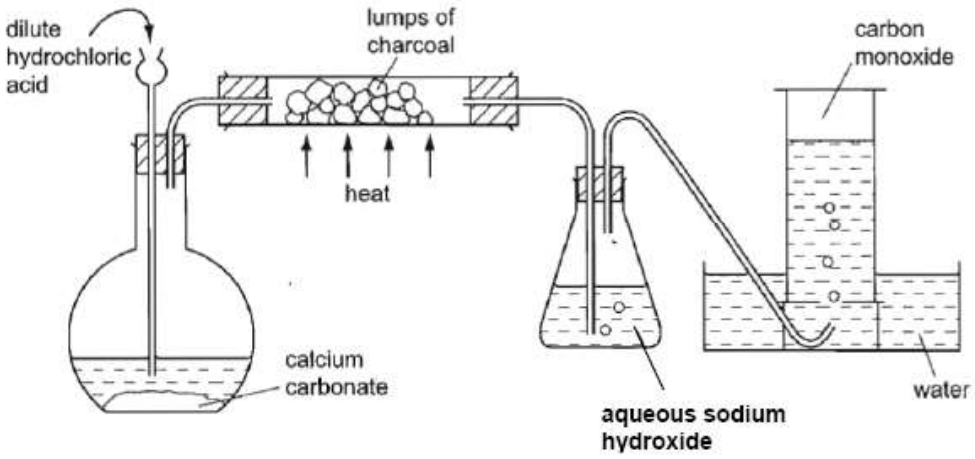
chemmadeeasy

"The 500"

Set A

1 The diagram below is a set-up used to obtain carbon monoxide.



What is the main purpose of the charcoal?

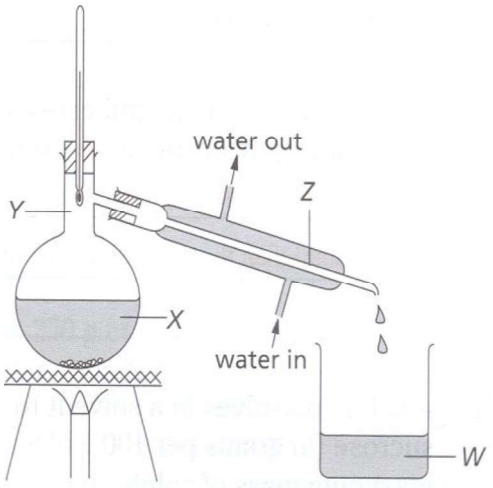
A To remove the oxygen present

B To remove the excess acid

C To reduce the carbon dioxide present

D To remove moisture from the carbon monoxide

2 The diagram shows the apparatus used to obtain water from aqueous iron(II) sulfate .



Which statement about the separation process is true?

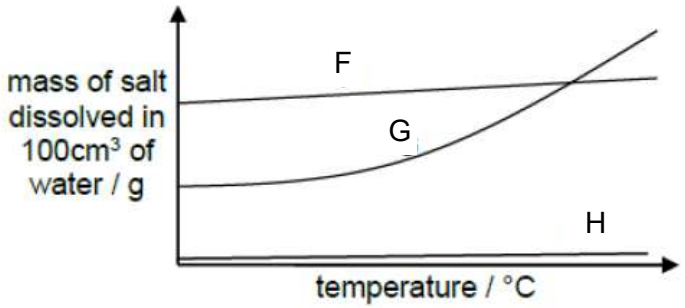
A Liquid X becomes darker in colour.

B A green precipitate is formed in liquid W.

C Liquid W changes from colourless to green.

D The temperature at Y steadily rises as liquid W is being collected.

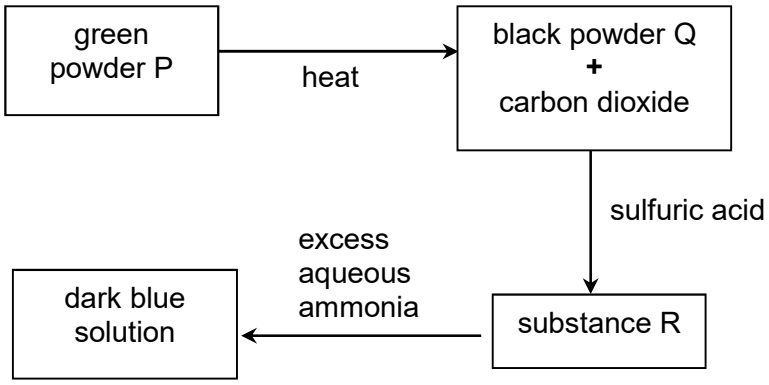
3 The diagram shows the solubility curves of three salts, F, G and H over a range of temperatures.



