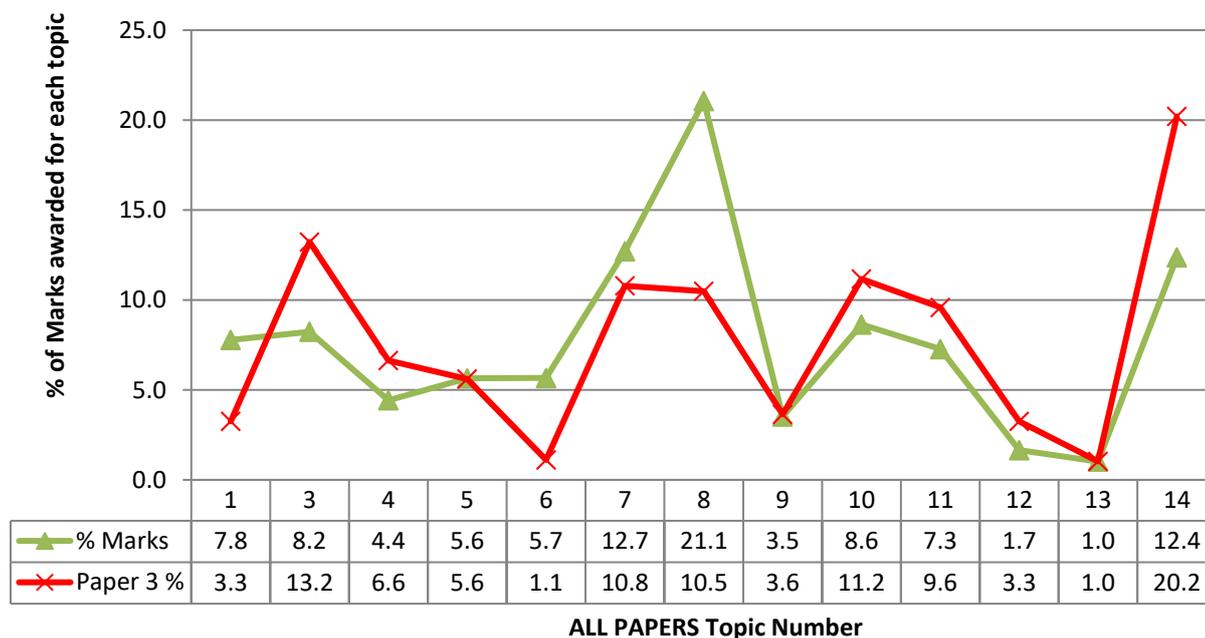


## iG Chem 12&amp;13 EQ P3 15w to 10s 4Teachers NEW 100marks

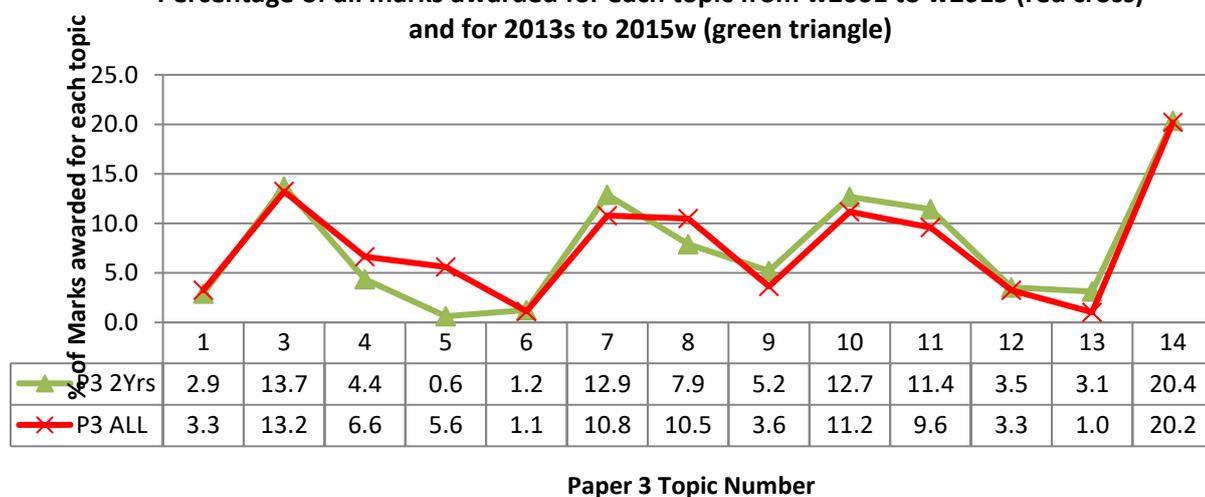
## PAPERS 1, 3 and 6

Percentage of all WEIGHTED marks awarded for each topic from w2001 to w2015 (green) and % of Paper 3 marks (red)



## PAPER 3

Percentage of all marks awarded for each topic from w2001 to w2015 (red cross) and for 2013s to 2015w (green triangle)



	Tot al	Che m 1	Che m 3	Che m 4	Che m 5	Che m 6	Che m 7	Che m 8	Che m 9	Che m 10	Che m 11	Che m 12	Che m 13	Che m 14
<u>Total Marks</u>	2320	74	312	155	81	26	256	246	85	296	231	76	24	474
% of Marks	2336	3.2	13.4	6.6	3.5	1.1	11.0	10.5	3.6	12.7	9.9	3.3	1.0	20.3
# of Questions		19	59	39	18	6	47	54	19	58	48	14	5	80
Average marks per Q		3.9	5.3	4.0	4.5	4.3	5.4	4.6	4.5	5.1	4.8	5.4	4.8	5.9



	1st Paper	1st P rank	Last Paper	Last P rank	Total # Papers	Marks/ paper	Theor. All Papers	Actual All Marks	Difference	Weight per paper	Weight per mark
Paper 1	2002s	5	2012w	26	22	40	880	869	-11	30	0.75
Paper 3	2001w	4	2015w	32	29	80	2320	2336	16	50	0.625
Paper 6	2001w	4	2015w	32	29	60	1740	1890	150	20	0.625

Topic	14	3	10	7	8	11	4	5	9	1	12	6	13
Rank ALL Papers	2	4	5	3	1	6	9	8	11	7	12	10	13
Rank P3: A* Focus	1	2	3	4	5	6	7	8	9	10	10	12	13
All Syllabus Word Count RANK	1	2	5	3	6	4	9	7	10	8	12	11	13

## CIE iGCSE Chemistry Syllabus Details

(syllabus code 0620)

The core material is examined in all three exam papers (papers 1,3 and 6) and is intended to assess understanding up to a grade C level. From 2016, the Supplement material is **examined in all three papers**, however, before 2016 papers 1 and 6 did not contain any Supplement material. If the number of marks that can be awarded above a C grade will remain the same, in practice this means that:

