PEARSON EDEXCEL GCSE CHEMISTRY · 1CH0

CHEMISTRY



EXAM QUESTION PACK

TOPIC 0: FORMULAE, EQUATIONS AND HAZARDS (PACK 2)

SCORE	PERCENTAGE
/181	%

STEMUP

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Q1.

Titanium and iron are examples of transition metals.

2.24 g of iron combines with 0.96 g of oxygen to form an oxide of iron.

Determine the formula of this oxide of iron and use it to complete the balanced equation.

(relative atomic masses: Fe = 56.0, O = 16.0)

You must show your working.

(4)

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balanced equation for the reaction is

..... Fe + ... O_2 → .....

(Total for question = 4 marks)

Q2.

Cracking involves the breaking down of large hydrocarbon molecules into smaller hydrocarbon molecules.

(i) Octane, C_8H_{18}, can be cracked to produce one molecule of ethene, C_2H_4, and one molecule of C_xH_{14}.

$$C_8H_{18} \rightarrow C_2H_4 + C_xH_{14}$$

Determine the value of x in the molecule of C_xH_{14}.

(1)

x = ...

(ii) Dodecane is a large hydrocarbon molecule.

When one molecule of dodecane is cracked the products are one molecule of octane and one molecule of butene.

dodecane → octane + butene

Calculate the maximum mass of octane that could be produced when 340 g of dodecane is cracked in this reaction.

(relative formula masses: dodecane = 170, octane = 114)

(2)

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mass of octane = ... g

(Total for question = 3 marks)

Q3.

Ammonium sulfate and ammonium nitrate are used as fertilisers as they both contain nitrogen, which will increase the yield of crops.

(i) Suggest **one** other reason for using solid ammonium sulfate and solid ammonium nitrate as nitrogenous fertilisers.

(1)

.....

.....

(ii) Ammonium nitrate can be made by the reaction of ammonia with nitric acid.

Write the balanced equation for this reaction.

(2)

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(iii) Describe **one** similarity and **one** difference between the industrial production of ammonium sulfate and the laboratory
preparation of ammonium sulfate.

(2)

similarity .....

.....

difference .....

.....

(Total for question = 5 marks)

Q4.

Tests are carried out to identify the ions in two solids, **P** and **Q**.

P and **Q** dissolve in water to form colourless solutions.

Figure 7 shows the results of tests on these solutions.

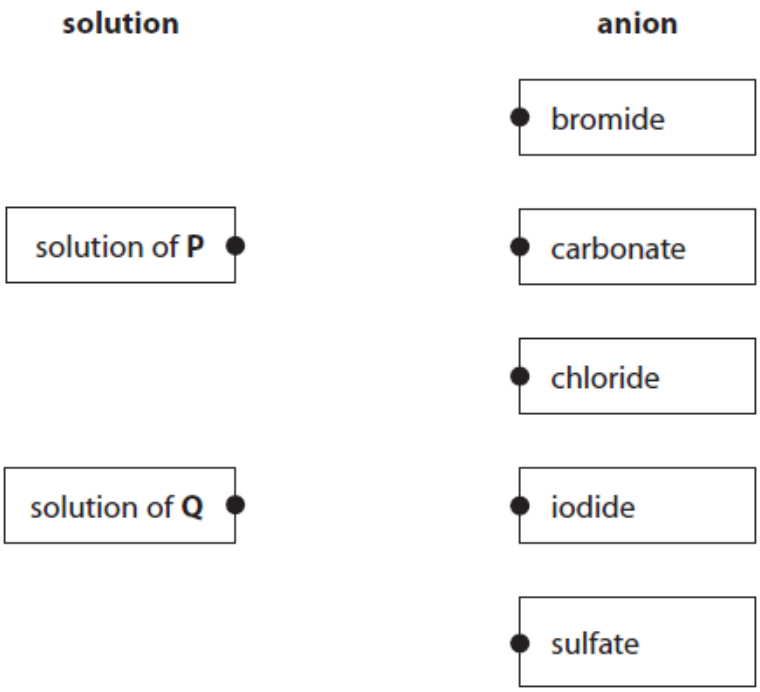
test	results	
	solution of P	solution of Q
dilute hydrochloric acid added, then barium chloride solution	a white precipitate	remains colourless
dilute nitric acid added, then silver nitrate solution	remains colourless	a yellow precipitate

Figure 7

(i) The anions in solutions of **P** and **Q** can be identified from the results of the tests shown in Figure 7.

Draw one straight line from each solution to the anion present.

(2)



(ii) The formula of barium chloride is $BaCl_2$.

Give the total number of ions in the formula $BaCl_2$.

(1)

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(Total for question = 3 marks)

Q5.

A substance used to purify gold is kept in a container.
There are some hazard symbols on the container.

Draw one straight line from each hazard symbol to its meaning.

(2)

hazard symbol	meaning
	corrosive
	flammable
	hazardous to the environment
	oxidising

(Total for question = 2 marks)

Q6.

Electrolysis

(a) Some metal objects are electroplated to improve their appearance.

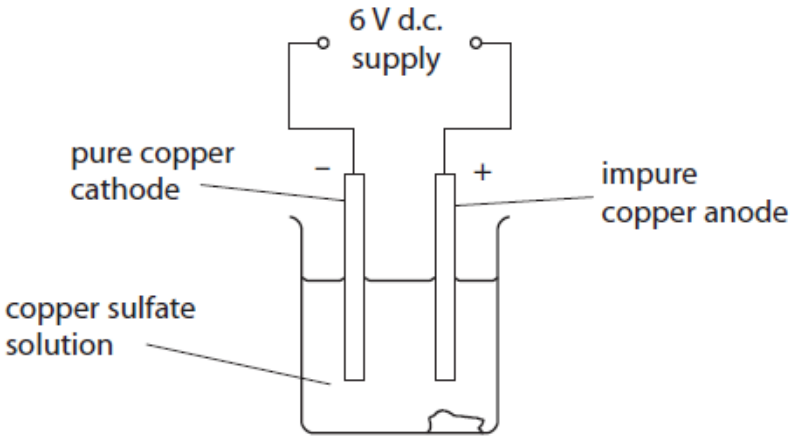
Give another reason why some metal objects are electroplated.