Which are the best methods to obtain solid samples of the salts from the diagram above?

	salt F	salt G	salt H
A	crystallisation	crystallisation	evaporation to dryness
B	crystallisation	evaporation to dryness	precipitation
C	crystallisation	precipitation	evaporation to dryness
D	evaporation to dryness	crystallisation	precipitation

4 The diagram below shows a series of tests starting with substance P.



Which of the following statements is true?

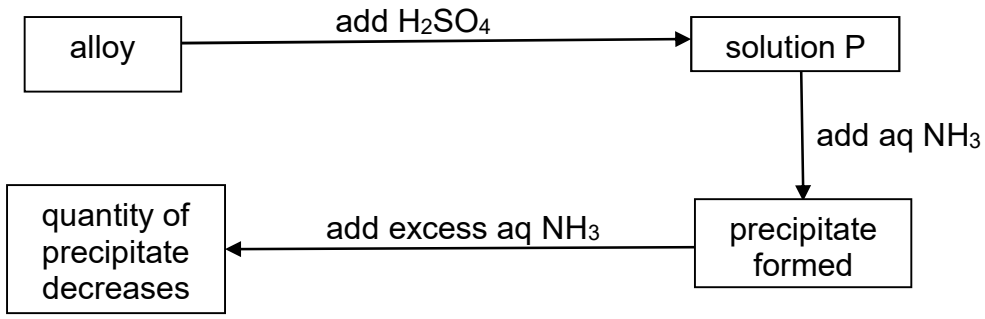
A P can react directly with dilute sulfuric acid to give R.

B Q reacts with acids to liberate hydrogen gas.

C Substance R is also green in colour.

D R forms a green precipitate with aqueous sodium hydroxide.

5 A sample of an alloy containing two metals was subjected to the following tests.



What are the two metals present in the alloy?

A copper and zinc

B iron and copper

C iron and lead

D iron and zinc

6 An element P with a relative atomic mass of 152.4 exists in three isotopic forms as shown below.

Isotope	^{150}P	^{155}P	^{157}P
Isotopic abundance	60%	x%	y%

What is the value of x?

A 10 **B** 15

C 20 **D** 25

7 The symbols for two ions are shown below.

$$^{19}_{9}F^{-} \qquad ^{21}_{11}Na^{+}$$

Which of the following statements is correct?

A The fluoride ion contains more electrons than the sodium ion.

B The sodium ion contains more neutrons than the fluoride ion.

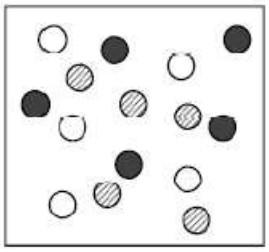
C The two ions contain the same number of electrons.

D The two ions contain the same number of protons.

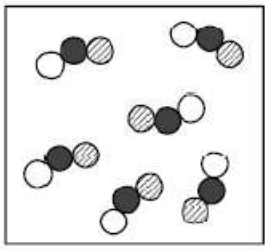
8 A gaseous compound is made up of nitrogen, oxygen and chlorine.

Which diagram could show a pure sample of the molecules of this gas?