- Paper 3 will contain fewer Supplement marks, so more core marks so will be easier (if you can answer the Paper 3 questions from before 2016 then you will be fine)
- Papers 1 and 3 will contain Supplement marks, unlike in all papers before 2016, so will assess material they have not done before, so will be harder because of the questions and as there are no previous questions to practice on, will be harder because of the newness.

Material that is new or changed in 2016 is highlighted with BLACK LINES next to it.

12. Sulfur	
<p><b>Core</b></p> <ul style="list-style-type: none"> <li>Name some sources of sulfur</li> <li>Name the use of sulfur in the manufacture of sulfuric acid</li> <li>State the uses of sulfur dioxide as a bleach in the manufacture of wood pulp for paper and as a food preservative (by killing bacteria)</li> </ul>	<p><b>Supplement</b></p> <ul style="list-style-type: none"> <li>Describe the manufacture of sulfuric acid by the Contact process, including essential conditions and reactions</li> <li>Describe the properties and uses of dilute and concentrated sulfuric acid</li> </ul>
13. Carbonates	
<p><b>Core</b></p> <ul style="list-style-type: none"> <li>Describe the manufacture of lime (calcium oxide) from calcium carbonate (limestone) in terms of thermal decomposition</li> <li>Name some uses of lime and slaked lime such as in treating acidic soil and neutralising acidic industrial waste products, e.g. flue gas desulfurisation</li> <li>Name the uses of calcium carbonate in the manufacture of iron and cement</li> </ul>	