(1)

.....

.....

(b) Copper sulfate solution was electrolysed using copper electrodes.
The mass of each electrode was determined before it was placed in the solution.



The electrolysis was carried out for a period of time.
The electrodes were removed, washed, dried and their masses redetermined.

The table shows the masses of the electrodes before and after electrolysis.

	mass of electrode before electrolysis / g	mass of electrode after electrolysis / g	change in mass
mass of impure copper anode	40.0	35.0	5.0 g decrease
mass of pure copper cathode	10.0	14.8	4.8 g increase

Explain these results.

(3)

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(c) In an electrolysis experiment, oxide ions, O^{2-}, form oxygen gas, O_2.

Write the balanced half equation for the reaction.

(2)

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*(d) Sodium chloride is an ionic compound.
It contains sodium ions, Na^+, and chloride ions, Cl^-.

When molten sodium chloride is electrolysed, sodium metal and chlorine gas are formed.

Describe how the sodium ions and chloride ions in solid sodium chloride are converted into sodium and chlorine by electrolysis.

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(Total for question = 12 marks)

Q7.

Electrolysis

(a) Some metal objects are electroplated to improve their appearance.

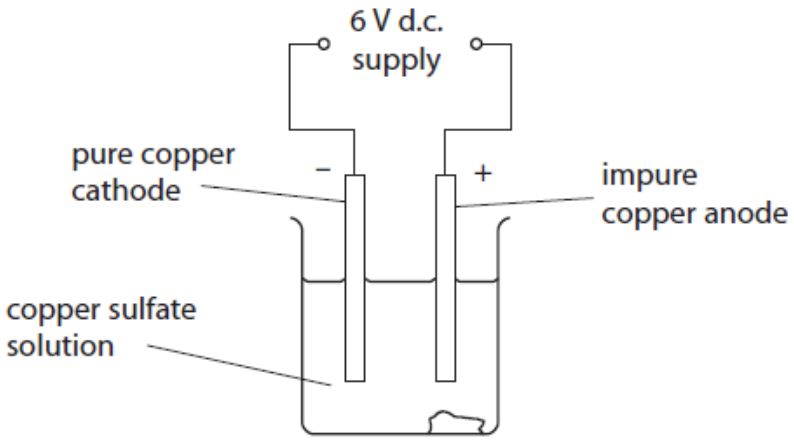
Give another reason why some metal objects are electroplated.

(1)

.....

.....

(b) Copper sulfate solution was electrolysed using copper electrodes.
The mass of each electrode was determined before it was placed in the solution.



The electrolysis was carried out for a period of time.
The electrodes were removed, washed, dried and their masses redetermined.

The table shows the masses of the electrodes before and after electrolysis.

	mass of electrode before electrolysis / g	mass of electrode after electrolysis / g	change in mass
mass of impure copper anode	40.0	35.0	5.0 g decrease
mass of pure copper cathode	10.0	14.8	4.8 g increase

Explain these results.

(3)

.....

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(c) In an electrolysis experiment, oxide ions, O^{2-}, form oxygen gas, O_2.

Write the balanced half equation for the reaction.

(2)

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*(d) Sodium chloride is an ionic compound.

It contains sodium ions, Na^+, and chloride ions, Cl^-.

When molten sodium chloride is electrolysed, sodium metal and chlorine gas are formed.

Describe how the sodium ions and chloride ions in solid sodium chloride are converted into sodium and chlorine by electrolysis.

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(Total for question = 12 marks)

Q8.

Electrolysis

(a) When molten sodium chloride is electrolysed, the products are sodium and chlorine.

(i) Give the formula of sodium chloride.

(1)

.....

(ii) State why molten sodium is used in some nuclear reactors.

(1)

.....

.....

(b) Molten lead bromide is electrolysed.

(i) Complete the sentence describing the type of reaction.

(1)

During the electrolysis the lead ions gain electrons at the cathode.

The type of reactions in which metal ions gain electrons is called
.....

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Molten lead bromide, rather than solid lead bromide, has to be electrolysed because

(1)

☒ **A** ions can only move freely in molten lead bromide

☒ **B** electrolysis is too fast in solid lead bromide

☒ **C** molten lead bromide contains free electrons

☒ **D** lead bromide has a very low melting point

(iii) When molten lead bromide is electrolysed, a silver-coloured liquid is produced at the cathode and a red-brown gas is produced at the anode.

Complete the word equation by showing the products formed when molten lead bromide is electrolysed.

(2)

lead bromide → ..... + ...

(c) Three colourless liquids, **A**, **B** and **C**, are tested.

Tests 1, 2 and 3 are carried out on each of these liquids.

Test 1: the liquid is tested to see if it conducts electricity.

Test 2: 20 cm^3 of the liquid is shaken vigorously with a few drops of soap solution.

Test 3: 20 cm^3 of the liquid is boiled and then test 2 is carried out on the boiled liquid.

The results are shown in the table.

liquid	observations		
	test 1	test 2	test 3
A	conducts	scum formed, no lather	scum formed, no lather
B	conducts	scum formed, no lather	lather formed
C	does not conduct	lather formed	lather formed

(i) State which of the liquids are electrolytes.

(1)

.....