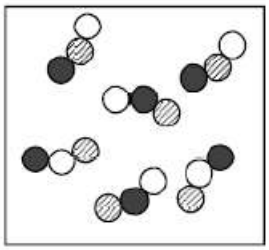
A



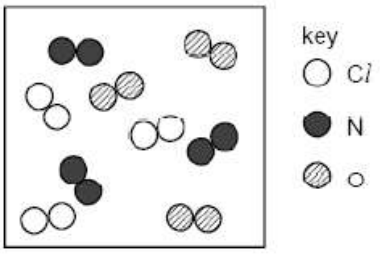
B



C



D

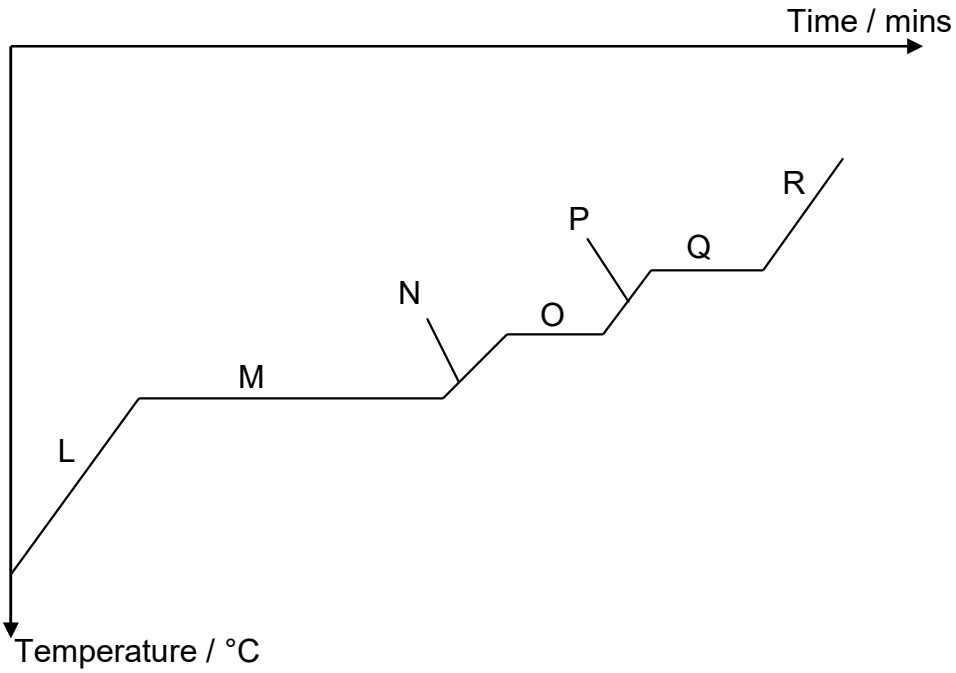


9 Brass is an alloy of zinc (30%) and copper (70%).

Which one of the following correctly describes the atoms in a sample of molten brass?

	copper atoms	zinc atoms
A	closely packed together and vibrating vigorously	closely packed together and vibrating vigorously
B	widely spaced and vibrating vigorously	closely packed together and vibrating vigorously
C	widely spaced and vibrating vigorously	widely spaced and moving at random
D	closely packed together and moving at random	widely spaced and moving at random

10 Liquid air can be separated into three main components by fractional distillation. The graph below shows the temperature of the mixture during the distillation process.



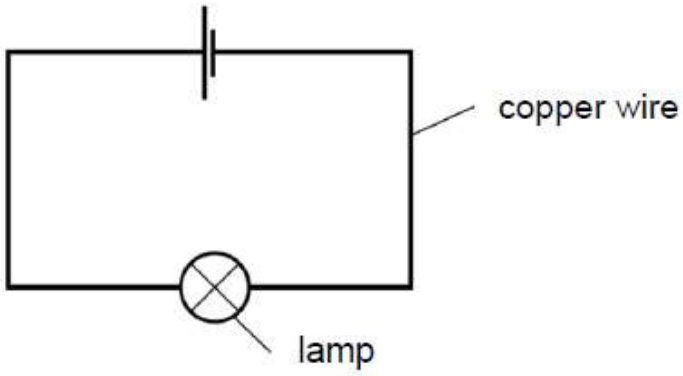
The boiling points of the three main components of liquid air are shown in the table below :

component	boiling point / °C
argon	-186
nitrogen	-196
oxygen	-183

Which sections of the graph represent the three components in their gaseous states?

	nitrogen	argon	oxygen
A	M	O	Q
B	Q	O	M
C	L	N	P
D	N	P	R

11 Copper wire is used to complete an electrical circuit.



What happens in the copper wire?

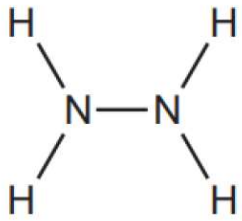
A Electrons move along the wire to the negative terminal. Positive ions stay in position.

B Electrons move along the wire to the positive terminal. Positive ions move to the negative terminal.

C Electrons move along the wire to the positive terminal. Positive ions stay in position.

D Negative ions move along the wire to the positive terminal. Positive ions move to the negative terminal.

12 The diagram shows the structural formula of the covalent molecule hydrazine, N_2H_4.



Consider all the electrons in a molecule of hydrazine.

Which description fits the arrangement of these electrons in the molecule?

	total number of electrons involved in bonding	total number of electrons not involved in bonding
A	5	4
B	5	8
C	10	4
D	10	8

13 The table below shows the physical properties of substances P, Q, R and S.

substance	melting point/°C	electrical conductivity	
		in solid state	in molten state
P	high	poor	good
Q	high	good	good
R	high	poor	poor
S	low	poor	poor

Using the information from the table, which statement is true about substances P, Q, R and S?

A Substance R consists of weak bonds between the atoms.

B Substance S exists as a simple molecular structure.

C Substance P contains mobile electrons to conduct electricity when in molten state.

D Substance Q consists of strong electrostatic attractions between oppositely charged ions.

14 60 cm^3 of oxygen was mixed with 10 cm^3 of gaseous hydrocarbon in a closed vessel. After explosion and cooling, the gases occupied 50 cm^3 and after passing the gas through aqueous sodium hydroxide, 30 cm^3 of oxygen remained.

