

## **Cambridge International Examinations**

Cambridge International General Certificate of Secondary Education

0620/12 **CHEMISTRY** 

October/November 2017 Paper 1 Multiple Choice (Core)

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 15 printed pages and 1 blank page.



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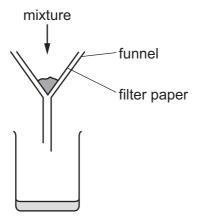
1 The melting points and boiling points of four elements are shown.

element	melting point/°C	boiling point/°C
W	<b>–</b> 7	60
X	-101	-34
Y	114	184
Z	39	688

In which elements do the particles vibrate about fixed positions at 0 °C?

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

2 The apparatus used to separate a mixture is shown.



What is the mixture?

- A aqueous calcium chloride and aqueous calcium nitrate
- **B** calcium carbonate and aqueous calcium chloride
- C ethanol and water
- **D** sand and calcium carbonate
- **3** During an experiment a measurement is recorded in cm<sup>3</sup>.

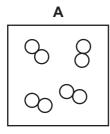
Which apparatus is used?

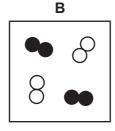
- A balance
- **B** measuring cylinder
- C stopclock
- **D** thermometer

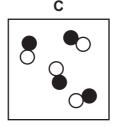
**4** Substance Q boils at 445 °C and is a yellow solid at room temperature.

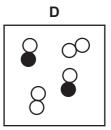
Which temperature could be the melting point of pure Q?

- **A** −9 °C
- **B** 72 °C to 78 °C
- **C** 116 °C
- **D** 116 °C to 126 °C
- 5 Which diagram shows a mixture of an element and a compound?





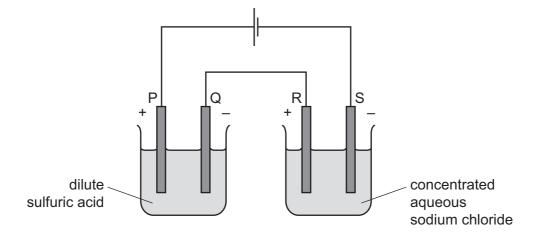




- **6** Which pair of atoms contains the same number of neutrons?
  - **A**  $^{59}_{27}$ Co and  $^{59}_{28}$ Ni
  - **B** <sup>64</sup><sub>29</sub>Cu and <sup>65</sup><sub>29</sub>Cu
  - **C**  $^{64}_{29}$ Cu and  $^{65}_{30}$ Zn
  - **D**  $^{65}_{29}$ Cu and  $^{65}_{30}$ Zn
- 7 In which row do the properties described match the type of bonding?

	melting point	electrical conductivity when liquid	type of bonding
Α	high	does not conduct	ionic
В	low	conducts	covalent
С	low	conducts	ionic
D	low	does not conduct	covalent

- 8 Which statement explains why graphite is used a lubricant?
  - A All bonds between the atoms are weak.
  - **B** It conducts electricity.
  - **C** It has a low melting point.
  - **D** Layers in the structure can slide over each other.
- **9** What is the relative formula mass of magnesium nitrate, Mg(NO<sub>3</sub>)<sub>2</sub>?
  - **A** 74
- **B** 86
- **C** 134
- **D** 148
- **10** The diagram shows the electrolysis of two solutions using inert electrodes.



Which substance is made at each electrode?

	Р	Q	R	S
Α	hydrogen	oxygen	chlorine	sodium
В	hydrogen	oxygen	sodium	chlorine
С	oxygen	hydrogen	chlorine	hydrogen
D	oxygen	hydrogen	hydrogen	chlorine

- **11** Two chemical processes are described.
  - During the combustion of ethanol, energy is .....1......
  - During the electrolysis of aqueous sodium chloride, energy is .....2......

Which words complete gaps 1 and 2?

	1	2
Α	given out	given out
В	given out	taken in
С	taken in	given out
D	taken in	taken in

**12** Water is added to anhydrous copper(II) sulfate in a test-tube.

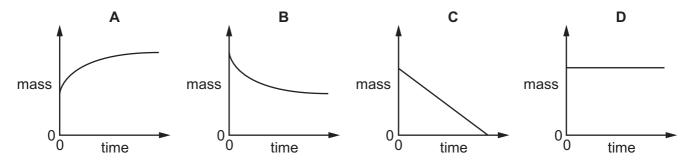
The mixture becomes hot.

