

M1.(a) because they are gases

ignore vapours / evaporate / (g)

allow it is a gas

1

(b) (i) 80 / 79.5

correct answer with or without working = 2 marks

ignore units

*if no answer **or** incorrect answer then evidence of*

64 / 63.5 + 16 gains 1 mark

2

(ii) 79.375 - 80

correct answer with or without working = 2 marks

*if no answer **or** incorrect answer then evidence of*

$\frac{64}{80}$ or $\frac{63.5}{79.5}$ ($\times 100$) gains 1 mark

accept (ecf) $\frac{64 \text{ or } 63.5}{\text{answer (b)(i)}} \times 100$ for 2 marks

if answer correctly calculated.

if incorrectly calculated evidence of $\frac{64 \text{ or } 63.5}{\text{answer (b)(i)}} (\times 100)$ gains 1 mark

2

(iii) 3.2

correct answer with or without working = 1 mark

allow (ecf)

4 x ((b)(ii)/100) for 1 mark if correctly calculated

1

(c) (i) 3.3

*accept 3.33..... **or** 3 1/3 **or** 3.3•*

***or** 3.3r*

1

- (ii) (measure to) more decimal places **or** (use a) more sensitive balance / apparatus
*allow use smaller scale (division) **or** use a smaller unit*
ignore accurate / repeat

1

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

*ignore systematic / human / apparatus / zero / measurement /
random / weighing / reading / recording errors unless qualified*

different balances used **or** faulty balance

ignore dirty apparatus

reading / using the balance incorrectly

accept incorrect weighing of copper / copper oxide

spilling copper oxide / copper

allow some copper left in tube

copper oxide impure

allow impure copper (produced)

not all of the copper oxide was reduced / converted to copper **or** not enough /
different amounts of methane used

accept not all copper oxide (fully) reacted

heated for different times heated at different temperatures

*if neither of these points awarded allow different amounts of heat
used*

accept Bunsen burner / flame at different temperatures

some of the copper produced is oxidised / forms copper oxide

some of the copper oxide / copper blown out / escapes (from tube)

ignore some copper oxide / copper lost

some water still in the test tube

2

[10]

M2.(a) electrons transferred from potassium to sulfur 1

two potassium atoms each lose one electron 1

forming K^+ / 1+ ions 1

sulfur atoms gain 2 electrons 1

forming S^{2-} / 2- ions 1

(b) there are no gaps / sticks between the potassium ions and sulfide ions 1

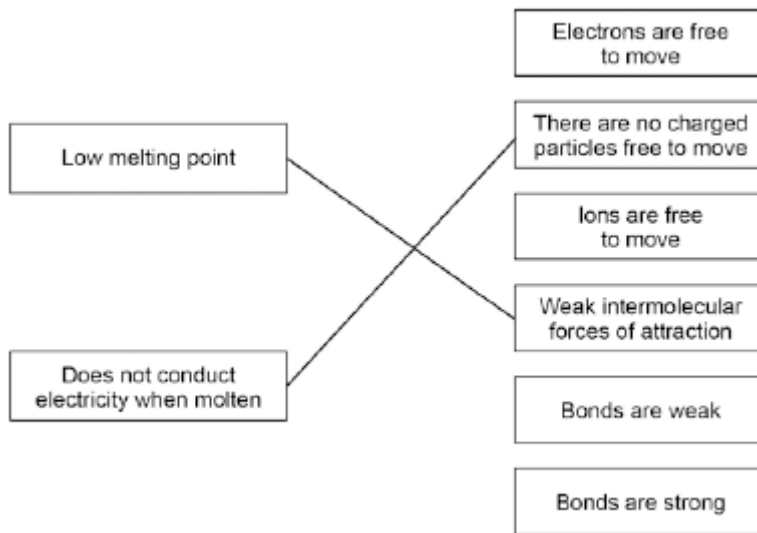
(c) (two) shared pairs between H and S 1

rest correct - no additional hydrogen electrons and two non-bonding pairs on sulfur
second mark dependent on first 1

