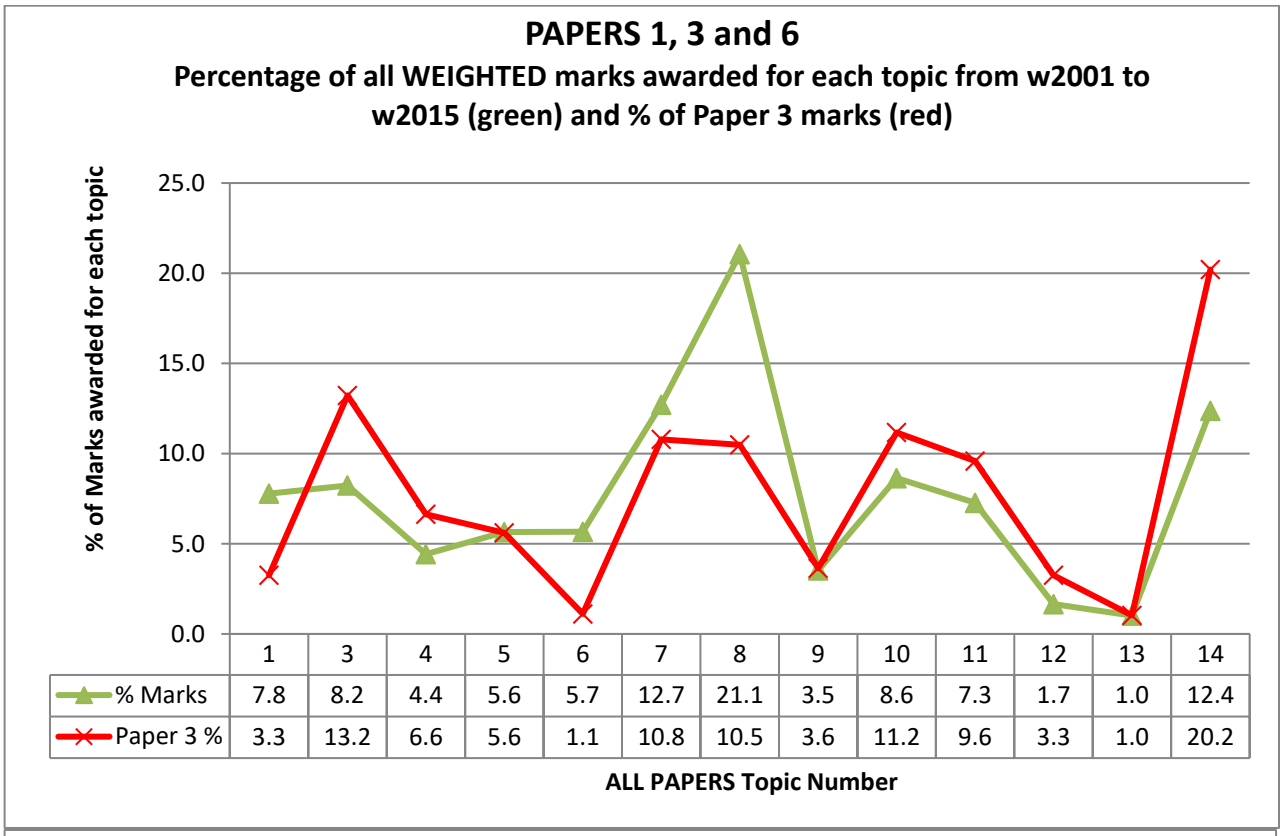
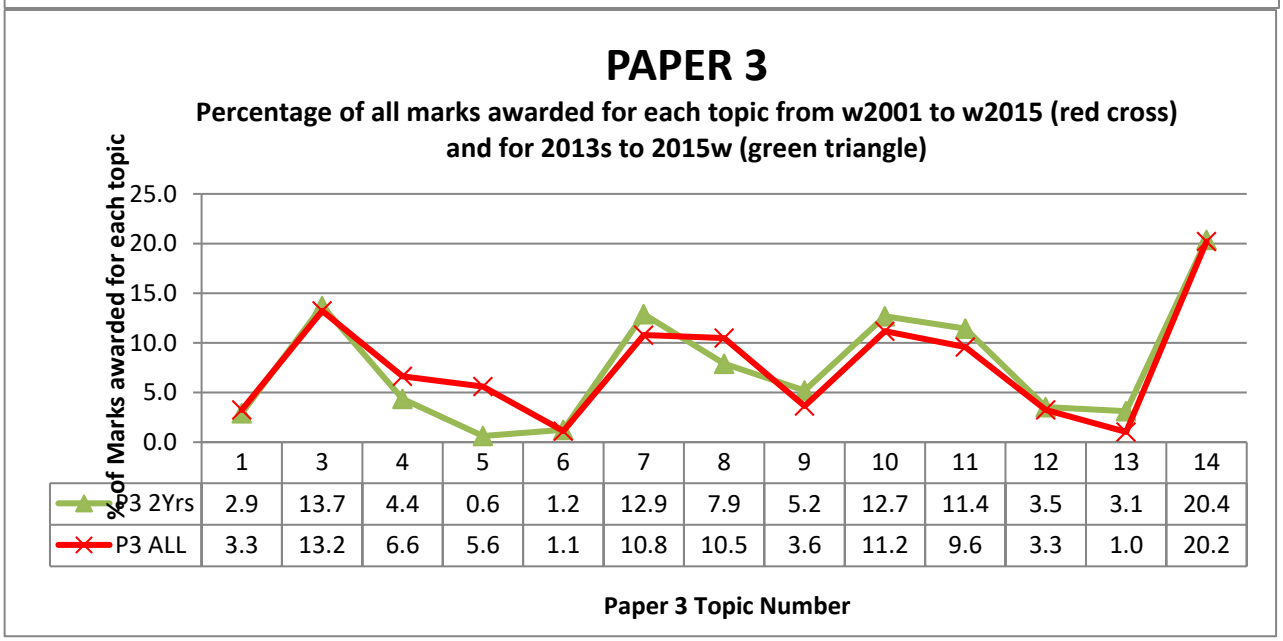
iG Chem 11 EQ P3 13w to 01s 4Students NEW 72marks





