Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/13**

Paper 1 Multiple Choice (Core) **May/June 2017**

45 minutes

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

* 9 9 0 8 3 4 0 5 5 2 *

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.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level1/Level 2 Certificate.

This document consists of **13** printed pages and **3** blank pages.

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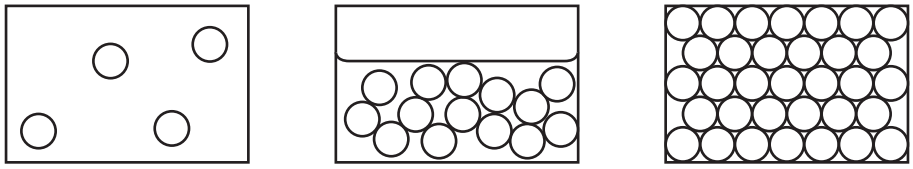
1 Diagrams R, S and T represent the three states of matter.



R S T

Which change occurs during freezing?

A R → S **B** S → T **C** T → R **D** T → S

2 A student needs to measure 22 cm^3 of water at 40 °C.

Which apparatus is required?

A beaker and stopwatch

B beaker and thermometer

C measuring cylinder and stopwatch

D measuring cylinder and thermometer

3 A compound, X, has a melting point of 71 °C and a boiling point of 375 °C.

Which statement about X is correct?

A It is a liquid at 52 °C and a gas at 175 °C.

B It is a liquid at 69 °C and a gas at 380 °C.

C It is a liquid at 75 °C and a gas at 350 °C.

D It is a liquid at 80 °C and a gas at 400 °C.

4 Which method is used to obtain a concentrated solution of ethanol from a dilute solution of ethanol dissolved in water?

A crystallisation

B distillation

C filtration

D paper chromatography

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5 Which definition of isotopes is correct?

A atoms of the same element that have the same number of electrons and nucleons

B atoms of the same element that have the same number of neutrons and protons

C atoms of the same element that have the same number of protons but a different number of electrons

D atoms of the same element that have the same number of protons but a different number of nucleons

6 Which statement about a molecule of ammonia, NH_3, is correct?

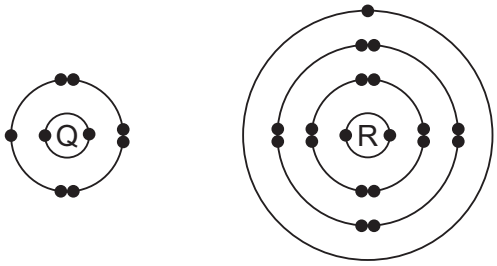
A Each hydrogen atom donates a pair of electrons to a nitrogen atom.

B There are double covalent bonds between the nitrogen atom and the hydrogen atoms.

C There are single covalent bonds between its hydrogen atoms.

D There are three shared pairs of electrons in the molecule.

7 The electronic structures of atoms Q and R are shown.



Q and R form an ionic compound.

What is the formula of the compound?

A QR_7 **B** Q_2R_4 **C** QR **D** Q_7R

8 Which substance is a macromolecule?

A ammonia

B carbon dioxide

C diamond

D water

9 What is the relative formula mass of aluminium oxide, Al_2O_3?

A 43 **B** 70 **C** 102 **D** 113

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10 Which products are initially obtained at each electrode during the electrolysis of concentrated aqueous sodium chloride?

	cathode	anode
A	hydrogen	chlorine
B	hydrogen	oxygen
C	sodium	chlorine
D	sodium	oxygen

11 Heat energy is produced when hydrocarbons burn in air.

Which equations represent this statement?

1 $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$

2 $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$

3 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

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

12 Which statements about exothermic and endothermic reactions are correct?

1 During an exothermic reaction, heat is given out.

2 The temperature of an endothermic reaction goes up because heat is taken in.

3 Burning methane in the air is an exothermic reaction.

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

13 Which changes are physical changes?

1 melting ice to form water

2 burning hydrogen to form water

3 adding sodium to water

4 boiling water to form steam

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

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14 Which colour change is seen when hydrated cobalt(II) chloride is heated so that it becomes anhydrous cobalt(II) chloride?