(ii) Use the results of the tests to explain whether each of the liquids **A**, **B** and **C** is soft, shows permanent hardness, or shows temporary hardness.

(3)

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(Total for question = 10 marks)

Q9.

Electrolysis

(a) When molten sodium chloride is electrolysed, the products are sodium and chlorine.

(i) Give the formula of sodium chloride.

(1)

.....

(ii) State why molten sodium is used in some nuclear reactors.

(1)

.....

.....

(b) Molten lead bromide is electrolysed.

(i) Complete the sentence describing the type of reaction.

(1)

During the electrolysis the lead ions gain electrons at the cathode.

The type of reactions in which metal ions gain electrons is called
.....

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Molten lead bromide, rather than solid lead bromide, has to be electrolysed because

(1)

☒ **A** ions can only move freely in molten lead bromide

☒ **B** electrolysis is too fast in solid lead bromide

☒ **C** molten lead bromide contains free electrons

☒ **D** lead bromide has a very low melting point

(iii) When molten lead bromide is electrolysed, a silver-coloured liquid is produced at the cathode and a red-brown gas is produced at the anode.

Complete the word equation by showing the products formed when molten lead bromide is electrolysed.

(2)

lead bromide → ..... + ...

(c) Three colourless liquids, **A**, **B** and **C**, are tested.

Tests 1, 2 and 3 are carried out on each of these liquids.

Test 1: the liquid is tested to see if it conducts electricity.

Test 2: 20 cm^3 of the liquid is shaken vigorously with a few drops of soap solution.

Test 3: 20 cm^3 of the liquid is boiled and then test 2 is carried out on the boiled liquid.

The results are shown in the table.

liquid	observations		
	test 1	test 2	test 3
A	conducts	scum formed, no lather	scum formed, no lather
B	conducts	scum formed, no lather	lather formed
C	does not conduct	lather formed	lather formed

(i) State which of the liquids are electrolytes.

(1)

.....

(ii) Use the results of the tests to explain whether each of the liquids **A**, **B** and **C** is soft, shows permanent hardness, or shows temporary hardness.

(3)

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(Total for question = 10 marks)

Q10.

Elements in the periodic table

(a) Copper is a metal.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

In the periodic table copper is in

(1)

☒ **A** group 0

☒ **B** group 1

☒ **C** group 7

☒ **D** the transition metals

(ii) Which of these is a property of copper metal?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** does not conduct an electric current

☒ **B** forms colourless compounds

☒ **C** has a low melting point

☒ **D** is malleable

(b) Helium and argon are noble gases.

(i) Choose the correct word from this box to complete the sentence below.

non- flammable	odourless	reactive

(1)

Argon can be used to put out fires because it is .....

(ii) Choose the correct phrase from this box to complete the sentence below.

has a high density	has a low density	is colourless



(1)

Helium is used in airships because it .....

(c) Chlorine, bromine and iodine are halogens.

(i) The table shows the appearance of bromine and iodine at room temperature.

Complete the table to show the appearance of chlorine at room temperature.

(2)

halogen	appearance at room temperature
chlorine	
bromine	dark red liquid
iodine	grey solid

(ii) Chlorine reacts with hydrogen to form hydrogen chloride.

Write the word equation for this reaction.

(2)

..... + ... → .....

(Total for question = 8 marks)

Q11.

Elements in the periodic table

(a) Copper is a metal.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

In the periodic table copper is in

(1)

☒ **A** group 0

☒ **B** group 1

☒ **C** group 7

☒ **D** the transition metals

(ii) Which of these is a property of copper metal?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** does not conduct an electric current

☒ **B** forms colourless compounds

☒ **C** has a low melting point

☒ **D** is malleable

(b) Helium and argon are noble gases.

(i) Choose the correct word from this box to complete the sentence below.

non- flammable	odourless	reactive

(1)

Argon can be used to put out fires because it is .....

(ii) Choose the correct phrase from this box to complete the sentence below.

has a high density	has a low density	is colourless



(1)

Helium is used in airships because it .....

(c) Chlorine, bromine and iodine are halogens.

(i) The table shows the appearance of bromine and iodine at room temperature.

Complete the table to show the appearance of chlorine at room temperature.

(2)

halogen	appearance at room temperature
chlorine	
bromine	dark red liquid
iodine	grey solid

(ii) Chlorine reacts with hydrogen to form hydrogen chloride.

Write the word equation for this reaction.

(2)

..... + ... → .....

(Total for question = 8 marks)

Q12.

Energy changes and rates of reaction

(a) When zinc reacts with copper sulfate solution, zinc sulfate solution and copper are formed.

(i) An experiment was carried out to measure the temperature change when zinc powder reacts with copper sulfate solution.

initial temperature of copper sulfate solution = 20 °C
final temperature of mixture after the reaction = 46 °C

Explain what the temperature readings show about the type of heat change that occurs during this reaction.

(2)

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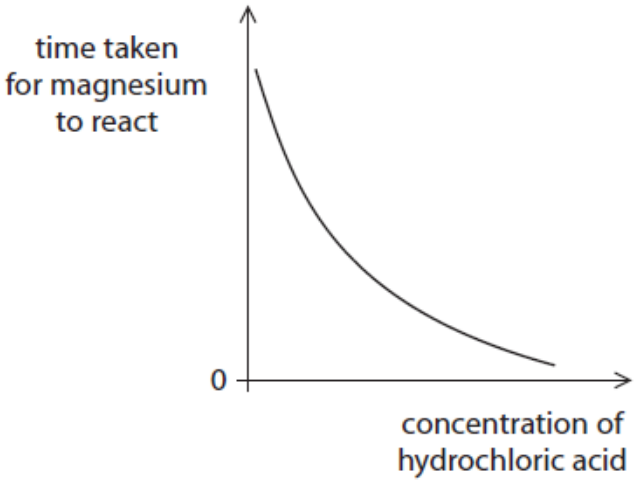
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(ii) Complete the equation for the reaction between zinc and copper sulfate by putting formulae in the spaces provided.

