Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CHEMISTRY **5070/11**

Paper 1 Multiple Choice **October/November 2018**

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)

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READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page 16.
Electronic calculators may be used.

This document consists of **15** printed pages and **1** blank page.

1 A student titrates aqueous sodium hydroxide from a burette with dilute hydrochloric acid in a conical flask.

After the titration is complete, the conical flask is emptied.

What is the correct procedure before the next titration?

A Rinse out the conical flask with aqueous sodium hydroxide.

B Rinse out the conical flask with dilute hydrochloric acid.

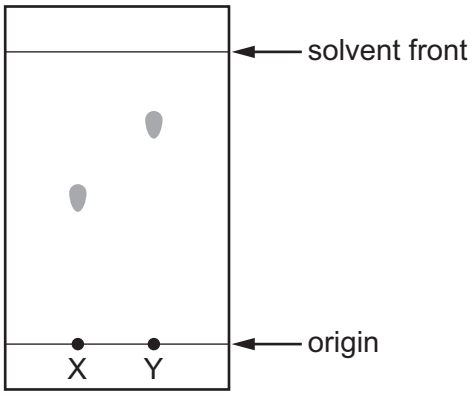
C Rinse out the conical flask with distilled water.

D Use the conical flask again without rinsing.

2 The results of a paper chromatography experiment are shown.

X is an aqueous solution of a salt of a Group I element.

Y is an aqueous solution of a salt of a transition element.



Which row is correct?

	larger R_f value	requires a locating agent
A	X	X
B	X	Y
C	Y	X
D	Y	Y

3 A substance dissolves in water to form a colourless solution. This solution reacts with aqueous silver nitrate in the presence of dilute nitric acid to give a yellow precipitate.

What is the possible identity of the substance?

A calcium iodide

B copper(II) chloride

C iron(II) iodide

D sodium chloride

4 Which statements are correct?

1 The volume of a gas at constant pressure increases as the temperature increases.

2 The rate of diffusion of a gas increases as the temperature increases.

3 The pressure of a gas at constant volume decreases as the temperature increases.

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

5 Which row shows the numbers of particles in $^{34}_{16}S^{2-}$?

	protons	neutrons	electrons
A	16	16	16
B	16	18	18
C	18	16	20
D	20	14	22

6 Which substance has a giant covalent structure at room temperature?

A methane

B sand

C sodium chloride

D water

7 Magnesium oxide has a high melting point. It is used to line the inside of furnaces that operate at high temperatures.

Why does magnesium oxide have a high melting point?

A It has metallic bonds.

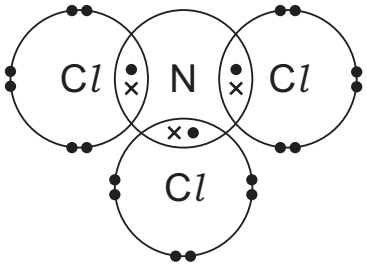
B It has strong forces between its molecules.

C It is a simple molecular substance.

D It is an ionic compound.

8 What is the dot-and-cross diagram for NCl_3?

A



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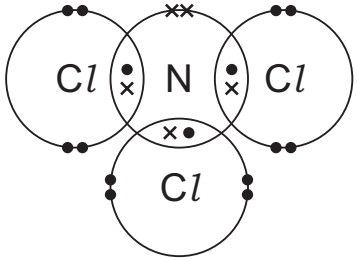

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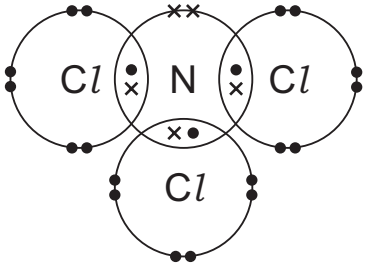

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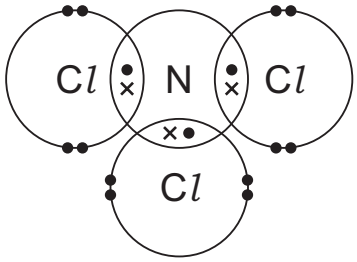


9 Two properties of a metal are given.

1 It is malleable.

2 It conducts electricity.

Which of these properties are due to the layers of positive ions being able to move?

