Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CHEMISTRY **5070/11**

Paper 1 Multiple Choice **October/November 2016**

1 hour

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

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 is given only the nucleon number of an atom.

What can be deduced about the structure of the atom?

A number of neutrons plus protons

B number of neutrons only

C number of protons plus electrons

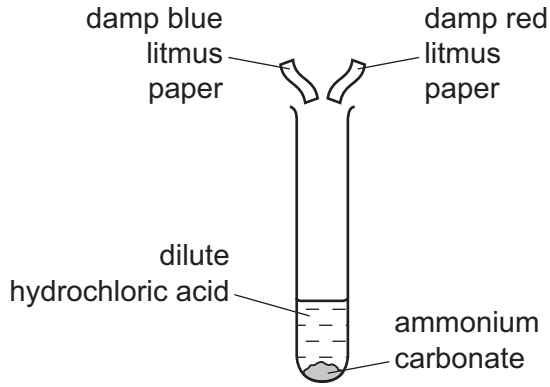
D number of protons only

2 Two experiments were carried out.

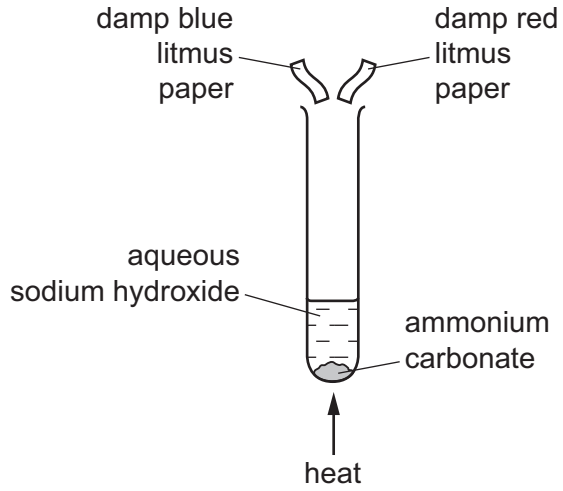
In experiment 1, ammonium carbonate was reacted with dilute hydrochloric acid.

In experiment 2, ammonium carbonate was heated with aqueous sodium hydroxide.

In each experiment, the gas evolved was tested with damp blue litmus paper and damp red litmus paper.



experiment 1

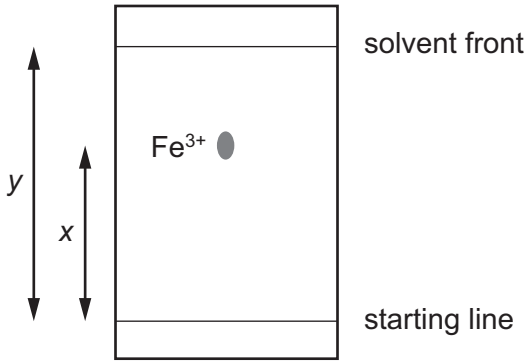


experiment 2

Which row correctly shows the colour of both the pieces of litmus paper at the end of each experiment?

