

Year 11 Chemistry A' level Bridging work W/C 4/5/20MARK SCHEME FOR QUANTITATIVE CHEMISTRY QUESTIONS

Q1. (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) i.e. $24/(i) \times 100$
 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]

- Q2. (a)** 152 correct answer with **or** without working = **2 marks**
 56 + 32 + (4 × 16) gains **1** mark
ignore any units **2**
- (b) 152g(rams)
ecf from the answer to (a) and g
must have unit g / gram / gramme / grams etc
*accept g / mol **or** g per mole **or** g mole⁻¹ **or** g/mol **or** g per mol **or** g mol⁻¹*
*do **not** accept g m*
*do **not** accept G* **1**
- (c) 76(g)
ecf from their answer to (a) or (b) divided by 2
ignore units **1**
- [4]**
- Q3. (a)** lithium (atom) loses (one) electron(s) **1**
 chlorine (atom) gains (one) electron(s) **1**
 reference to transfer of one electron **1**
 to form positive and negative ions
allow to form noble gas electronic structures
or
allow to form stable electron arrangements
or
allow to form full outer shells
or
allow reference to ionic bonding **1**
- (b) $\frac{161}{81+98} \times 100$ **1**
 = 89.944134 **1**
 = 89.9 (%) **1**
*an answer of 89.9 (%) scores **3** marks*
- (c) more sustainable **or** less waste
allow any sensible economic or environmental reason but not 'cheaper'
without qualification **1**

(d) $50 / 1000 \text{ (dm}^3\text{) or } 0.05 \text{ dm}^3$

or

$80 / 1000 \text{ (g / cm}^3\text{) or } 0.08 \text{ g / cm}^3$

1

$= 4(.00) \text{ (g)}$

1

an answer of 4(.00) (g) scores 2 marks

[10]

M4. (a) any four from:

- sulphuric acid measure by pipette
or diagram
- potassium hydroxide in burette
or diagram
- if solutions reversed, award
- note initial reading
- use of indicator
- note final reading or amount used

4

(b) $\frac{34 \times 2}{1000}$

1

$= 0.068$

1

(c) $\frac{1}{2}$ or 0.5 moles H_2SO_4 react with 1 mole KOH

1

moles H_2SO_4 in $25.0 \text{ cm}^3 = 0.068 \times 0.5$

1

\therefore moles H_2SO_4 in $1 \text{ dm}^3 = \frac{0.068 \times 0.5 \times 1000}{25} = 1.36 \text{ mol/dm}^3$

1

[9]

- M5. (a)** pipette / burette **1**
- (b) named indicator eg methyl orange / phenolphthalein
not universal
 accept litmus but **not** litmus paper **1**
- (c) $\frac{25 \times 0.4}{1000}$
 2 for correct answer **1**
- = 0.01 **1**
- (d) 1KOH \equiv 1 HCl
 \therefore 0.01 moles HCl in 35 cm³ **1**
- $\therefore \frac{0.01 \times 1000}{35} = 0.29$
 2 for correct answer
 0.3 = (1) (with correct working = (2)) **1**
- [6]**
- Q6. (a)** (sulfuric acid is) completely / fully ionised **1**
- In aqueous solution **or** when dissolved in water **1**
- (b) $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$
allow multiples
1 mark for equation
1 mark for state symbols **2**

- (c) adds indicator, eg phenolphthalein / methyl orange / litmus added to the sodium hydroxide (in the conical flask)
do not accept universal indicator 1
- (adds the acid from a) burette 1
- with swirling **or** dropwise towards the end point **or** until the indicator just changes colour 1
- until the indicator changes from pink to colourless (for phenolphthalein) or yellow to red (for methyl orange) or blue to red (for litmus) 1
- (d) titrations 3, 4 and 5
or
$$\frac{27.05 + 27.15 + 27.15}{3}$$
 1
- 27.12 cm³
accept 27.12 with no working shown for 2 marks 1
allow 27.1166 with no working shown for 2 marks
- (e) Moles H₂SO₄ = conc × vol = 0.00271
allow ecf from 8.4 1
- Ratio H₂SO₄:NaOH is 1:2
or
Moles NaOH = Moles H₂SO₄ × 2 = 0.00542 1
- Concentration NaOH = mol / vol = 0.00542 / 0.025 = 0.2168 1
- 0.217 (mol / dm³)
accept 0.217 with no working for 4 marks 1
accept 0.2168 with no working for 3 marks