A 1 only

B 2 only

C both 1 and 2

D neither 1 nor 2

10 What are the relative formula masses of one mole of solid magnesium and one mole of gaseous chlorine?

	magnesium	chlorine
A	12	17
B	24	35.5
C	24	71
D	48	71

11 Complete combustion of a hydrocarbon produces only carbon dioxide, CO_2, and water, H_2O.

$$C_5H_{12}(l) + 8O_2(g) \rightarrow 5CO_2(g) + 6H_2O(g)$$

When 0.1 mol of the hydrocarbon C_5H_{12} is completely combusted, which volume of carbon dioxide, measured at room temperature and pressure, is produced?

A $0.5\,dm^3$ **B** $2.4\,dm^3$ **C** $5.0\,dm^3$ **D** $12\,dm^3$

12 What is observed during the electrolysis of aqueous copper(II) sulfate using carbon electrodes?

A A pink solid is deposited on the anode.

B Bubbles form on the negative electrode.

C The colour of the solution fades.

D The negative electrode becomes smaller.

13 Electrolysis is used to plate a metal statue with silver.

The statue is an electrode in a suitable electrolyte.

Which row is correct?

	statue	electrolyte
A	cathode	$AgCl(aq)$
B	cathode	$AgNO_3(aq)$
C	anode	$AgCl(aq)$
D	anode	$AgNO_3(aq)$

14 Which statements about endothermic reactions are correct?

1 Energy is absorbed from the surroundings.

2 Energy is released to the surroundings.

3 The temperature of the reaction mixture falls.

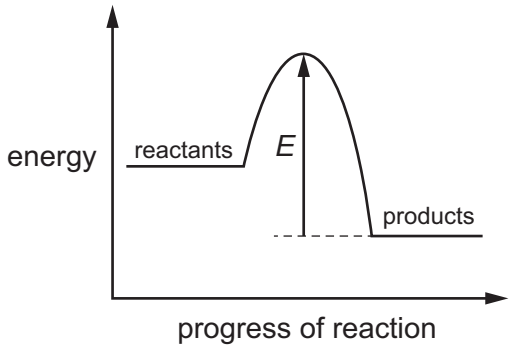
4 The temperature of the reaction mixture rises.

A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

15 The equation represents the reaction between two gases, X_2 and Y_2, to form compound XY.

$$X_2(g) + Y_2(g) \rightarrow 2XY(g)$$

The energy profile diagram for the reaction is shown.



Which statement about this reaction is correct?

A The activation energy for the reaction is equal to *E*.

B The enthalpy change for the reaction is equal to *E*.

C The reaction is exothermic.

D The total energy needed to break bonds is greater than the total energy needed to form bonds.

16 The equation shows the reaction for the manufacture of ammonia.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

Which change will decrease the activation energy of the reaction?

A addition of a catalyst

B decrease in temperature

C increase in concentration

D increase in pressure

17 When bismuth(III) chloride, $BiCl_3$, is added to water, a reaction occurs and a white precipitate of $BiOCl$ is formed.

$$BiCl_3(aq) + H_2O(l) \rightleftharpoons BiOCl(s) + 2HCl(aq)$$

Which changes increase the mass of white precipitate formed?

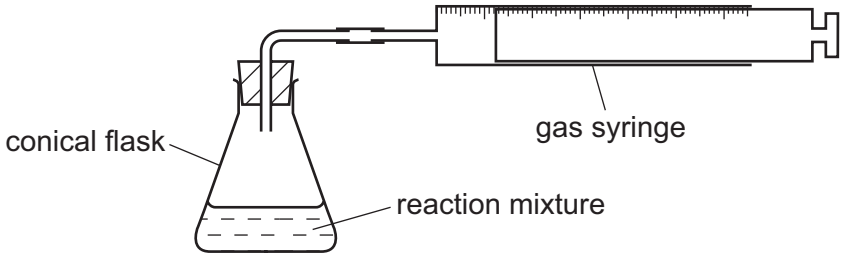
1 adding more water

2 adding aqueous sodium hydroxide

3 adding dilute hydrochloric acid

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

18 Calcium carbonate reacts with dilute hydrochloric acid to produce carbon dioxide. The carbon dioxide is collected using the apparatus shown.



The reaction is done four times. For each reaction, 25 g of calcium carbonate and an excess of hydrochloric acid are used.

Which reaction mixture fills the gas syringe with carbon dioxide in the shortest time?