	experiment 1	experiment 2
A	blue	blue
B	blue	red
C	red	blue
D	red	red

3 A paper chromatography experiment is carried out to find an R_f value for $Fe^{3+}(aq)$. The result is shown.



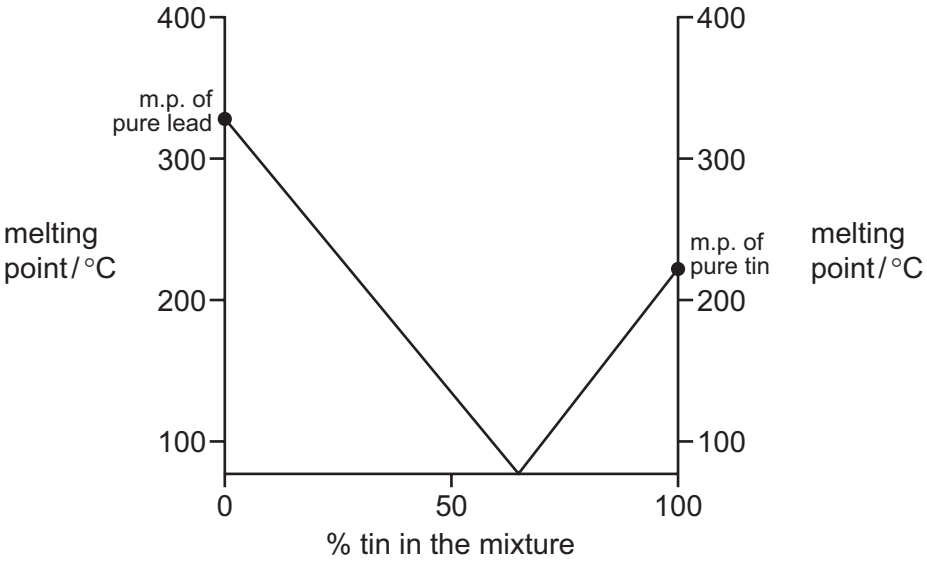
To make the spot containing $Fe^{3+}(aq)$ more visible, the paper is sprayed with aqueous sodium hydroxide so that a precipitate of iron(III) hydroxide forms.

Under the conditions of the experiment, the R_f of $Fe^{3+}(aq)$ is given by .....1..... and the colour of the precipitate is .....2..... .

Which row correctly completes gaps 1 and 2?

	gap 1	gap 2
A	$\frac{x}{y}$	red-brown
B	$\frac{x}{y}$	green
C	$\frac{y}{x}$	red-brown
D	$\frac{y}{x}$	green

4 The graph gives the melting points (m.p.) of mixtures of lead and tin.



The graph shows that any mixture of lead and tin must have a melting point that is

A above that of tin.

B below that of lead.

C below that of both tin and lead.

D between that of tin and lead.

5 Some students wrote three statements about the bonding in a molecule of ammonia, NH_3.

1 A nitrogen atom has three outer electrons so all outer electrons are involved in bonding.

2 A nitrogen atom has five outer electrons so two outer electrons are not involved in bonding.

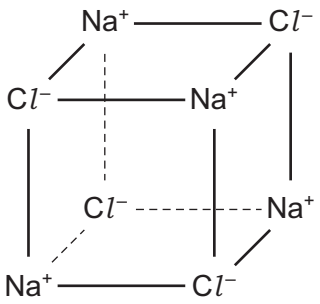
3 A nitrogen atom shares electrons with each of three hydrogen atoms.

Which statements about the bonding in ammonia are correct?

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

6 Which diagram correctly shows the arrangement of the ions in solid sodium chloride?

A



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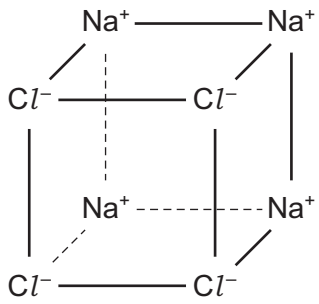

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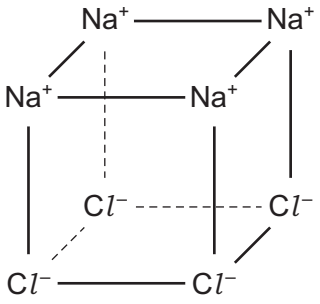

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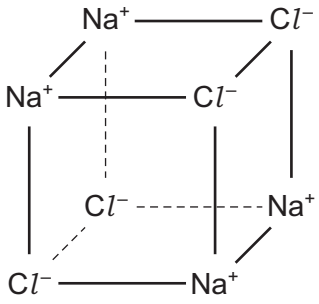


7 The table shows some properties of four solid elements.

Which element could be graphite?

	electrical conductivity	melting point / °C
A	good	97
B	good	3550
C	poor	113
D	poor	4750

8 Which statement about chlorine atoms and chloride ions is correct?

A They are both isotopes of chlorine.

