not credit just 'very reactive'*  
*accept a recognised general reaction for a Group I metal such as  
reacts with oxygen **or** chlorine **or** acids*
- form alkalis with water
- give off hydrogen with water  
*It must specify a named chemical reaction* 1

- (ii) any **one** from
- low melting  
*accept solid*
  - low density  
*accept float on water*
  - malleable
  - soft  
*accept easily cut with a knife*
  - ductile
  - shiny
  - (good) conductors

1

**[5]****45**

- (a) (i) Cl  
*only*
- (ii) Na  
*only*
- (b) (i) Mg  
*only*
- (ii) halogens  
*do not credit halide*
- (c) (i) 2.8  
*ignore commas **or** fullstops*
- (ii) 2.8.3

1

1

1

1

1

1

(d) the number of protons

*accept the number of electrons in an atom or 'number of protons or electrons'*

*do not credit just the number of electrons*

1

(e) neutron

1

**[8]****46**

(a) gas

1

(b) (i)

acid

*ignore any reference to a particular kind of acid*

1

(ii) 7

1

(c) 1

*credit potassium or K written into Group 1*

1

(d) (i) reacts rapidly **or** quickly **or** fast

*credit melts or fizzes or dissolves or violently or less violently (than K)*

1

sodium hydroxide **or** hydrogen

*credit NaOH or H<sub>2</sub>*

1

(ii) add universal indicator

*credit add indicator or litmus or use pH paper*

1

turns blue **or** purple

*credit 'it goes purple' providing something has been added to the water*

1

(e) any two from

heat **or** warm

cut it up **or** have smaller pieces or larger surface area

*do not accept more lithium **or** less water*

stir

2

[10]

47

(a) (i) any **one** from

noble gases inert gases

*accept group 0 **or** group 8 do not accept rare gases*

1

(ii) any **pair** from

*an appropriate reason gains the second mark*

balloons lighter than air

airships lighter than air **or** non-flammable

*do not accept light*

*do not accept they go up **or***

*rise in the air **or** unreactive*

for divers insoluble in blood **or**

(air supply) to stop the bends

2

(iii) neon **or** argon

*accept krypton, xenon, radon*

1

(iv) Ne **or** Ar

*accept Kr, Xe, Rn*

*do not accept NE **or** AR **or** ne*

***or** ar etc*

1

(b) any **two** from

oxygen

nitrogen

hydrogen

chlorine

fluorine

2

(c) any **pair** from

*the first mark for the name and the  
second mark for the correct symbol*

sodium	Na
potassium	K
lithium	Li

*accept rubidium, caesium, francium Rb,  
Cs, Fr*

*do not accept NA or na etc*

2

(d) any **one** from

low density

*accept floats on water*

soft

*accept malleable **or** ductile*

grey

shiny when cut

conducts electricity **or** heat

1

**[10]****48**

(a) 2.8.2. magnesium or 2.8.8.2. calcium

inner shell (2)

outer shell (2)

intermediate shell/s correct

element named to match structure

*each for 1 mark*

*(Structure correct for element name but not in group  
2, award 2 marks)*

4

- (b) Similar hydrogen and/or an alkali/hydroxide produced  
*for 1 mark*
- Reasons: chemical reaction involves loss of an electron  
 Na + Li have the same number of electrons in the outer  
 shell  
 (do not allow same group of p.table)  
*each for 1 mark*
- Different rate of reaction faster for sodium\*  
*for 1 mark*
- Reason: outer electron more easily lost from the sodium atom  
 [\* allow sodium hydroxide produced]  
*for 1 mark*

5

[9]

49

- (a) (i) 9  
 (ii) 2.8.7 gas  
 (iii) liquid  
*each for 1 mark*
- (b) increase as go down the table/F → I/down group/  
 as more protons/as atoms get bigger  
*for 1 mark*
- (c) (i) reactions depend on taking/sharing electrons  
 same number of electrons in outer shell/highest energy level  
 (ii) F → I electrons in a higher energy level/further from nucleus  
 so less easy to gain/hold electrons  
*each for 1 mark*

4

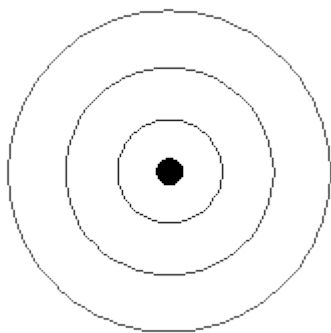
1

4

[9]

50

(a)



each shell completed correctly  
[for written 2.8.2 award 1 mark]

*for 1 mark each*

3

(b) idea that

- chemical reactions of metals, involves losing electrons  
*for 1 mark*
- these three elements have the same number of electrons in the outer shell/highest energy level  
*gains 1 mark*

**but**

- these three elements all have two electrons in the outer shell/highest energy level  
*gains 2 marks*

All form ions with a 2+ charge gains all 3 of these marks

- reactivity depends on how easily the electrons are lost  
*for 1 mark*
- the further the electrons are from the nucleus/the higher the energy level they are in, the more shells the atom has\* then the more easily they are lost  
*for 1 mark*
- in calcium the electrons are further from the nucleus than in magnesium than in beryllium  
*for 1 mark*