Deduce the molecular formula of the hydrocarbon.

A CH_4

B C_2H_4

C C_2H_6

D C_3H_6

15 Two unknown reactants X and Y undergo a chemical reaction as shown in the equation below:

$$2X + 3Y \rightarrow 3Z$$

If 2 moles of X and 2 moles of Y react to form 1.75 moles of Z, what is the percentage yield of Z in the reaction?

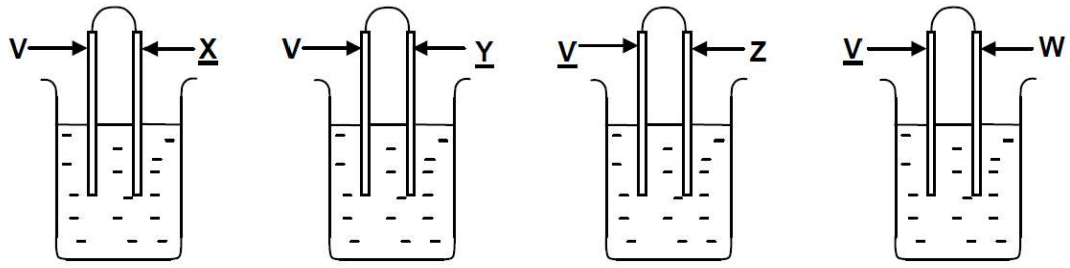
A 43.8%

B 66.7%

C 58.3%

D 87.5%

16 Four simple cells were set up using dilute sulfuric acid as the electrolyte to study the reactivity of the metals.

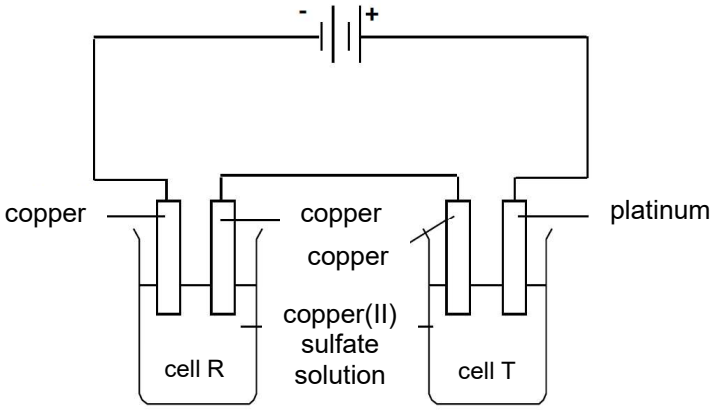


In each cell, only the underlined electrode dissolved. To establish the order of reactivity of metals V, W, X, Y and Z, it is necessary to set up two more cells, cell A and cell B.

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

	Electrodes in cell A	Electrodes in cell B
A	W/Z	X/Y
B	W/Z	W/Y
C	W/X	W/Y
D	W/X	X/Y

17 A current is passed through two electrolytic cells, R and T, for some time. The electrolyte in both cells is blue copper(II) sulfate solution of the same concentration. Cell R has two copper electrodes, while Cell T has a copper and a platinum electrode.



Which statement about the reactions above is not true?

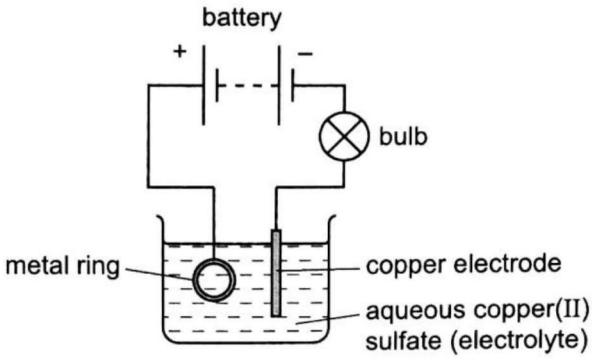
A The oxygen evolved at the anode of Cell T burns the platinum.

B The cathode in Cell R increases in mass.

C The concentration of the copper(II) sulfate solution in Cell R remains the same.

D The blue colour of the copper(II) sulfate solution in Cell T fades slowly and eventually disappears.

18 The diagram shows a failed attempt to copper-plate a metal ring.



Which action will plate the metal ring with copper?