B They undergo the same chemical reactions.

C They have the same number of protons.

D They have the same physical properties.

[Turn over

9 Four gases are listed.

1 CH_4

2 NH_3

3 CO_2

4 N_2

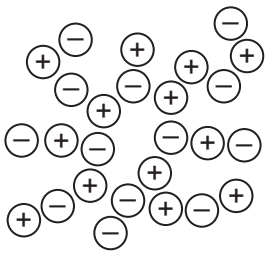
1 mol / dm^3 of each of gases 1 – 4 is allowed to diffuse.

What is the order of their rate of diffusion at room temperature and pressure?

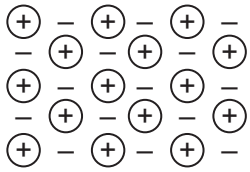
	slowest →			fastest
A	1	2	4	3
B	2	1	3	4
C	3	4	2	1
D	4	1	3	2

10 Which diagram best represents the structure of a solid metal?

A



B



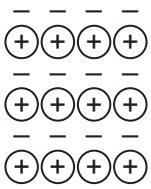
key

⊖ a negative ion

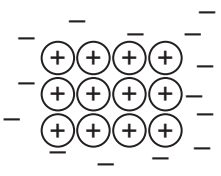
⊕ a positive ion

– an electron

C



D



11 A compound containing only the elements carbon and hydrogen has 80.0% by mass of carbon.

What is its empirical formula?

A C_3H **B** CH_3 **C** CH_4 **D** C_2H_6

12 An ionic compound has the formula *XY*, where *Y* is a non-metal.

Which statement about *XY* is correct?

A An atom of *X* has lost at least one electron to form a positive ion.

B Both *X* and *Y* share a pair of electrons.

C Element *X* is also a non-metal.

D *XY* will not conduct electricity when liquid.

13 In an experiment, 1 cm^3 of a gaseous hydrocarbon, **Z**, requires 4 cm^3 of oxygen for complete combustion to give 3 cm^3 of carbon dioxide. All gas volumes are measured at r.t.p.

Which formula represents **Z**?

A C_2H_2 **B** C_2H_4 **C** C_3H_4 **D** C_3H_8

14 Aqueous copper(II) sulfate is electrolysed using copper as the positive electrode and carbon as the negative electrode.

Which row gives correct information about this electrolysis?

	positive electrode	negative electrode	electrolyte
A	electrode dissolves	copper deposited	stays a constant blue colour
B	electrode dissolves	hydrogen gas given off	blue colour becomes more intense
C	hydrogen gas given off	oxygen gas given off	stays a constant blue colour
D	oxygen gas given off	hydrogen gas given off	stays a constant blue colour

15 Molten salts of four metals are electrolysed.

The ions of which metal require the smallest number of electrons for one mole of atoms to be liberated during electrolysis?

A aluminium

B calcium

C iron

D sodium

16 Which two products are formed during photosynthesis?

A carbon dioxide and water

B chlorophyll and oxygen

C glucose and oxygen

D glucose and water

17 A student investigates how the concentration of a reagent affects the rate of a chemical reaction.

Which piece of apparatus is essential for all rate investigations?

A balance

B gas syringe

C measuring cylinder

D stopwatch

18 Gold is used as a catalyst in some chemical reactions.

In these reactions, gold

- helps reduce the energy costs of the reaction.
- increases the yield of the reaction.
- is unchanged at the end of the reaction.
- speeds up the rate of the reaction.

How many of these statements are correct?

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

19 The table shows some properties of four metal chlorides.

Which row is magnesium chloride?

	colour	solubility in water	method of preparation
A	green	insoluble	precipitation
B	green	soluble	metal and acid
C	white	insoluble	precipitation
D	white	soluble	metal and acid

20 A lump of element **X** can be cut by a knife.

During its reaction with water, **X** floats and melts.