(d) 342 2

allow 1 mark for evidence of $(2 \times 27) + 3[32 + (16 \times 4)]$

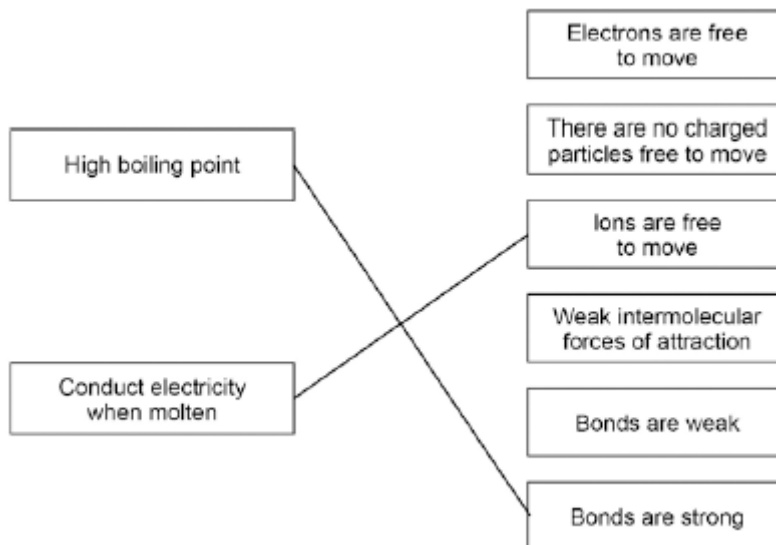
(e) **Property** **Explanation of property**



more than one line drawn from a variable negates the mark

2

(f) **Property** **Explanation of property**



more than one line drawn from a variable negates the mark

2

[14]

M3. (a) (i) 40

correct answer with or without working **or** incorrect working
if the answer is incorrect then evidence of $24 + 16$ gains **1** mark
ignore units

2

(ii) 60

correct answer with **or** without working or incorrect working
if the answer is incorrect then evidence of $24/40$ **or** $24/(i)$ gains **1** mark
ecf allowed from part(i)
ie $24/(i) \times 100$
ignore units

2

(iii) 15

ecf allowed from parts(i) and (ii)
 $24/(i) \times 25$ or $(ii)/100 \times 25$
ignore units

1

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

ignore gas is lost

- error in weighing magnesium / magnesium oxide
allow some magnesium oxide left in crucible
- loss of magnesium oxide / magnesium
allow they lifted the lid too much
allow loss of reactants / products
- not all of the magnesium has reacted
allow not heated enough
allow not enough oxygen / air

2

(ii) any **two** from:

ignore fair test

- check that the result is not anomalous
- to calculate a mean / average
allow improve the accuracy of the mean / average
- improve the reliability
allow make it reliable
- reduce the effect of errors

2

[9]

M4. (a) 1.86

ignore units / 1.9

1

(b) use a balance which weighs to more decimal places

accept (use a measuring cylinder with) smaller (scale) divisions / intervals

or use more sensitive balance

allow reference to more decimal places allow smaller units / scale

1

(c) (i) 45.8(3333333)

correct answer gains 2 marks with or without working

ignore units / 46

if the answer is not correct then evidence of:

(45.4 + 46.3 + 45.8) ÷ 3

or 137.5 ÷ 3

or 47.25 / 47.3 / 47.2 gains 1 mark

2

(ii) any **two** from:

ignore zero error / faulty equipmen

- loss of gas **or** leak
- error in measurement of volume of gas / gas in cylinder / 1 dm³
- error in weighing the canister / gas at start
- error in weighing the canister / gas at end
error in weighing the canister / gas = 1 mark
- change in temperature
allow incorrect measurement of temperature
- change in pressure
allow incorrect measurement of pressure
if no other mark awarded allow error in weighing for 1 mark

