1 **(a)** repeat experiment without indicator **or** use carbon to remove indicator [1]
(partially) evaporate **or** boil **or** heat [1]
allow to cool **or** crystallise **or** crystals [1]
dry crystals [1]
MUST be in correct order
NB evaporate to dryness, marks one and two **ONLY**

(b) number of moles of NaOH used = 0.025 x 2.24 = 0.056 [1]

maximum number of moles of $Na_2SO_4.10H_2O$ that could be formed = 0.028 [1]

mass of one mole of $Na_2SO_4.10H_2O$ = 322g

maximum yield of sodium sulphate – 10 - water = 9.02g [1]

percentage yield = 42.8% [1]
mark **ecf** but NOT to simple integers
if **ecf** marking, mark to at least one place of decimals
if percentage > 100% then 3/4 maximum

[Total: 8]

2 **(a) (i)** $Zn(OH)_2 = ZnO + H_2O$ **[2]**
reactant [1] products [1]

(ii) it would melt **or** it does not decompose **or** it does not react **[1]**
NOT no change

(iii) blue (solid) **[1]**
to black (solid) **[1]**
brown gas **[1]**

Mark consequentially to any error **but not involving simple integers**
There has to be some evidence that the candidate has attempted to work through the calculation and not merely inserted whole numbers.
For example 2, 1, 160 or 1, 0.5, 80
number of moles of $Fe_2(SO_4)_3$ = 1/40 **or** 0.025
number of moles of Fe_2O_3 formed = 1/40 **or** 0.025
mass of iron(III) oxide formed = 0.025 x 160 = 4g
number of moles of SO_3 produced = 3/40 **or** 0.075
volume of sulphur trioxide at r.t.p. = 0.075 x 25
= 1.8dm^3 **[5]**

TOTAL = 11

PhysicsAndMathsTutor.com

3 **(a)** **(i)** 3 ignore any charges [1]

(ii) high melting **or** boiling point
hard
poor conductor of electricity **or** heat
brittle
Any TWO [2]
NOT insoluble, dull, or malleable

(iii) carbon, graphite diamond silicon, germanium [1]
silicon (IV) oxide **or** silica **or** silicon dioxide **or** silicon oxide
or sand **or** silicon carbide **or** named polymer [1]

(iv) four around one [1]
cond looks tetrahedral **or** shows continuation [1]
For graphite layers [1] weak bonds between layers [1]
Accept any macromolecule, no link with (iii)
For polymer repeat unit [1] continuation [1]

(b) **(i)** white precipitate [1]
COND upon a precipitate
dissolves in excess or forms solution [1]

(ii) blue precipitate [1]
COND upon a precipitate
does not dissolve in excess [1]

(c) **(i)** number of moles CO_2 = 0.24/24 = 0.01
conseq number of moles of $CaCO_3$ and $MgCO_3$ = 0.01
conseq number of moles of $CaCO_3$ = 0.005 [3]

(ii) Calculate the volume of hydrochloric acid, 1.0 mole/dm^3, needed to react with one tablet.
number of moles of $CaCO_3$ and $MgCO_3$ in one tablet = 0.01
Expect same as answer to (c)(i). NO marks to be awarded. Just mark consequentially to this response
conseq number of moles of HCl needed
to react with one tablet = 0.02 [1]

conseq volume of hydrochloric acid, 1.0 mole/dm^3, needed to react with one tablet = 0.02 dm^3 or 20 cm^3 [1]

TOTAL = 16

4 (a) (i) preserve food **or** sterilising [1]
(ii) making paper [1]

(b) (i) making sulphuric acid **or** Contact Process [1]
(ii) oxygen [1]
(iii) vanadium oxide as catalyst (ignore oxidation state)
400 to 500 °C
pressure less than 10 atm
Any TWO [2]

(c) (i) pink **or** purple [1]
colourless **NOT** clear [1]
(ii) barium sulphate [1]
cond bromine oxidises **or** reacts with [1]
sulphur dioxide to form sulphate ion [1]

(d) the number of moles of SO_2 in the mixture = 0.125
the number of moles of Cl_2 in the mixture = 0.2
cond reagent was not in excess? SO_2
cond moles of SO_2Cl_2 formed = 0.125
cond the mass of sulphuryl chloride formed = 16.9g
[5]

TOTAL = 16

PhysicsAndMathsTutor.com