(f) $\frac{20}{1000} \times 0.18 = \text{no of moles}$

or

$0.15 \times 40 \text{ g}$

1

0.144 (g)

1

accept 0.144g with no working for 2 marks

[16]

Q7. (a) add excess copper carbonate (to dilute hydrochloric acid)

accept alternatives to excess, such as 'until no more reacts'

1

filter (to remove excess copper carbonate)

reject heat until dry

1

heat filtrate to evaporate some water or heat to point of crystallisation

accept leave to evaporate or leave in evaporating basin

1

leave to cool (so crystals form)

until crystals form

1

must be in correct order to gain 4 marks

(b) $M_r \text{ CuCl}_2 = 134.5$

correct answer scores 4 marks

1

moles copper chloride = $(\text{mass} / M_r = 11 / 134.5) = 0.0817843866$

1

$M_r \text{ CuCO}_3 = 123.5$

1

Mass CuCO_3 (=moles $\times M_2 = 0.08178 \times 123.5) = 10.1(00)$

1

accept 10.1 with no working shown for 4 marks

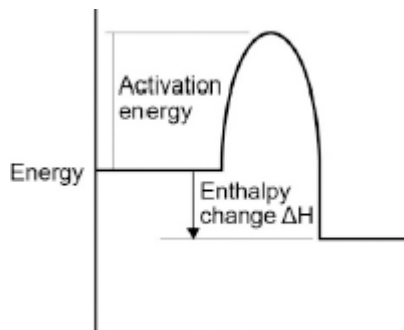
- (c) $\frac{79.1}{100} \times 11.0$
or
 11.0×0.791 **1**
 8.70 (g) **1**
accept 8.70(g) with no working shown for 2 marks
- (d) Total mass of reactants = 152.5 **1**
134.5
 152.5
allow ecf from step 1 **1**
 88.20 (%) **1**
allow 88.20 with no working shown for 3 marks
- (e) atom economy using carbonate lower because an additional product is made **or** carbon dioxide is made as well
allow ecf **1**
[14]
- Q8.** (a) circle round any one (or more) of the covalent bonds
any correct indication of the bond – the line between letters **1**
- (b) Methane contains atoms of two elements, combined chemically **1**

- (c) (i) activation energy labelled from level of reagents to highest point of curve

ignore arrowheads

1

enthalpy change labelled from reagents to products



*arrowhead **must** go from reagents to products only*

1

- (ii) 2O_2

1

$2 \text{H}_2\text{O}$

if not fully correct, award 1 mark for all formulae correct.

ignore state symbols

1

- (iii) carbon monoxide is made

1

this combines with the blood / haemoglobin **or** prevents oxygen being carried in the blood / round body **or** kills you **or** is toxic **or** poisonous

dependent on first marking point

1

- (iv) energy is taken in / required to break bonds

accept bond breaking is endothermic

1

energy is given out when bonds are made

accept bond making is exothermic

1

the energy given out is greater than the energy taken in

this mark only awarded if both of previous marks awarded

1

- (d) (i) energy to break bonds = 1895
calculation with no explanation max = 2 **1**
- energy from making bonds = 1998 **1**
- 1895 – 1998 (= -103)
or
energy to break bonds = 656
energy from making bonds = 759
656 – 759 (= -103)
allow:
bonds broken – bonds made =
413 + 243 – 327 – 432 = -103 for 3 marks. **1**
- (ii) The C — Br bond is weaker than the C — Cl bond **1**
- [15]**