

Cambridge International General Certificate of Secondary Education

CHEMISTRY

Paper 1 Multiple Choice (Core)

0620/13 May/June 2016

45 Minutes

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

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

This document consists of 16 printed pages.

1 In which changes do the particles move further apart?

$$gas \stackrel{W}{\rightleftharpoons} liquid \stackrel{X}{\rightleftharpoons} solid$$

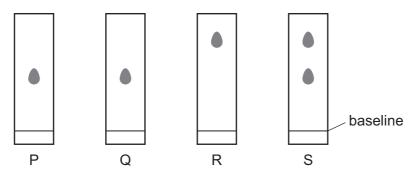
$$Y \qquad Z$$

$$A W and X \qquad B W and Z \qquad C X and Y \qquad D Y and Z$$

2 Chromatography experiments are carried out on four substances, P, Q, R and S.

The same solvent is used in each experiment.

The resulting chromatograms are shown below.



Which statement is not correct?

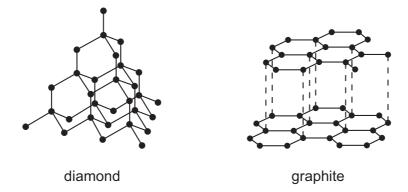
- **A** P and Q are pure substances.
- **B** P and R are different substances.
- **C** R and S are pure substances.
- **D** S is a mixture of substances.
- 3 One of the instructions for an experiment reads as follows.

Quickly add $50 \, \text{cm}^3$ of acid.

What is the best piece of apparatus to use?

- A a burette
- B a conical flask
- **C** a measuring cylinder
- D a pipette

4 The structures of diamond and graphite are shown.



Which statement about diamond and graphite is not correct?

- A Diamond is used in cutting tools because the strong covalent bonds make it very hard.
- **B** Graphite acts a lubricant because of the weak bonds between the layers.
- **C** Graphite conducts electricity because the electrons between the layers are free to move.
- **D** Graphite has a low melting point because of the weak bonds between the layers.
- 5 The table shows the electronic structure of four atoms.

atom	electronic structure
W	2,8,1
Х	2,8,4
Y	2,8,7
Z	2,8,8

Which two atoms combine to form a covalent compound?

A W and X **B** W and Y **C** X and Y **D** X and Z

6 The table shows the atomic structure of four atoms.

Which atom is **not** a metal?

	electrons	neutrons	protons
Α	18	22	18
В	19	20	19
С	19	21	19
D	20	20	20

7 Potassium, K, forms a compound with fluorine, F.

Which statements about this compound are correct?

- 1 The compound is ionic.
- 2 The formula of the compound is KF.
- 3 The compound is soluble in water.

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

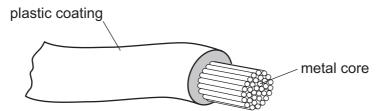
8 The equation shows the reaction between magnesium and sulfuric acid. [*A*_r: H, 1; O, 16; Mg, 24; S, 32]

$$Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$$

In this reaction, which mass of magnesium sulfate is formed when 6g of magnesium react with excess sulfuric acid?

A 8 **B** 24 **C** 30 **D** 60

9 The diagram shows an electrical cable.



Which statement about the substances used is correct?

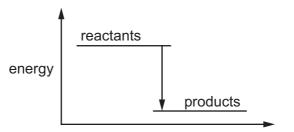
- **A** The coating is plastic because it conducts electricity well.
- **B** The core is copper because it conducts electricity well.
- **C** The core is copper because it is cheap and strong.
- **D** The core is iron because it is cheap and strong.

10 Electricity is passed separately through concentrated hydrochloric acid, concentrated aqueous sodium chloride and dilute sulfuric acid.

						cathode produ	uct	anode product
		1	concentrated hydrochloric acid		hydrogen		chlorine	
		2	concentrated aqueous sodium chloride		sodium		chlorine	
		3	dilute sulfuric acid			hydrogen		oxygen
Α	1, 2 a	and 3	в	1 and 2 only	С	1 and 3 only	D	2 and 3 only

In which rows are the electrolysis products correctly named?