A lumps of calcium carbonate with 1 mol / dm^3 hydrochloric acid

B lumps of calcium carbonate with 2 mol / dm^3 hydrochloric acid

C powdered calcium carbonate with 1 mol / dm^3 hydrochloric acid

D powdered calcium carbonate with 2 mol / dm^3 hydrochloric acid

19 Many reactions involve oxidation and reduction.

Which statement is correct?

A Acidified manganate(VII) ions change colour from colourless to purple when reduced.

B All reactions that involve oxidation also involve reduction.

C During a reaction, oxidising agents lose electrons.

D Reduction is the loss of hydrogen from a compound.

20 Three separate mixtures of a solution and a solid are made, as shown in the table.

The mixtures are warmed.

In which mixtures does gas form?

	NaOH(aq) and NH_4Cl(s)	H_2SO_4(aq) and NH_4Cl(s)	H_2SO_4(aq) and Mg(s)
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

key

✓ = gas forms

✗ = no gas forms

21 Insoluble salts are prepared by reacting aqueous solutions of soluble salts. A precipitate forms.

Which pairs of aqueous solutions form a precipitate?

1 barium chloride and nitric acid

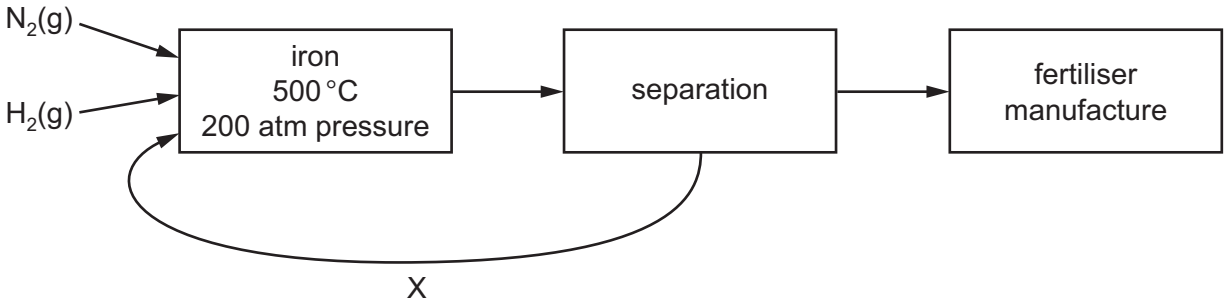
2 barium chloride and sulfuric acid

3 barium nitrate and nitric acid

4 barium nitrate and sulfuric acid

A 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

22 The diagram shows the main stages in the manufacture of an ammonia-based fertiliser.



What is happening in the process labelled X?

A Ammonia is returned to the start of the process to shift the equilibrium towards the product.

B The gases are cooled to cause ammonia to form a liquid.

C Unreacted hydrogen only is recycled.

D Unreacted hydrogen and nitrogen are recycled.

23 What is a use of sulfuric acid?

A as a bleach

B as a food preservative

C in the manufacture of detergents

D in the manufacture of vanadium(V) oxide, V_2O_5

24 Which property shows an increasing trend in the elements, from Group I to Group VII, across a period of the Periodic Table?

A ability to form anions

B metallic character

C number of electron shells

D reactivity with water

25 The melting point of lithium is 181 °C. The melting point of sodium is 98 °C.

Which statement explains why lithium has a higher melting point than sodium?

A Lithium has more valency electrons than sodium.

B Sodium is more reactive than lithium.

C Sodium is softer than lithium.

D The attraction between the positive ions and the 'sea of electrons' is stronger in lithium than in sodium.

26 From their position in the Periodic Table, which properties would you expect the elements vanadium, chromium and cobalt to have?

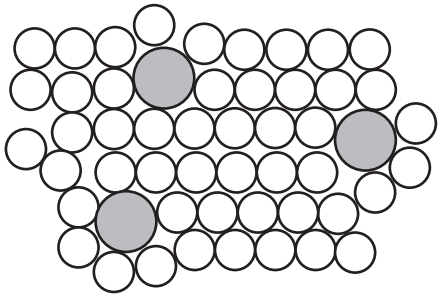
1 variable oxidation states

2 coloured compounds

3 high melting points

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

27 The diagram shows the structure of an alloy.



Which statement about alloys is correct?

A Alloys can only be formed by mixing copper or iron with other metals.

B High carbon steel alloys are soft and easily shaped.

C In an alloy there is attraction between positive ions and a 'sea of electrons'.

D The alloy brass has a chemical formula.

28 The list shows the position of metal X in the reactivity series of metals.

Na Al Fe X Cu Ag

Which methods could be used to extract metal X?

