Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/13**

Paper 1 Multiple Choice (Core) **October/November 2018**

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 The statements describe two changes of state.

1 The molecules of substance X are arranged randomly.
During the change of state, they lose energy and become more ordered. The molecules can still move freely.

2 The molecules of substance Y are arranged in a regular lattice.
During the change of state, they gain energy and become less ordered. The molecules are still close together.

Which changes of state are described by the statements?

	1	2
A	condensation	evaporation
B	condensation	melting
C	freezing	evaporation
D	freezing	melting

2 Which statement about gases is correct?

A Gases are difficult to compress when pressure is applied.

B The particles in gases are close together.

C The particles in gases have a random arrangement.

D The particles in gases move slowly past each other.

3 Salt is added to pure water to form an aqueous solution.

Which statement is correct?

A The melting point and the boiling point of the water both decrease.

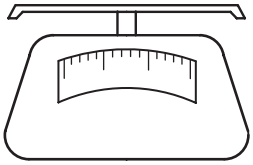
B The melting point and the boiling point of the water both increase.

C The melting point of the water decreases but its boiling point increases.

D The melting point of the water increases but its boiling point decreases.

4 The diagrams show four pieces of laboratory equipment.

balance



pipette

stop-clock

thermometer

Which equipment is essential to find out if dissolving a salt in water is an exothermic process?

	balance	pipette	stop-clock	thermometer
A	✗	✗	✗	✓
B	✓	✗	✗	✓
C	✗	✓	✗	✓
D	✓	✗	✓	✗

5 Which statement describes isotopes?

A Isotopes of the same element have different electron arrangements.

B Isotopes of the same element have different nuclear charges.

C Isotopes of the same element have nuclei with masses that are the same.

D Isotopes of the same element have the same number of protons.

6 Substance X conducts electricity.

What is X?

A a typical covalent compound in the liquid state

B a typical covalent compound in the solid state

C a typical ionic compound in the liquid state

D a typical ionic compound in the solid state

[Turn over

7 Which statement describes the elements in Group I?

A They all form ions by gaining electrons.

B They all form ions with the same charge.

C They have different numbers of electrons in their outer shells.

D They all have the same number of electron shells.

8 Calcium phosphate has the formula $Ca_3(PO_4)_2$.

What is the relative formula mass of calcium phosphate?

A 135 **B** 215 **C** 230 **D** 310

9 Limestone fizzes and dissolves in dilute hydrochloric acid.

What is the word equation for the reaction which occurs?

A calcium carbonate + hydrochloric acid → calcium chloride + water + carbon dioxide

B calcium carbonate + hydrochloric acid → calcium chloride + hydrogen

C calcium hydroxide + hydrochloric acid → calcium chloride + water

D calcium oxide + hydrochloric acid → calcium chloride + water

10 When solution Q is electrolysed using carbon electrodes, colourless gases are produced at both electrodes.

What is Q?

A concentrated hydrochloric acid

B concentrated sodium chloride solution

C dilute sulfuric acid

D pure water

11 Which electrodes and electrolyte can be used to electroplate a copper medal with gold?

	positive electrode	negative electrode	electrolyte
A	copper	gold	an aqueous copper compound
B	copper	gold	an aqueous gold compound
C	gold	copper	an aqueous copper compound
D	gold	copper	an aqueous gold compound

12 Which substance does **not** use oxygen to produce heat energy?

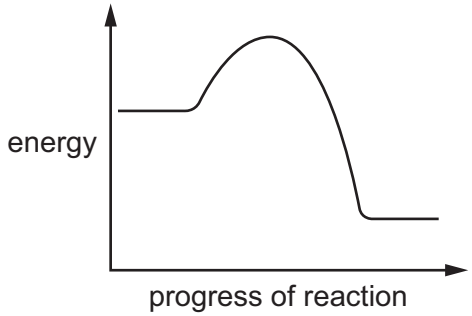
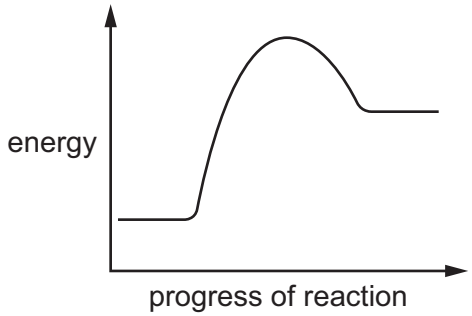
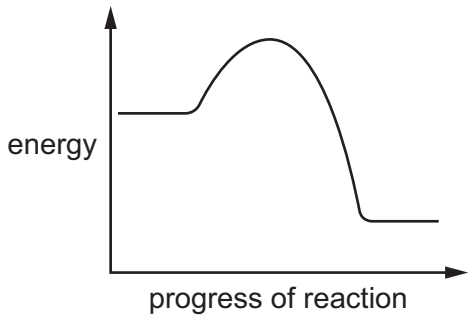
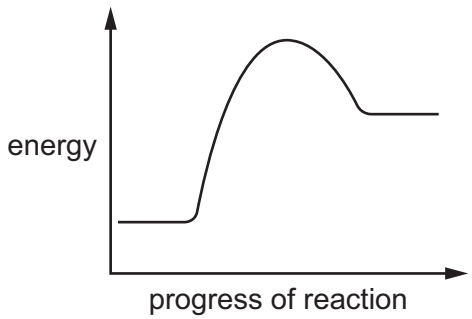
A coal