11 The energy level diagram shows the energy of the reactants and products in a chemical reaction.

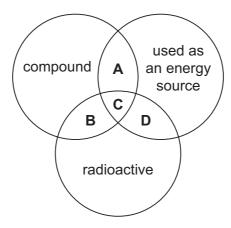


Which row correctly describes the energy change and the type of reaction shown?

	energy change	type of reaction
A	energy is given out to the surroundings	endothermic
В	energy is given out to the surroundings	exothermic
С	energy is taken in from the surroundings	endothermic
D	energy is taken in from the surroundings	exothermic

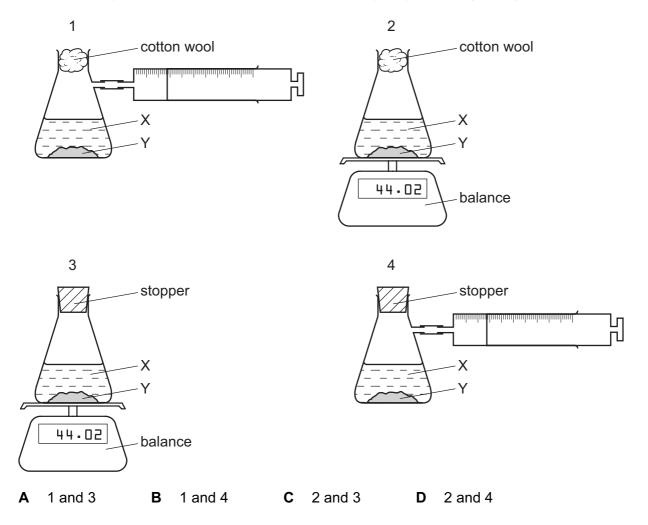
12 The diagram shows some properties that substances may have.

To which labelled part of the diagram does ²³⁵U belong?



13 A liquid X reacts with solid Y to form a gas.

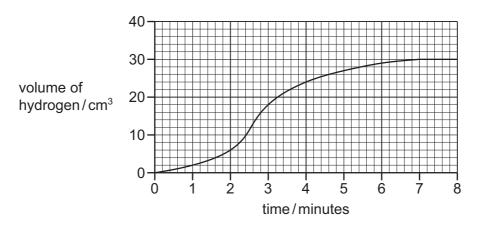
Which two diagrams show suitable methods for investigating the rate (speed) of the reaction?



14 Magnesium is reacted with a dilute acid.

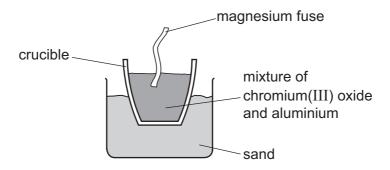
The hydrogen gas is collected and its volume measured.

The results are shown on the graph.



Between which times was the reaction fastest?

- A 0 and 1 minute
- **B** 1 and 2 minutes
- C 2 and 3 minutes
- D 7 and 8 minutes
- **15** A violent reaction occurs when a mixture of chromium(III) oxide and aluminium is ignited with a magnesium fuse as shown.



The equation for the reaction is shown.

 Cr_2O_3 + $2Al \rightarrow 2Cr$ + Al_2O_3

Which substance is oxidised in the reaction?

- **A** aluminium
- B aluminium oxide
- **C** chromium
- D chromium(III) oxide

16 Equations for the effect of water on anhydrous cobalt(II) chloride and anhydrous copper(II) sulfate are shown.

 $CoCl_2(s) + 6H_2O(I) \rightarrow CoCl_2.6H_2O(s)$ $CuSO_4(s) + 5H_2O(I) \rightarrow CuSO_4.5H_2O(s)$

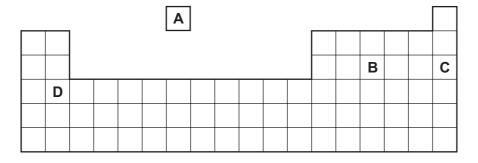
Which statement is not correct?

- **A** Both reactions can be reversed by changing the conditions.
- **B** Both reactions can be used as a test for water.
- **C** The colour change observed when hydrated copper(II) sulfate is heated is from blue to white.
- **D** The colour change observed when water is added to anhydrous cobalt(II) chloride is from pink to blue.
- 17 Which statements are properties of an acid?
 - 1 reacts with ammonium sulfate to form ammonia
 - 2 turns red litmus blue

	1	2
Α	\checkmark	1
в	\checkmark	x
С	x	\checkmark
D	X	x

18 Part of the Periodic Table is shown.

Which element forms an acidic oxide?



19 Salts can be made by adding different substances to dilute hydrochloric acid.

For which substance could any excess **not** be removed by filtration?

- A copper(II) oxide
- **B** magnesium
- **C** sodium hydroxide
- D zinc hydroxide
- 20 A solution containing substance X was tested. The table shows the results.

test	result
flame test	lilac colour
acidified silver nitrate solution added	yellow precipitate

What is X?

- A lithium bromide
- B lithium iodide
- **C** potassium bromide
- D potassium iodide
- 21 Where in the Periodic Table is the metallic character of the elements greatest?

	left or right side of a period	at the top or bottom of a group
Α	left	bottom
В	left	top
С	right	bottom
D	right	top

- 22 Which statement about the elements in Group I is correct?
 - A Hydrogen is evolved when they react with water.
 - **B** lons of Group I elements have a –1 charge.
 - **C** Sodium is more reactive than potassium.
 - **D** Solid sodium is a poor electrical conductor.