	Total	Chem 1	Chem 3	Chem 4	Chem 5	Chem 6	Chem 7	Chem 8	Chem 9	Chem 10	Chem 11	Chem 12	Chem 13	Chem 14
Total Marks	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:

1. 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)
2. 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.

11. Air and water	
11.1 Water **Core** • Describe chemical tests for water using cobalt(II) chloride and copper(II) sulfate • Describe, in outline, the treatment of the water supply in terms of filtration and chlorination • Name some of the uses of water in industry and in the home	**Supplement** • Discuss the implications of an inadequate supply of water, limited to safe water for drinking and water for irrigating crops
11.2 Air **Core** • State the composition of clean, dry air as being approximately 78% nitrogen, 21% oxygen and the remainder as being a mixture of noble gases and carbon dioxide • Name the common pollutants in the air as being carbon monoxide, sulfur dioxide, oxides of nitrogen and lead compounds • State the source of each of these pollutants: – carbon monoxide from the incomplete combustion of carbon-containing substances – sulfur dioxide from the combustion of fossil fuels which contain sulfur compounds (leading to 'acid rain') – oxides of nitrogen from car engines – lead compounds from leaded petrol	**Supplement** • Describe the separation of oxygen and nitrogen from liquid air by fractional distillation • Describe and explain the presence of oxides of nitrogen in car engines and their catalytic removal

