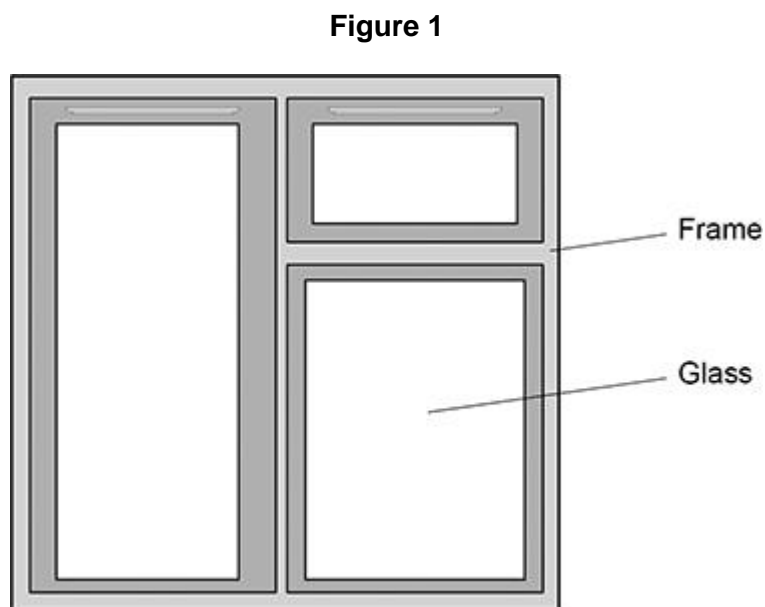


C15 Using Our Resources Homework task 1

Q1.

This question is about substances used to make windows and window frames.

Figure 1 shows a window.



- (a) Glass is made by heating sand with **two** other materials.

Which **two** other materials are used to make glass?

Tick (✓) **two** boxes.

Clay

Graphite

Limestone

Sodium carbonate

Sodium hydroxide

(2)

Window frames need to be:

- easy to install
- resistant to damage.

The polymers poly(chloroethene) and HDPE are used to make window frames.

Table 1 shows information about poly(chloroethene) and HDPE.

Table 1

Property	Poly(chloroethene)	HDPE
Density in g/cm ³	1.4	0.92
Relative strength	72	25

- (b) Suggest **one** advantage of using poly(chloroethene) compared with HDPE to make window frames.

Give **one** reason for your answer.

Use **Table 1**.

Advantage _____

Reason _____

(2)

- (c) Suggest **one** advantage of using HDPE compared with poly(chloroethene) to make window frames.

Give **one** reason for your answer.

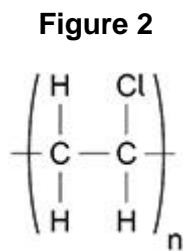
Use **Table 1**.

Advantage _____

Reason _____

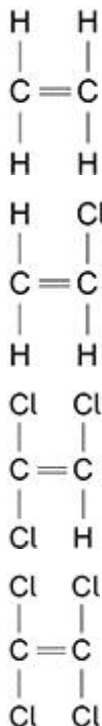
(2)

(d) **Figure 2** shows the displayed structural formula of poly(chloroethene).



Which monomer is used to make poly(chloroethene)?

Tick (✓) **one** box.



(1)

(e) Chlorine gas is used to produce poly(chloroethene).

Describe a test to identify chlorine gas.

Give the result of the test.

Test _____

Result _____

(2)

(f) Wood can be used instead of polymers to make window frames.

- Polymers are unreactive.

- Polymers are produced from crude oil.
- Wood breaks down in wet conditions.
- Wood is produced from trees.

Suggest **one** advantage of using polymers and **one** advantage of using wood to make window frames.

Advantage of polymers _____

Advantage of wood _____

(2)

Window frames can also be made from an alloy of aluminium.

(g) 6.00 kg of the alloy is used to make a window frame.

Table 2 shows the mass of each element in 6.00 kg of the alloy.

Table 2

Element	Mass in kg
Aluminium	5.94
Magnesium	0.04
Silicon	0.02

Calculate the percentage of aluminium in 6.00 kg of the alloy.