23 Osmium is a transition element.

Which row gives the expected properties of osmium?

	melting point	density	compounds formed
Α	high	high	coloured
в	high	high	white
С	high	low	white
D	low	high	coloured

- **24** Two statements about noble gases are given.
 - 1 Noble gases are reactive, monatomic gases.
 - 2 Noble gases all have full outer shells of electrons.

Which is correct?

- **A** Both statements are correct and statement 2 explains statement 1.
- **B** Both statements are correct but statement 2 does not explain statement 1.
- **C** Statement 1 is correct but statement 2 is incorrect.
- **D** Statement 2 is correct but statement 1 is incorrect.
- 25 Some properties of substance X are listed.
 - It conducts electricity when molten.
 - It has a high melting point.
 - It burns in oxygen and the product dissolves in water to give a solution with pH 11.

What is X?

- A a covalent compound
- B a macromolecule
- C a metal
- **D** an ionic compound

- **26** The list shows the order of reactivity of some elements.
 - K Na Ca Mg Zn Fe (H) Cu

Which statement about the reactivity of these metals is correct?

- A Copper reacts with steam to form hydrogen gas.
- **B** Magnesium is more reactive than calcium.
- **C** Potassium reacts with water to form hydrogen gas.
- **D** Sodium oxide is reduced by carbon to sodium.
- 27 Iron is obtained from its ore in a blast furnace and is used to make steel.

Iron obtained from the blast furnace is contaminated with1......

In order to remove this substance,2..... is passed through the molten iron.

......3..... is also added to remove oxides of phosphorus and silicon which are4......

Which words complete the sentences about the conversion of iron to steel?

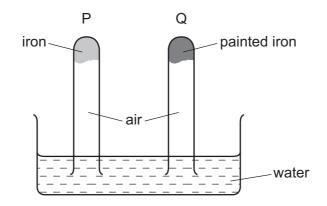
	1	2	3	4
Α	carbon	nitrogen	calcium carbonate	acidic
в	carbon	oxygen	calcium oxide	acidic
С	carbon	oxygen	calcium oxide	basic
D	sand	oxygen	calcium oxide	basic

28 Copper is a transition element used to make saucepans.

Which property is not correct for copper?

- A good conductor of heat
- B insoluble in water
- **C** low melting point
- **D** malleable (can be hammered into shape)

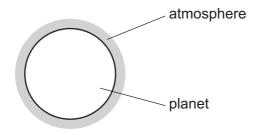
29 The diagram shows an experiment to investigate how paint affects the rusting of iron.



What happens to the water level in tubes P and Q?

	tube P	tube Q
Α	falls	rises
в	no change	rises
С	rises	falls
D	rises	no change

30 A new planet has been discovered and its atmosphere has been analysed.



The table shows the composition of its atmosphere.

gas	percentage by volume
carbon dioxide	4
nitrogen	72
oxygen	24

Which gases are present in the atmosphere of the planet in a higher percentage than they are in the Earth's atmosphere?

- A carbon dioxide and oxygen
- B carbon dioxide only
- C nitrogen and oxygen
- D nitrogen only

31 The following substances can be formed when petrol is burnt in a car engine.

Which substance is the main cause of acid rain?

- A carbon
- B carbon monoxide
- **C** nitrogen dioxide
- D water
- 32 Which statement about methane is not correct?
 - **A** It is a greenhouse gas.
 - **B** It is an alkene.
 - **C** It is formed by decomposition of vegetation.
 - D It is used as a fuel.
- **33** The formulae of four compounds, W, X Y and Z, are given.

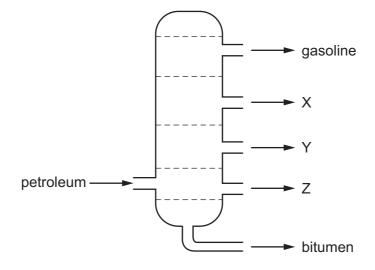
compound	formula
W	FeSO ₄
Х	(NH ₄) ₃ PO ₄
Y	KNO₃
Z	NaC1

Which mixture of compounds makes a complete fertiliser?

A W and X B W and Z C X and Y D Y and Z

- 34 Which process is used to make lime (calcium oxide) from limestone (calcium carbonate)?
 - A chromatography
 - B electrolysis
 - **C** fractional distillation
 - **D** thermal decomposition

35 The diagram shows the separation of petroleum into fractions.



What could X, Y and Z represent?