4 Zinc is extracted from zinc blende, ZnS.

(a) Zinc blende is heated in air to give zinc oxide and sulphur dioxide. Most of the sulphur dioxide is used to make sulphur trioxide. This is used to manufacture sulphuric acid. Some of the acid is used in the plant, but most of it is used to make fertilisers.

(i) Give another use of sulphur dioxide.

..... [1]

(ii) Describe how sulphur dioxide is converted into sulphur trioxide.

.....  
.....  
..... [3]

(iii) Name a fertiliser made from sulphuric acid.

..... [1]

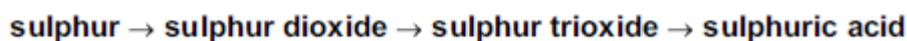
(iii) Explain, mentioning both rate and percentage yield, why the temperature used in the Contact process is 450°C.

.....  
..... [2]

(iv) Describe how the sulphur trioxide is changed into concentrated sulphuric acid.

.....  
..... [2]

5 Sulphuric acid is made by the Contact process in the following sequence of reactions.



(a) (i) How is sulphur dioxide made from sulphur?

..... [1]

(ii) Sulphur dioxide has other uses.  
Why is it used in the manufacture of paper?

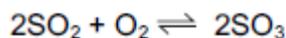
..... [1]

(iii) How does it preserve food?

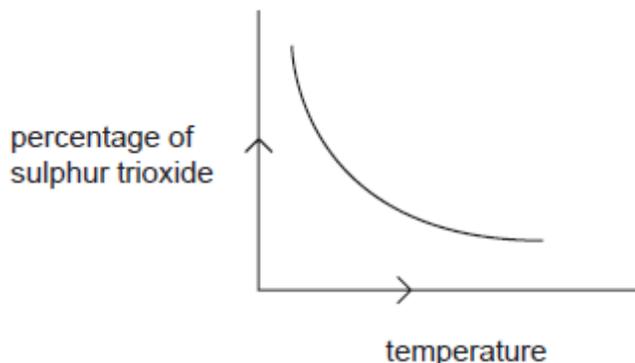
..... [1]



(b) The equation for a stage of the Contact process is



The percentage of sulphur trioxide in the equilibrium mixture varies with temperature.



(i) How does the percentage of sulphur trioxide in the equilibrium mixture vary as the temperature increases? Circle the correct answer.

increases

stays the same

decreases

[1]

(ii) Is the forward reaction in the equilibrium  $2\text{SO}_2 + \text{O}_2 \rightleftharpoons 2\text{SO}_3$  exothermic or endothermic? Give a reason for your choice.

.....  
..... [2]

Topic Chem 12 Q# 4/ iGCSE Chemistry/2005/s/Paper 3/Q4

(c) Sulphuric acid is manufactured by the Contact Process. Sulphur dioxide is oxidised to sulphur trioxide by oxygen.



(i) Name the catalyst used in this reaction.

..... [1]

(ii) What temperature is used for this reaction?

..... [1]

(iii) Describe how sulphur trioxide is changed into sulphuric acid.

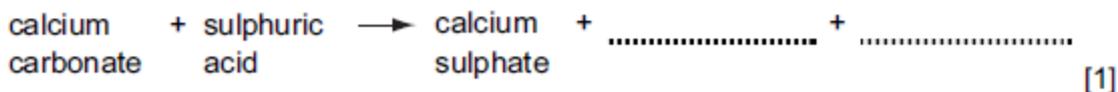
.....  
..... [2]



4 The Carlsbad caverns in New Mexico are very large underground caves. Although the walls of these caves are coated with gypsum (hydrated calcium sulphate), the caves have been formed in limestone.