(2)

$Zn + CuSO_4 \rightarrow$ ..... + ...

(b) A length of magnesium ribbon was added to excess hydrochloric acid. The time for all of the magnesium to react was recorded. The experiment was repeated with the same lengths of magnesium ribbon but different concentrations of the acid.
The graph shows the time taken for the magnesium to react with different concentrations of this acid.



Use the graph to explain how the rate of this reaction changes as the concentration of hydrochloric acid increases.

(2)

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*(c) Marble chips react with dilute hydrochloric acid to produce carbon dioxide gas. The rate of this reaction can be changed by changing the size of the marble chips.

Describe experiments to investigate what effect using smaller marble chips has on the rate of this reaction.

(6)

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(Total for question = 12 marks)

Q13.

Energy changes and rates of reaction

(a) When zinc reacts with copper sulfate solution, zinc sulfate solution and copper are formed.

(i) An experiment was carried out to measure the temperature change when zinc powder reacts with copper sulfate solution.

initial temperature of copper sulfate solution = 20 °C
final temperature of mixture after the reaction = 46 °C

Explain what the temperature readings show about the type of heat change that occurs during this reaction.

(2)

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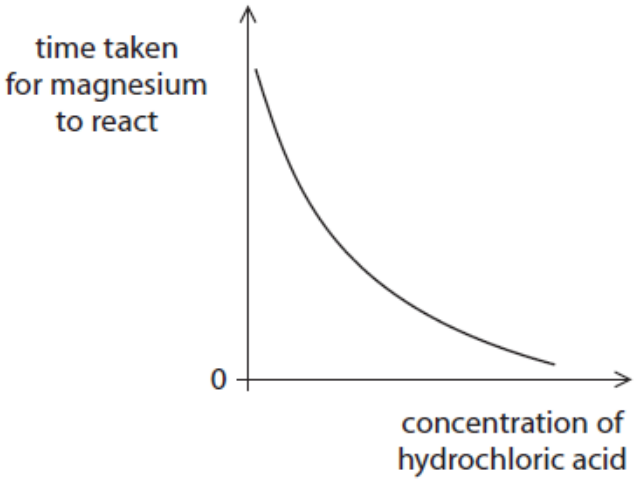
(ii) Complete the equation for the reaction between zinc and copper sulfate by putting formulae in the spaces provided.

(2)

$Zn + CuSO_4 \rightarrow$ ..... + ...

(b) A length of magnesium ribbon was added to excess hydrochloric acid. The time for all of the

magnesium to react was recorded. The experiment was repeated with the same lengths of magnesium ribbon but different concentrations of the acid.
The graph shows the time taken for the magnesium to react with different concentrations of this acid.



Use the graph to explain how the rate of this reaction changes as the concentration of hydrochloric acid increases.

(2)

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*(c) Marble chips react with dilute hydrochloric acid to produce carbon dioxide gas. The rate of this reaction can be changed by changing the size of the marble chips.

Describe experiments to investigate what effect using smaller marble chips has on the rate of this reaction.

(6)

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(Total for question = 12 marks)

Q14.

Aluminium reacts with chlorine to form aluminium chloride.

Write the balanced equation for this reaction.

(3)

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(Total for question = 3 marks)

Q15.

Lithium, sodium and potassium are reactive metals in group 1 of the periodic table.

Sodium reacts with water to form sodium hydroxide solution and hydrogen.

Complete the balancing of the equation for this reaction and add the state symbols for each substance.

(3)

.....$Na($.....$) + 2H_2O($.....$) \rightarrow$ ..... $NaOH($.....$) + H_2($.....$)$

(Total for question = 3 marks)

Q16.

Lithium, sodium and potassium are reactive metals in group 1 of the periodic table.

Sodium reacts with water to form sodium hydroxide in solution and hydrogen.

Complete the balancing of the equation for this reaction and add the state symbols for each substance.

(3)

.....Na(.....) + $2H_2O$(.....) → .....NaOH(.....) + H_2(.....)

(Total for question = 3 marks)

Q17.

(a) A bottle of wine is opened and left exposed to the air for a few days.
The ethanol in the wine reacts with oxygen from the air to form ethanoic acid.

Complete the sentence by putting a cross (☒) in the box next to your answer.

In this reaction the ethanol is

(1)

☒ **A** hydrated

☒ **B** neutralised

☒ **C** oxidised

☒ **D** reduced

(b) Vinegar is a dilute solution of ethanoic acid.

Complete the sentence by putting a cross (☒) in the box next to your answer.

Vinegar is used as a

(1)

- ☒ **A** fibre
- ☒ **B** fuel
- ☒ **C** perfume
- ☒ **D** preservative

(c) State the colour of Universal indicator in a solution of ethanoic acid.

(1)

.....

(d) The word equation for the reaction of dilute ethanoic acid with sodium hydroxide solution is

ethanoic acid + sodium hydroxide → sodium ethanoate + water

Complete the balanced equation for this reaction.

CH_3COOH + ... → CH_3COONa + ...

(e) When magnesium is added to dilute ethanoic acid, a colourless gas is formed. This gas gives a squeaky pop when mixed with air and ignited.

Give the name of the gas given off in this reaction.

(1)

.....

(f) Ethanoic acid reacts with ethanol to form ethyl ethanoate.

(i) Write the word equation for this reaction.

(2)

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(ii) Ethyl ethanoate is an ester.

Explain **one** use of esters.

(2)

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(Total for Question = 10 marks)

Q18.