What is **X**?

A calcium

B copper

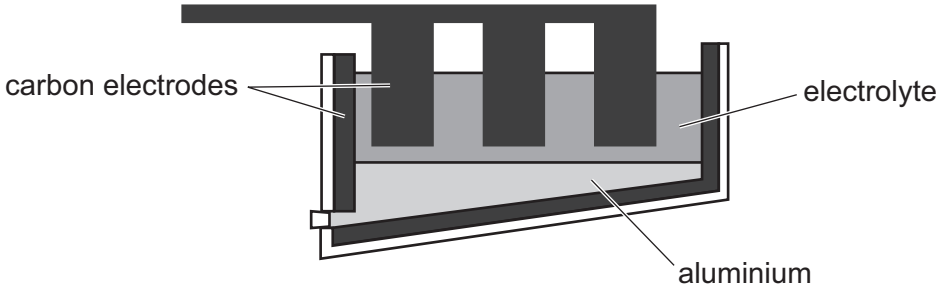
C magnesium

D potassium

21 Which row shows the pH values for 0.1 mol / dm^3 solutions of ammonia, hydrochloric acid, sodium chloride and sodium hydroxide?

	pH values			
	NH_3	HCl	$NaCl$	NaOH
A	1	7	13	11
B	7	1	11	13
C	11	1	7	13
D	13	11	7	1

22 The diagram shows the apparatus used to extract aluminium from aluminium oxide.



Which statement about this process is correct?

A The electrolyte is a solid mixture of aluminium oxide and cryolite.

B The electrolyte is aluminium oxide dissolved in water.

C The equation for the reaction at the positive electrode is $Al^{3+} + 3e^- \rightarrow Al$.

D The positive carbon electrodes lose mass during the process and need regular replacement.

23 A student has five reagents.

- dilute hydrochloric acid
- dilute sulfuric acid
- dilute nitric acid
- solid calcium carbonate
- solid copper(II) carbonate

How many soluble salts can be prepared?

A 3 **B** 4 **C** 5 **D** 6

24 Which reaction is **not** a redox reaction?

A $CaCO_3 \rightarrow CaO + CO_2$

B $2C + O_2 \rightarrow 2CO$

C $C + CO_2 \rightarrow 2CO$

D $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

25 Some properties which make elements different from each other are listed.

1 metallic character

2 number of electron shells in an atom

3 number of protons in an atom

4 total number of electrons in an atom

Which two properties increase across a period of the Periodic Table?

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

26 Aqueous copper(II) sulfate solution is placed in an iron container and left to stand for several days.

Which statement describes what happens?

A Atmospheric oxygen reacts with the copper(II) sulfate to give black copper(II) oxide.

B Some fine iron particles are formed in the solution.

C The part of the container in contact with the solution is coated with copper.

D The solution turns from green to blue.

27 Which equation shows a reaction that will occur at room temperature and pressure?

A $Br_2(aq) + 2NaCl(aq) \rightarrow 2NaBr(aq) + Cl_2(aq)$

B $Br_2(aq) + 2NaI(aq) \rightarrow 2NaBr(aq) + I_2(aq)$

C $I_2(aq) + 2NaCl(aq) \rightarrow 2NaI(aq) + Cl_2(aq)$

D $I_2(aq) + 2NaBr(aq) \rightarrow 2NaI(aq) + Br_2(aq)$

28 Attaching pieces of magnesium to underground iron pipes can protect the iron from corrosion.

Which reaction protects the iron from corrosion?