1 electrolysis of the solid metal oxide

2 heating the metal oxide with carbon

3 heating the metal oxide with copper

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

29 An old commercial process for aluminium extraction used large quantities of sodium to convert aluminium ions into aluminium atoms.

The modern aluminium extraction process uses electrolysis.

Which statements are correct?

In the old process:

1 The sodium acted as an oxidising agent.

2 The reaction worked because sodium is more reactive than aluminium.

In the modern process:

3 The equation for the cathode reaction is $Al^{3+}(l) + 3e^- \rightarrow Al(l)$.

4 The carbon anode needs replacing often because it is oxidised to carbon dioxide by the oxygen evolved.

	old process	modern process
A	1 and 2	3 and 4
B	1 and 2	3 only
C	1 only	4 only
D	2 only	3 and 4

30 Which element is always present in steel?

A calcium

B copper

C iron

D zinc

31 Aluminium is used to make saucepans because of its apparent lack of reactivity.

Which property of aluminium explains its unreactivity?

A It has a layer of oxide on its surface.

B It has a low density.

C It is a good conductor of electricity.

D It is in Group III of the Periodic Table.

[Turn over

32 Pollutant gases are released by the bacterial decay of vegetable matter.

The bacterial decay of vegetable matter is the main source of which gas?

A carbon monoxide

B methane

C nitrogen dioxide

D sulfur dioxide

33 Lakes contain a variety of dissolved substances.

Which substance is responsible for eutrophication in lakes?

A metal compounds

B nitrate fertilisers

C oxygen

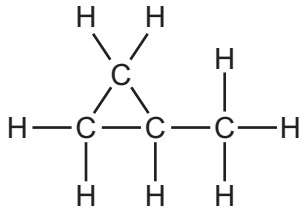
D sulfuric acid

34 How many of the molecules shown belong to the homologous series of alkanes?

C_2H_4 C_3H_8 C_4H_{10} C_5H_{10} C_6H_{14}

A 1 **B** 2 **C** 3 **D** 4

35 The diagram shows the structural formula of an organic compound.



Which statement about this compound is correct?

A It is a saturated hydrocarbon.

B It is an alkene.

C It is an isomer of butane.

D It will undergo addition with hydrogen.

36 Which statement about vegetable oil and the margarine made from it is correct?

A Both are liquids at room temperature.

B Both occur naturally.

C Margarine has the higher melting point.

D Vegetable oil has fewer carbon-carbon double bonds than margarine.

37 Which group is found in alcohols?

A C=C **B** CO_2H **C** CONH **D** OH

38 An ester is formed from a carboxylic acid and an alcohol.

How does the number of carbon, hydrogen and oxygen atoms in an ester differ from the total number of these atoms in the carboxylic acid and alcohol from which the ester is formed?

	carbon atoms	hydrogen atoms	oxygen atoms
A	fewer	fewer	fewer
B	fewer	same	fewer
C	same	fewer	fewer
D	same	same	same

39 Which statement about the composition of polymers is correct?

A Nylon contains oxygen atoms but not nitrogen atoms.

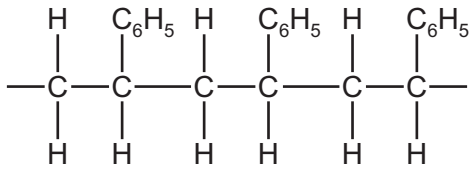
B Proteins contain both nitrogen atoms and oxygen atoms.

C *Terylene* contains nitrogen atoms.

D The polymer used to make clingfilm contains oxygen atoms.

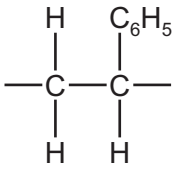
40 Poly(styrene) is an addition polymer.

The partial structure of poly(styrene) is shown.



What is the formula of the monomer from which poly(styrene) is made?

A



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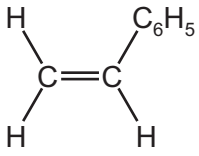

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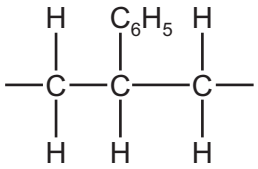

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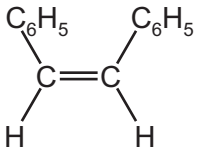

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The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

Key

atomic number
atomic symbol
name
relative atomic mass

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).