(a) A bottle of wine is opened and left exposed to the air for a few days.
The ethanol in the wine reacts with oxygen from the air to form ethanoic acid.

Complete the sentence by putting a cross (☒) in the box next to your answer.

In this reaction the ethanol is

(1)

☒ **A** hydrated

☒ **B** neutralised

☒ **C** oxidised

☒ **D** reduced

(b) Vinegar is a dilute solution of ethanoic acid.

Complete the sentence by putting a cross (☒) in the box next to your answer.

Vinegar is used as a

(1)

☒ **A** fibre

☒ **B** fuel

☒ **C** perfume

☒ **D** preservative

(c) State the colour of Universal indicator in a solution of ethanoic acid.

(1)

.....

(d) The word equation for the reaction of dilute ethanoic acid with sodium hydroxide solution is

ethanoic acid + sodium hydroxide → sodium ethanoate + water

Complete the balanced equation for this reaction.

CH_3COOH + ... → CH_3COONa + ...

(e) When magnesium is added to dilute ethanoic acid, a colourless gas is formed. This gas gives a squeaky pop when mixed with air and ignited.

Give the name of the gas given off in this reaction.

(1)

.....

(f) Ethanoic acid reacts with ethanol to form ethyl ethanoate.

(i) Write the word equation for this reaction.

(2)

.....

(ii) Ethyl ethanoate is an ester.

Explain **one** use of esters.

(2)

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(Total for Question = 10 marks)

Q19.

Ethanol is produced by the fermentation of glucose.

Yeast is needed for the fermentation reaction.

(i) State **two** other conditions for fermentation.

(2)

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(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

A dilute solution of ethanol can be converted to a concentrated solution of ethanol by

(1)

☒ **A** filtration

☒ **B** fractional distillation

☒ **C** dehydration

☒ **D** cracking

(iii) Write the balanced equation for the fermentation of glucose, $C_6H_{12}O_6$.

(2)

.....

Q20.

Ethanol is produced by the fermentation of glucose.

Yeast is needed for the fermentation reaction.

(i) State **two** other conditions for fermentation.

(2)

.....

.....

.....

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

A dilute solution of ethanol can be converted to a concentrated solution of ethanol by

(1)

☒ **A** filtration

☒ **B** fractional distillation

☒ **C** dehydration

☒ **D** cracking

(iii) Write the balanced equation for the fermentation of glucose, $C_6H_{12}O_6$.

(2)

.....

Q21.

(a) Ethanol can be produced by reacting ethene with steam.

Write the balanced equation for this reaction.

(2)

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(b) Ethanol can also be produced by fermentation.

Describe how ethanol can be produced from sugar by fermentation.

(2)

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(c) A country has large amounts of available fertile land.
It has no reserves of crude oil.
It is not a wealthy country.

Explain why this country produces the ethanol it needs by fermentation rather than from

ethene.

(3)

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(d) An atom of phosphorus contains 15 electrons.

Describe how these 15 electrons are arranged in a phosphorus atom.

(2)

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(c) A country has large amounts of available fertile land.
It has no reserves of crude oil.
It is not a wealthy country.

Explain why this country produces the ethanol it needs by fermentation rather than from ethene.

(3)

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(d) Ethanol is a member of the homologous series of alcohols.
The first three members of the series are

methanol CH_3OH

ethanol C_2H_5OH

propanol C_3H_7OH

Use the formulae of these molecules to explain why these alcohols are members of the same homologous series.

(2)

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(Total for Question = 9 marks)

Q22.

(a) Ethanol can be produced by reacting ethene with steam.

Write the balanced equation for this reaction.

(2)

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(b) Ethanol can also be produced by fermentation.

Describe how ethanol can be produced from sugar by fermentation.

(2)

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(c) A country has large amounts of available fertile land.
It has no reserves of crude oil.
It is not a wealthy country.

Explain why this country produces the ethanol it needs by fermentation rather than from ethene.

(3)

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(d) An atom of phosphorus contains 15 electrons.

Describe how these 15 electrons are arranged in a phosphorus atom.

(2)

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(c) A country has large amounts of available fertile land.
It has no reserves of crude oil.
It is not a wealthy country.

Explain why this country produces the ethanol it needs by fermentation rather than from ethene.

(3)

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(d) Ethanol is a member of the homologous series of alcohols.
The first three members of the series are

methanol CH_3OH

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propanol C_3H_7OH

Use the formulae of these molecules to explain why these alcohols are members of the same homologous series.

(2)

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(Total for Question = 9 marks)

Q23.

Ethanol

Ethanol is present in alcoholic drinks.

(a) Ethanol is produced by fermentation of carbohydrates.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The conditions used for fermentation are

(1)

☒ **A** add manganese(IV) oxide, temperature below 20°C

☒ **B** add yeast, temperature of about 35°C

☒ **C** add manganese(IV) oxide, temperature of 45°C

☒ **D** add yeast, temperature above 60°C

(b) Ethanol, C_2H_5OH, is also produced by the reaction of ethene with steam.

Write the balanced equation for this reaction.

(2)

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(c) Ethanol is a member of the homologous series, the alcohols.

(i) Describe what is meant by an **homologous series**.

(2)

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(ii) Draw the structure of a molecule of methanol, CH_3OH.

Show all the covalent bonds.

(1)

(d) When a bottle of wine is left open for a few days, ethanol in the wine changes into ethanoic acid.

(i) State the type of reaction that occurs when ethanol changes into ethanoic acid.

(1)

.....

(ii) Describe what you would **see** when a piece of magnesium ribbon is added to dilute ethanoic acid.

(2)

.....

.....

.....

.....

(Total for question = 9 marks)

Q24.

Ethanol

Ethanol is present in alcoholic drinks.