Percentage of aluminium = _____ %

(2)

(h) Why is an alloy used instead of pure aluminium to make window frames?

(1)

(Total 14 marks)

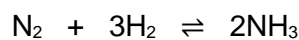
HIGHER TIER QUESTIONS

Q2.

This question is about ammonia and fertilisers.

- (a) Ammonia is produced by a reversible reaction.

The equation for the reaction is:



Complete the sentence.

The forward reaction is exothermic, so the reverse reaction

is _____

(1)

- (b) Calculate the percentage by mass of nitrogen in ammonia (NH_3).

Relative atomic masses (A_r): H = 1; N = 14

You **must** show how you work out your answer.

Percentage by mass of nitrogen = _____ %

(3)

- (c) A neutral solution can be produced when ammonia reacts with an acid.

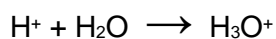
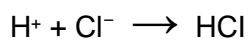
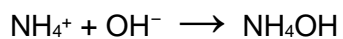
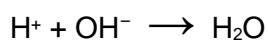
- (i) Give the pH of a neutral solution.

pH _____

(1)

- (ii) Which of these ionic equations shows a neutralisation reaction?

Tick (✓) **one** box.



(1)

- (iii) Name the salt produced when ammonia reacts with hydrochloric acid.

(1)

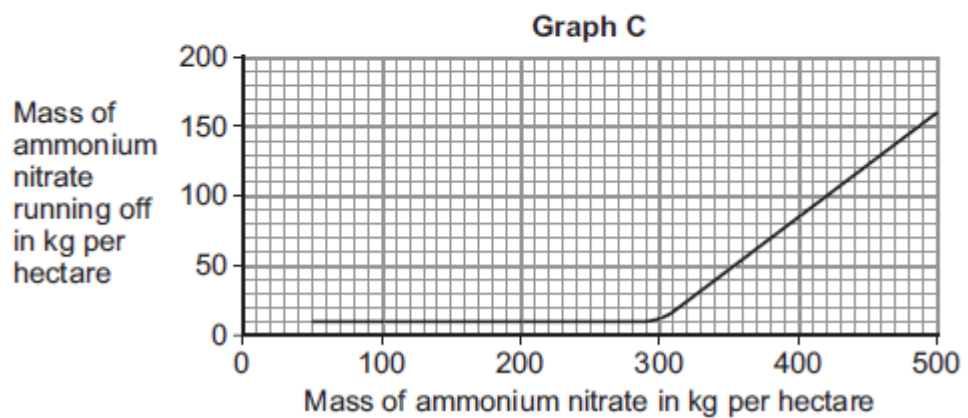
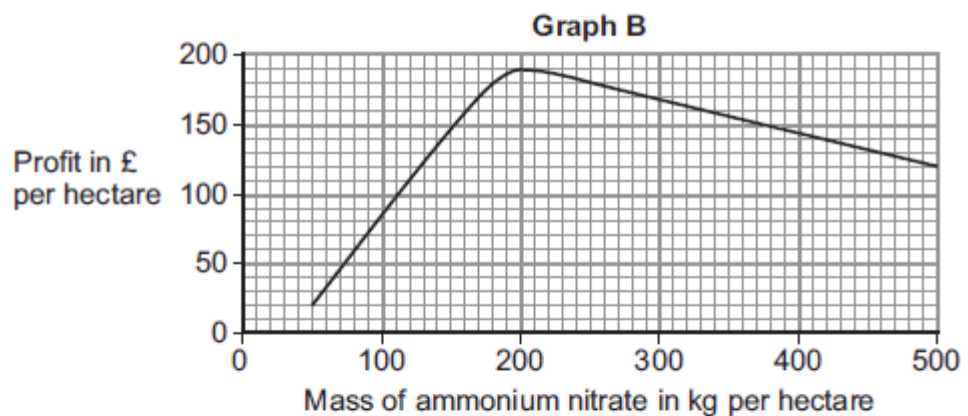
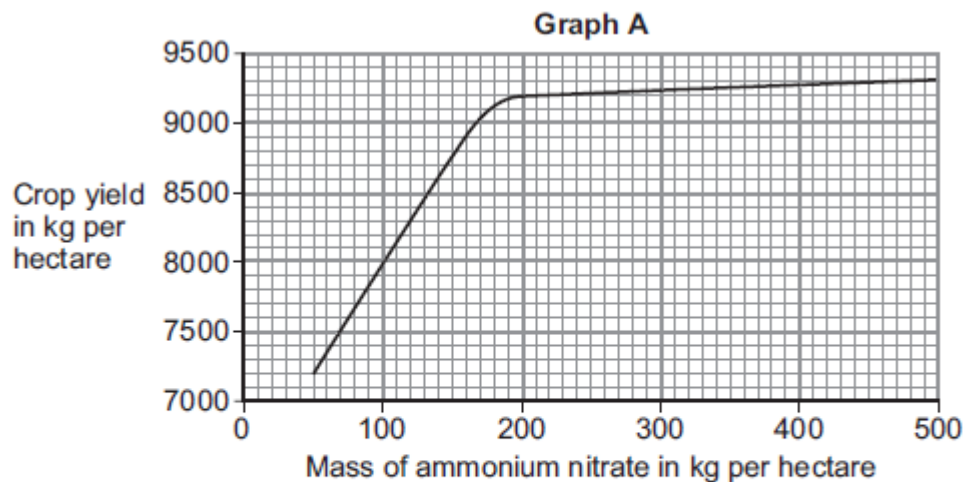
- (d) In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Farmers use ammonium nitrate as a fertiliser for crops.