Which type of reaction and energy level diagram apply to this reaction?

	type of reaction	energy level diagram
A	endothermic	energy reactants products
В	endothermic	energy reactants products
С	exothermic	energy reactants products
D	exothermic	energy reactants products

**13** The mass of a beaker and its contents is plotted against time.

Which graph represents what happens when sodium carbonate reacts with an excess of dilute hydrochloric acid in an open beaker?



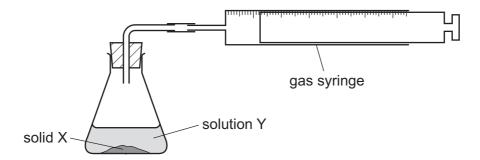
**14** When blue copper(II) sulfate is heated, a white solid and water are formed.

The white solid turns blue and gives out heat when water is added to it.

Which terms describe the blue copper(II) sulfate and the reactions?

	the blue copper(II) sulfate is	reactions
Α	a mixture	can be reversed
В	a mixture	cannot be reversed
С	hydrated	can be reversed
D	hydrated	cannot be reversed

15 An experiment was carried out to find the rate of reaction when 1 g of solid X reacts with 100 cm<sup>3</sup> of solution Y.



The experiment took place too quickly for measurements to be made.

Which change could be made to slow down the reaction?

- A add a catalyst
- **B** decrease the concentration of solution Y
- **C** decrease the particle size of solid X
- **D** increase the temperature

**16** The equations for two reactions P and Q are given.

$$P \quad 2\underline{\mathsf{NaNO}_2} \, + \, \mathsf{O_2} \, \rightarrow \, 2\mathsf{NaNO}_3$$

Q 
$$2HgO \rightarrow 2Hg + O_2$$

In which of these reactions does oxidation of the underlined substance occur?

	Р	Q
Α	✓	✓
В	✓	X
С	X	✓
D	X	X

- 17 What is **not** a typical characteristic of acids?
  - **A** They react with alkalis producing water.
  - **B** They react with **all** metals producing hydrogen.
  - **C** They react with carbonates producing carbon dioxide.
  - **D** They turn blue litmus paper red.

18 Elements Q and R both burn in air.

The oxides formed both dissolve in water.

The solution of the oxide formed from element Q turns Universal Indicator red.

The solution of the oxide formed from element R turns Universal Indicator blue.

What are Q and R?

	Q	R
Α	carbon	sulfur
В	sodium	magnesium
С	sodium	sulfur
D	sulfur	sodium

**19** Copper(II) sulfate can be prepared by adding excess copper(II) carbonate to sulfuric acid.

Why is an **excess** of copper(II) carbonate added?

- A to ensure all the copper(II) carbonate has reacted
- B to ensure all the sulfuric acid has reacted
- **C** to increase the rate of reaction
- **D** to increase the yield of copper(II) sulfate

20 Compound P reacts with hydrochloric acid to produce a gas that turns limewater milky.

What is P?

- A sodium carbonate
- **B** sodium chloride
- C sodium hydroxide
- **D** sodium sulfate

21 Which statement about nitrogen and phosphorus is **not** correct?

- **A** Both are in the same group of the Periodic Table.
- **B** Both are in the same period of the Periodic Table.
- C Both are non-metals.
- **D** Both have the same number of electrons in their outer shell.

22 Sodium and rubidium are elements in Group I of the Periodic Table.

Which statement is correct?

- A Sodium atoms have more electrons than rubidium atoms.
- **B** Sodium has a lower density than rubidium.
- **C** Sodium has a lower melting point than rubidium.
- **D** Sodium is more reactive than rubidium.
- 23 Which properties do the elements chromium, iron and vanadium have in common?
  - 1 They all conduct electricity.
  - 2 They, or their compounds, can act as catalysts.
  - 3 They all form coloured compounds.
  - **A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only
- 24 Why is argon gas used to fill electric lamps?
  - A It conducts electricity.
  - **B** It glows when heated.
  - C It is less dense than air.
  - **D** It is not reactive.
- 25 What is a property of all metals?
  - A conduct electricity
  - **B** hard
  - C low melting points
  - **D** react with water
- **26** Which process is used to extract iron from hematite in the blast furnace?
  - A electrolysis
  - B reduction with carbon monoxide
  - C reduction with lime
  - **D** thermal decomposition