(a) Ethanol is produced by fermentation of carbohydrates.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The conditions used for fermentation are

(1)

☒ **A** add manganese(IV) oxide, temperature below 20°C

☒ **B** add yeast, temperature of about 35°C

☒ **C** add manganese(IV) oxide, temperature of 45°C

☒ **D** add yeast, temperature above 60°C

(b) Ethanol, C_2H_5OH, is also produced by the reaction of ethene with steam.

Write the balanced equation for this reaction.

(2)

.....

(c) Ethanol is a member of the homologous series, the alcohols.

(i) Describe what is meant by an **homologous series**.

(2)

.....

.....

.....

.....

(ii) Draw the structure of a molecule of methanol, CH_3OH.

Show all the covalent bonds.

(1)

(d) When a bottle of wine is left open for a few days, ethanol in the wine changes into ethanoic acid.

(i) State the type of reaction that occurs when ethanol changes into ethanoic acid.

(1)

.....

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(2)

.....

.....

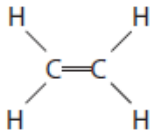
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(Total for question = 9 marks)

Q25.

The diagram shows the structure of a molecule of ethene, C_2H_4.



(i) The complete combustion of ethene produces carbon dioxide and water.

Balance this equation by putting numbers in the spaces.

(2)

C_2H_4 + ... O_2 → ..... CO_2 + ... H_2O

(ii) Ethene can form the polymer poly(ethene).

Draw a diagram to show the part of a poly(ethene) molecule formed by the reaction of two ethene molecules.

(2)

(Total for question = 4 marks)

Q26.

Calcium nitrate solution can be made by adding solid calcium carbonate to dilute nitric acid in a beaker. The solid calcium carbonate is added until some remains at the bottom of the beaker.

(i) The mixture in the beaker is filtered to remove the excess solid calcium carbonate.

Draw a diagram to show the apparatus used to filter the mixture and to collect the filtrate.

(2)

(ii) Explain why the calcium carbonate is added until some solid remains at the bottom of the beaker.

(2)

.....

.....

(iii) Write the balanced equation for the reaction between calcium carbonate and nitric acid to form calcium nitrate, $Ca(NO_3)_2$.

(3)

.....

(Total for question = 7 marks)

Q27.

Lithium, sodium and potassium are reactive metals in group 1 of the periodic table.

In an experiment equal-sized pieces of lithium, sodium and potassium are added to separate samples of water.

(i) A flame is produced only with potassium because potassium

(1)

☒ **A** is the softest metal

☒ **B** has the lowest melting point

☒ **C** is the most reactive

☒ **D** is the only flammable metal

* (ii) A teacher demonstrated this experiment.

The results are shown in Figure 14.

	lithium	sodium	potassium
position of metal in water	floats	floats	floats
movement of metal	slow	fast	very fast
effervescence / bubbling	slow	fast	very fast

Figure 14

Describe, in detail, how the teacher would demonstrate this experiment safely, showing how the results give the order of reactivity of the metals.

(Total for question = 7 marks)

Q28.

Iron is extracted from iron oxide, Fe_2O_3.

In the extraction process the iron oxide is heated with carbon to form iron and carbon dioxide.

Write the balanced equation for this reaction.

(3)

.....

Q29.

Ethanol is produced by the fermentation of glucose solution.

(i) Describe how this fermentation is carried out.

(2)

.....

.....

.....

.....

(ii) Complete the word equation for the fermentation of glucose.

(2)

glucose → ..... +
.....

(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Fermentation produces a dilute solution of ethanol.

A concentrated solution of ethanol is produced from a dilute solution by

(1)

☒ **A** cracking

☒ **B** dehydration

☒ **C** fractional distillation

☒ **D** polymerisation

(iv) State a possible harmful effect of consuming too many alcoholic drinks.

(1)

.....

.....

.....

Q30.

Ethanol is produced by the fermentation of glucose solution.

(i) Describe how this fermentation is carried out.

(2)

.....

.....

.....

.....

(ii) Complete the word equation for the fermentation of glucose.

(2)

glucose → ..... +
.....

(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Fermentation produces a dilute solution of ethanol.

A concentrated solution of ethanol is produced from a dilute solution by

(1)

☒ **A** cracking

☒ **B** dehydration

☒ **C** fractional distillation

☒ **D** polymerisation

(iv) State a possible harmful effect of consuming too many alcoholic drinks.

(1)

.....

.....

.....

Q31.

Fertilisers and ammonia

(a) State why farmers spread fertilisers on their fields.

(1)

.....

.....

.....

(b) Using too much fertiliser can harm the environment.

Describe how the spreading of too much fertiliser on fields can harm the environment.

(2)

.....

.....

.....

.....

(c) Ammonium nitrate is a fertiliser.

Ammonium nitrate is formed when nitric acid reacts with ammonia.

(i) Write the word equation for this reaction.

(2)

..... + ... → .....

(ii) This hazard symbol appears on a bottle of nitric acid.



Complete the sentence by putting a cross (☒) in the box next to your answer.

This hazard symbol shows that the nitric acid is

(1)

☒ **A** corrosive

☒ **B** explosive

☒ **C** flammable

☒ **D** toxic

(d) In the Haber process, nitrogen and hydrogen react to form ammonia.

$$\text{nitrogen} + \text{hydrogen} \rightleftharpoons \text{ammonia}$$

(i) The ⇌ symbol in the word equation shows that the reaction goes forwards and backwards at the same time.

Give the name of this type of reaction.

(1)

.....

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The formula for a molecule of ammonia is

(1)

☒ **A** Am_3

☒ **B** HN

☒ **C** NH_3

☒ **D** N_3O

(Total for question = 8 marks)

Q32.

