Section A

Answer **all** questions in this section in the spaces provided.
The total mark for this section is 50.

A1 The following statements are taken from a student's notebook. Each statement incorrect but can be corrected by changing **one word**.

Underline **one word** that should be changed and give a correct word in the space provided.

(a) In the nucleus of an atom, the particles with a negative charge are protons and the particles with no charge are neutrons.

correct word .....

(b) The elements increase in metallic properties across a period in the Periodic Table.

correct word .....

(c) A weak acid is completely ionised in aqueous solution, resulting in a low pH value below 2.

correct word .....

(d) Chlorine reacts with aqueous bromide solution in a neutralisation reaction.

correct word .....

(e) In the extraction of iron from haematite in the blast furnace, iron(III) oxide reacts with carbon dioxide to form iron.

correct word .....

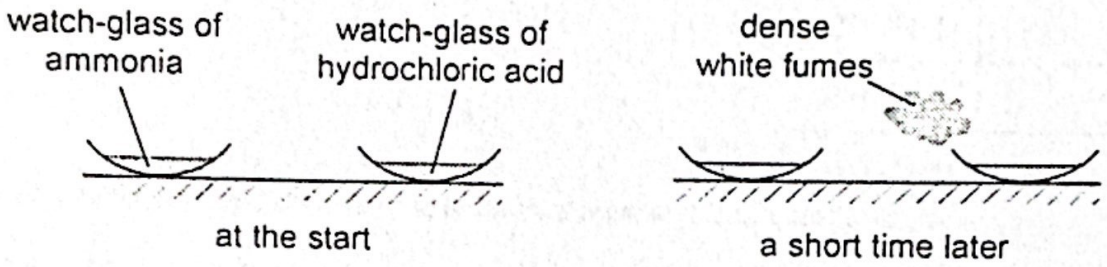
[Total: 5]

A2 Ammonia gas dissolves readily in water to form aqueous ammonia, which can be used in different experiments.

(a) One experiment involves placing watch-glasses of concentrated aqueous ammonia and concentrated hydrochloric acid near each other on a table.

At first, no white fumes were seen.

After a short time, dense white fumes were seen between the watch-glasses.



Explain these observations using the kinetic particle model.

.....

.....

.....

.....

.....

..... [3]

(b) Another experiment that involves aqueous ammonia is the identification of cations.

Explain how aqueous ammonia can be used to distinguish between solutions containing aluminium ions and zinc ions.

.....

.....

..... [2]

[Total: 5]

A3 Iron pyrite, FeS_2, is often called 'fool's gold' because of its yellow colour appearance, that makes it look like gold metal.

Impure samples of iron pyrite often contain a small amount of gold. The gold can be obtained by roasting impure iron pyrite which produces iron(III) oxide and sulfur dioxide. Gold does not react with oxygen.

(a) Write an equation to show the reaction between iron pyrite and oxygen during roasting.

..... [2]

(b) Describe an environmental consequence if the gaseous waste from roasting of iron pyrite is released directly into the atmosphere.

.....

.....

.....

..... [2]

(c) A sample of impure iron pyrite was roasted in oxygen until constant mass was obtained. Table 3.1 shows the mass of each solid product in the final mixture.

Table 3.1

solid product	mass / g
iron(III) oxide	33.18
gold	0.37

(i) Calculate the mass of iron pyrite present in the sample roasted.

[2]

(ii) Calculate the percentage purity of the sample of impure iron pyrite roasted.

[1]

[Total: 7]

A4 Chromate salts contain chromate anion, CrO_4^{2-} and they are useful chemicals for redox reactions. The primary ore used to obtain chromate salts is iron(II) chromite, $FeCr_2O_4$.

When heated, iron chromite ore can react with sodium carbonate in the presence of oxygen.

$$4FeCr_2O_4(s) + 8Na_2CO_3(s) + 7O_2(g) \longrightarrow 8Na_2CrO_4(s) + 2Fe_2O_3(s) + 8CO_2(g)$$

(a) (i) Complete the table to show the oxidation states of iron and chromium.

element	oxidation state in reactant	oxidation state in product
iron		
chromium		

[3]

(ii) Which element is reduced in the reaction?

..... [1]

(b) Describe how dry crystals of sodium chromate can be obtained from the solid product mixture of sodium chromate and iron oxide.

.....

.....

.....

.....

..... [3]

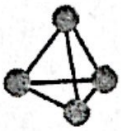
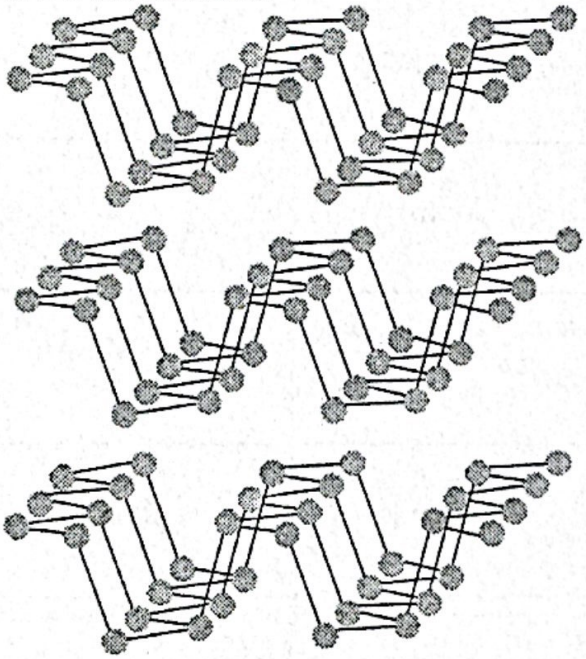
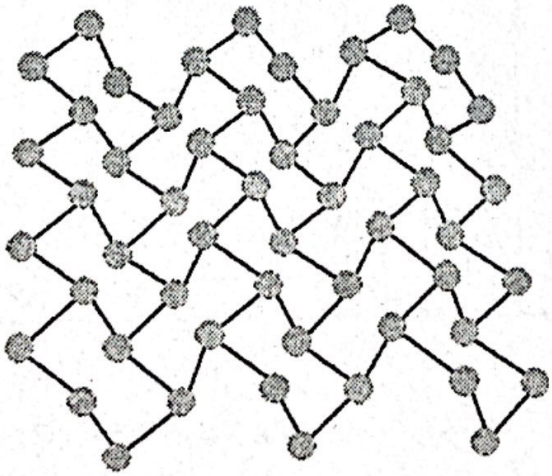
[Total: 7]

A5 Phosphorus can exist as different allotropes. The structures and melting points of two such allotropes, white phosphorus and black phosphorus, are shown in the Table 5.1.

Table 5.1

key

● phosphorus atom

allotrope	structure	melting point / °C
white phosphorus		44
black phosphorus	*Part of the structure:*  *Part of the structure of one single layer:* 	610

(a) With reference to white phosphorus and black phosphorus, explain what is meant by the term *allotropes*.

.....

..... [1]

(b) State the chemical formula of white phosphorus.

..... [1]

(c) Identify the structure of each allotrope of phosphorus.

white phosphorus .....

black phosphorus .....

[2]

(d) Explain the difference in the melting points of the two allotropes of phosphorus.

.....

.....

.....

.....

..... [3]

(e) A single layer of black phosphorus can be obtained by using the scotch tape delamination method. This method involved the use of a scotch tape to peel off a single layer.

Suggest why a single layer of black phosphorus can be easily peeled off using scotch tape.

.....

..... [1]

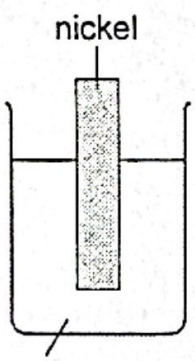
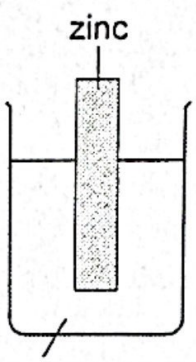
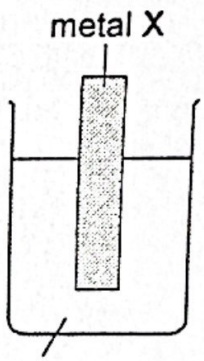
[Total: 8]

A6 Three experiments were carried out to find the order of reactivity of three metals.

