Cambridge
O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

CHEMISTRY **5070/11**

Paper 1 Multiple Choice **May/June 2019**

1 hour

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

5759037678

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 **14** printed pages and **2** blank pages.

© UCLES 2019

1 An experiment is done to measure the rate of reaction between calcium carbonate and dilute hydrochloric acid. The gas formed is collected in a gas syringe.

Which additional pieces of apparatus are essential to measure how the rate of the reaction changes with temperature and the amount of acid used?

	apparatus to measure temperature	apparatus to measure amount of acid used
A	balance	thermometer
B	measuring cylinder	balance
C	thermometer	condenser
D	thermometer	measuring cylinder

2 After acidification with dilute nitric acid, a colourless solution of **X** reacts with aqueous silver nitrate to give a white precipitate.

What could **X** be?

A calcium iodide

B copper(II) chloride

C lead(II) iodide

D sodium chloride

3 A paper chromatography experiment is carried out to separate and identify the mixture of amino acids produced from the hydrolysis of a protein.

Which apparatus is needed?

A chromatography paper, locating agent, marker pen, solvent

B chromatography paper, locating agent, pencil, ruler, solvent

C chromatography paper, locating agent, ruler, solvent, thermometer

D chromatography paper, locating agent, pencil, solvent, thermometer

4 Which conditions will give the highest rate of diffusion of a gas?

	molecular mass of gas	temperature
A	large	high
B	large	low
C	small	high
D	small	low

© UCLES 2019

5 Cobalt is a transition element.

A particle of cobalt contains 24 electrons and has a nucleon number of 60.

Which statement about this particle is correct?

A It is a 3+ ion.

B It is a 3– ion.

C It contains 24 neutrons.

D It contains 24 protons.

6 Diamond and graphite are two different forms of the element carbon. They each have different uses.

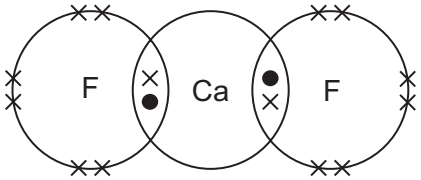
Which row is correct?

	use		
	to cut glass	as an electrode	as a lubricant
A	diamond	diamond	graphite
B	diamond	graphite	graphite
C	graphite	diamond	diamond
D	graphite	graphite	diamond

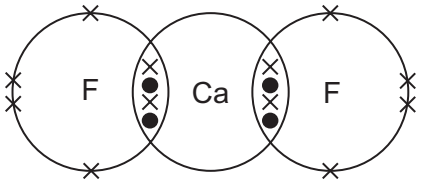
7 Which diagram shows the outer electron arrangement in calcium fluoride?

key
- ● an electron from calcium
- × an electron from fluorine

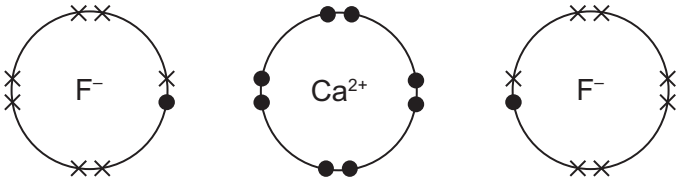
A



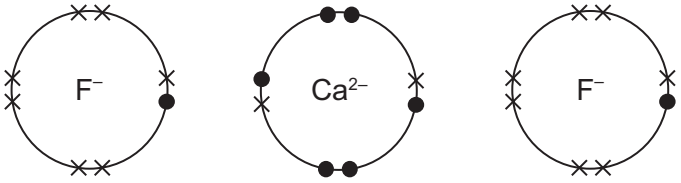
B



C



D



8 What is the number of shared pairs of electrons in an ammonia molecule?

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

9 Two statements about metals are given.

1 Metals contain a lattice of negative ions in a ‘sea of electrons’.

2 The electrical conductivity of metals is related to the mobility of the electrons in the structure.

Which is correct?

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

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

C Statement 1 is correct and statement 2 is incorrect.

D Statement 2 is correct and statement 1 is incorrect.

© UCLES 2019

10 Powdered calcium carbonate reacts with dilute hydrochloric acid to produce calcium chloride, water and carbon dioxide.