A cooling the copper(II) sulfate solution in an ice bath

B heating the copper sulfate solution to boiling point

C increasing the voltage from 3V to 6V

D exchange the position of copper electrode with the ring

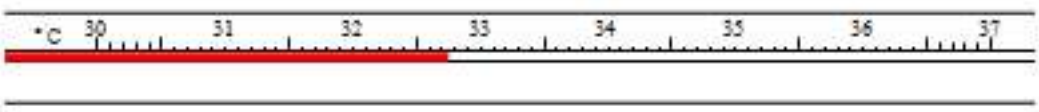
19 During electrolysis, 0.015 moles of chromium is deposited on the cathode when 0.090 moles of electrons is passed through a molten electrolyte containing chromium.

Which of the following substances could be the electrolyte?

A $CrCl_4$ **B** $CrBr_2$

C $Cr_2(SO_4)_3$ **D** $Cr(NO_3)_6$

20 A thermometer is placed in 50 cm^3 of water and the temperature is measured as shown.



5 g of ammonium nitrate is added to the water. The temperature changes by 3.5°C.

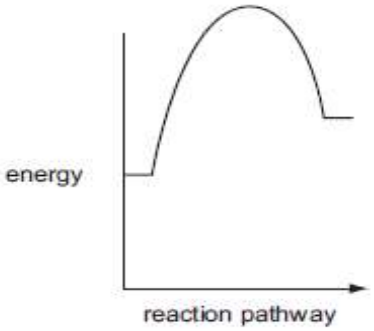
What is the final temperature of the mixture?

A 29.2°C **B** 32.7°C

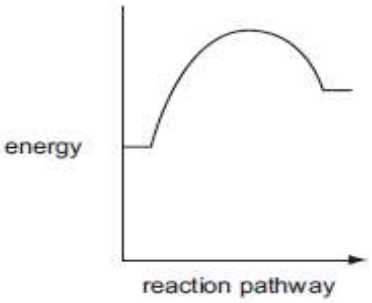
C 36.2°C **D** 37.7°C

21 Which reaction profile shows the fastest exothermic reaction?

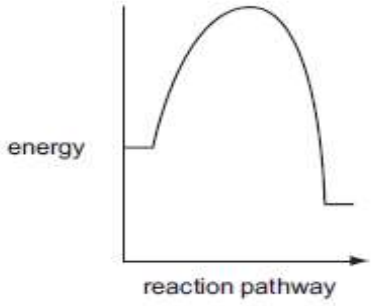
A



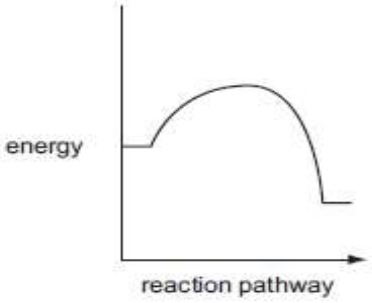
B



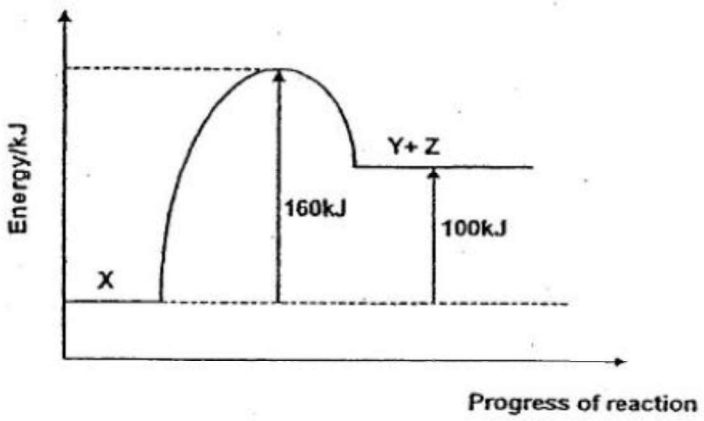
C



D



22 The diagram below shows the energy profile diagram for a reversible reaction.



What is the activation energy for the reverse reaction?

A - 60 kJ

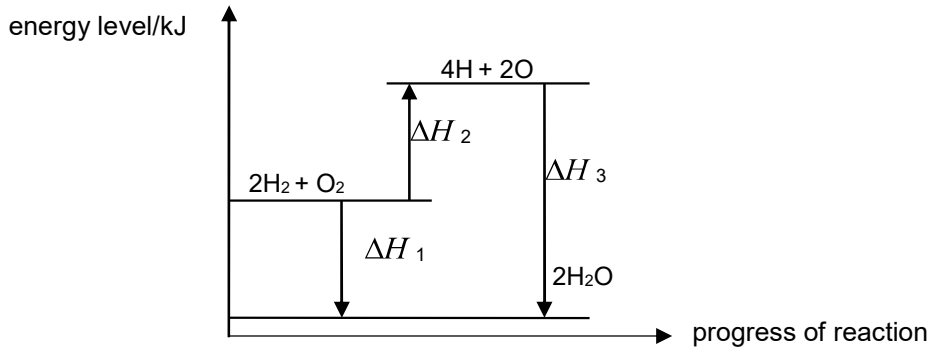
B + 60 kJ

C + 100 kJ

D + 160 kJ

23 The energy level diagram for the reaction between hydrogen and oxygen to form steam is shown below:

$$2H_2 + O_2 \rightarrow 2H_2O$$



Which of the following is true?