The metal used were nickel, zinc and an unknown metal **X**.

Table 6.1 shows information about the three experiments.

Table 6.1

		experiment 1	experiment 2	experiment 3
				
colour of metal	start	silver-grey	silver-grey	orange-brown
	end	pink coating on surface	silver-grey with crystals formed on surface	
colour of solution	start	blue	green	colourless
	end	paler blue	colourless	

(a) Suggest the name of metal **X**.

..... [1]

(b) Identify an information from Table 6.1 that suggests nickel is a transition metal.

..... [1]

(c) Complete Table 6.1 to show the colour of the metal and the solution at the end of experiment 3.

[1]

(d) Give the order of reactivity of the three metals.

least reactive .....

.....

most reactive .....

[1]

(e) Write an ionic equation, with state symbols, for the reaction in experiment 2.

..... [2]

[Total: 6]

A7 Methyl acrylate is an organic compound produced to make acrylate fibre, which is used for weaving synthetic carpets.

Fig 7.1 shows the structure of methyl acrylate.

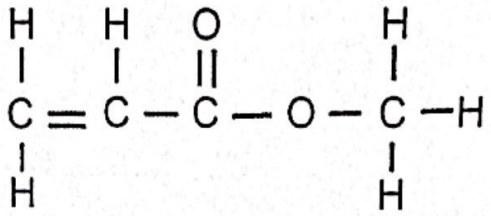


Fig. 7.1

(a) Methyl acrylate is formed by esterification of alcohol **X** and acrylic acid.

(i) State the name of alcohol **X**.

..... [1]

(ii) Draw the structure of acrylic acid.

[1]

(b) Methyl acrylate can undergo polymerisation to form poly(methyl acrylate).

Draw the structure of poly(methyl acrylate).

[1]

(c) A student has a sample of methyl acrylate and a sample of butanoic acid.

The student made the following statement:

Methyl acrylate and butanoic acid are isomers of each other.

Do you agree with his statement? Explain your answer.

Your answer should:

- define the term *isomer*
- include references to molecular formulae.

.....

.....

.....

.....

..... [3]

[Total: 6]

A8 An aqueous solution of potassium bromide was electrolysed using platinum electrodes as shown in Fig 8.1.

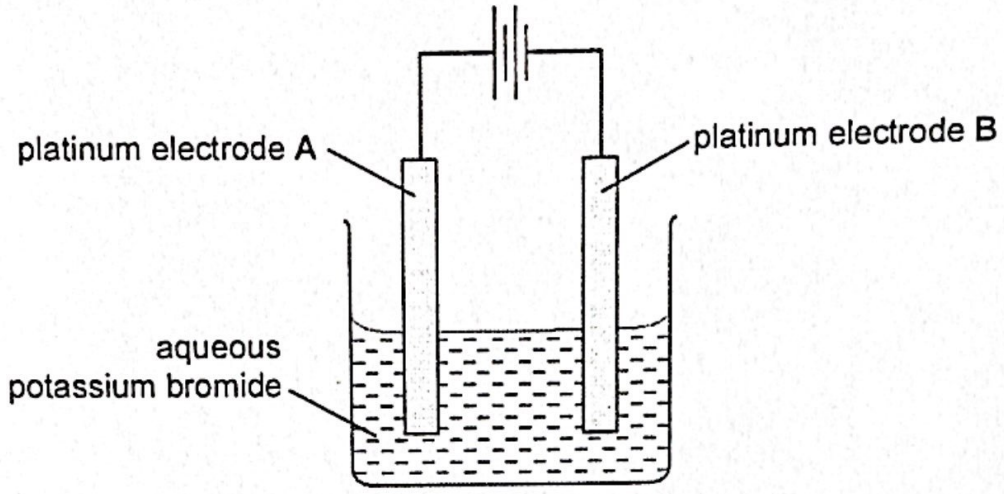


Fig. 8.1

A colour change was observed at one of the electrodes as soon as the electrolysis started.

(a) Complete the table by filling in the missing information.

colour change observed	
electrode at which the colour change occurred	

[2]

(b) Write equations for the reactions that happen at each electrode when electrolysis just begins.

electrode A .....

electrode B .....

[2]

(c) Is the aqueous solution of potassium bromide in the electrolysis a dilute or concentrated solution?

Explain your answer.

.....

.....

.....

..... [2]

[Total: 6]

Section B

Answer all **three** questions in this section.
The last question is in the form of an either/or and only **one** of the alternatives should be attempted.

B9 Gas Chromatography

Gas chromatography is a commonly used separation technique in many environmental and forensic laboratories for quality control as well as identification and quantitation of compounds in a miscible mixture. Gas chromatography allows for the separation and detection of compounds even in very small quantities. A broad variety of samples can be analysed as long as the compounds are sufficiently stable to heat and reasonably volatile.

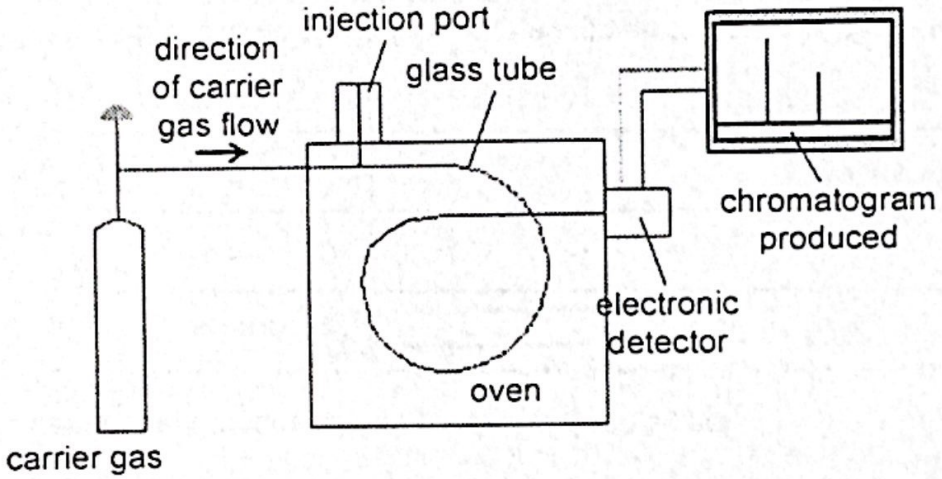


Fig. 9.1

Fig. 9.1 shows a schematic diagram of the gas chromatography machine. The gas chromatography machine consists of a thin glass tube placed inside an oven, where the temperature can be adjusted. A carrier gas, such as helium, is allowed to flow through the glass tube.

Next, a small sample of a mixture is injected into the glass tube and heated at a fixed temperature. The substance (in the mixture) with lower boiling point evaporates more easily and moves through the glass tube due to the flow of the carrier gas. The mixture separates into its constituent substances as it passes through the glass tube.

The time taken by each substance to reach the end of the glass tube is known as the retention time. Different substances have different retention times as they move through the glass tube at different rates.

A signal is recorded by the electronic dectector when each substance reaches the end of the glass tube.

(a) Helium is often used as a carrier gas in gas chromatography because it will not react with the mixture of substances analysed.

Explain why helium will not react with other substances.

.....

..... [2]

(b) Gas chromatography is often compared to fractional distillation due to their similarities.

State two similarities between gas chromatography and fractional distillation.

similarity 1 .....

.....

similarity 2 .....

.....

[2]

(c) A mixture of mesitylene and toluene is separated using gas chromatography. The boiling point of each compound is provided in the table below.

compound	boiling point / °C
mesitylene	165
toluene	111

Fig 9.2 shows the chromatogram obtained.