A $Fe^{2+}(aq) + 2e^- \rightarrow Fe(s)$

B $Fe(s) \rightarrow Fe^{2+}(aq) + 2e^-$

C $Mg^{2+}(aq) + 2e^- \rightarrow Mg(s)$

D $Mg(s) \rightarrow Mg^{2+}(aq) + 2e^-$

29 Which compound is used as a fertiliser?

A ammonium sulfate

B barium carbonate

C calcium hydroxide

D lead chloride

30 In the Haber process, hydrogen and nitrogen react to form ammonia in the presence of a catalyst.

Which of the two reactants is obtained by fractional distillation and what is the catalyst used in the Haber process?

	obtained by fractional distillation	catalyst
A	hydrogen	iron
B	hydrogen	nickel
C	nitrogen	iron
D	nitrogen	nickel

31 An element, *Z*, from Group II of the Periodic Table reacts with chlorine, an element from Group VII.

What is the formula of the ionic compound formed?

A ZCl_2 **B** Z_2Cl **C** Z_2Cl_7 **D** Z_7Cl_2

32 The table shows treatments used for drinking water supplies and reasons for using those treatments.

Which row is correct?

	method of water treatment	reason
A	chlorination	removes tastes
B	desalination	removes solids
C	filtration	removes salt
D	use of carbon	removes odours

33 The table shows some atmospheric pollutants and their possible effects.

Which row is **not** correct?

	pollutant	effect
A	CFCs	cause depletion of the ozone layer
B	CO_2	forms photochemical smog
C	CO	is poisonous to humans
D	NO_2	forms acid rain

34 How many moles of ethanoic acid, CH_3CO_2H, react with one mole of magnesium?

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

35 With which substance will ethene react to form more than one product?

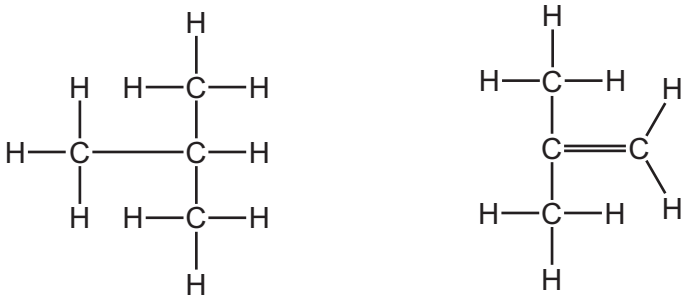
A argon

B hydrogen

C oxygen

D steam

36 The diagram shows the structures of two hydrocarbons, X and Y.



X

Y

Two students make the following statements.

Student 1	Hydrocarbon X is an isomer of Y.
Student 2	Hydrocarbon X is unsaturated but Y is saturated.

Which students are correct?

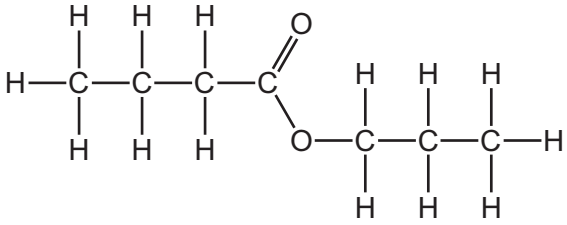
A both 1 and 2

B 1 only

C 2 only

D neither 1 nor 2

37 The diagram shows the structure of an ester.



What is the name of this ester?

A butyl butanoate

B butyl propanoate

C propyl butanoate

D propyl propanoate

38 An unsaturated hydrocarbon with six carbon atoms contains only three C=C double bonds. This hydrocarbon is reacted with excess hydrogen at a high temperature.

What is the formula of the resulting hydrocarbon?

A C_6H_8 **B** C_6H_{10} **C** C_6H_{14} **D** C_6H_{16}

39 Compound Q has the formula C_4H_{10}.

Which statement about compound Q is correct?

A It undergoes addition reactions with chlorine.

B It has a lower boiling point than methane.

C It has the same general formula as methane.

D There are four C–C bonds in the molecule.

40 Hydrolysis of **R**, a macromolecule, gives a mixture of amino acids.

What is **R**?

A a fat

B a nylon

C a polyester

D a protein

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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.)