	Energy absorbed for bond breaking	Energy released when new bonds are formed
A	ΔH_1	ΔH_2
B	ΔH_2	ΔH_3
C	ΔH_2	ΔH_1
D	ΔH_1	ΔH_3

24 Manganese(IV) oxide is used as a catalyst in the decomposition of hydrogen peroxide.

$$2H_2O_2\ (aq) \rightarrow 2H_2O\ (l) + O_2\ (g)$$

Which of the following would decrease if a better catalyst is used in place of manganese(IV) oxide in the above reaction?

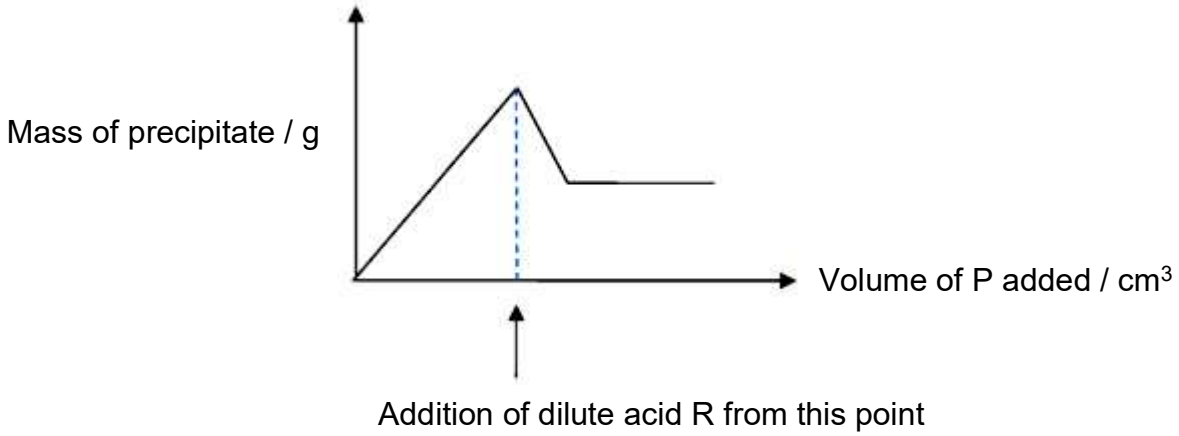
A The mass of hydrogen peroxide left at the end of the reaction.

B The time needed to produce a given volume of gas.

C The initial gradient of a graph of volume of gas against time.

D The initial rate of reaction.

25 In a qualitative analysis, reagent P is added gradually to solution Q, followed by the addition of a dilute acid R.



The graph below shows how the mass of the precipitate changes as the reagents are added.

Which of the following is correct?

	P	anions in Q	R
A	aqueous silver nitrate	Cl^- and CO_3^{2-}	dilute nitric acid
B	aqueous silver nitrate	Cl^-	dilute nitric acid
C	aqueous barium chloride	Cl^- and CO_3^{2-}	dilute hydrochloric acid
D	aqueous barium chloride	Cl^-	dilute hydrochloric acid

26 Which one of the options below shows the correct methods used to prepare the following salts?

	titration	precipitation	adding excess solid reactants
A	potassium ethanoate	sliver chloride	zinc sulfate
B	ammonium nitrate	lead(II) sulfate	sodium chloride
C	barium carbonate	calcium sulfate	magnesium chloride
D	copper(II) sulfate	ammonium chloride	lead(II) nitrate

27 Magnesium oxide is added slowly to a beaker containing hydrochloric acid until the magnesium oxide is in excess.

Which of the following statements about this reaction are true?

I	The temperature of the mixture increases.
II	The pH of the mixture increases till pH 7.
III	Effervescence is seen.
IV	A white precipitate is observed.

A I and II only

B II and III only

C III and IV only

D I, II and IV only

28 A series of four aqueous potassium hydroxide solutions with different concentrations was prepared, and tested with the indicator brilliant cresol blue. The results are shown below.

pH	colour with brilliant cresol blue
10	blue
11	green
12	yellow
13	yellow

Two unknown solutions were then tested with the indicator brilliant cresol blue.

unknown solution	colour with brilliant cresol blue
X	blue
Y	yellow

Based on the results of the above experiments, which of the following is the most likely conclusion about the pH of X and Y?