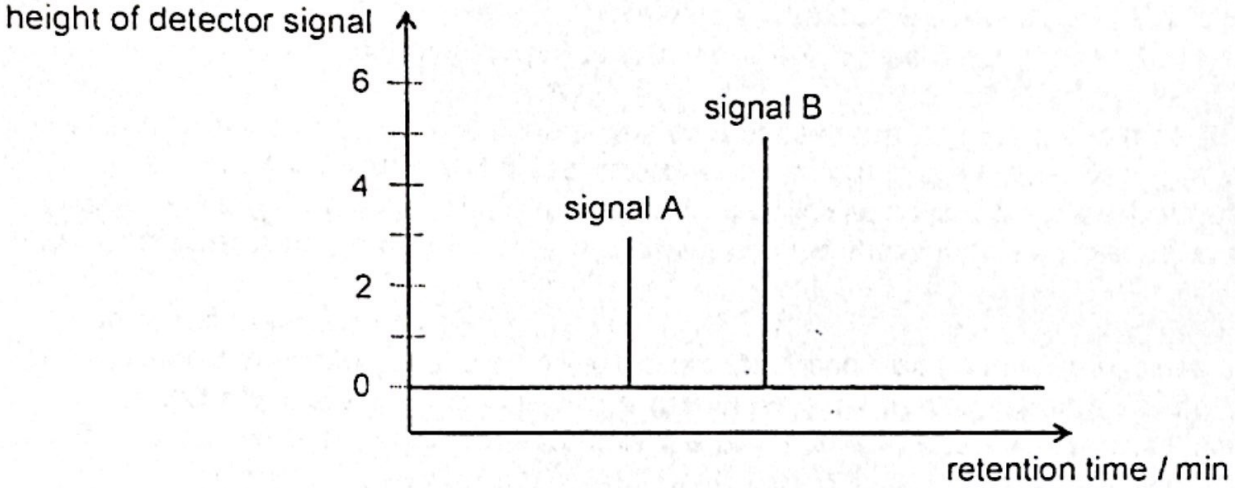


Fig 9.2

(i) Identify the compound that produced each signal.

signal	compound
A	
B	

[1]

(ii) The ratio of the heights of the signals gives the ratio of the amounts of the compounds present in the mixture.

Use the chromatogram above to find the percentage of each compound present.

Show your working in the space below.

[2]

(d) The flow rate of the carrier gas can affect the retention times of the substances separated by gas chromatography.

Three identical mixtures of benzene and hexane are separated using gas chromatography with different flow rates of the carrier gas. The type of carrier gas used, and the temperature of the oven are kept constant for the three separations.

Fig. 9.3 shows the chromatograms obtained for the different flow rate of carrier gas.

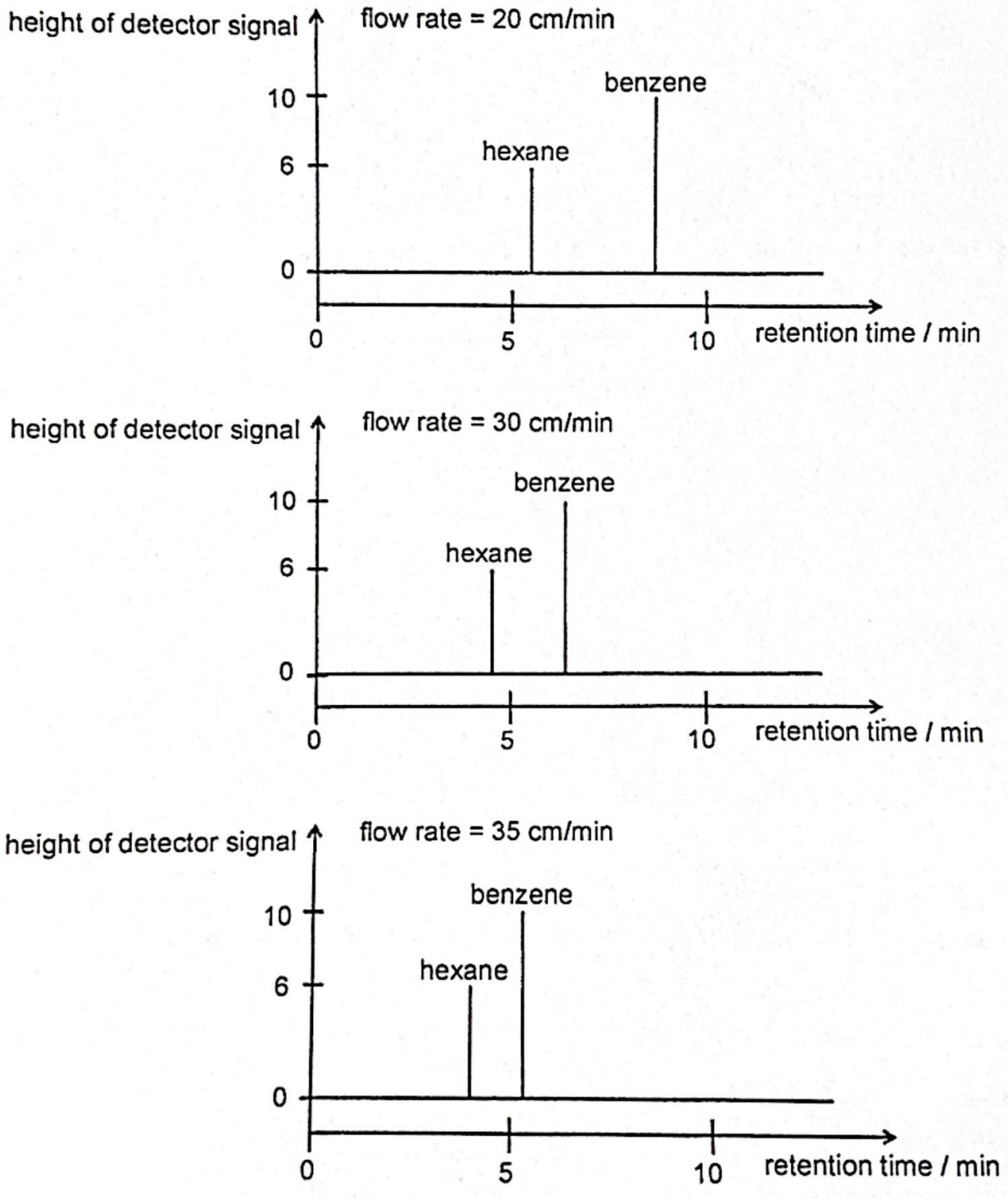


Fig. 9.3

(i) Describe how the flow rate of the carrier gas affects the retention time of the compounds.

.....

..... [2]

(ii) Another identical mixture of benzene and hexane is separated with gas chromatography. The type of carrier gas and temperature used are kept constant, but the flow rate of the carrier gas is increased to higher than 35 cm/min.

Only one signal is obtained in the chromatogram shown in Fig. 9.4.

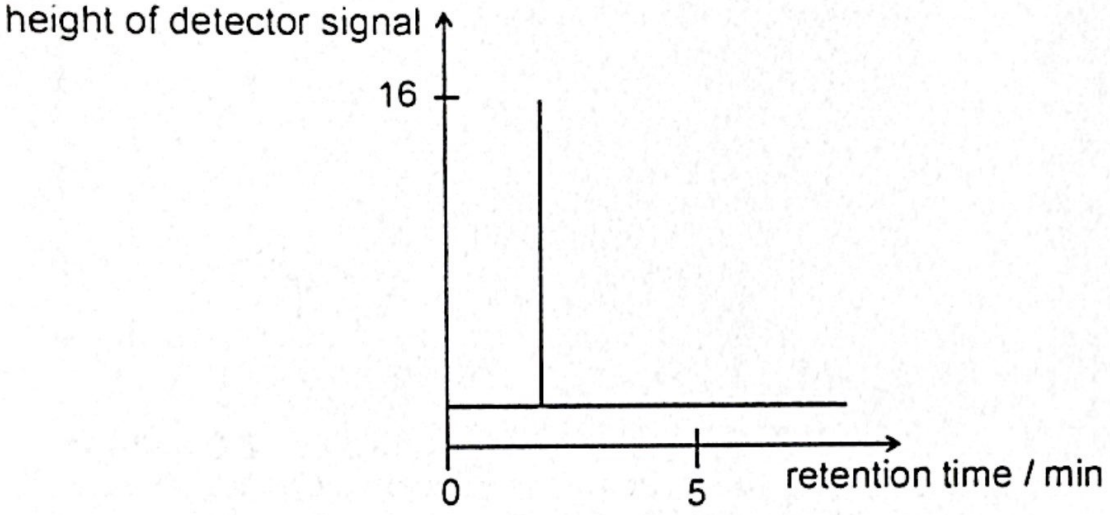


Fig 9.4

Suggest why only one signal is obtained.