Fertilisers and ammonia

(a) State why farmers spread fertilisers on their fields.

(1)

.....

.....

.....

(b) Using too much fertiliser can harm the environment.

Describe how the spreading of too much fertiliser on fields can harm the environment.

(2)

.....

.....

.....

.....

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(2)

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(1)

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(1)

☒ **A** Am_3

☒ **B** HN

☒ **C** NH_3

☒ **D** N_3O

(Total for question = 8 marks)

Q33.

(a) Nitrogen reacts with hydrogen to form ammonia.

(i) Which of these is the balanced equation for this reaction?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** $N + 3H \rightleftharpoons NH_3$

☒ **B** $N_2 + H_2 \rightleftharpoons NH_3$

☒ **C** $N_2 + 3H_2 \rightleftharpoons 2\ NH_3$

☒ **D** $N + H_3 \rightleftharpoons NH_3$

(ii) State the meaning of the symbol $\rightleftharpoons$ in an equation.

(1)

.....

.....

(b) Ammonia is used in the manufacture of some fertilisers.

(i) The table shows information about three fertilisers manufactured from ammonia.

substance	% by mass of nitrogen	% by mass of oxygen
ammonium nitrate	35	60
ammonium sulfate	21	48
urea	47	27

Use the information in the table to explain why urea might be the best fertiliser.

(2)

.....

.....

(ii) When rivers flow through areas where fertilisers have been spread on the land, plants and animals that live in the rivers can be affected.

Explain how this happens.

(2)

.....

.....

.....

.....

.....

Q34.

(a) Nitrogen reacts with hydrogen to form ammonia.

(i) Which of these is the balanced equation for this reaction?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** $N + 3H \rightleftharpoons NH_3$

☒ **B** $N_2 + H_2 \rightleftharpoons NH_3$

☒ **C** $N_2 + 3H_2 \rightleftharpoons 2\ NH_3$

☒ **D** $N + H_3 \rightleftharpoons NH_3$

(ii) State the meaning of the symbol $\rightleftharpoons$ in an equation.

(1)

.....

.....

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(2)

.....

.....

(ii) When rivers flow through areas where fertilisers have been spread on the land, plants and animals that live in the rivers can be affected.

Explain how this happens.

(2)

.....

.....

.....

.....

.....

Q35.

Aluminium ions, Al^{3+}, react with hydroxide ions in solution to give a white precipitate of aluminium hydroxide.

Write the ionic equation for this reaction.

(3)

.....

Q36.

Aluminium ions, Al^{3+}, react with hydroxide ions in solution to give a white precipitate of aluminium hydroxide.

Write the ionic equation for this reaction.

(3)

.....

Q37.

When sodium sulfate solution is electrolysed, using inert electrodes, hydrogen is formed at the cathode.

Write the half equation for the formation of hydrogen gas, H_2, from hydrogen ions, H^+.

(2)

.....

(Total for question = 2 marks)

Q38.

Figure 1 shows the dot and cross diagram for a molecule of ammonia.

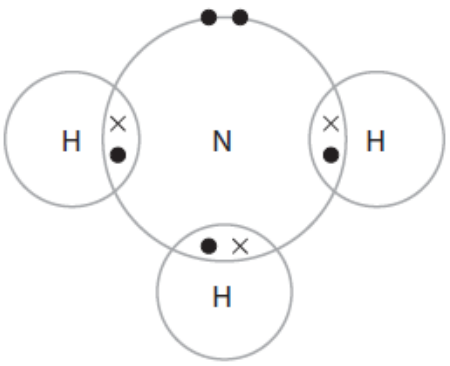


Figure 1

Ammonia reacts with nitric acid to form ammonium nitrate.

(i) Complete the word equation for this reaction.

(1)

..... + ... → .....

(ii) An ammonium ion has the formula NH_4^+.

A nitrate ion has the formula NO_3^-.

Which of the following is the formula for ammonium nitrate?

(1)

☒ **A** $(NH)_4NO_3$

☒ **B** $(NH_4NO)_3$

☒ **C** NH_4NO_3

☒ **D** $(NHNO)_{12}$

(iii) Explain why farmers spread ammonium nitrate on their fields.

(2)

.....

.....

(Total for question = 4 marks)

Q39.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Hydrochloric acid reacts with solid **B**.
Solid **B** is an alkali.

A student carries out an experiment to see how the pH changes when different masses of solid **B** are added to dilute hydrochloric acid.

The student uses the following method.

step 1 use a measuring cylinder to measure out 100 cm^3 of dilute hydrochloric acid

step 2 pour the acid into a beaker

step 3 measure the pH with a pH probe

step 4 add half a spatula of solid **B** and stir

step 5 repeat steps 3 and 4 until the pH stops changing.

(i) Give a safety precaution that should be taken during the experiment.

(1)

.....

.....

(ii) Give an improvement to step 4 that would produce more accurate results.

(1)

.....

.....

(iii) What is the most likely change in pH during the experiment?

(1)

☒ **A** from 1 to 7

☒ **B** from 1 to 12

☒ **C** from 7 to 12

☒ **D** from 12 to 1

(iv) If some methyl orange indicator is added to the acid in step 2, the mixture changes colour during the experiment.

State the colour change.

(2)

colour at start in acid ..... colour at end .....

(Total for question = 5 marks)

Q40.

Copper sulfate solution was mixed with sodium hydroxide solution.

A precipitate of copper hydroxide and a solution of sodium sulfate were formed.

Bottles of both copper sulfate solution and sodium hydroxide solution can have a hazard symbol on them.

The hazard symbol is shown in Figure 6.



Figure 6

Give one precaution that should be taken when using copper sulfate solution or sodium hydroxide solution as this hazard symbol is on the bottle.