• State the adverse effect of these common pollutants on buildings and on health and discuss why these pollutants are of global concern • State the conditions required for the rusting of iron • Describe and explain methods of rust prevention, specifically paint and other coatings to exclude oxygen	• Describe and explain sacrificial protection in terms of the reactivity series of metals and galvanising as a method of rust prevention
11.3 Nitrogen and fertilisers **Core** • Describe the need for nitrogen-, phosphorus- and potassium-containing fertilisers • Describe the displacement of ammonia from its salts	**Supplement** • Describe and explain the essential conditions for the manufacture of ammonia by the Haber process including the sources of the hydrogen and nitrogen, i.e. hydrocarbons or steam and air
11.4 Carbon dioxide and methane **Core** • State that carbon dioxide and methane are greenhouse gases and explain how they may contribute to climate change • State the formation of carbon dioxide: – as a product of complete combustion of carbon-containing substances – as a product of respiration – as a product of the reaction between an acid and a carbonate – from the thermal decomposition of a carbonate • State the sources of methane, including decomposition of vegetation and waste gases from digestion in animals	**Supplement** • Describe the carbon cycle, in simple terms, to include the processes of combustion, respiration and photosynthesis

Q# 6/ iGCSE Chemistry/2013/w/Paper 31/

3 Ammonia is manufactured by the Haber process.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

The forward reaction is exothermic.

(a) Describe how the reactants are obtained.

(i) Nitrogen

.....

..... [2]

(ii) Hydrogen

.....

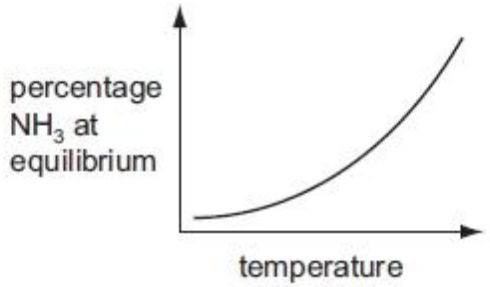
.....

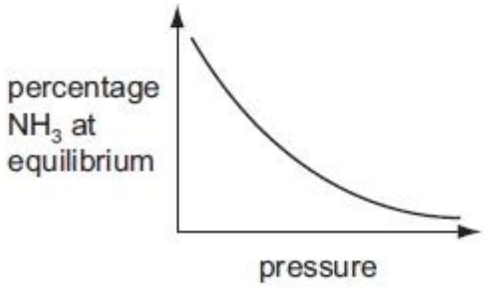
..... [3]

(b) The percentage of ammonia in the equilibrium mixture varies with temperature and pressure.

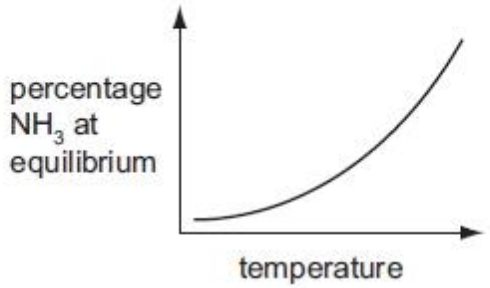
(i) Which pair of graphs, **A**, **B** or **C**, shows correctly how the percentage of ammonia at equilibrium varies with temperature and pressure?

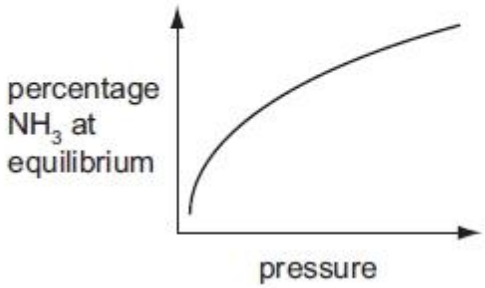
pair **A**



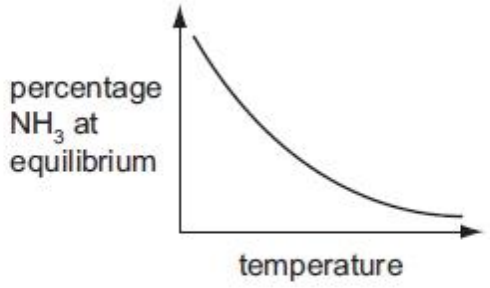


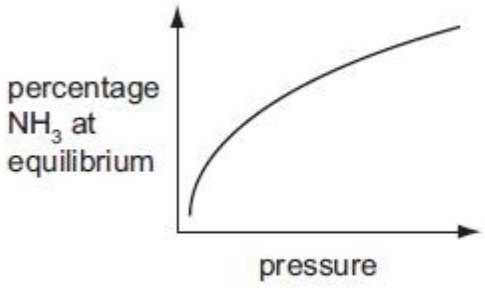
pair **B**





pair **C**





The pair with **both graphs correct** is ..... [1]

(ii) Give a full explanation of why the pair of graphs you have chosen in **(i)** is correct.