.....

..... [1]

[Total: 10]

B10 Ammonia is manufactured from nitrogen and hydrogen by the Haber process.

(a) State the essential conditions for the manufacture of ammonia by the Haber process.

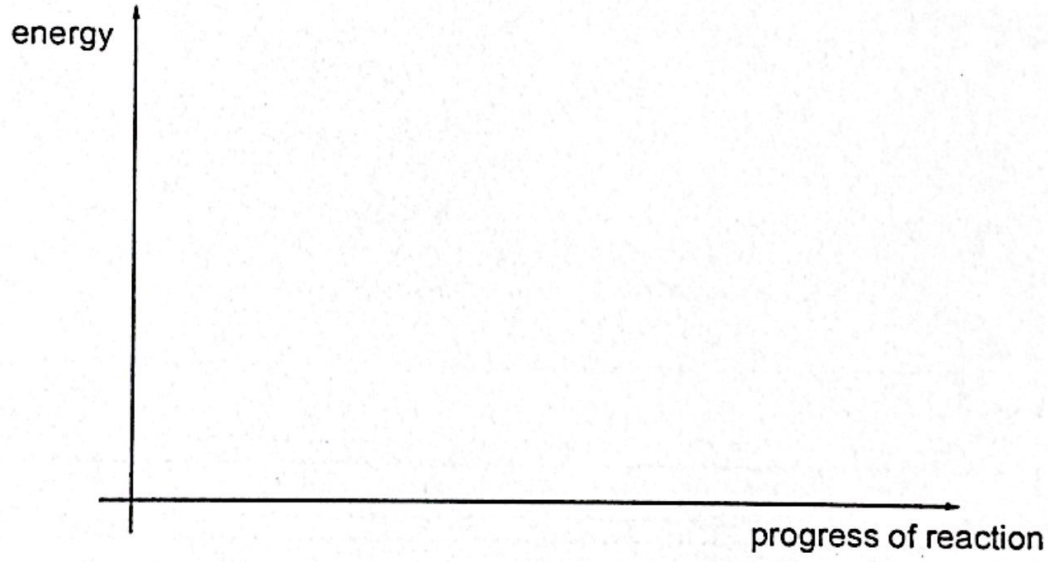
..... [1]

(b) The enthalpy change for Haber process is –92 kJ.

(i) Draw an energy profile diagram for manufacture of ammonia by Haber Process.

Your diagram should show:

- the formulae of the reactants and products
- the enthalpy change of reaction
- the activation energy for the reaction.



[3]

(ii) The enthalpy change for Haber process is –92 kJ.

Use ideas about breaking and forming bonds to explain why the enthalpy change value is negative.

.....

.....

.....

.....

..... [2]

(c) The Boltzmann distribution curve can be used to show the spread of number of molecules that have the energy E.

The area under the curve is used to find the total number of molecules that have energy below or above a particular value of energy.

For example, the shaded area under the Boltzmann distribution curve in Fig. 10.1 represents the total number of molecules that have energy above or equal to the energy, E_1.

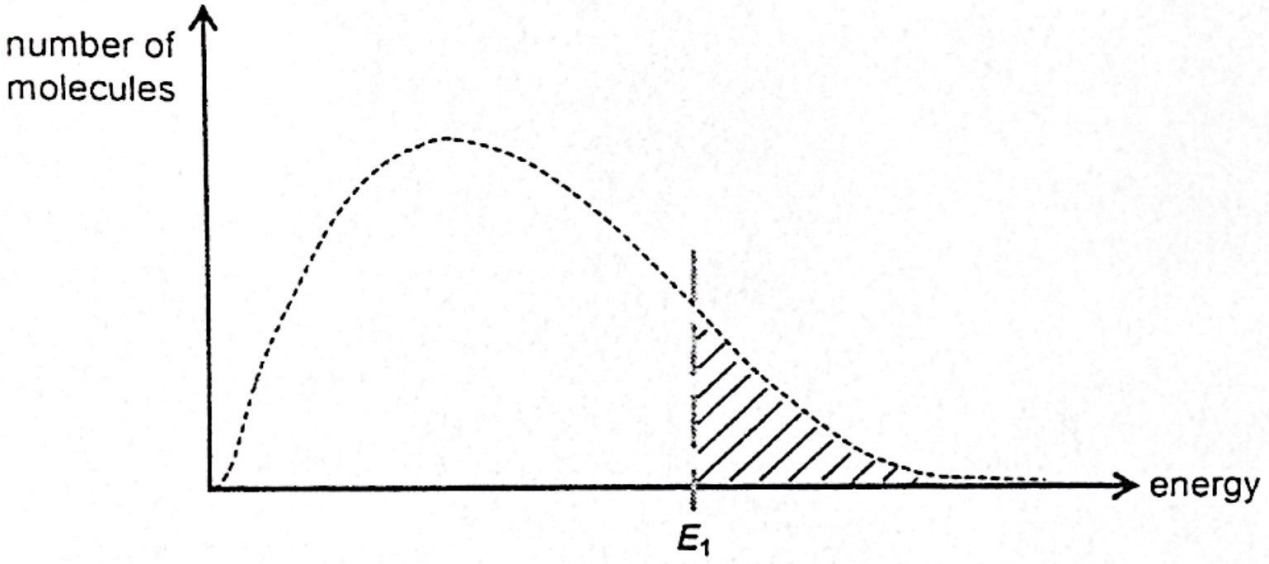


Fig. 10.1

The shape of the Boltzmann distribution curve changes with temperature as shown in Fig. 10.2.

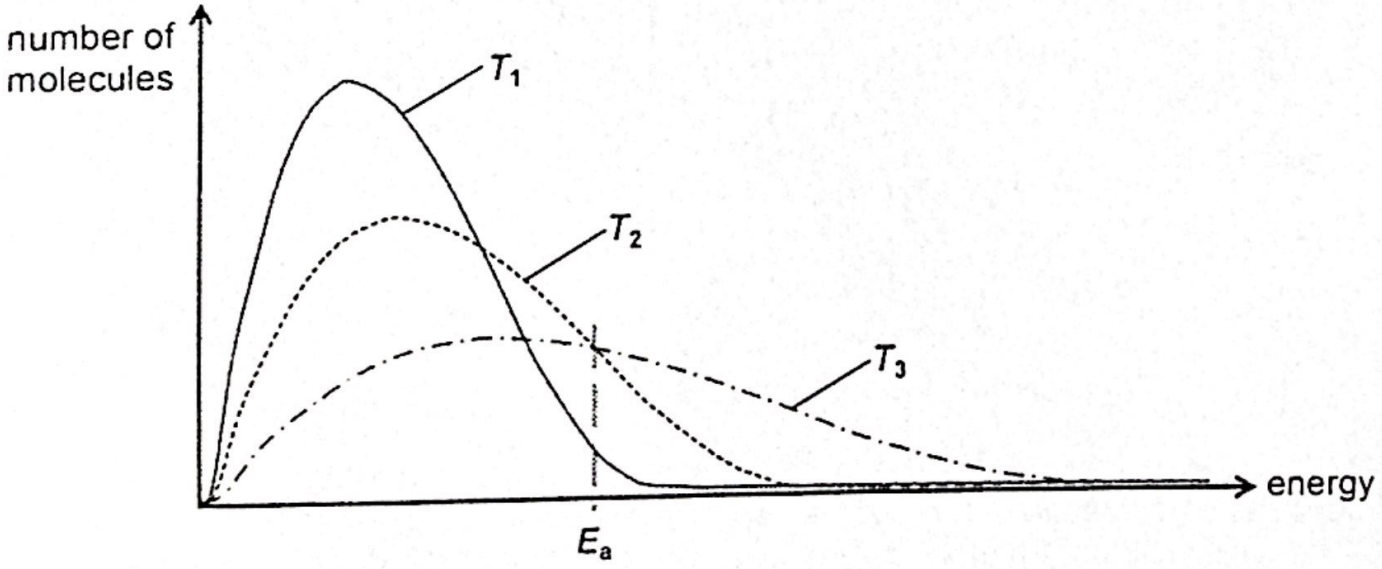


Fig. 10.2

(i) Arrange the temperature values, T_1, T_2 and T_3 in descending order.