Rainwater dissolves ammonium nitrate in the soil.

Some of the dissolved ammonium nitrate runs off into rivers and lakes.

The graphs **A**, **B** and **C** below show information about the use of ammonium nitrate as a fertiliser. A hectare is a measurement of an area of land.



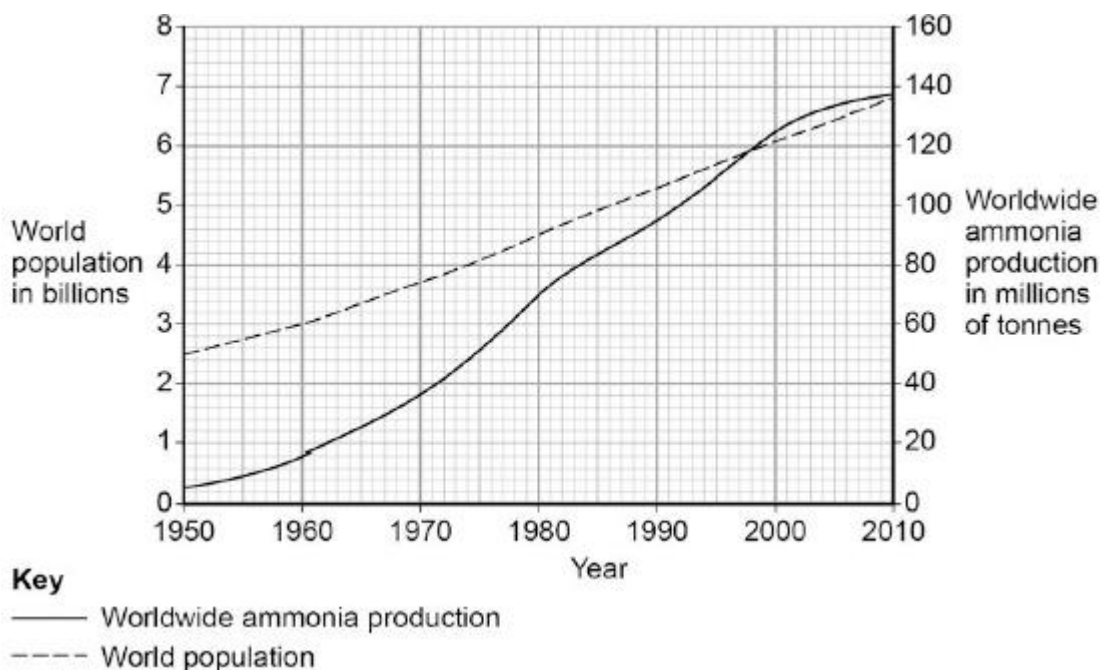
(b) A fertiliser contains the following information on the label:

NPK value = 14 : 11 : 11

Explain why this information is useful to farmers.