.....

.....

.....

.....

.....

.....

..... [6]

(iii) Catalysts do not alter the position of equilibrium. Explain why a catalyst is used in this process.

.....

.....

.....

..... [2]

Q# 7/ iGCSE Chemistry/2013/s/Paper 31/ Q6

(b) Ammonia is manufactured by the Haber Process. The economics of this process require that as much ammonia as possible is made as quickly as possible.
Explain how this can be done using the following information.

The conditions for the following reversible reaction are:

- 450 °C
- 200 atmospheres pressure
- iron catalyst

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ the reaction is exothermic

.....

.....

.....

.....

.....

..... [5]

Q# 8/ iGCSE Chemistry/2013/s/Paper 31/ Q6

(e) Hydrazine is a weak base and it removes dissolved oxygen from water. It is added to water in steel boilers to prevent rusting.

(i) One way it reduces the rate of rusting is by changing the pH of water.
What effect would hydrazine have on the pH of water?

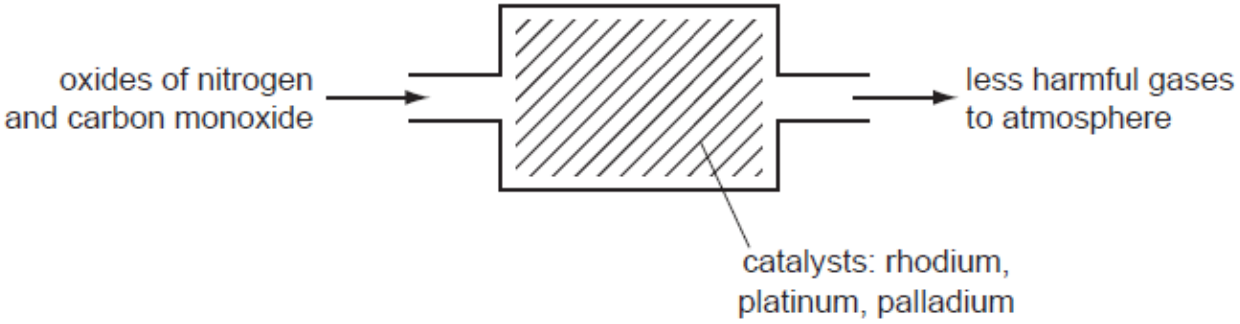
..... [1]

(ii) Give a reason, other than pH, why hydrazine reduces the rate of rusting.

..... [1]

Q# 9/ iGCSE Chemistry/2012/w/Paper 31/ Q3

(c) Catalytic converters reduce the pollution from motor vehicles.



(i) Describe how carbon monoxide and the oxides of nitrogen are formed in car engines.

.....

.....

.....

..... [4]

(ii) Describe the reaction(s) inside the catalytic converter which change these pollutants into less harmful gases. Include at least one equation in your description.

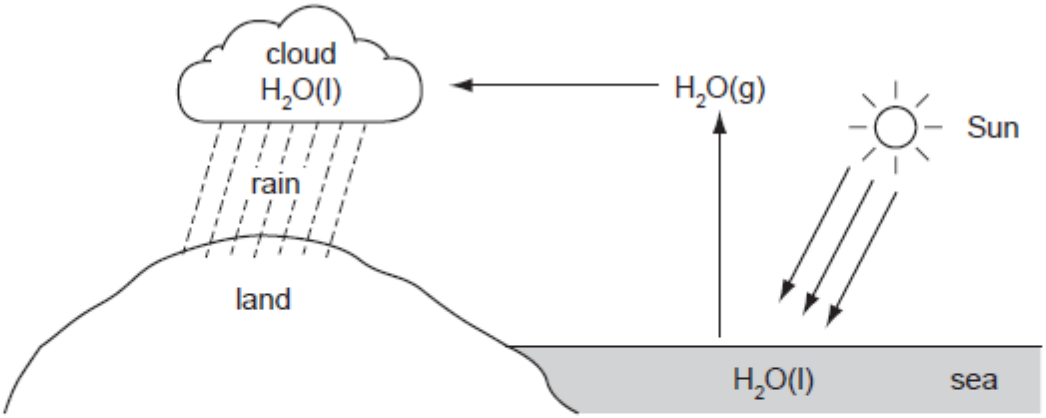
.....