2

(iii) any **one** from:

*ignore fair test / precise / valid **or** to check for errors / mistakes*

- check for anomalous results
- to find the mean / average
allow improve (accuracy of) mean / average
- (improve) reliability / make reliable

1

(d) 44

*correct answer gains **2** marks with or without working*

ignore units

*if the answer is incorrect evidence of $(3 \times 12) / 36$ **and** $(8 \times 1) / 8$
gains **1** mark*

2

[9]

M5. (a) because they are gases
 ignore vapours / evaporate / (g)
 allow it is a gas

1

(b) (i) 80 / 79.5
 correct answer with or without working = **2** marks
 ignore units
 if no answer **or** incorrect answer then evidence of 64 / 63.5 + 16
 gains **1** mark

2

(ii) 80 / 79.87 / 79.9 / 79.375 / 79.38 / 79.4
 correct answer with or without working = **2** marks
 if no answer **or** incorrect answer
 then

evidence of $\frac{64}{80}$ **or** $\frac{63.5}{79.5}$ (x100) gains **1** mark

accept (ecf)

$\frac{64 \text{ or } 63.5}{\text{answer}(b)(i)} (\times 100)$
 for **2** marks if correctly calculated
 if incorrectly calculated

evidence of $\frac{64 \text{ or } 63.5}{\text{answer}(b)(i)} (\times 100)$
 gains **1** mark

2

(iii) 3.2
 correct answer with or without working = **1** mark
 allow (ecf)
 4 x ((b)(ii)/100) for **1** mark if correctly calculated

1

(c) (i) 3.3

accept 3.33..... or $3\frac{1}{3}$ or 3.3 or 3.3

1

- (ii) *measure to more decimal places*
or use a more sensitive balance / apparatus
allow use smaller scale (division)
or use a smaller unit
ignore accurate / repeat

1

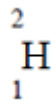
(iii) any **two** from:

- *ignore systematic / human / apparatus / zero / measurement / random / weighing / reading errors unless qualified*
- *different balances used or faulty balance*
ignore dirty apparatus
- *reading / using the balance incorrectly or recording error*
accept incorrect weighing of copper / copper oxide
- *spilling copper oxide / copper*
allow some copper left in tube
- *copper oxide impure*
allow impure copper (produced)
- *not all of the copper oxide was reduced / converted to copper*
or not enough / different amounts of methane used
accept not all copper oxide (fully) reacted
- *heated for different times*
- *heated at different temperatures*
accept Bunsen burner / flame at different temperatures
- *some of the copper made is oxidised / forms copper oxide*
- *some of the copper oxide / copper blown out / escapes (from tube)*
ignore some copper oxide / copper lost
- *some water still in the test tube*

2

[10]

M6. (a)



2 and 1 must be on the left

2 must be above half-way on the H and the 1 below half-way

accept diagram with 2 different particles in centre and 1 particle on circle

1

(b) (i) 18

ignore working

ignore units

1

(ii) forces (of attraction) between molecules **or**
bonding between molecules **or**
intermolecular forces /intermolecular bonds

1

are weak **or** not much energy needed to break them **or** easily overcome
must be linked to first mark

if no other mark awarded allow small molecules / small M_r for 1 mark

allow forces / bonds are weak for 1 mark

do **not** allow covalent bonding is weak

1

(c) any reference to more protons = 0 marks

H-2 atoms have 1 proton and 1 neutron

allow H-2 has more neutrons / particles for 1 mark

1

H-1 atoms have one proton

allow H-2 has two particles and H-1 has one particle for 1 mark

or

H-2 atom has one neutron (1)

allow H-2 atom has one more neutron for 2 marks

H-1 atom has no neutrons (1)

NB *heavy water (molecule) has 2 more neutrons = 2 marks*

heavy water (molecule) has more neutrons / particles = 1 mark

*if no other mark awarded then heavy water molecule has **M**, of 20
= 1 mark*

ignore reference to electrons

1

[6]