(2)

(c) The figure below shows worldwide ammonia production and world population from 1950 to 2010.



Use the figure above and your knowledge to explain the relationship between ammonia production and world population.

(3)

(Total 6 marks)

Mark schemes

Q1.

- (a) limestone 1
- sodium carbonate 1
- (b) (advantage) stronger 1
- (reason) less easily damaged 1
- (c) (advantage) lower density 1
- (reason) lighter (to install) 1
- (d)
- $$\begin{array}{c} \text{H} \quad \text{Cl} \\ | \quad | \\ \text{C} = \text{C} \\ | \quad | \\ \text{H} \quad \text{H} \end{array}$$
- 1
- (e) (add damp) litmus paper 1
- (litmus paper) is bleached
or
(litmus paper) turns white
ignore (litmus paper) turns red 1
- (f) (polymers)
last a long time
ignore references to cost
allow break down slowly 1
- (wood)
renewable
allow trees can be replanted
allow aesthetic reasons 1
- (g) (percentage of aluminium =)
 $\frac{5.94}{6.00} \times 100$ 1
- = 99 (%)

1

- (h) (alloy is) harder (than pure aluminium)
allow (alloy is) stronger (than pure aluminium)
ignore references to cost

1

[14]

Q2.

- (a) endothermic

1

- (b) 82 (%)

correct answer with working gains 3 marks
if 17 or 34 not shown in working max 2 marks
accept 82.4
accept 82.35 to full calculator display (82.35294...) correctly rounded to at least 2 sf
if no answer or incorrect answer, then
(M_r =) 17 gains 1 mark or
14/17 gains 2 marks
OR
(2M_r =) 34 gains 1 mark or
28/34 gains 2 marks
OR
14/their M_r shown gains 1 mark or
correct calculation of 14/their M_r gains 2 marks

3

- (c) (i) 7 / seven

1

- (ii) $H^+ + OH^- \rightarrow H_2O$

1

- (iii) ammonium chloride

allow NH₄Cl

1

ignore an incorrect formula

- (d) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

Level 3 (5 – 6 marks):

Suggestion with reasons from all three graphs, and linking of ideas which may explain a compromise.

Level 2 (3 – 4 marks):

Suggestion with reasons referring to more than one graph.

Level 1 (1 – 2 marks):

Suggestion with a reference to a graph.

0 marks:

No relevant content.

Examples of chemistry points made in response:

A reasonable suggested amount of fertiliser would be in the region of 200 kg (per ha).

Accept any suggestion from about 180 kg (per ha) to 500 kg (per ha).

Yield:

- Using fertiliser improves yield.
- Yield improved most up to about 200 kg (per ha) of fertiliser.
- Yield only increased slightly above about 200 kg (per ha).

Profit:

- About 200 kg of fertiliser gives the most profit.
- Above about 200 kg (per ha) of fertiliser profit declines.

Run off:

- Run off is at low levels until about 300 kg (per ha) of fertiliser.
- Above about 300 kg (per ha) of fertiliser, run off increases.

Examples of linking of ideas:

- Overall 200 kg gives high crop yield and most profit.
- In conclusion 200 kg gives high crop yield and low run off.
- 200 kg gives most profit and low run off.

Examples of compromise:

- Profits go down after about 200 kg (per ha) of fertiliser because cost of fertiliser is not covered by increased yield.
- 200 kg gives the highest profit although it is not the highest yield.
- 500 kg gives the best yield but has the most runoff.

6

[13]

Q3.

- (a) ammonia **and** nitric acid

allow NH₄OH

allow NH₃(aq)

1

- (b) shows fertilisers are formulations

allow gives percentage / proportion of nitrogen, phosphorus and potassium in the fertiliser

1

(so) farmers can choose fertiliser with required properties

1

- (c) as world population increases, ammonia production increases

1

ammonia is used to produce fertilisers

1

so increasing need for fertilisers as more food required for increased population

allow as more food produced less mortality

1