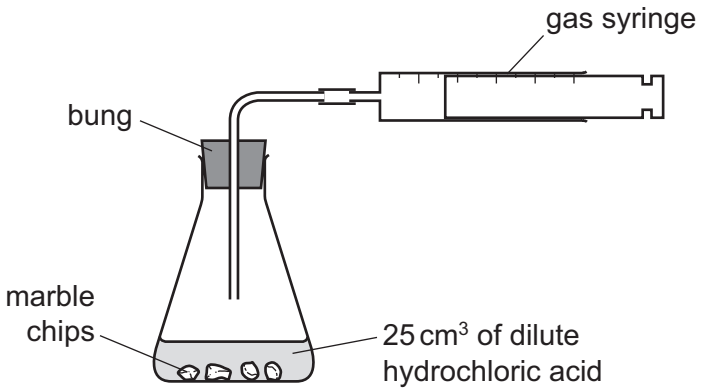
A blue to pink

B blue to white

C pink to blue

D white to blue

15 A student was investigating the reaction between marble chips and dilute hydrochloric acid.



Which changes slow down the rate of reaction?

	temperature of acid	concentration of acid	surface area of marble chips
A	decrease	decrease	decrease
B	decrease	decrease	increase
C	increase	decrease	decrease
D	increase	increase	increase

16 The reactions shown may occur in the air during a thunder-storm.

$N_2 + O_2 \rightarrow 2NO$

$2NO + O_2 \rightarrow 2NO_2$

$NO + O_3 \rightarrow NO_2 + O_2$

Which row shows what happens to the reactant molecules in each of these reactions?

	N_2	NO	O_3
A	oxidised	oxidised	oxidised
B	oxidised	oxidised	reduced
C	reduced	reduced	oxidised
D	reduced	reduced	reduced

17 Three separate experiments are carried out on a solution of substance X.

1 A gas is produced when X is heated with ammonium chloride.

2 Methyl orange is yellow when added to X.

3 There is no reaction between X and sodium carbonate.

Which type of substance is X?

A acid

B base

C indicator

D salt

18 Farmers spread slaked lime (calcium hydroxide) on their fields to neutralise soils that are too acidic for crops to grow well.

Which ion in slaked lime neutralises the acid in the soil?

A Ca^{2+} **B** H^+ **C** O^{2-} **D** OH^-

19 Which salt preparation uses a burette and a pipette?

A calcium nitrate from calcium carbonate and nitric acid

B copper(II) sulfate from copper(II) hydroxide and sulfuric acid

C potassium chloride from potassium hydroxide and hydrochloric acid

D zinc chloride from zinc and hydrochloric acid

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20 Aqueous sodium hydroxide reacts with an aqueous solution of compound Y to give a green precipitate.

Aqueous ammonia also reacts with an aqueous solution of compound Y to give a green precipitate.

In each case the precipitate is insoluble when an excess of reagent is added.

Which ion is present in Y?

A chromium(III)

B copper(II)

C iron(II)

D iron(III)

21 Period 3 of the Periodic Table is shown.

Na	Mg	A*l*	Si	P	S	C*l*	Ar

What increases from left to right across Period 3?

A density

B melting point

C non-metallic character

D the number of electron shells

22 Which element is less reactive than the other members of its group in the Periodic Table?

A astatine

B caesium

C fluorine

D rubidium

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23 An element has the following properties.

- It forms coloured compounds.
- It acts as a catalyst.
- It melts at 1539 °C.

In which part of the Periodic Table is the element found?

A Group I

B Group VII

C Group VIII

D transition elements

24 Why are weather balloons sometimes filled with helium rather than hydrogen?

A Helium is found in air.

B Helium is less dense than hydrogen.

C Helium is more dense than hydrogen.

D Helium is unreactive.

25 Element E:

- forms an alloy
- has a basic oxide
- is below hydrogen in the reactivity series.

What is E?

A carbon

B copper

C sulfur

D zinc

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26 Which row shows how the metal reacts?

	metal	reacts with dilute acid	reacts rapidly with cold water	reacts with steam
A	calcium	✗	✓	✓
B	copper	✓	✗	✗
C	magnesium	✓	✗	✓
D	zinc	✓	✗	✗

27 Which statement about the extraction of iron from hematite is correct?

A Air is blown into the blast furnace to oxidise the molten iron.

B Carbon dioxide is reduced by coke to carbon monoxide.

C Hematite is oxidised by carbon to molten iron.

D The slag produced is denser than molten iron.

28 Stainless steel is an alloy of iron and other metals. It is strong and does not rust but it costs much more than normal steel.

What is **not** made from stainless steel?

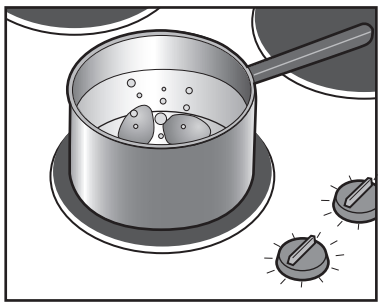
A cutlery

B pipes in a chemical factory

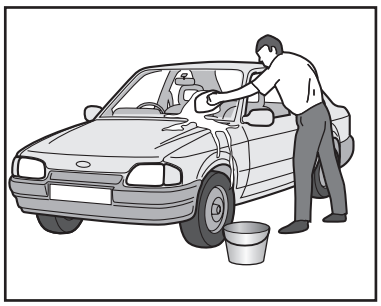
C railway lines

D saucepans

29 The diagram shows some uses of water in the home.



1



2

3

For which uses is it important for the water to have been treated?