..... [1]

(ii) The activation energy, E_a, for the formation of ammonia is indicated in Fig. 10.2.

Explain, in terms of collisions between particles and with reference to the Boltzmann distribution curve, how a higher temperature affects the rate of production of ammonia.

.....

.....

.....

.....

.....

..... [3]

[Total: 10]

EITHER

B11 Butane is an alkane and butene is an alkene.

(a) Compare the structure and properties of butane and butene.

Your answer should include a discussion of the similarities and differences in their

- structural formula
- combustion reactions
- reaction with aqueous bromine

Your answer should also include equations for any reactions discussed.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [7]

(b) Butane undergoes a photochemical substitution reaction with chlorine gas.

Explain, with the help of an equation showing full structural formulae, why this reaction is a *substitution* reaction and suggest why it is described as *photochemical*.

.....

.....

.....

..... [3]

[Total: 10]

OR

B11 Nylon and *Terylene* are synthetic polymers.

Fig. 11.1 and Fig. 11.2 show the sturctures of nylon and Terylene respectively.

nylon

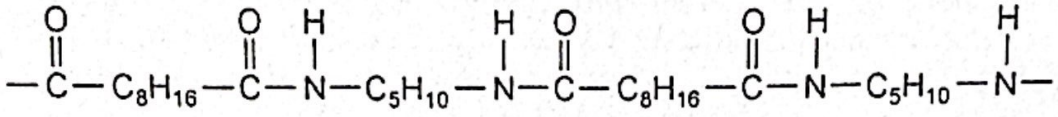


Fig. 11.1

Terylene

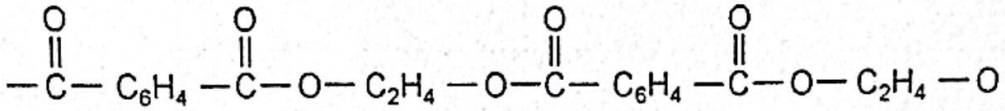


Fig. 11.2

(a) Construct a table to show the following information about nylon and Terylene.

- the formula and name of the type of linkages present in each type of polymer
- the structures of the monomers that react to form each polymer
- the formula of the molecule that is eliminated when the polymer forms.

[6]

(b) Both nylon and *Terylene* are condensation polymers.

Explain what the terms *condensation* and *polymer* mean.

.....

.....

.....

..... [2]

(c) Both nylon and *Terylene* are used to make tents for camping. One reason that they are suitable for this purpose is that they are non-biodegradable.

Explain why being non-biodegradable is both an advantage and a disadvantage.

.....

.....

.....

..... [2]

[Total: 10]

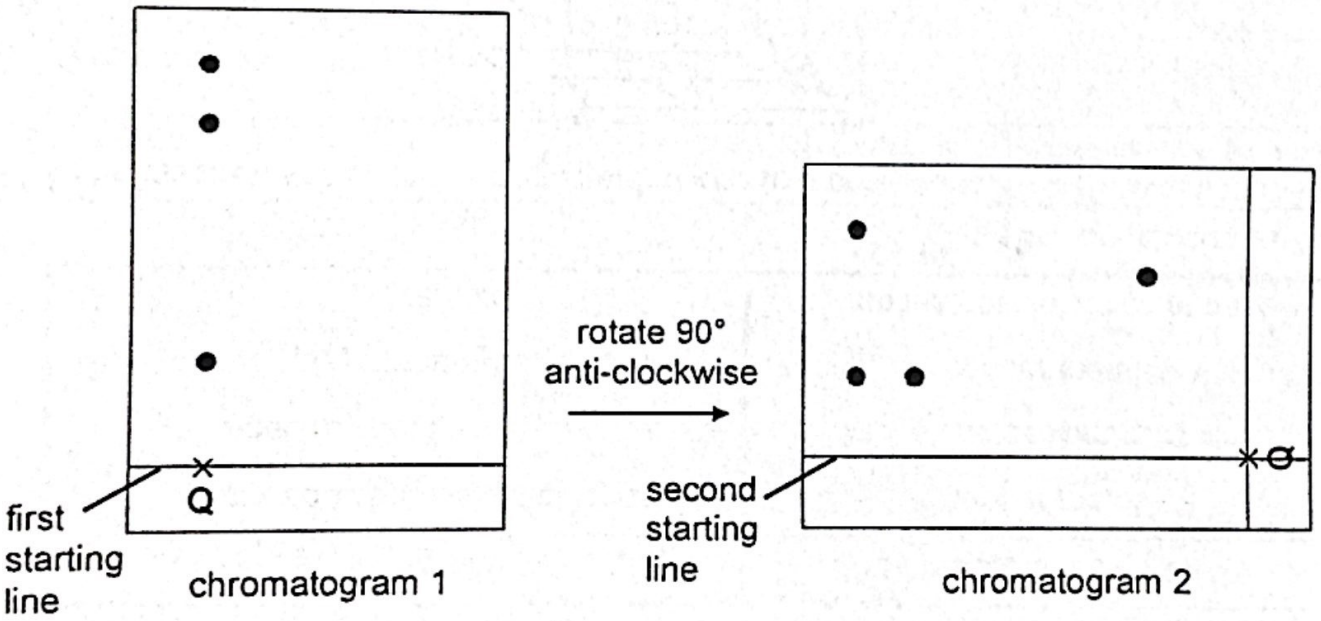
1 A student wants to investigate if dissolving 2.35 g of a salt in 25.0 cm^3 of water is an endothermic process.

Which pieces of apparatus are required?

	electronic balance	measuring cylinder	stopwatch	thermometer
A	✓	✓	×	✓
B	✓	×	×	✓
C	×	✓	×	✓
D	✓	×	✓	×

2 Chromatogram 1 shows the separation of coloured inks in mixture Q, using solvent A.

Chromatogram 2 shows the separation using the same piece of paper in another solvent B after it has been rotated 90° anti-clockwise.



How many different types of ink are present in mixture Q?

A 3 B 4 C 6 D 7

3 A solution contains barium ions and sodium ions and one type of anion.

What could the anion be?