What is the correct ionic equation, including state symbols, for this reaction?

A $CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$

B $Ca^{2+}(aq) + CO_3^{2-}(aq) + 2H^+(aq) \rightarrow Ca^{2+}(aq) + H_2O(l) + CO_2(g)$

C $CO_3^{2-}(aq) + 2H^+(aq) \rightarrow H_2O(l) + CO_2(g)$

D $CaCO_3(s) + 2H^+(aq) \rightarrow Ca^{2+}(aq) + H_2O(l) + CO_2(g)$

11 In a volumetric experiment, 25.0 cm^3 of 0.100 mol/dm^3 sodium hydroxide reacts exactly with 20.0 cm^3 of sulfuric acid.

$$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$$

What is the concentration of the sulfuric acid?

A 0.0625 mol/dm^3

B 0.0800 mol/dm^3

C 0.125 mol/dm^3

D 0.250 mol/dm^3

12 The reaction for the conversion of bromoethane to ethanol is shown.

$$C_2H_5Br + NaOH \rightarrow C_2H_5OH + NaBr$$

In an experiment, 10.90 g of bromoethane is converted into 3.45 g of ethanol.

What is the percentage yield of ethanol?

[M_r: C_2H_5Br, 109; C_2H_5OH, 46]

A 32% **B** 42% **C** 75% **D** 100%

13 One mole of a sugar, $(CH_2O)_6$, is burned.

Which volume of oxygen, measured at room temperature and pressure, is required for complete combustion of the sugar?

A 24 dm^3 **B** 36 dm^3 **C** 144 dm^3 **D** 216 dm^3

© UCLES 2019

14 Which statement about the purification of copper by electrolysis is correct?

A A pure copper anode is used.

B A pure copper cathode is used.

C The colour of the electrolyte fades throughout the process.

D The electrolyte used is a solution of copper oxide in water.

15 Which negative ions are present in aqueous copper(II) sulfate?

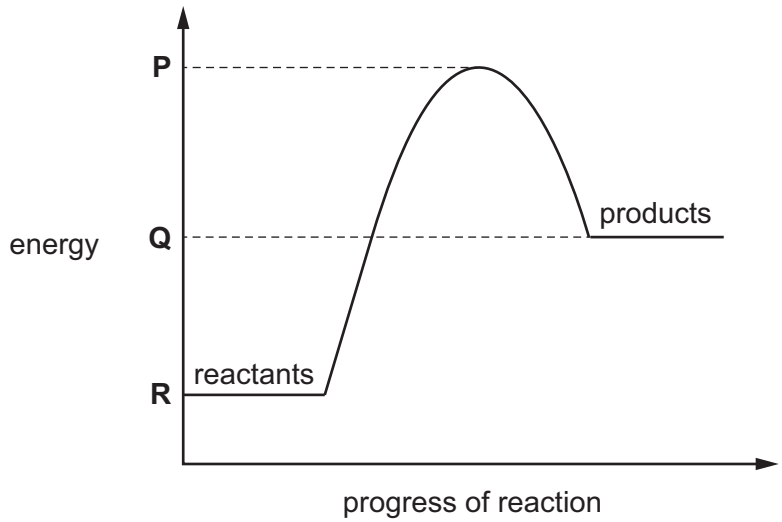
A copper(II) ions and hydrogen ions

B copper(II) ions only

C sulfate ions and hydroxide ions

D sulfate ions only

16 The diagram shows the energy profile for a reaction.



Which statement about this reaction is correct?

A It is endothermic and the activation energy is **P** – **Q**.

B It is endothermic and the activation energy is **P** – **R**.

C It is exothermic and the activation energy is **P** – **Q**.

D It is exothermic and the activation energy is **P** – **R**.

© UCLES 2019

17 The table shows the energy released by the complete combustion of some compounds.

compound	formula	M_r	ΔH in kJ / mol
benzene	C_6H_6	78	–3270
heptane	C_7H_{16}	100	–4800
octane	C_8H_{18}	114	–5510
propane	C_3H_8	44	–2200

Which compound releases the least energy when 1 g is completely burned?

