AS-LEVEL PAPER 1 PP7 MS

**1.**       (a)     2s22p63s1

*1s2 can be rewritten  
Allow 2s22px22py22pz23s1Allow subscripts and capitals*

**1**

(b)     (i)      Energy/enthalpy (needed) to remove one mole of electrons  
from one mole of atoms/compounds/molecules/elements

**1**

***OR***

Energy to form one mole of positive ions from one mole of atoms

OR

Energy/enthalpy to remove one electron from one atom

In the gaseous state (to form 1 mol of gaseous ions)

*Energy given out loses M1*

*M2 is dependent on a reasonable attempt at M1*

*Energy needed for this change  
X(g) → X+(g) + e(–) = 2 marks  
This equation alone scores one mark*

**1**

(ii)     Mg+(g) → Mg2+(g) + e(–)Mg+(g) + e(–) → Mg2+(g) + 2e(–)Mg+(g) – e(–) → Mg2+(g)

*Do not penalise MG  
Not equation with X*

**1**

(iii)     Electron being removed from a positive ion (therefore need more  
energy)/electron being removed is closer to the nucleus/Mg+smaller (than Mg)/Mg+ more positive than Mg

*Allow from a + particle/species  
Not electron from a higher energy level/or higher sub-level  
More protons = 0*

**1**

(iv)    Range from 5000 to 9000 kJ mol–1

**1**

(c)     Increase

*If decrease CE = 0/3  
If blank mark on*

**1**

Bigger nuclear charge (from Na to Cl)/more protons

*QWC*

**1**

electron (taken) from same (sub)shell/similar or same shielding/  
electron closer to the nucleus/smaller atomic radius

*If no shielding = 0  
Smaller ionic radius = 0*

**1**

(d)     Lower

*If not lower CE = 0/3  
If blank mark on  
Allow does not increase*

**1**

Two/pair of electrons in (3)p orbital or implied

*Not 2p*

**1**

repel (each other)

*M3 dependent upon a reasonable attempt at M2*

**1**

(e)     Boron/B or oxygen/O/O2

**1**

**[13]**

**2.**      (a)     Mg + 2HCl → MgCl2 + H2

**1**

MgO + 2HCl → MgCl2 + H2O

*Allow ionic equations*

**1**

(b)     Hydrogen collection  
Using a gas syringe or measuring cylinder/ graduated vessel over water

*Allow if shown in a diagram*

**1**

          Measurements                              (i) P 1  
                                                      (ii) T 1  
                                                      (iii) V 1

Use ideal gas equation to calculate mol hydrogen or mass/*M*r  
Mol H2 = mol Mg (Mark consequentially to equation)

**2**

(c)     MgCl2 + 2NaOH → Mg(OH)2 + 2NaCl Species

**1**

          Balanced

**1**

*Allow an ionic equation*

          Mg(OH)2 → MgO + H2O

**1**

(d)     ***Allow 2 significant figures in these calculations and  
ignore additional figures***

          EITHER

          Mol MgO obtained stage 2 = mass MgO/*M*rMgO

**1**

          = 6.41/ 40.(3)                     = 0.159 *Allow 0.16*

*Allow method mark if formula of magnesium oxide or Mr incorrect*

**1**

          Moles of Mg = moles of H2 hence

Mol original MgO = mol MgO from stage 2 - mol H2

**1**

= 0.159 – 0.0528 = 0.106 *Allow 0.11*

*Mark consequentially to moles of magnesium oxide determined above*

          OR

          Mass MgO formed from Mg = 0.0528 × *M*r MgO {or 40.(3)}             **(1)**

= 2.13 g

*Allow 2.1* ***(1)***

*Allow method mark if formula of magnesium oxide or Mr incorrect*

          Mass original MgO = total mass MgO - mass formed from Mg

                             = 6.41 – 2.13 = 4.28 g           *Allow 4.3*                 **(1)**

Mark consequentially mass of magnesium oxide determined above

Mol original MgO = 4.28/40.3 = 0.106 (1)

Moles of MgO in 100 g = 100/6.25 x 0.106 = 1.70

**1**

**[15]**

**3.** (a)     Covalent

*If not covalent CE = 0/2*

*If dative covalent CE = 0/2*

*If blank mark on*

*Ignore polar*

*If number of pairs of electrons specified, must be 3*

**1**

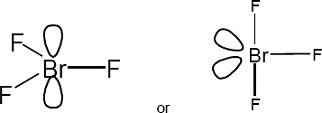
Shared pair(s) of electrons / one electron from Br and one electron from F

*Not 2 electrons from 1 atom*

*Not shared pair between ions/molecules*

**1**

(b)     (i)



*BrF3 should have 3 bp and 2 lp and correct atoms for the mark*

*Penalise Fl*

**1**

BrF3 if trigonal planar shown = 120°

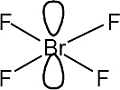
*Allow 84 – 90° or 120° and ignore 180°*

or if T shape shown 84 – 90°

*Irrespective of shape drawn*

**1**

(ii)