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

30 Which pollutant gas **cannot** be produced by the combustion of fossil fuels (coal, petroleum and natural gas)?

A carbon monoxide

B methane

C nitrogen dioxide

D sulfur dioxide

31 A farmer wrongly adds two substances to the soil at the same time.

They react together to form a gas which turns damp red litmus blue.

What are the two substances?

A a basic oxide and a potassium salt

B a basic oxide and an ammonium salt

C an acidic oxide and a potassium salt

D an acidic oxide and an ammonium salt

32 In which process is carbon dioxide **not** formed?

A burning of natural gas

B fermentation

C heating lime

D respiration

33 Two equations are shown.

reaction 1 $CaCO_3 \rightarrow CaO + CO_2$

reaction 2 $CaO + H_2O \rightarrow Ca(OH)_2$

Which terms describe reactions 1 and 2?

	reaction 1	reaction 2
A	reduction	hydration
B	reduction	hydrolysis
C	thermal decomposition	hydration
D	thermal decomposition	hydrolysis

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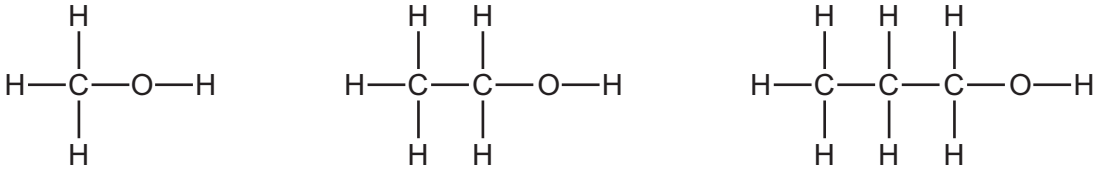
34 The structures of three substances are shown.



Why do these substances all belong to the same homologous series?

A They are all compounds.

B They are all saturated.

C They all contain oxygen.

D They all contain the same functional group.

35 Fuel oil, gasoline, kerosene and naphtha are four fractions obtained from the fractional distillation of petroleum.

What is the order of the boiling points of these fractions?

	highest boiling point → lowest boiling point
A	fuel oil → kerosene → gasoline → naphtha
B	fuel oil → kerosene → naphtha → gasoline
C	gasoline → naphtha → kerosene → fuel oil
D	naphtha → gasoline → kerosene → fuel oil

36 Which process produces alkenes from alkanes?

A combustion

B cracking

C fermentation

D polymerisation

37 Poly(ethene) is made from ethene.

Ethene is .....1..... hydrocarbon because it contains a carbon to carbon .....2..... bond.

The general name given to small molecules that undergo polymerisation is .....3..... .

Which words complete gaps 1, 2 and 3?

	1	2	3
A	an unsaturated	double	monomers
B	an unsaturated	single	alkenes
C	a saturated	double	alkenes
D	a saturated	single	monomers

38 Which reaction is used to manufacture ethanol?

A reacting ethane with oxygen in the presence of a catalyst

B reacting ethane with steam in the presence of a catalyst

C reacting ethene with steam in the presence of a catalyst

D reacting glucose with steam in the presence of a catalyst

39 Which statement about aqueous ethanoic acid is **not** correct?

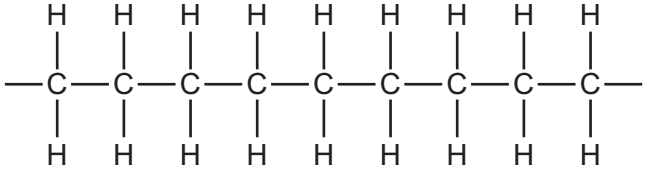
A It effervesces with sodium carbonate.

B It neutralises aqueous sodium hydroxide.

C It turns blue litmus from blue to red.

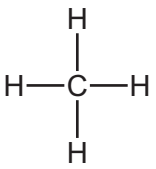
D It turns methyl orange from orange to yellow.

40 The diagram shows part of the molecule of a polymer.



Which diagram shows the monomer from which this polymer could be manufactured?

A



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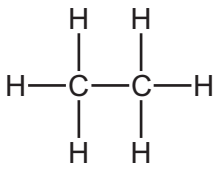

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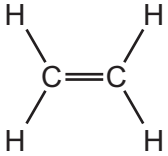
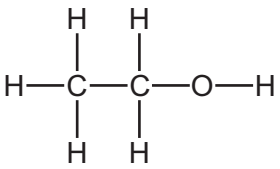


D



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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.).