**or** as you go down the group .....  
(\*not just "the more electrons"....)

6

[9]

- 51** (a) (i) W and Z (allow oxygen and sulphur)  
*for 1 mark*
- (ii) Group 6  
*for 1 mark*
- (b) W and Y (allow oxygen and nitrogen or correct symbol for any 2 gaseous elements)  
*for 1 mark*
- (c) (i) (S) • produce an alkali/hydroxide *each*  
• produce hydrogen or idea of effervescence
- (D) • (alkali is) sodium hydroxide  
• the reaction is faster/more vigorous  
*any 3 • for 1 mark*
- (ii) *ideas that*  
potassium is further down the group or more electron shells  
*gains 1 mark*
- but** because the electrons in potassium are further from the nucleus/in a more outer shell / in a higher energy level  
*gains 2 marks*
- so they are most easily lost **or** less strongly pulled/held by nucleus  
*for 1 mark*

2

1

3

3

[9]

- 52** (a) sodium / magnesium / aluminium (*Allow correct symbols*)  
*for 1 mark*
- (b) argon (*Allow correct symbols*)  
*for 1 mark*
- (c) chlorine (*Allow correct symbols*)  
*for 1 mark*

1

1

1

[3]



53

- correct reactants (i.e. sodium + water either way round)
- correct products (i.e. sodium hydroxide + hydrogen, either way round)
- arrow  $\rightarrow$  / = [do not allow produce/makes or similar]

[do not allow symbols or formulae]

*each for 1 mark*

[3]

54

(a) *ideas that*

- hydrogen is in a group / is with the halogens
- only seven groups / no group O / no noble gases / fewer elements
- halogens are in the first group / Group 1
- other elements are in one group higher / one example
- modern table only has two elements in the top row/period
- metals and non-metals are not separated
- arranged in increasing mass number [*Credit converse answers*]  
*any three for 1 mark each*

3

(b) *ideas that*

- all rows / periods are the same length / have seven elements
- all elements had to be in one of the groups
- he didn't know about the noble gases / not all the elements  
had been discovered
- he didn't know about atomic number / proton number / atomic structure  
/ electron structure  
*any one for 1 mark*

1

[4]

55

(a) ideas that

- hydrogen is in a group / is with the halogens
- only seven groups / no group O / no noble gases / fewer elements
- halogens are in the first group / Group 1
- other elements are in one group higher (*or example*)
- modern table only has two elements in the top row / period
- modern table not in order of atomic weight/mass
- metals and non-metals not at opposite ends

*(NB allow converse answers throughout)**any three for 1 mark each*

3

(b) ideas that

- all rows / periods are the same length / have seven elements
- all elements had to be in one of the groups
- he didn't know about the noble gases / not all the elements had been discovered
- he didn't know about atomic/proton number/electron structure
- he arranged elements in order of atomic weight/mass

*any one for 1 mark*

1

(c) (i) *ideas that*  
tellurium and iodine are in reverse order*for 1 mark*

1

(ii) elements are arranged in order of proton (atomic) number  
or based on electron structure/outer shell electrons  
(so tellurium is correctly placed before iodine)*[tellurium = 'dead mark']**each for 1 mark*

2

**[7]**

56

- (a) A is sodium/Na\*  
B is argon/Ar\*

*each for 1 mark*  
*(\*case of letters must be correct)*

2

- (b) (i) *ideas that*

- outer electron (in element C / 2.8.8.1 / potassium) is at a higher energy level / in a more outer shell/further away from nucleus / shielded by more full electron shells
  - electron is more easily lost/less strongly held / attracted
- each for 1 mark*

2

- (ii) *ideas that*

- (element B / 2.8.8 / argon) has an outer shell that is complete/has 8 electrons
  - no tendency to gain or lose electrons / has a stable configuration
  - (not 'is stable' / 'in group O' / 'a noble gas')
- each for 1 mark*

2

**[6]**

57

- (a) • water  
*(allow acid\*)*
- (metal) hydroxide (solution)/alkali  
*(allow metal salt / compound)*
- hydrogen  
*(allow hydrogen)*  
*for 1 mark each*

(\*if named acid then matching salt)

**or**

- oxygen / chlorine / halogen
- for 1 mark
- oxide / chloride / halide  
*gains 1 mark*

**but**

- named oxide(s) *gains 2 marks*  
(accept fully correct formulae throughout)

3

(b) *idea that*

- hydrogen and iodine would only react if heated to > 200°C / a high temperature (*ignore* reference to light / dark)
- reactivity decreases down the Group / iodine is lower in the Group than bromine / iodine is the lowest in the Group

(**or** converse N.B. credit this idea here even if given in (d))

*for 1 mark each*

2

(c)  $\text{H}_2 + \text{Cl}_2 \rightleftharpoons 2\text{HCl}$  or  $\frac{1}{2}\text{H}_2 + \frac{1}{2}\text{Cl}_2 \rightarrow \text{HCl}$

*for 1 mark*

1

(d) idea that (or converse)

- in atoms lower down the Group the electrons in the outer shell / highest energy level (of electrons) are further from the nucleus  
**or shielded by** more (inner) shells / electrons

[but not simply “more electrons”]

**or** are less strongly attracted to the nucleus

- so an electron is less easily gained  
*for 1 mark each*

2

**[8]**