*BrF4– should have 4 bp and 2 lp and all atoms for the mark(ignore sign)*

*Allow Fl*

**1**

BrF4– 90°

*Only*

*Ignore 180°*

**1**

(c)     Ionic or (forces of) attraction between ions / bonds between ions

*If molecules, IMF, metallic, CE =0*

*If covalent bonds mentioned, 0/3, unless specified within the BrF4– ion and not broken*

*Ignore atoms*

**1**

Strong (electrostatic) attraction / strong bonds / lots of energy needed to break  
bonds

**1**

Between K+ and BrF4– ions/oppositely charged ions / + and – ions

*If ions mentioned they must be correct*

*Strong bonds between + and – ions =3/3*

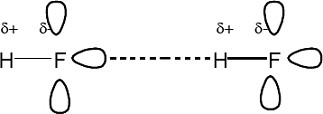
**1**

(d)     (i)     Hydrogen bonds/hydrogen bonding/H bonds/H bonding

*Not just hydrogen*

**1**

(ii)



*One mark for 4 partial charges*

*One mark for 6 lone pairs*

*One mark for H bond from the lone pair to the Hδ+*

*Allow Fl*

*If more than 2 molecules are shown they must all be correct.Treat any errors as contradictions within each marking point.*

*CE = 0/3 if incorrect molecules shown.*

**3**

(e)     vdw / van der Waals forces between molecules

*QoL*

*Not vdw between HF molecules, CE = 0/2*

*vdw between atoms, CE = 0/2*

*If covalent, ionic, metallic, CE=0/2*

**1**

IMF are weak / need little energy to break IMF / easy to overcome IMF

**1**

**[15]**

**4.**      (a)      (i)     **M1**    iodine ***OR*** I2 OR I3–

*Ignore state symbols*

*Credit* ***M1*** *for “iodine solution”*

**M2**    Cl2 + **2**I –  **2**Cl – + I2***OR***½ Cl2 + I –  Cl – + ½ I2

*Penalise multiples in M2 except those shown*

***M2*** *accept correct use of I3–*

**M3**    redox or reduction-oxidation or displacement

**3**

(ii)     **M1**    (the white precipitate is) silver chloride

***M1*** *must be named and for this mark ignore incorrect formula*

**M2**    Ag+ + Cl –  AgCl

*For* ***M2*** *ignore state symbols*

*Penalise multiples*

**M3**    (white) precipitate / it dissolves

***OR***    colourless solution

*Ignore references to “clear” alone*

**3**

(b)     (i)      **M1**    H2SO4 + **2**Cl –  **2**HCl + SO42–

*For* ***M1*** *ignore state symbols*

***OR***    H2SO4 + Cl–  HCl + HSO4–

*Penalise multiples for equations and apply the list principle*

***OR***    H+ + Cl–  HCl

**M2**    hydrogen chloride ***OR*** HCl ***OR*** hydrochloric acid

**2**

(ii)     **M1 and M2 in either order**

*For* ***M1*** *and* ***M2****, ignore state symbols and credit multiples*

**M1    2**I –  **I**2 + **2**e –

***OR***

         8I –  4I2 + 8e –

*Do not penalise absence of charge on the electron*

*Credit electrons shown correctly on the other side of each equation*

**M2** H2SO4 + 8H+ + 8e –  H2S + 4H2O

**OR**

SO42– + 10H+ + 8e –  H2S + 4H2O

# Additional equations should not contradict

**M3**oxidising agent / oxidises the iodide (ions)

***OR***

electron acceptor

**M4** sulfur *OR* S *OR* S2 *OR* S8 *OR* sulphur

**4**

**(iii)     M1**The NaOH / OH– / (sodium) hydroxide reacts with / neutralises the H+ / acid / HBr (lowering its concentration)

***OR*** a correct neutralisation equation for H+ or HBr with NaOH or with  
hydroxide ion

# Ignore reference to NaOH reacting with bromide ions

*Ignore reference to NaOH reacting with HBrO alone*

**M2** Requires a correct statement for M1

The (position of) equilibrium moves / shifts(from L to R)

•        to replace the H+ / acid / HBr that has been removed / lost

•        *OR*  to increase the H+ / acid / HBr concentration

•        *OR* to make more H+ / acid / HBr / product(s)

•        *OR* to oppose the loss of H+ / loss of product(s)

•        *OR* to oppose the decrease in concentration of product(s)

*In M2, answers must refer to the (position of) equilibrium shifts / moves and is not enough to state simply that it / the system / the reaction shifts to oppose the change.*

## M3    The (health) benefit outweighs the risk or wtte

***OR***

a clear statement that once it has done its job, little of it remains

***OR***

used in (very) dilute concentrations / small amounts / low doses

**3**

**[15]**

|  |  |
| --- | --- |
| **5.** |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

**6.** C

**[1]**

**7.** C

**[1]**

**8.** D

**[1]**

**9.** A

**[1]**

**10.** D

**[1]**

**11.** B

**[1]**

**12.** D

**[1]**

**13.** A

**[1]**

**14.** A

**[1]**

**15.** D

**[1]**

**16.** A

**[1]**

**17.** B

**[1]**

**18.** B

**[1]**

**19.** D

**[1]**