(a) It is believed that the caves were formed by sulphuric acid reacting with the limestone.

(i) Complete the word equation.



(ii) Describe how you could test the water entering the cave to show that it contained sulphate ions.

test .....

result ..... [2]

(iii) How could you show that the water entering the cave has a high concentration of hydrogen ions?

..... [1]

(b) Hydrogen sulphide gas which was escaping from nearby petroleum deposits was being oxidised to sulphuric acid.

(i) Complete the equation for this reaction forming sulphuric acid.



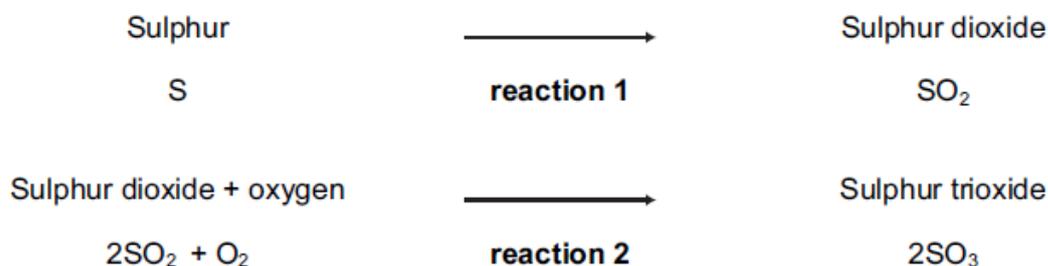
(ii) Explain why all the hydrogen sulphide should be removed from the petroleum before it is used as a fuel.

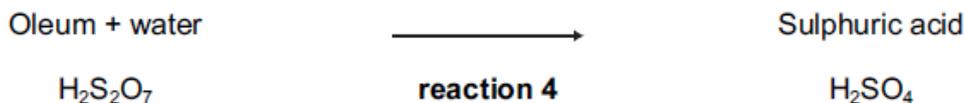
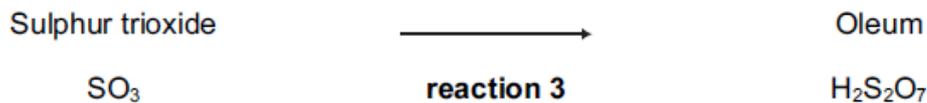
.....

..... [1]

2 Sulphur is used to make sulphuric acid. In the UK, the annual production of the acid is about 2.5 million tonnes.

(a) The reactions in the manufacture of sulphuric acid by the Contact Process are shown below.





(i) Give a large scale source of the element sulphur.

..... [1]

(ii) State another use of sulphur dioxide.

..... [1]

(iii) How is sulphur changed into sulphur dioxide?

..... [1]

(iv) Name the catalyst used in reaction 2.

..... [1]

(v) Reaction 2 is exothermic. Why is a catalyst, rather than a higher temperature, used to increase the rate of this reversible reaction?

..... [2]

(vi) Write a word equation for reaction 3.

..... [1]

(vii) Write a symbol equation for reaction 4.

..... [1]

Topic Chem 12 Q# 7/ iGCSE Chemistry/2003/w/Paper 3/

5 Sulphur dioxide,  $\text{SO}_2$ , and sulphur trioxide,  $\text{SO}_3$ , are the two oxides of sulphur.

(a) Sulphur dioxide can kill bacteria and has bleaching properties. Give a use of sulphur dioxide that depends on each of these properties.

(i) ability to kill bacteria ..... [1]

(ii) bleaching properties ..... [1]

(b) Sulphur trioxide can be made from sulphur dioxide.

(i) Why is this reaction important industrially?

..... [1]



(ii) Complete the word equation.

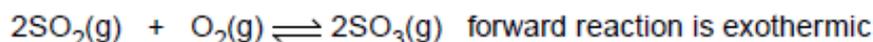
sulphur dioxide + ..... → sulphur trioxide [1]

(iii) What are the conditions for this reaction?

