1 Choose a gas from the following list to answer the questions below. Each gas may be used once, more than once or not at all.

ammonia **carbon dioxide** **carbon monoxide** **fluorine**

hydrogen **krypton** **nitroge** **propene** **sulfur dioxide**

(a) It is a product of respiration. ..... [1]

(b) It polymerises to form a poly(alkene). ..... [1]

(c) It is a noble gas. ..... [1]

(d) It is the main component of air. ..... [1]

(e) It is a very reactive non-metal. ..... [1]

(f) It is used to kill micro-organisms in fruit juice. ..... [1]

(g) It burns to form water as the only product. ..... [1]

[Total: 7]

2 Antimony, Sb, is an element in Group V.

(a) The main ore of antimony is its sulfide. The extraction of antimony is similar to that of zinc.
Describe how each of these changes in the extraction of antimony is carried out.

(i) antimony sulfide to antimony oxide

..... [1]

(ii) antimony oxide to antimony

..... [1]

(b) Antimony oxide is a white powder which is insoluble in water.
Describe how you would find out if it is a basic, an acidic or an amphoteric oxide.

.....

.....

.....

..... [4]

(c) When antimony chloride is added to water, a faint white precipitate forms and the mixture slowly goes cloudy.

$$SbCl_3(aq) + H_2O(l) \underset{\text{backward}}{\overset{\text{forward}}{\rightleftharpoons}} 2HCl(aq) + SbOCl(s)$$

colourless white

(i) Explain why after some time the appearance of the mixture remains unchanged.

.....

..... [2]

(ii) When a few drops of concentrated hydrochloric acid are added to the mixture, it changes to a colourless solution. Suggest an explanation.

.....

..... [1]

(iii) Suggest how you could make the colourless solution go cloudy.

..... [1]

[Total: 10]

3 The hydrolysis of complex carbohydrates to simple sugars is catalysed by enzymes called carbohydrases and also by dilute acids.

(a) **(i)** They are both catalysts. How do enzymes differ from catalysts such as dilute acids?

..... [1]

(ii) Explain why ethanol, C_2H_6O, is not a carbohydrate but glucose, $C_6H_{12}O_6$, is a carbohydrate.

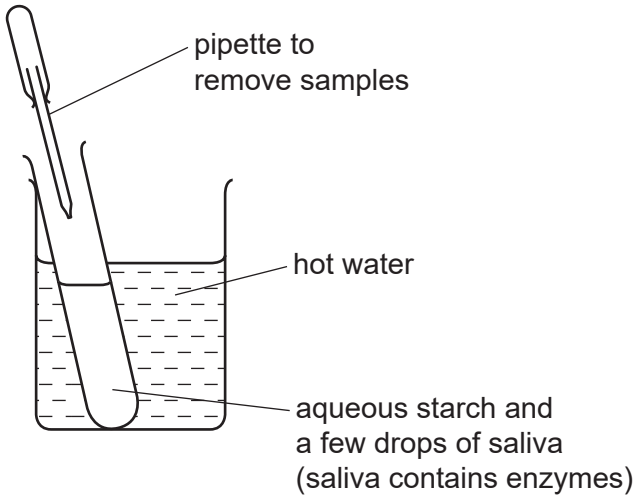
.....

..... [2]

(b) Draw the structure of a complex carbohydrate, such as starch. The formula of a simple sugar can be represented by HO—□—OH.

(c) Iodine reacts with starch to form a deep blue colour.

(i) In the experiment illustrated below, samples are removed at intervals and tested with iodine in potassium iodide solution.



Typical results of this experiment are shown in the table.

time / min	colour of sample tested with iodine in potassium iodide solution
0	deep blue
10	pale blue
30	colourless

Explain these results.

.....

.....

..... [3]

(ii) If the experiment was repeated at a higher temperature, 60 °C, all the samples stayed blue. Suggest an explanation.

..... [1]

[Total: 10]

4 Complete the following table.

gas	test for gas
ammonia	
	bleaches damp litmus paper
hydrogen	
	relights a glowing splint
	turns limewater milky

[Total: 5]

5 Choose a gas from the following list to answer the questions below. Each gas may be used once, more than once or not at all.

ammonia **argon** **carbon dioxide** **carbon monoxide** **chlorine**

ethene **hydrogen** **nitrogen** **oxygen**

Which gas

(i) is a noble gas,

.....

(ii) is an acidic oxide,

.....

(iii) can be polymerised,

.....

(iv) is the active component of air,

.....

(v) is used in the treatment of water,

.....

(vi) is a product of respiration?

.....

[6]

6 **(a)** **(i)** Coal is a solid fossil fuel. Name another fossil fuel.

..... [1]

(ii) Explain what is meant by the term *fossil fuel*.

.....

..... [2]

(b) The burning of fossil fuels is largely responsible for the formation of acid rain. Two of the acids in acid rain are sulfuric acid and nitric acid.

(i) Explain how the combustion of coal can form sulfuric acid.

.....

.....

..... [3]

(ii) High temperatures generated by the combustion of fossil fuels can lead to the formation of nitric acid. Explain.

.....

.....

..... [3]

(iii) Nitric acid contains nitrate ions.

Describe a test for nitrate ions.

.....

..... [2]

(iv) Explain how you could determine which one of two samples of acid rain had the higher concentration of hydrogen ions.

.....

..... [2]

[Total: 13]

7 Three of the halogens in Group VII are:

chlorine
bromine
iodine

(a) How does their colour change down the Group?

.....

[1]

(ii) How does their physical state (solid, liquid or gas) change down the Group?

.....

[1]

(iii) Predict the colour and physical state of fluorine.

colour .....

physical state ..... [2]

(b) Describe how you could distinguish between aqueous potassium bromide and aqueous potassium iodide.

test .....

result with bromide .....

result with iodide ..... [3]

(c) 0.015 moles of iodine react with 0.045 moles of chlorine to form 0.030 moles of a single product. Complete the equation.

I_2 + ... Cl_2 → ..... [2]

(d) Traces of chlorine can be separated from bromine vapour by diffusion.
Which gas would diffuse the faster and why?

.....

..... [2]