	Х	Y	Z					
Α	diesel oil	lubricating fraction	paraffin					
в	lubricating fraction	diesel oil	paraffin					
С	paraffin	lubricating fraction	diesel oil					
D	paraffin	diesel oil	lubricating fraction					

- **36** Which compound does **not** belong to the same homologous series as the other three compounds?
 - **A** CH₃OH **B** C₂H₅COOH **C** C₂H₅OH **D** C₇H₁₅OH
- 37 Which reaction is used as a test for alkenes?
 - A Alkenes burn in air to give carbon dioxide and water.
 - **B** Alkenes decolourise aqueous bromine.
 - C Alkenes form polymers when heated in the presence of a catalyst.
 - D Alkenes react with steam to form alcohols.
- 38 Which statement about ethanol is correct?
 - **A** It burns in air to form ethene and water.
 - **B** It is prepared from ethene by fermentation.
 - **C** It is prepared from glucose in an addition reaction.
 - **D** It is the only product when ethene reacts with steam.

39 Ethene forms an addition polymer as shown.



Which terms describe this polymer?

- **A** a saturated compound called poly(ethane)
- **B** a saturated compound called poly(ethene)
- **C** an unsaturated compound called poly(ethane)
- **D** an unsaturated compound called poly(ethene)
- 40 Liquid W burns completely to give carbon dioxide and water.

Liquid W is a compound containing carbon, hydrogen and oxygen.

A solution of liquid W in water is pH7.

What is liquid W?

- A ethanoic acid
- B ethanol
- C gasoline
- D methane

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Group	VIII	2	He	helium 4	10	Ne	neon 20	18	Ar	argon 40	36	Ъ	krypton 84	54	Xe	xenon 131	86	Rn	radon _			
	١١٨				6	ш	fluorine 19	17	Cl	chlorine 35.5	35	Ъ	bromine 80	53	Ι	iodine 127	85	At	astatine _			
	N				8	0	oxygen 16	16	S	sulfur 32	34	Se	selenium 79	52	Te	tellurium 128	84	Ро	polonium I	116	2	livermorium -
	>				7	z	nitrogen 14	15	٩	phosphorus 31	33	As	arsenic 75	51	Sb	antimony 122	83	Ξ	bismuth 209			
	\geq				9	ပ	carbon 12	14	Si	silicon 28	32	Ge	germanium 73	50	Sn	tin 119	82	Pb	lead 207	114	Fl	flerovium -
					5	В	boron 11	13	Ρl	aluminium 27	31	Ga	gallium 70	49	In	indium 115	81	11	thallium 204			
					<u>.</u>						30	Zn	zinc 65	48	Cq	cadmium 112	80	Hg	mercury 201	112	C	copernicium -
											29	Cu	copper 64	47	Ag	silver 108	79	Au	gold 197	111	Rg	roentgenium -
											28	ïZ	nickel 59	46	Ъd	palladium 106	78	Ę	platinum 195	110	Ds	darmstadtium -
											27	ပိ	cobalt 59	45	Rh	rhodium 103	77	Ir	iridium 192	109	Mt	meitnerium -
		1	т	hydrogen 1							26	Ее	iron 56	44	Ru	ruthenium 101	76	Os	osmium 190	108	Hs	hassium -
											25	Mn	manganese 55	43	Ъ	technetium -	75	Re	rhenium 186	107	Bh	bohrium -
						loc	SS				24	ŗ	chromium 52	42	Mo	molybdenum 96	74	8	tungsten 184	106	Sg	seaborgium -
				Key	atomic number	atomic symbo	name relative atomic mass				23	>	vanadium 51	41	qN	niobium 93	73	Та	tantalum 181	105	Db	dubnium –
							rela				22	F	titanium 48	40	Zr	zirconium 91	72	Ŧ	hafnium 178	104	Ŗ	rutherfordium -
								_			21	Sc	scandium 45	39	≻	yttrium 89	57-71	lanthanoids		89–103	actinoids	
	=				4	Be	beryllium 9	12	Mg	magnesium 24	20	Са	calcium 40	38	ي ۲	strontium 88	56	Ba	barium 137	88	Ra	radium -
	_				с	:	lithium 7	11	Na	sodium 23	19	¥	potassium 39	37	Rb	rubidium 85	55	Cs	caesium 133	87	Ъг	francium -

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pressure
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71 Lu Iutetium 175 103 Lr Iawrencium

70 Yterbium 173 102 NO nobelium

69 thuium 169 101 Md mendelevium

68 erbium 167 100 100 fermium

67 holmium 165 99 99 einsteinium

66 Dy dysprosium 163 98 Cf Cf

65 Tb 159 97 BK

64 gadolinium 157 96 CM curium

63 Eu 152 95 95 americium

62 Smartium 150 94 **Pu** Putonnium

60 neodymium 144 U U 238 238

59 Praseodymium 141 91 Pa protactinium 231

58 Cerium 140 90 90 90 232 232

57 La lanthanum 139 89 89 actinium

actinoids

lanthanoids

93 Np neptunium

61 Pm promethium

The Periodic Table of Elements

0620/13/M/J/16

16