A benzene

B heptane

C octane

D propane

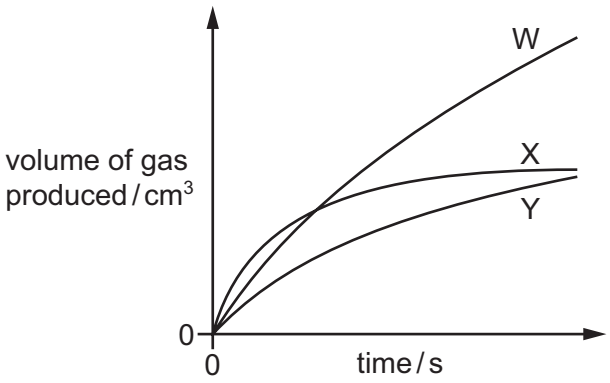
18 Three experiments are carried out in which the same mass of magnesium is reacted with the same volume of dilute sulfuric acid at room temperature. The magnesium is in excess.

experiment 1 Large pieces of magnesium are used.

experiment 2 Small pieces of magnesium are used.

experiment 3 Large pieces of magnesium are used but the concentration of the acid is increased.

Graphs of the results are shown.



Which row is correct?

	experiment 1	experiment 2	experiment 3
A	W	X	Y
B	X	Y	W
C	Y	W	X
D	Y	X	W

19 The equations show four reversible reactions.

For which reaction would the equilibrium move to the right for both an increase in pressure and an increase in temperature?

	reaction	enthalpy change
A	$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$	exothermic
B	$4NO(g) + 6H_2O(g) \rightleftharpoons 4NH_3(g) + 5O_2(g)$	endothermic
C	$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$	endothermic
D	$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$	exothermic

20 Gas X turns acidified potassium manganate(VII) from purple to colourless.

Gas Y turns aqueous potassium iodide from colourless to brown.

What do these observations show about gas X and gas Y?

	gas X	gas Y
A	oxidising agent	oxidising agent
B	oxidising agent	reducing agent
C	reducing agent	oxidising agent
D	reducing agent	reducing agent

21 Why is ethanoic acid described as a weak acid?

A It is an organic acid.

B It is a poor conductor of electricity.

C It is only slightly dissociated in water.

D It reacts only with very reactive metals.

22 What is the best method to prepare a pure sample of copper(II) sulfate?

A Add copper to aqueous zinc sulfate.

B Add copper to dilute sulfuric acid.

C Add copper(II) carbonate to aqueous sodium sulfate.

D Add copper(II) oxide to dilute sulfuric acid.

23 What is the percentage by mass of nitrogen in ammonium nitrate, NH_4NO_3?

A 17.5 **B** 22.2 **C** 33.3 **D** 35.0

© UCLES 2019

24 A student makes three suggestions about the Haber process and the Contact process.

1 Only one process uses a raw material obtained by fractional distillation of air.

2 Only one process involves the use of a catalyst.

3 The product of each catalysed reaction has a formula of the type XY_3.

Which suggestions are correct?

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

25 Which uses for sulfuric acid are correct?

1 as a bleach in the manufacture of wood pulp for paper

2 as a food preservative in tinned foods

3 as a raw material in the manufacture of detergents

4 as a fertiliser

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

26 Element X forms:

- a covalent compound, H_2X
- an ionic compound, Na_2X
- oxides XO_2 and XO_3.

To which group of the Periodic Table does X belong?

A II **B** III **C** IV **D** VI

27 Which property is common to ^{40}Ca, ^{39}K and ^{23}Na?

A Their atoms all have more neutrons than protons.

B Their ions all have eight electrons in their outer shell.

C They all sink when added to water.

D They are all deposited at the positive electrode when their molten chloride is electrolysed.

© UCLES 2019

28 Palladium is an element, atomic number 46. Some of its properties, and the properties of its compounds, can be predicted from its position in the Periodic Table.

Which row is correct?

	predicted property of palladium	predicted property of palladium compounds
A	Its density is similar to the density of sodium.	Some of them can act as catalysts.
B	Its density is similar to the density of sodium.	They are white in the solid state.
C	It is present in compounds in more than one oxidation state.	Some of them can act as catalysts.
D	It is present in compounds in more than one oxidation state.	They are white in the solid state.