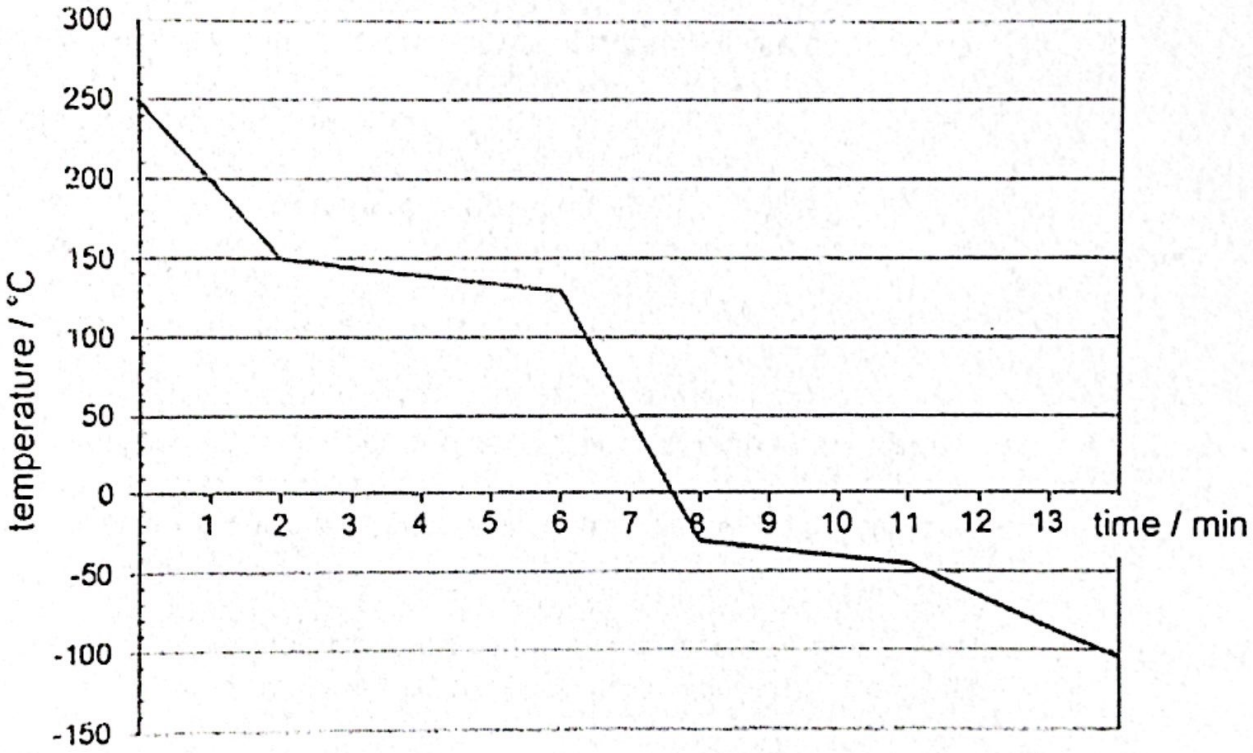
A chloride only

B nitrate only

C sulfate only

D chloride or nitrate

4 The cooling curve of an impure sample of substance Y is shown.



Which row gives possible melting and boiling points of a pure sample of Y?

	melting point / °C	boiling point / °C
A	–25	125
B	–30	150
C	–40	140
D	–55	155

5 A reaction in gas clouds of the Universe is as shown.

$$H_2\,(g) + H_2^+(g) \rightarrow H(g) + H_3^+(g)$$

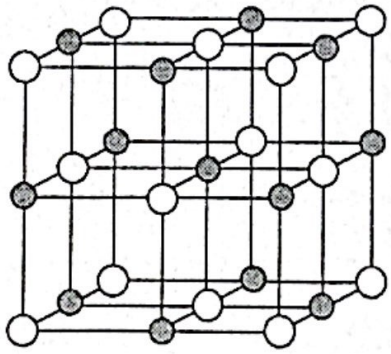
How many protons, neutrons and electrons does an H_3^+ ion contain?

	protons	neutrons	electrons
A	2	1	1
B	2	1	2
C	3	0	1
D	3	0	2

6 Which pair of substances conducts electricity by mobile electrons?

	substance 1	substance 2
A	aqueous potassium chloride	copper metal
B	aqueous potassium chloride	molten potassium chloride
C	graphite	copper metal
D	graphite	molten potassium chloride

7 The diagram shows the arrangement of ions in a compound.



● metal ion **M**

○ non-metal ion **X**

What is the formula of this compound?

A $M_{14}X_{13}$ B M_2X C MX_6 D MX

8 Which molecule has an equal number of bonding electrons and non-bonding valence electrons?

A CO_2 B Cl_2O C HF D NH_3

9 Copper is a metallic element.

Which statements about copper are correct?

1 Copper is malleable because layers of ions are in fixed positions and cannot move.

2 The structure of copper consists of positive ions in a lattice.

3 Electrons hold copper ions together in a lattice by electrostatic attraction.

A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

10 Sodium dichromate(VI), $Na_2Cr_2O_7$, reacts with acid and hydrogen peroxide, H_2O_2, producing Cr^{3+} ions, water and oxygen.

What is the correctly balanced ionic equation for this reaction?

A $Cr_2O_7^{2-} + 2H^+ + H_2O_2 \rightarrow 2Cr^{3+} + 2H_2O + 4O_2$

B $Cr_2O_7^{2-} + 8H^+ + 3H_2O_2 \rightarrow 2Cr^{3+} + 7H_2O + 3O_2$

C $Cr_2O_7^{2-} + 8H^+ + 6H_2O_2 \rightarrow 2Cr^{3+} + 10H_2O + 6O_2$

D $Cr_2O_7^{2-} + 14H^+ + 3H_2O_2 \rightarrow 2Cr^{3+} + 7H_2O + 3O_2$

11 The relative molecular mass, M_r, of liquid Z is 60. Z contains 40.0% carbon, 6.7% hydrogen and 53.3% oxygen.

Which row shows the correct empirical and molecular formulae of Z?

	empirical formula	molecular formula
A	CH_2O	CH_2O
B	CH_2O	$C_2H_4O_2$
C	$C_2H_4O_2$	$C_2H_4O_2$
D	C_3H_8O	C_3H_8O

12 Hydrogen bromide decomposes to form hydrogen and bromine. The equation is shown.

$$2HBr(g) \rightarrow H_2(g) + Br_2(g)$$

The bond energies are shown in the table.

bond	bond energy in kJ/mol
Br–Br	193
H–Br	366
H–H	436

What is the energy change for the reaction?

A +263 kJ/mol B +103 kJ/mol C −103 kJ/mol D −263 kJ/mol

13 The table gives some information about four redox reactions.

Which row gives correct information about what is oxidised and the evidence that this is oxidation?

	equation	what is oxidised	evidence for this oxidation
A	$CuO(s) + C(s) \rightarrow CO(g) + Cu(s)$	copper	copper oxide has given oxygen to carbon
B	$2Na(s) + Cl_2(g) \rightarrow 2NaCl(s)$	sodium	sodium has lost an electron
C	$N_2(g) + 3H_2 \rightleftharpoons 2NH_3(g)$	nitrogen	nitrogen has gained hydrogen
D	$ZnCl_2(aq) + Mg(s) \rightarrow MgCl_2(aq) + Zn(s)$	zinc	zinc has gained two electrons

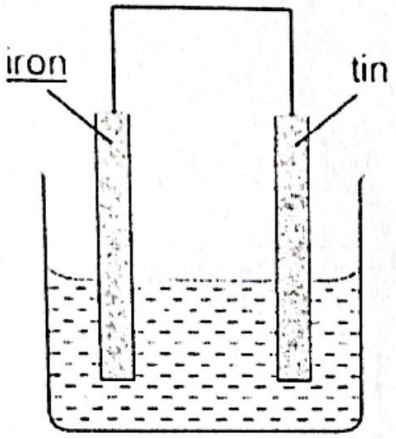
14 Molten sodium chloride and concentrated aqueous sodium chloride are electrolysed using platinum electrodes.

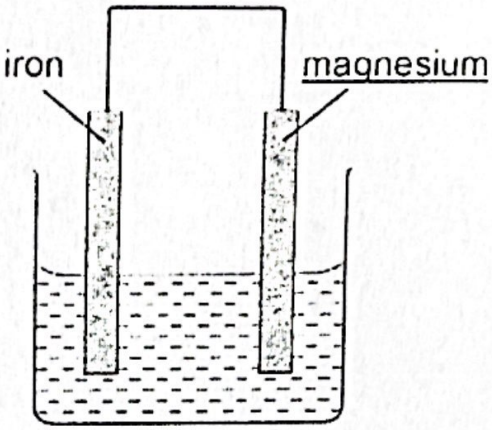
What are the products at the negative electrode in each electrolysis?

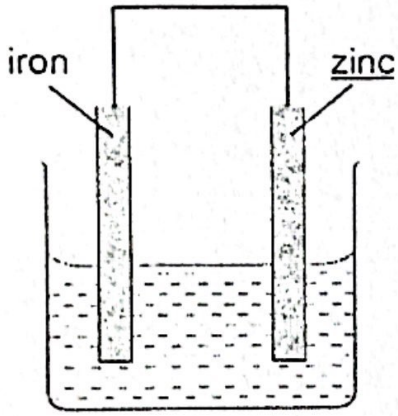
	molten sodium chloride	concentrated aqueous sodium chloride
A	hydrogen	hydrogen
B	hydrogen	sodium
C	sodium	hydrogen
D	sodium	sodium

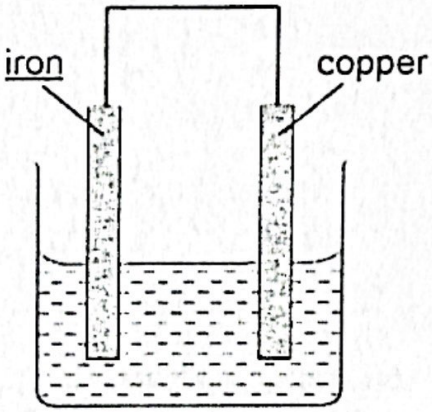
15 Four cells were set up using aqueous sodium chloride as the electrolyte.