(1)

.....

.....

(Total for question = 1 mark)

Q41.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Concentrated hydrochloric acid can be broken down using electricity.
The apparatus that can be used is shown in Figure 6.

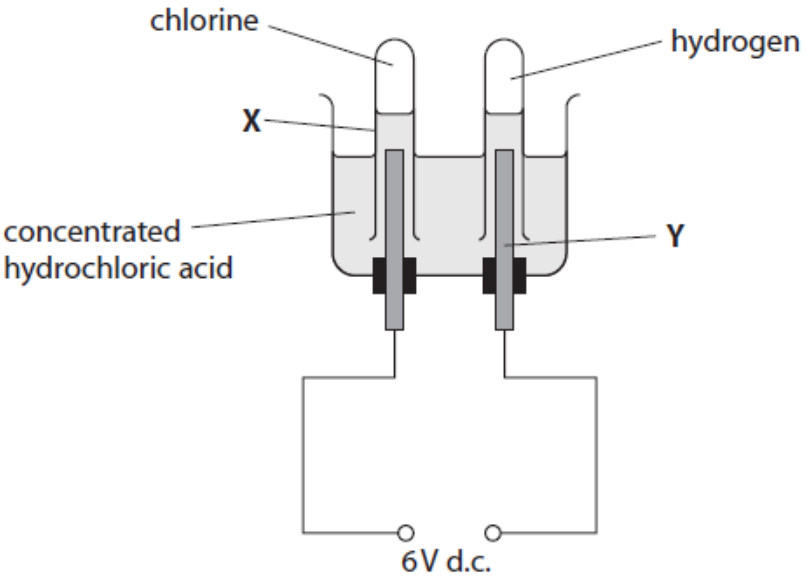


Figure 6

(i) Give the name of the piece of apparatus labelled **X**.

(1)

.....

(ii) The rod labelled **Y** in Figure 6 is made of graphite.

What is the name of this piece of apparatus?

(1)

☒ **A** electrode

☒ **B** electrolysis

☒ **C** electrolyte

☒ **D** electron

(iii) Give **one** reason why graphite is a suitable material to make **Y**.

(1)

.....

(iv) Complete the balanced equation for the reaction that occurs.

(1)

..... $HCl \rightarrow H_2 + Cl_2$

(Total for question = 4 marks)

Q42.

In the Haber process, hydrogen and nitrogen react to form ammonia.

$$\text{hydrogen} + \text{nitrogen} \rightleftharpoons \text{ammonia}$$

(i) The $\rightleftharpoons$ symbol in the word equation shows that the reaction goes forwards and backwards at the same time.

Give the name of this type of reaction.

(1)

.....

(ii) State the formula of a molecule of ammonia.

(1)

.....

(iii) Figure 7 shows a graph of world ammonia production, in millions of tonnes, from 1945 to 2015.

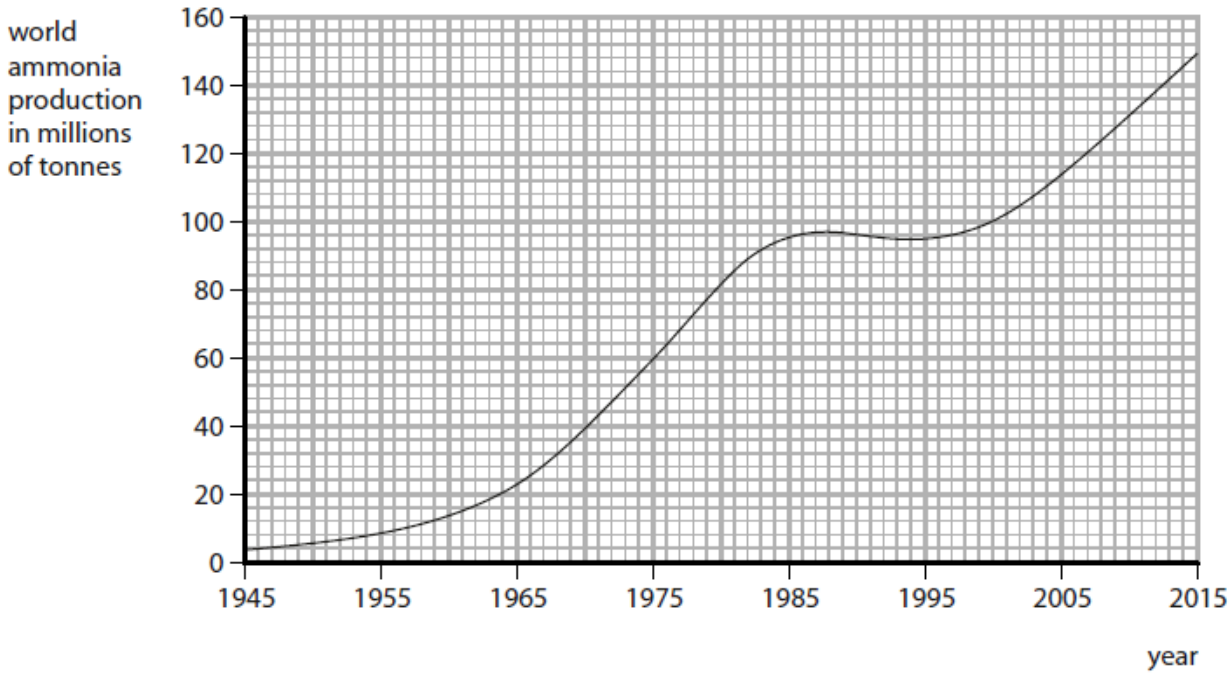


Figure 7

State the overall trend in world ammonia production from 1945 to 2015.

(1)

.....

.....

.....

(Total for question = 3 marks)