A The pH of X is 10, and the pH of Y is 12.

B The pH of X is 10, and the pH of Y is 12 or more.

C The pH of X is 10 or less, and the pH of Y is 12 or more.

D The pH of X is 10, and the pH of Y is between 12 and 13, inclusive.

29 A student carried out the following reactions on a sample of ammonium nitrate.

reaction 1	warming with aqueous sodium hydroxide
reaction 2	warming with aluminium and aqueous sodium hydroxide
reaction 3	warming with dilute hydrochloric acid
reaction 4	warming with water

Which of the above reactions produces a gas that turns damp red litmus paper blue?

A 1 and 2 only **B** 1 and 3 only

C 2 and 3 only **D** 2 and 4 only

30 Which of the following statements concerning the Haber process is incorrect?

A A catalyst of finely divided iron is used.

B Nitrogen and hydrogen are fed into the reactor in the volume ratio of 1:3.

C The cost of high pressure technology means that the reaction is carried out at the more economical pressure of 4 atm.

D The optimal yield of ammonia is achieved by the use of low temperatures, although temperatures of around 450 °C are actually used.

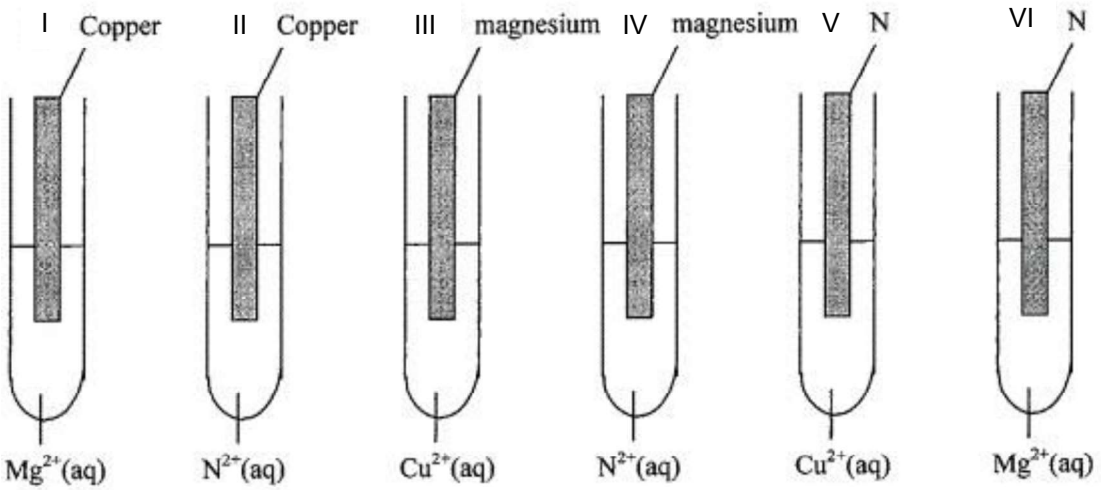
31 N is an unknown metal.

A student did the following experiments to compare the reactivity of magnesium, copper and metal N.

Six tubes were arranged as shown in the diagrams below. Each tube contained a piece of metal half immersed in an aqueous solution containing ions of one of the other two metals. The following observation were made:

There was a deposit seen in only three tubes including tube V.

There was no deposit in tube VI.



Which of the two tubes, besides tube V contain a deposit?

A I and II

B II and III

C II and IV

D III and IV

32 The table gives information about the reactivity of three metals P, Q and R.

Metal	metal reaction with air	reaction with steam	reaction with dilute hydrochloric acid
P	burns with sparks	forms an oxide	forms hydrogen
Q	slowly forms an oxide	no reaction	no reaction
R	slowly forms an oxide	no reaction	forms hydrogen

What is the order of reactivity of P, Q and R?

	most reactive → least reactive		
A	P	Q	R
B	P	R	Q
C	Q	R	P
D	R	Q	P

33 Which reaction is a step in the production of iron from haematite in the blast furnace?

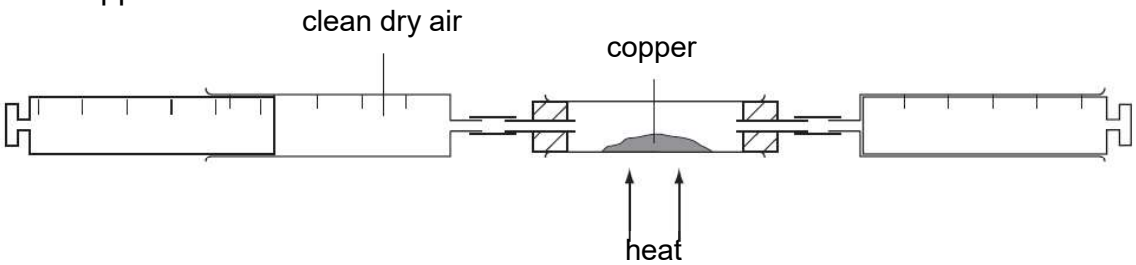
A carbon (coke) burning in air to produce carbon monoxide