B hydrogen

C natural gas

D uranium

13 Which row describes an endothermic reaction?

	energy level diagram	energy transfer
A		energy is transferred from the surroundings to the reaction
B		energy is transferred from the surroundings to the reaction
C		energy is transferred from the reaction to the surroundings
D		energy is transferred from the reaction to the surroundings

14 When solid hydrated cobalt(II) chloride crystals are heated they turn blue and steam is produced.

Adding water to the blue crystals turns them pink.

Which type of reaction has occurred?

A neutralisation

B oxidation

C reduction

D reversible

15 Iron(III) oxide reacts with carbon monoxide.

The equation is shown.

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

Which substance is reduced?

A CO **B** CO_2 **C** Fe **D** Fe_2O_3

16 In Experiment 1, 1 g of calcium carbonate is reacted with an excess of dilute hydrochloric acid. The volume of gas produced every minute is recorded.

In Experiment 2, Experiment 1 is repeated using smaller pieces of calcium carbonate. All other conditions are kept the same.

The results from both experiments are shown.

time / s	0	60	120	180	240
volume of gas from Experiment 1 / cm^3	0	98	172	212	220
volume of gas from Experiment 2 / cm^3	0	157	209	220	220

Which statement about Experiment 2 is correct?

A The rate of reaction is faster than in Experiment 1 and there is the same amount of product.

B The rate of reaction is faster than in Experiment 1 and there is more product.

C The rate of reaction is the same as in Experiment 1 and there is the same amount of product.

D The rate of reaction is the same as in Experiment 1 and there is more product.

17 The results of some experiments with sulfur dioxide are shown.

experiment	description	result
1	mix with dilute hydrochloric acid	does not react
2	mix with concentrated sodium hydroxide	a salt forms
3	add Universal Indicator	Universal Indicator turns purple
4	add acidified aqueous potassium manganate(VII)	purple solution turns colourless

Which results are correct?

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

18 A student prepares solid hydrated copper(II) sulfate from dilute sulfuric acid and the insoluble base copper(II) oxide.

Which process is **not** used in the procedure?

A crystallisation

B distillation

C evaporation

D filtration

19 A white precipitate is produced when small amounts of two colourless solutions are mixed together.

Which pairs of solutions produce a white precipitate?

1 sodium hydroxide and zinc nitrate

2 sodium hydroxide and aluminium chloride

3 barium chloride and sulfuric acid

4 acidified barium nitrate and potassium sulfate

A 1, 2, 3 and 4

B 1, 2 and 4 only

C 1 and 2 only

D 2 only

20 Solution Q is warmed with ammonium chloride.

In a separate experiment, solution Q is added to methyl orange.

Which observations show that solution Q is basic?

	warmed with ammonium chloride	added to methyl orange
A	gas is produced	turns red
B	gas is produced	turns yellow
C	no reaction	turns red
D	no reaction	turns yellow

21 Which statement about elements in the Periodic Table is correct?

A Elements are arranged in order of increasing nucleon number.

B Elements change from non-metallic to metallic across a period.

C Elements in the same period have similar properties.

D Elements on the left of the Periodic Table form basic oxides.

22 Elements in Group I of the Periodic Table react with water.

Which row describes the products made in the reaction and the trend in reactivity of the elements?

	products	trend in reactivity
A	metal hydroxide and hydrogen	less reactive down the group
B	metal hydroxide and hydrogen	more reactive down the group
C	metal oxide and hydrogen	less reactive down the group
D	metal oxide and hydrogen	more reactive down the group

23 The equation shows the reaction between a halogen and aqueous bromide ions.

$$X_2 + 2Br^- \rightarrow 2X^- + Br_2$$

.....1..... .....2..... .....3.....

Which words complete gaps 1, 2 and 3?

	1	2	3
A	chlorine	brown	colourless
B	chlorine	colourless	brown
C	iodine	brown	colourless
D	iodine	colourless	brown

24 An inert gas R is used to fill weather balloons.

Which descriptions of R are correct?

	number of outer shell electrons in atoms of R	structure of gas R
A	2	diatomic molecules
B	2	single atoms
C	8	diatomic molecules
D	8	single atoms

25 Calcium reacts with cold water to produce hydrogen.

Lead reacts slowly when heated in air to form an oxide but has almost no reaction with steam.