.....  
.....[2]

Topic Chem 12 Q# 8/ iGCSE Chemistry/2002/w/Paper 3/

1 (a) Sulphuric acid is made by the Contact Process.



(i) What are the reaction conditions for the Contact Process?

.....  
.....[3]

(ii) Would the yield of sulphur trioxide increase, decrease or stay the same when the temperature is increased? Explain your answer.

.....  
.....  
.....[2]

(iii) Describe how sulphur trioxide is changed into concentrated sulphuric acid.

.....  
.....[2]

Topic Chem 12 Q# 9/ iGCSE Chemistry/2001/w/Paper 3/

5 (a) In the USA, sulphur is obtained from underground deposits. It burns to form sulphur dioxide. This is used in paper making, to preserve food and in the manufacture of sulphuric acid.

(i) Why is sulphur dioxide needed in paper making?

.....[1]

(ii) How does sulphur dioxide preserve food?

.....[1]

Topic Chem 13 Q# 10/ iGCSE Chemistry/2006/w/Paper 3/Q3



(c) Calcium carbonate is used to control soil acidity.

(i) Why is it important to control soil acidity?

..... [1]

(ii) Both calcium carbonate, insoluble in water, and calcium oxide, slightly soluble, are used to increase soil pH. Suggest **two** advantages of using calcium carbonate.

.....  
..... [2]

(iii) Give **one** use of calcium carbonate other than for making calcium oxide and controlling soil pH.

..... [1]

Topic Chem 13 Q# 11/ iGCSE Chemistry/2006/w/Paper 3/

3 Calcium carbonate is an important raw material.

(a) Name a rock which is made up of calcium carbonate.

..... [1]

## Mark Scheme

Q# 1/ iGCSE Chemistry/2007/w/Paper 3/

4 (a) (i) bleach for wood pulp or preserving food or sterilising  
or in wine making or as a refrigerant or in metallurgy or  
(liquid) sulphur dioxide is used in the petroleum industry  
or kill microbes(etc) or insecticide [1]

(ii) (react with) oxygen or air [1]

NOT burnt/burn in air/oxygen [1]

450°C [1]

vanadium oxide catalyst (if oxidation state given has to be correct) or platinum [1]

If four conditions are given which include high pressure then **MAX** [2]

High pressure is incorrect **MAX** 10 atm.

(iii) ammonium sulphate or superphosphate [1]  
or potassium sulphate or magnesium sulphate

Q# 2/ iGCSE Chemistry/2006/s/Paper 3/Q5 (b)

(iii) Low enough for good yield [1]  
High enough for (economic) rate [1]

Any similar explanation will be awarded the mark  
NOT just that it is the optimum temperature

(iv) bubble into (conc) sulphuric acid [1]  
add water [1]

NOT consequential



Q# 3/ iGCSE Chemistry/2006/s/Paper 3/

- 5 (a) (i) Burn sulphur in air (or oxygen) [1]  
(ii) as a bleach [1]  
(iii) kill bacteria/micro-organisms [1]  
**NOT** prevents food going bad or rotten or decaying
- (b) (i) decrease [1]  
(ii) exothermic [1]  
**COND** increase temperature favours back reaction so it is endothermic, so forward reaction must be exothermic [1]  
**OR** any similar explanation will be awarded the mark, for example The forward reaction is not favoured by an increase in temperature so it is exothermic (rather than endothermic)
- (iii) Low enough for good yield [1]  
High enough for (economic) rate [1]  
Any similar explanation will be awarded the mark  
**NOT** just that it is the optimum temperature

Q# 4/ iGCSE Chemistry/2005/s/Paper 3/

- (c) (i) vanadium oxide **or** vanadium(V) oxide **or** vanadium pentoxide or  $V_2O_5$  [1]  
Must be correct oxidation state if one given
- (ii) 400 to 500° C [1]
- (iii) add to (concentrated) sulphuric acid **NOT** dilute [1]  
**COND** (upon sulphuric acid) above then add water [1]