.....

..... [3]

Q# 10/ iGCSE Chemistry/2012/s/Paper 31/

1 The diagram below shows part of the Water Cycle.



(a) (i) State the name of each of the following changes of state.

$$H_2O(l) \rightarrow H_2O(g)$$

name .....

$$H_2O(g) \rightarrow H_2O(l)$$

name .....

[2]

(ii) Which **one** of the above changes of state is exothermic? Explain your choice.

.....

..... [1]

(b) The rain drains into rivers and then into reservoirs. Describe how water is treated before it enters the water supply.

.....

..... [2]

(c) (i) Explain how acid rain is formed.

.....

.....

.....

..... [4]

Q# 11/ iGCSE Chemistry/2011/w/Paper 31/

2 Two important greenhouse gases are methane and carbon dioxide.

(a) Methane is twenty times more effective as a greenhouse gas than carbon dioxide. The methane in the atmosphere comes from both natural and industrial sources.

(i) Describe **two** natural sources of methane.

.....

..... [2]

(ii) Although methane can persist in the atmosphere for up to 15 years, it is eventually removed by oxidation.
What are the products of this oxidation?

..... [2]

(b) How do the processes of respiration, combustion and photosynthesis determine the percentage of carbon dioxide in the atmosphere?

.....

.....

.....

..... [4]

Q# 12/ iGCSE Chemistry/2011/w/Paper 31/

1 This question is concerned with the following oxides.

sulfur dioxide
carbon monoxide
lithium oxide
aluminium oxide
nitrogen dioxide
strontium oxide

(b) Two of the oxides are responsible for acid rain.
Identify the **two** oxides and explain their presence in the atmosphere.

.....

.....

.....

.....

..... [5]

Q# 13/ iGCSE Chemistry/2011/s/Paper 31/

2 Selenium and sulfur are in Group VI. They have similar properties.

(a) One of the main uses of selenium is in photoelectric cells. These cells can change light into electrical energy.

(i) Name a process which can change light into chemical energy.

.....

(b) Ammonia is made by the Haber Process.

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ forward reaction is exothermic

The percentage of ammonia in the equilibrium mixture varies with conditions.

pressure / atmospheres	100	200	300	400
% ammonia at 300 °C	45	65	72	78
% ammonia at 500 °C	9	18	25	31

The conditions actually used are 200 atmospheres, 450 °C and an iron catalyst.

(i) The original catalyst was platinum. Suggest a reason why it was changed to iron.

..... [1]

(ii) Explain why the highest pressure gives the highest percentage of ammonia in the equilibrium mixture.

.....

..... [2]

(iii) What happens to the unreacted nitrogen and hydrogen?

.....

..... [1]

(iv) State **one** advantage and **one** disadvantage of using a lower temperature.

advantage .....

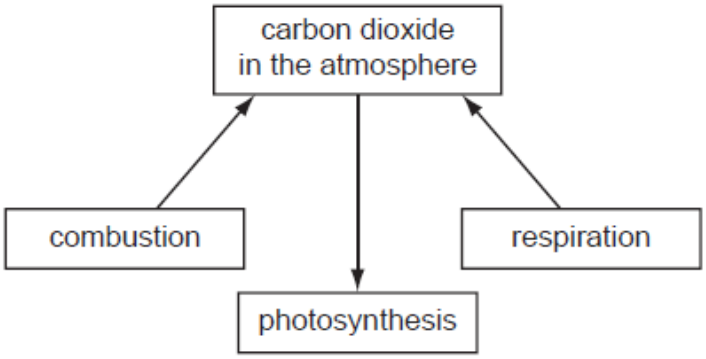
..... [1]

disadvantage .....