27 Some reactions of three metals are listed in the table.

metal	metal reacts with dilute hydrochloric acid	metal oxide is reduced by carbon
Р	yes	yes
Q	yes	no
R	no	yes

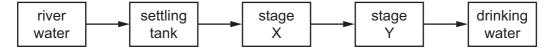
What is the order of reactivity of the metals?

	most reactive		least reactive
Α	Р	Q	R
В	Р	R	Q
С	Q	Р	R
D	R	Р	Q

28 Which uses of the metals shown are both correct?

	aluminium	copper
Α	aircraft bodies	electrical wiring
В	car bodies	aircraft bodies
С	chemical plant	cooking utensils
D	food containers	chemical plant

29 The flow chart shows stages in the treatment of river water to produce drinking water.



What occurs at stages X and Y?

	Х	Y
Α	distillation	chlorination
В	distillation	filtration
С	filtration	chlorination
D	filtration	distillation

30	Which	element in	Group '	VI is	a com	ponent of air	?
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- **A** argon
- **B** nitrogen
- C oxygen
- **D** sulfur
- 31 Iron is a metal that rusts in the presence of oxygen and water.

Mild steel is used for .....1..... and is prevented from rusting by .....2.....

Stainless steel does not rust. It is produced by ......3..... iron with another metal.

Which words complete gaps 1, 2 and 3?

	1	2	3
Α	car bodies	greasing	covering
В	car bodies	painting	mixing
С	cutlery	greasing	covering
D	cutlery	painting	mixing

**32** A chemical reaction is carried out on substance X.

A gas is produced that turns red litmus paper blue.

What is this reaction?

- A the reaction of an acid with a metal carbonate
- **B** the reaction of an acid with an ammonium salt
- **C** the reaction of an alkali with a metal carbonate
- **D** the reaction of an alkali with an ammonium salt

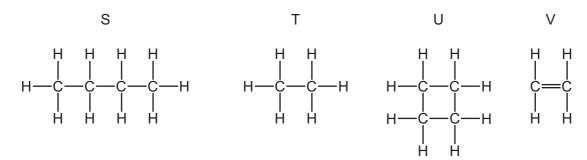
33 Some marble chips (calcium carbonate) are heated strongly and substances X and Y are formed.

Substance X is a white solid that reacts with water, giving out heat. Substance Y is a colourless gas.

What are substances X and Y?

	Х	Y
Α	calcium chloride	oxygen
В	calcium hydroxide	carbon dioxide
С	calcium oxide	carbon dioxide
D	calcium sulfate	oxygen

**34** The structures of four organic compounds are shown.



Which compounds are unsaturated?

- A Sonly
- **B** T and U
- **C** U only
- **D** V only

**35** Which statement is **not** correct?

- A Petroleum is a mixture of hydrocarbons.
- **B** The main constituent of natural gas is ethane.
- **C** The naphtha fraction of petroleum is used for making chemicals.
- **D** When natural gas burns in air, carbon dioxide and water are formed.

36 Which equation represents the complete combustion of butane, C<sub>4</sub>H<sub>10</sub>?

**A** 
$$2C_4H_{10} + 5O_2 \rightarrow 8C + 10H_2O$$

**B** 
$$2C_4H_{10} + 9O_2 \rightarrow 8CO + 10H_2O$$

$$C$$
 2C<sub>4</sub>H<sub>10</sub> + 13O<sub>2</sub>  $\rightarrow$  8CO<sub>2</sub> + 10H<sub>2</sub>O

**D** 
$$C_4H_{10} + 4O_2 \rightarrow 4CO_2 + 5H_2$$

**37** X, Y and Z are three hydrocarbons.

X CH<sub>2</sub>=CH<sub>2</sub>

Y CH<sub>3</sub>-CH=CH<sub>2</sub>

Z CH<sub>3</sub>-CH<sub>2</sub>-CH=CH<sub>2</sub>

What do compounds X, Y and Z have in common?

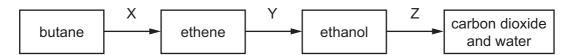
- 1 They are all alkenes.
- 2 They are all part of the same homologous series.
- 3 They all have the same boiling point.
- **A** 1, 2 and 3
- **B** 1 and 2 only
- C 1 and 3 only
- **D** 2 and 3 only

**38** The table shows bonds that are present and bonds that are not present in compound X.

bond	
C–C	✓
C=C	x
C–H	✓
C–O	✓
C=O	✓
O–H	✓

What type of compound is X?