B carbon (coke) reacting with carbon monoxide to form carbon dioxide

C iron(III) oxide reacting with carbon monoxide to form iron

D iron reacting with limestone to produce slag

34 A sample of clean, dry air is passed over hot copper until all the oxygen in the air reacts with the copper.



The volume of air decreases by 30 cm^3.

What was the starting volume of the sample of air?

A 60 cm^3 **B** 100 cm^3

C 150 cm^3 **D** 300 cm^3

35 The table below shows the differences in the composition of the mixtures of exhaust gases from two cars, one fitted with a catalytic converter and one without.

	% by volume of nitrogen monoxide	% by volume of carbon dioxide	% by volume of water vapour
Car without catalytic convertor	67.60	12.00	11.00
Car with catalytic convertor	23.60	32.25	41.10

Which statement does not explain the differences in the data above?

A The percentage of nitrogen monoxide decreases as it is reduced to form nitrogen in the catalytic converter.

B The percentage of carbon dioxide increases as unburnt hydrocarbons undergo complete combustion in the catalytic converter.

C The percentage of water vapour increases as unburnt hydrocarbons undergo complete combustion in the catalytic converter.

D The percentage of nitrogen monoxide decreases as it is oxidised to form nitrogen in the catalytic converter.

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

Which waste gas cannot be removed by powdered calcium carbonate?

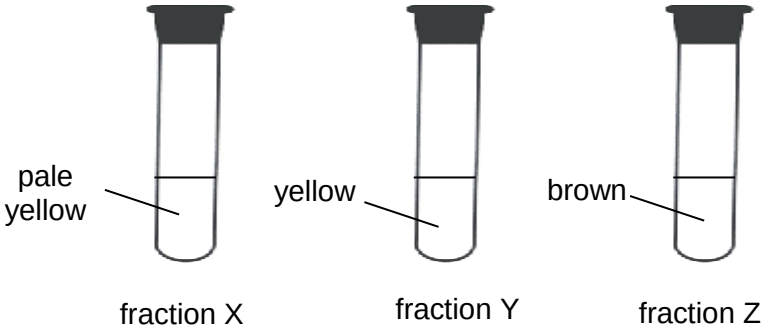
A carbon monoxide

B nitrogen dioxide

C phosphorus (V) oxide

D sulfur dioxide

37 The diagram below shows the colour of the fractions obtained from the fractional distillation of crude oil.



Which of the following correctly represents the uses of these fractions?

	X	Y	Z
A	used as a lubricating oil	fuel for car engines	feedstock for petrochemical industry
B	fuel for diesel engines	fuel for car engines	used to make wax and polish
C	fuel for cooking	feedstock for petrochemical industry	fuel for aircraft engines
D	feedstock for petrochemical industry	used to make roads	fuel for diesel engines

38 Which of the following must be the same for molecules which are isomers?

I	empirical formula
II	general formula
III	functional group
IV	structural formula
V	molecular formula

A **I**, **II** and **III**

B **II** and **III**

C **II**, **III** and **IV**

D **I**, **II** and **V**

39 What happens when one mole of ethane is mixed in the dark with six moles of chlorine gas?

A There is no reaction.

B One mole of CH_3CH_2Cl and one mole of HCl are formed.

C One mole of C_2Cl_6 and six moles of HCl are formed.

D Only one mole of C_2Cl_6 is formed.

40 Linoleic acid has the molecular formula $C_{18}H_{32}O_2$.

How many carbon, carbon double covalent bonds are there in one molecule of the acid?

A 0 **B** 1

C 2 **D** 3

END OF PAPER 1

Paper 1

1	C	**11**	C	**21**	D	**31**	D
2	A	**12**	D	**22**	B	**32**	B
3	D	**13**	B	**23**	B	**33**	C
4	A	**14**	B	**24**	B	**34**	C
5	D	**15**	D	**25**	A	**35**	D
6	C	**16**	A	**26**	A	**36**	A
7	C	**17**	A	**27**	A	**37**	C
8	B	**18**	D	**28**	D	**38**	D
9	D	**19**	D	**29**	A	**39**	A
10	D	**20**	A	**30**	C	**40**	C