..... [1]

Q# 15/ iGCSE Chemistry/2010/w/Paper 31/

7 The diagram shows part of the carbon cycle. This includes some of the processes which determine the percentage of carbon dioxide in the atmosphere.



(i) Carbon dioxide is one greenhouse gas. Name another one.

..... [1]

(ii) Explain the term *respiration* and how this process increases the percentage of carbon dioxide in the atmosphere.

.....

.....

..... [3]

(iii) Explain why the combustion of waste crop material should not alter the percentage of carbon dioxide in the atmosphere.

.....

..... [2]

(iv) In 1960 the percentage of carbon dioxide in the atmosphere was 0.032% and in 2008 it was 0.038%. Suggest an explanation for this increase.

.....

..... [2]

Q# 16/ iGCSE Chemistry/2010/s/Paper 31/ Q2

(iv) The oxides of nitrogen are atmospheric pollutants. Describe how they are formed.

.....

.....

..... [2]

(v) Complete the equation for the decomposition of ozone.

..... O_3 → .....

[2]

Q# 17/ iGCSE Chemistry/2010/s/Paper 31/ Q2

(ii) Chloromethane is formed when seaweed decomposes. Name the compounds in the environment from which seaweed might have obtained the following elements:

carbon; .....

hydrogen; .....

chlorine. ..... [3]

Mark Scheme

Q# 6/ iGCSE Chemistry/2013/w/Paper 31/

3 **(a)** **(i)** fractional distillation [1]
(liquid) air [1]

(ii) cracking / heat in presence of catalyst [1]
of alkane / petroleum [1]
to give an alkene and hydrogen [1]

OR: electrolysis (1)
named electrolyte (1)
hydrogen at cathode (1)

OR: from methane (1)
react water / steam (1)
heat catalyst (1)
only **ACCEPT:** water with methane **or** electrolysis

(b) **(i)** the pair with both graphs correct is C [1]
NOTE: mark **(b)(ii)** independent of **(b)(i)**

(ii) high pressure favours side with lower volume / fewer moles [1]
this is RHS / product / ammonia [1]
%NH_3 / yield increases as pressure increases [1]

the forward reaction is exothermic [1]
exothermic reactions favoured by low temperatures [1]
%NH_3 / yield decreases as temperature increases [1]
ACCEPT: reverse arguments

(iii) increases reaction rate [1]
ACCEPT: reduces activation energy [1]
OR: decreases the amount of energy particles need to react
OR: economic rate at lower temperature so higher yield

[Total: 14]

Q# 7/ iGCSE Chemistry/2013/s/Paper 31/ Q6

(b) any five from:

- high pressure favours lower volume side / movement to right / ammonia side, **or** high pressure increases the yield
- high pressure increases rate
- low temperature favours exothermic reaction / increases yield / favours the forward reaction
- low temperature gives low rate or vice versa
- catalyst increases rate or lowers activation energy
- 450 °C low enough to give an economic yield but with catalyst gives a fast enough rate
  note need whole concept to get this compromise temperature point [5]

Q# 8/ iGCSE Chemistry/2013/s/Paper 31/ Q6

(e) (i) pH increases [1]

(ii) oxygen needed for rusting / removes oxygen / reacts with oxygen [1]

Q# 9/ iGCSE Chemistry/2012/w/Paper 31/ Q3

(c) (i) carbon monoxide-incomplete combustion; [1]
carbon - containing fuel / fossil fuel / petrol; [1]

oxides of nitrogen - oxygen and nitrogen react; [1]
at high temperature / in engine; [1]
not: in exhaust

(ii) carbon monoxide to carbon dioxide; [1]
oxides of nitrogen to nitrogen; [1]
correct balanced equation; [1]