Q# 5/ iGCSE Chemistry/2005/s/Paper 3/

- 4 (a) (i) correct word equation (carbon dioxide and water) [1]  
**Accept** correct symbol equation
- (ii) Must have a correct reagent otherwise wc = 0 [1]  
add (acidified) barium chloride(aq) **or** nitrate **or** add barium ions [1]  
**COND** white precipitate [1]  
**NOT** lead(II) compounds
- (iii) low pH **or** universal indicator turns red(aq) [1]  
pH 3 **or** less
- (b) (i)  $H_2S + 2O_2 = H_2SO_4$  [2]  
unbalanced [1]
- (ii) unpleasant smell **or** it is poisonous **or** when burnt forms acid rain **or** forms sulphur dioxide **or** forms sulphuric acid [1]  
**NOT** it is a pollutant
- (iii) 2H to 1S [2]  
**COND** 8e around sulphur atom  
2e per hydrogen atom  
**THREE** correct  
**TWO** from above [1]  
Ionic structure = [0]



Q# 6/ iGCSE Chemistry/2004/s/Paper 3/

2. (a) (i) USA or Texas or Poland or Mexico or Japan or Ethiopia  
Australia or Sicily [1]  
accept other sources of sulphur eg petroleum  
or natural gas or metal sulphides or volcanoes  
NOT coal, NOT underground
- (ii) Preserving food or bleaching or sterilising or  
disinfecting or making paper or bleaching wood pulp  
or wine or jam or fumigation or making paper [1]  
NOT making wood pulp
- (iii) burnt/roast in oxygen or air [1]
- (iv) vanadium(V) oxide or vanadium oxide or platinum [1]  
ignore oxidation state of vanadium
- (v) Increase temperature (increases rate) but reduces yield [1]  
catalyst only increases rate or a catalyst does not  
influence position of equilibrium [1]  
NOT a definition of a catalyst
- (vi) sulphur trioxide + sulphuric acid = oleum [1]  
correct symbol equation acceptable
- (vii)  $H_2S_2O_7 + H_2O = 2H_2SO_4$  [1]

Q# 7/ iGCSE Chemistry/2003/w/Paper 3/

- 5 (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]

Q# 8/ iGCSE Chemistry/2002/w/Paper 3/

- 1 (a) (i) vanadium(V) oxide as catalyst - ignore oxidation state  
and accept no oxidation state  
temperature 300 to 600 °C  
pressure up to 10 atmos, accept atmospheric pressure  
volume ratio of gases either 2:1 or slight excess of oxygen  
ANY three [3]
- (ii) decrease [1]  
COND back reaction is endothermic or same argument based on  
forward reaction is exothermic [1]  
or increase in temp favours back reaction
- (iii) dissolve in (conc) sulphuric acid NOT dilute [1]  
add water or dilute [1]

Q# 9/ iGCSE Chemistry/2001/w/Paper 3/Q4



5 (a) (i) bleach [1]

(ii) kills bacteria or germs or micro organisms [1]

Q# 10/ iGCSE Chemistry/2006/w/Paper 3/Q3

(c) (i) Any reasonable explanation  
Plants prefer soil pH about 7  
Plants do not grow (well) in acidic soils/plants grow better  
To increase crop yields  
Any ONE [1]  
Do NOT accept in acidic soils plants die

(ii) With calcium carbonate, pH cannot go above 7 [1]  
It is not washed away by the rain/remains longer in the soil  
It is not absorbed by the plant [1]

OR [1]  
With calcium oxide, pH can go above 7 [1]  
It is washed away by the rain [1]

(iii) Any correct use - making steel/iron, making cement, making glass, [1]  
disposing of acid wastes, removing sulphur dioxide from flue  
gases, (stone in) building, indigestion tablets, toothpaste, cosmetics etc

Q# 11/ iGCSE Chemistry/2006/w/Paper 3/

3 (a) limestone or marble or chalk or coral or calcite or aragonite [1]