29 Three different elements react by losing electrons. The ions formed all have the electronic configuration 2,8.

Which statement about these elements is correct?

A They are in the same group.

B They are in the same period.

C They are noble gases.

D They are transition elements.

30 A power cable requires an element that:

1 conducts electricity

2 has a relatively low density

3 is resistant to aerial oxidation.

Which of these conditions does aluminium satisfy?

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

31 Some atmospheric pollutants are listed.

1 sulfur dioxide

2 methane

3 nitrogen dioxide

4 unburned hydrocarbons

Which substances could be removed by reacting with calcium carbonate?

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

© UCLES 2019

32 River water contains many impurities.

Which process alone can produce pure water from river water?

A adding chlorine

B distillation

C filtering

D passing through carbon

33 Compound **Q** is a hydrocarbon that has no isomers. Compound **Q** does not decolourise bromine in the dark.

Which compound could be **Q**?

A C_3H_6 **B** C_3H_8 **C** C_4H_8 **D** C_4H_{10}

34 Which organic compound requires the least number of moles of oxygen for the complete combustion of one mole of the compound?

A C_3H_7OH **B** C_3H_7COOH **C** C_3H_8 **D** C_4H_8

35 When a molecule of a saturated hydrocarbon is cracked, it forms two molecules X and Y.

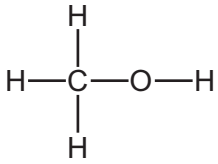
Which row is correct?

	X	Y
A	H_2	C_nH_{2n}
B	H_2	C_nH_{2n+2}
C	H_2O	C_nH_{2n}
D	H_2O	C_nH_{2n+2}

© UCLES 2019

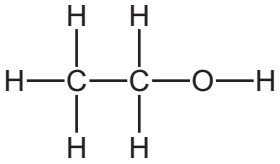
36 The structures and names of three alcohols, P, Q and R are shown. The structures may not be named correctly.

P



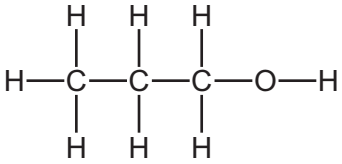
propanol

Q



ethanol

R



methanol

Which structures are correctly named?

A P, Q and R **B** P only **C** Q only **D** R only

37 What is the empirical formula of ethanoic acid?

A CH_2O **B** CH_4O **C** C_2H_3O **D** $C_2H_4O_2$

38 What is the structure of propyl methanoate?

A $CH_3COOCH_2CH_2CH_3$

B $CH_3COOCCH_2CH_3$

C $CH_3CH_2COOCH_3$

D $CH_3CH_2CH_2OOCH$

39 Which substance, on combustion, produces oxides of nitrogen?

A fat

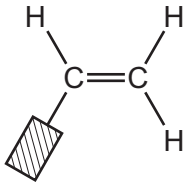
B protein

C starch

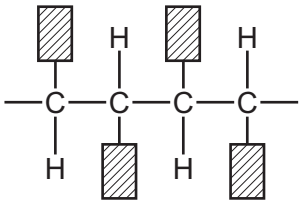
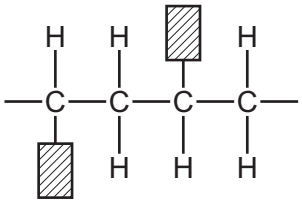
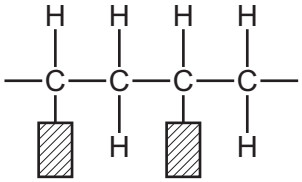
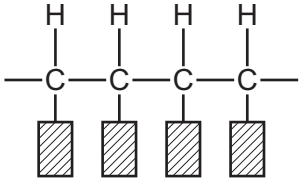
D *Terylene*

© UCLES 2019

40 The monomer used to manufacture polystyrene is shown.



By which type of polymerisation is polystyrene formed and what is a possible partial structure of the polymer?

	type of polymerisation	possible partial structure of polymer
A	addition	
B	addition	
C	condensation	
D	condensation	

BLANK PAGE

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

© UCLES 2019

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.).