In each cell, only the underlined electrode dissolved. To establish the order of reactivity of the metals, it is necessary to set up two or more cells.







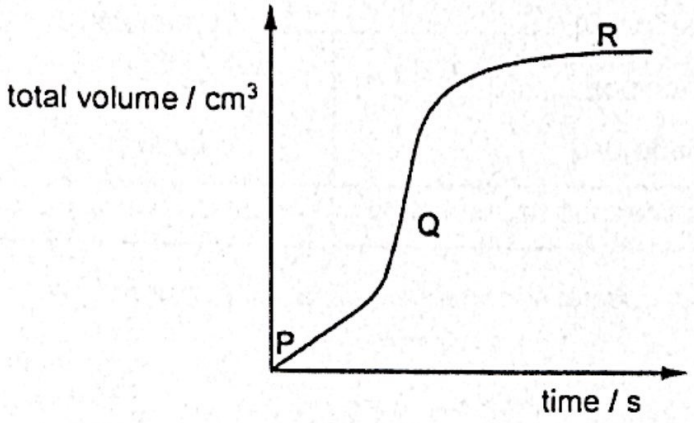


Which pairs of cells are needed in addition to the four cells above?

	first cell electrodes	second cell electrodes
A	copper / tin	magnesium / zinc
B	iron / iron	iron / zinc
C	magnesium / tin	copper / zinc
D	tin / zinc	magnesium / copper

16 A large excess of magnesium ribbon is added to dilute hydrochloric acid and the volume of hydrogen gas produced is measured as the reaction proceeds. The reaction is exothermic.

The results are shown.



Which row explains the changes in the rate of reaction between points P and Q and between points Q and R?

	between points P and Q	between points Q and R
A	the reaction temperature is increasing	the acid concentration is falling
B	the reaction temperature is increasing	the magnesium has been used up
C	surface area of magnesium is decreasing	the acid concentration is falling
D	surface area of magnesium is decreasing	the magnesium has been used up

17 The oxides of three elements, T, U and V, are added to water.

	oxide of T	oxide of U	oxide of V
water added	dissolved to form a solution of pH 10	insoluble	dissolved to form a solution of pH 2

The oxide of U is white in colour.

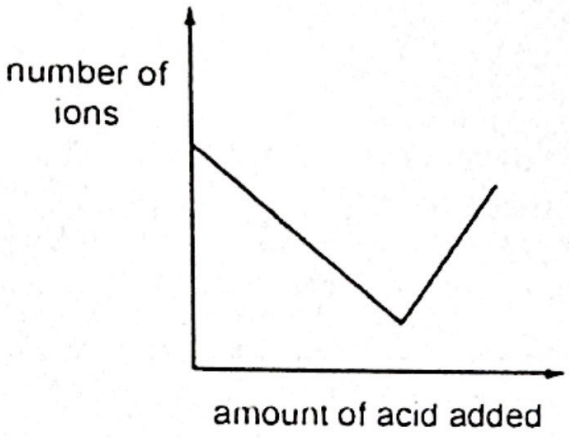
What are elements, T, U and V?

	T	U	V
A	calcium	aluminium	sulfur
B	calcium	copper	sulfur
C	sulfur	aluminium	calcium
D	sulfur	copper	calcium

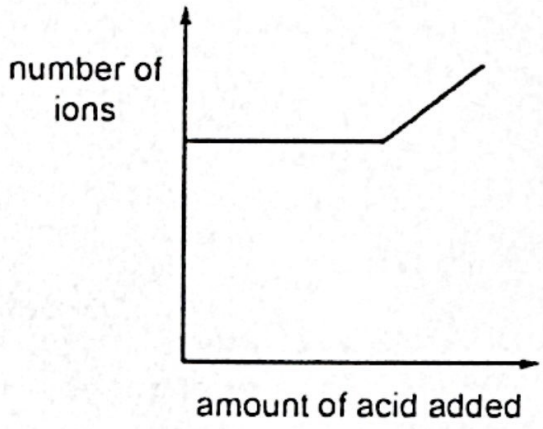
18 Dilute sulfuric acid was added to aqueous barium hydroxide until the acid was present in excess.

How will the total number of ions present in the reacting mixture vary?

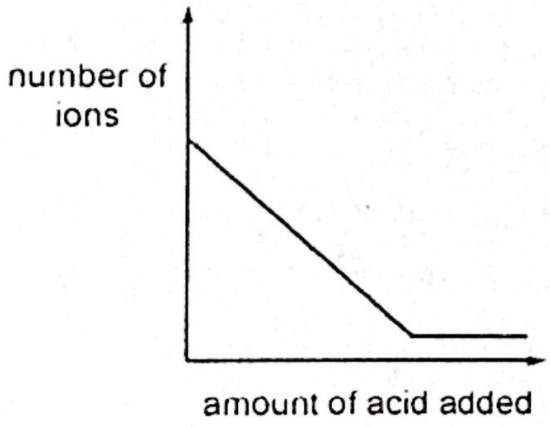
A



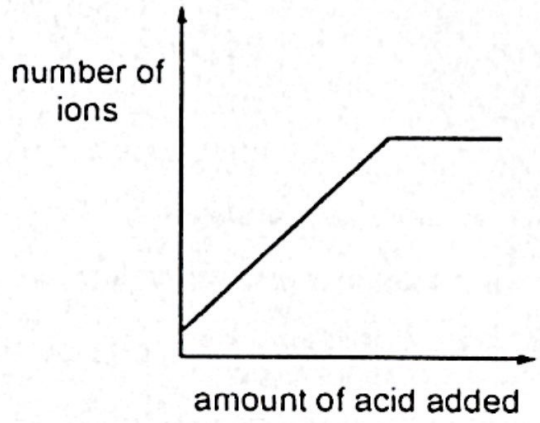
B



C



D



19 A mixture contains copper(II) carbonate and iron(II) carbonate. A sample of the mixture is dissolved in nitric acid to produce a solution.

How could this solution be processed into a copper(II) compound and a separate iron(II) compound?

A Add excess $NH_3(aq)$, filter off the solid copper(II) hydroxide.

B Add excess $NH_3(aq)$, filter off the solid iron(II) hydroxide.

C Add excess NaOH(aq), filter off the solid copper(II) hydroxide.

D Add excess NaOH(aq), filter off the solid iron(II) hydroxide.

20 In the Haber process, a high yield of ammonia is favoured by high pressure and low temperature. In practice, a high temperature is used.

Which statement best explains the discrepancy in the preferred temperature?

A At low temperature, ammonia decomposes back to its original reactants.

B At low temperature, the activation energy is too low.

C At low temperature, the catalyst is inactive.

D At low temperature, the reaction is too slow.

21 Elements in Group IV of the Periodic Table are shown.

carbon
silicon
germanium
tin
lead

Which does **not** occur in Group IV as it is descended?

A The proton number of the elements increases.

B The elements become more metallic.

C The elements have more electrons in their outer shell.

D The elements have more electrons shells.

22 Rubidium has the atomic number 37.

Rubidium reacts with water to form gas **P** and solution **Q**. When solution **Q** reacts with dilute sulfuric acid, salt **R** is formed.

What are the formulae of **P**, **Q** and **R**?

	P	Q	R
A	H_2	RbOH	Rb_2SO_4
B	H_2	$Rb(OH)_2$	$RbSO_4$
C	O_2	RbOH	$RbSO_4$
D	O_2	$Rb(OH)_2$	Rb_2SO_4

23 The table gives some information on elements X, Y and Z.

element	X	Y	Z
melting point / °C	–7	63	–189
boiling point / °C	58	766	–186
colour	red-brown	silvery	colourless
density / g cm^{-3}	3.1	0.86	0.0017

To which group do X, Y and Z belong?