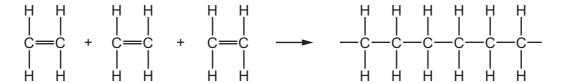
- A a carboxylic acid
- B an alcohol
- C an alkane
- **D** an alkene
- **39** The diagram shows a reaction sequence.



Which row names the processes X, Y and Z?

	Χ	Y	Z
Α	cracking	fermentation	respiration
В	cracking	hydration	combustion
С	distillation	fermentation	respiration
D	distillation	hydration	combustion

**40** Molecules of a substance react together as shown.



Which type of reaction has taken place?

- A cracking
- **B** oxidation
- **C** polymerisation
- **D** reduction

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The Periodic Table of Elements

	\	2 J	helium 4	10	Ne	neon 20	18	Ā	argon 40	36	궃	krypton 84	55	Xe	xenon 131	98	R	radon -			
	\			6	ш	fluorine 19	17	ľ	chlorine 35.5	35	ğ	bromine 80	53	П	iodine 127	85	¥	astatine -			
	I			8	0	oxygen 16	16	ഗ	sulfur 32	34	Se	selenium 79	52	<u>e</u>	tellurium 128	84	Ъ	polonium -	116	^	livermorium -
	>			7	z	nitrogen 14	15	₾	phosphorus 31	33	As	arsenic 75	51	Sp	antimony 122	83	:E	bismuth 209			
	>			9	O	carbon 12	14	Si	silicon 28	32	Ge	germanium 73	20	Sn	tin 119	82	Pb	lead 207	114	Εl	flerovium
	≡			2	Ф	boron 11	13	Αl	aluminium 27	31	Ga	gallium 70	49	I	indium 115	81	11	thallium 204			
										30	Zu	zinc 65	48	В	cadmium 112	80	Нg	mercury 201	112	ű	copernicium
										29	Co	copper 64	47	Ag	silver 108	62	Αu	gold 197	111	Rg	roentgenium -
dn										28	z	nickel 59	46	Pd	palladium 106	78	凸	platinum 195	110	Ds	darmstadtium -
Group										27	ပိ	cobalt 59	45	뫈	rhodium 103	77	'n	iridium 192	109	¥	meitnerium -
	_	- I	hydrogen 1							26	Fe	iron 56	44	Ru	ruthenium 101	92	Os	osmium 190	108	Hs	hassium
										25	Mn	manganese 55	43	ပ	technetium -	75	Re	rhenium 186	107	Bh	bohrium
					loc	ISS				24	ပ်	chromium 52		Mo		74	≥	tungsten 184	106	Sg	seaborgium
			Key	atomic number	atomic symbo	name relative atomic mass				23	>	vanadium 51	41	g	niobium 93	73	<u>a</u>	tantalum 181	105	Op	dubnium
					ato	rela				22	i=	titanium 48	40	Zr	zirconium 91	72	士	hafnium 178	104	弘	rutherfordium -
							•			21	Sc	scandium 45	39	>	yttrium 89	57-71	lanthanoids		89–103	actinoids	
	=			4	Be	beryllium 9	12	Mg	magnesium 24	20	Ca	calcium 40	38	ഗ്	strontium 88	56	Ba	barium 137	88	Ra	radium
	_			3	:=	lithium 7	11	Na	sodium 23	19	$\prec$	potassium 39	37	Rb	rubidium 85	55	Cs	caesium 133	87	ቷ	francium

71 Lu lutetium 175	Lr lawrencium
70 Yb ytterbium 173	NO nobelium
69 Tm thulium 169	Md mendelevium
68 Er erbium 167	100 Fm fermium
67 Ho holmium 165	99 Einsteinium
66 Dy dysprosium 163	98 Cf
65 Tb terbium 159	97 BK berkelium
64 <b>Gd</b> gadolinium 157	96 Cm curium
63 <b>Eu</b> europium 152	95 Am americium
62 Sm samarium 150	94 Pu
61 Pm promethium	Np neptunium
	92 U uranium 238
Pr praseodymium 141	91 Pa protactinium 231
Ce cerium	90 Th thorium 232
La lanthanum 139	89 Ac actinium
lanthanoids	actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).