Q# 10/ iGCSE Chemistry/2012/s/Paper 31/

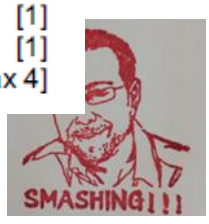
1 (a) (i) evaporation / boiling / vaporisation / evaporate / vaporise; [1]
condensation / liquefaction / condense / liquefy; [1]

(ii) condensation **accept:** correct equation $H_2O_{(g)} \rightarrow H_2O_{(l)}$
because energy / heat is given out / gas has more energy than liquid / need to supply energy to change liquid to gas so reverse must give out energy / bonds form; [1]

(b) chlorination / chlorine to kill microbes; [1]

filtration or filter; [1]
accept: sedimentation or sand or gravel or grit

(c) (i) combustion of fossil fuels; [1]
(which contain) sulfur; [1]
sulfur dioxide formed; [1]
(reacts in air / with water to form) **sulfurous / sulfuric acid**; [1]
OR
nitrogen and oxygen in air; [1]
react at high temperatures / in engines; [1]
to form oxides of nitrogen **or** named oxide of nitrogen; [1]
(reacts in air / with water to form) nitrous / nitric acid; [1]
[max 4]



Q# 11/ iGCSE Chemistry/2011/w/Paper 31/

2 **(a)** **(i)** (waste gases) from animals [1]
decaying vegetation / anaerobic decay [1]
accept: decomposition of organic material / natural gas

(ii) carbon dioxide [1]
water [1]

(b) photosynthesis removes carbon dioxide from the atmosphere [1]
both respiration and combustion produce carbon dioxide [1]
any **two** of the following: [2]
plants photosynthesis changes carbon dioxide into carbohydrates
(burning) of fossil fuels / named fuel / petrol / alkanes
respiration by living organisms to obtain energy from carbon–containing compounds
comment that the balance between these processes determines the percentage of carbon dioxide

Q# 12/ iGCSE Chemistry/2011/w/Paper 31/ QiGCSE Chemistry/201

(b) sulfur dioxide [1]
burn (fossil) fuel containing sulfur / volcanoes [1]
nitrogen dioxide [1]
reaction of nitrogen and oxygen [1]
high temperatures / in car engine [1]
not: exhaust

Q# 13/ iGCSE Chemistry/2011/s/Paper 31/

2 **(a)** **(i)** photosynthesis or a photochemical reaction [1]
not an example, question requires a process
not devices which convert light into electricity

Q# 14/ iGCSE Chemistry/2010/w/Paper 31/ Q4

(b) **(i)** expensive metal / iron cheaper / better catalyst [1]

(ii) high pressure favours side with smaller volume / fewer moles [1]
this is right hand side / product / ammonia side [1]

(iii) recycled / sent over catalyst again [1]
accept used again

(iv) advantage high yield [1]
disadvantage slow reaction rate etc [1]

Q# 15/ iGCSE Chemistry/2010/w/Paper 31/

7 **(i)** methane / water vapour / oxides of nitrogen / hydrofluorocarbons / perfluorocarbons / ozone [1]
not sulfur dioxide

(ii) living organisms / plants and animals / cells [1]
produce energy (from food / glucose / carbohydrates) [1]
this forms carbon dioxide (could be in an equation) [1]

(iii) when growing the crop removed carbon dioxide from atmosphere / crop photosynthesised and used carbon dioxide [1]
combustion returned the carbon dioxide [1]

(iv) increased combustion [1]
of fossil fuels / named fossil fuel [1]

or deforestation [1]
less photosynthesis [1]
not greater population

[Total: 8]

Q# 16/ iGCSE Chemistry/2010/s/Paper 31/ Q2

(iv) oxygen and nitrogen (in air) [1]
not from fuel, negates mark 1
(react) at high temperatures / lightning / in engine [1]
not combustion or exhaust, negates mark 2

(v) $2O_3 \rightarrow 3O_2$ [2]
not balanced = [1]

Q# 17/ iGCSE Chemistry/2010/s/Paper 31/ Q2

(ii) carbon dioxide / calcium carbonate [1]
not methane
water [1]
sodium chloride / brine / seawater [1]