	X	Y	Z
A	I	0	VII
B	VII	I	0
C	VII	0	I
D	0	I	VII

24 Which statement describes a transition element?

A It can act as a catalyst and some of its compounds can also act as catalysts.

B It forms white compounds with sulfur, oxygen, chlorine, and bromine.

C It has a low density and a piece of it will float on water.

D It is a very poor conductor of electricity.

25 Steels differ in how much carbon they contain.

Which are the properties of a high carbon steel?

A soft and brittle

B soft and easily shaped

C strong and brittle

D strong and easily shaped

26 Reactions of three metals and their oxides are shown.

metal	add dilute hydrochloric acid to metal	heat metal oxide with carbon
1	✓	✓
2	✓	×
3	×	✓

key
✓ = reacts
× = does not react

What is the order of reactivity of these metals, from most reactive to least reactive?

A 1 → 2 → 3 B 1 → 3 → 2 C 2 → 1 → 3 D 2 → 3 → 1

27 Equal masses of calcium carbonate and copper(II) carbonate are heated at the same temperature.

Which carbonate decomposes faster, and which one produces a greater volume of carbon dioxide gas?

	faster rate of decomposition	greater volume of carbon dioxide
A	calcium carbonate	calcium carbonate
B	calcium carbonate	copper(II) carbonate
C	copper(II) carbonate	calcium carbonate
D	copper(II) carbonate	copper(II) carbonate

28 Some types of chemical reaction are listed.

1 neutralisation
2 combustion
3 redox

Which types of reaction occur in a blast furnace during the extraction of iron?

A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

29 Scrap iron is often recycled.

Which reason for recycling is **not** correct?

A It conserves finite metal resources.

B It reduces the amount of pollution at the site of the ore extraction.

C It reduces the amount of waste taken to landfill sites.

D It reduces the need to collect the scrap iron.

30 Mild steel is galvanised to prevent corrosion of the iron.

Which statements about galvanising are correct?

1 Galvanising prevents corrosion because zinc forms an alloy.
2 If the coating is damaged, water and oxygen do not corrode the iron.
3 Zinc is a sacrificial metal and corrodes in preference to iron.

A 1 and 2 B 1 and 3 C 2 and 3 D 3 only

31 To reduce atmospheric pollution, the waste gases from a coal-burning power station are passed through powdered calcium carbonate.

Which waste gas will **not** be removed by the powdered calcium carbonate?

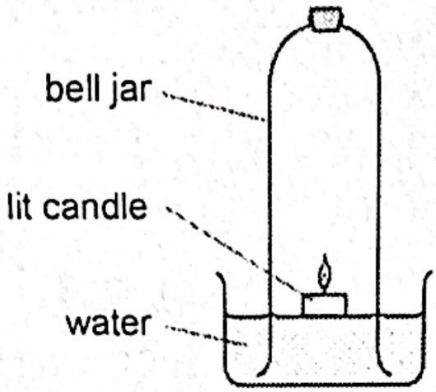
A carbon monoxide

B nitrogen dioxide

C phosphorus(V) oxide

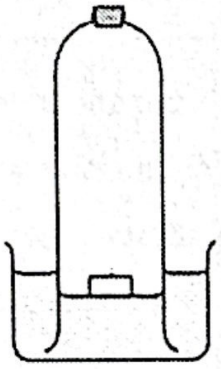
D sulfur dioxide

32 The diagram shows an experiment to determine the percentage of oxygen in air.

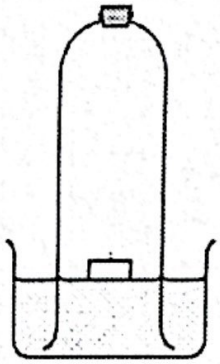


Which diagram shows the correct level of water after the candle stops burning?

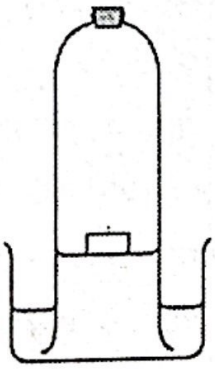
A



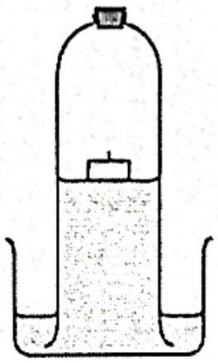
B



C



D



33 Two statements about the fractional distillation of crude oil are given.

statement 1 Fractional distillation is used to separate crude oil into useful fractions.

statement 2 The fractions with lower boiling points are found at the top of the fractionating column.

Which of the following is true?

A Both statements are correct and statement 2 explains statement 1.

B Both statements are correct but statement 2 does not explain statement 1.

C Statement 1 is correct but statement 2 is incorrect.

D Statement 1 is incorrect but statement 2 is correct.

34 Petroleum is separated to produce useful fractions.

Which row matches the fraction to its use?

	fraction	use
A	bitumen	fuel in cars
B	lubricating oils	for maxing waxes and polishes
C	paraffin	provide feedstock for petrochemical industry
D	petrol	aircraft fuel

35 In which lists are the compounds in the same homologous series?

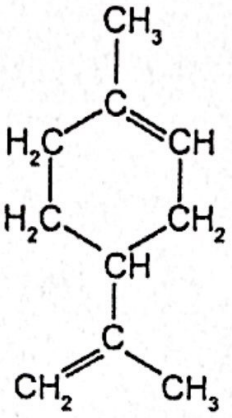
1 CH_4, C_2H_4, C_3H_8

2 CH_3OH, C_2H_5OH, C_3H_7OH

3 CH_3CO_2H, CH_3CH_2OH, $CH_3CH_2CH_2OH$

A 1 and 2 B 1 and 3 C 2 only D 3 only

36 The citrus flavour of lemon is due to the compound limonene, present in both the peel and the juice.



Which statement correctly describes limonene?

A Limonene burns in excess oxygen to form carbon dioxide and water only.

B Limonene can decolourise aqueous bromine only in the presence of sunlight.

C Limonene cannot undergo addition polymerisation.

D The empirical formula of limonene is CH_2.

37 A vegetable oil is polyunsaturated.

Which statement about this vegetable oil is correct?

A It has double bonds between carbon and hydrogen atoms.

B It reacts with hydrogen to form a solid compound.

C It reacts with steam to form margarine.

D It turns aqueous bromine from colourless to brown.

38 When ethanol is left standing in the air for some time, it become acidic.

Which equation represents this change?

A $CH_3CH_2OH + CO \rightarrow CH_3CH_2CO_2H$

B $CH_3CH_2OH + O_2 \rightarrow CH_3CO_2H + H_2O$

C $CH_3CH_2OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$

D $2CH_3CH_2OH + O_2 \rightarrow 2CH_3CO_2H + H_2$

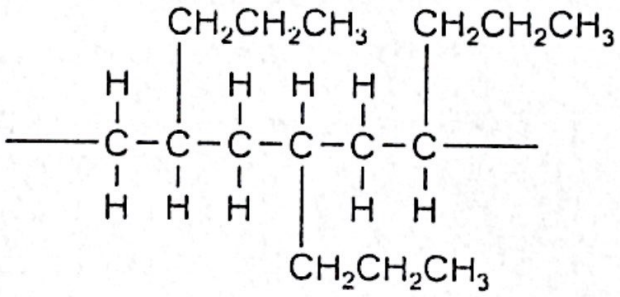
39 Ethanol can be manufactured from ethene or from glucose. The table gives statements about the processes involved.

In which row are both statements **incorrect**?

	process using ethene	process using glucose
A	conversion to ethanol needs temperature greater than 100 °C	conversion to ethanol also produces carbon dioxide
B	conversion to ethanol uses yeast as catalysts	conversion to ethanol is carried out at 100 °C
C	ethene is obtained from cracking	glucose is obtained from plants
D	conversion reaction is carried out with reagents as gases	conversion reaction is carried out in aqueous solution

40 Engine oil is used to lubricate the car engine. Certain polymers are added to engine oil to improve its viscosity.

A part of the chain of one such polymer is shown.



A molecule of this polymer contains 16 000 carbon atoms.

How many monomer molecules are required to form one molecule of this polymer?

A 1600 B 2667 C 3200 D 4000