Silver does not react with either air or water.

Zinc reacts when heated with steam to produce hydrogen.

What is the order of reactivity starting with the least reactive?

	least reactive ⟶ most reactive			
A	calcium	lead	zinc	silver
B	calcium	zinc	lead	silver
C	silver	lead	zinc	calcium
D	silver	zinc	lead	calcium

26 Iron and potassium are both metals.

Which row shows the reactivity of the metal and how it is extracted from its ore?

	metal	reactivity	extracted by
A	iron	high	electrolysis
B	iron	medium	heating with carbon
C	potassium	medium	electrolysis
D	potassium	high	heating with carbon

27 Which row describes the use of a metal and the property upon which the use depends?

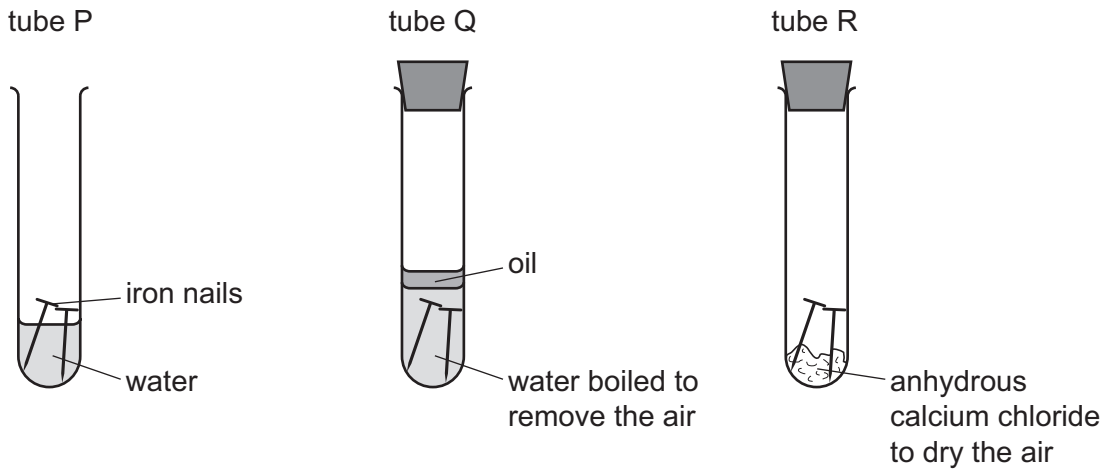
	metal	use	property
A	aluminium	aircraft bodies	aluminium is a heat conductor
B	aluminium	cooking utensils	aluminium has a low density
C	copper	cooking utensils	copper has a high density
D	copper	electrical wiring	copper is a good conductor of electricity

28 Argon is a noble gas used to fill light bulbs.

What is the approximate percentage of argon in air?

A 1% **B** 20% **C** 79% **D** 99%

29 The diagrams show experiments involving the rusting of iron.



A student predicted the following results.

1 In tube P, the iron nails rust.

2 In tube Q, the iron nails do not rust.

3 In tube R, the iron nails do not rust.

Which predictions are correct?

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

30 Which equation represents the incomplete combustion of propane, C_3H_8?

A $2C_3H_8 + 7O_2 \rightarrow 6CO + 8H_2O$

B $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

C $2C_3H_8 + 11O_2 \rightarrow 6CO + 16H_2O$

D $C_3H_8 + 7O_2 \rightarrow 3CO_2 + 8H_2O$

31 The table describes three types of water.

water type	source of water	appearance before treatment	treatment	appearance after treatment
P	river	muddy	none	muddy
Q	river	muddy	filtration and chlorination	clear
R	well	clear	chlorination only	clear

Which statement is correct?

A Only Q and R are suitable for drinking, while P could be used for irrigation.

B Only Q and R are suitable for drinking, while P is unsuitable for any purpose.

C Only Q is suitable for drinking. R could be used for washing cars and P for irrigation.

D P, Q and R are suitable for irrigation and washing cars, but are not suitable for drinking.

32 Which compound would **not** be used as an important part of a garden fertiliser?

A $Ca_3(PO_4)_2$ **B** KNO_3 **C** $Mg(OH)_2$ **D** $(NH_4)_2SO_4$

33 Carbon dioxide and methane both contribute to climate change.

Which process produces both gases?

A complete combustion of natural gas

B farming cattle

C heating calcium carbonate

D respiration

34 Which equation represents the formation of lime?

A $CaCO_3 \rightarrow CaO + CO_2$

B $CaO + H_2O \rightarrow Ca(OH)_2$

C $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

D $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

35 Petroleum is a mixture of different hydrocarbons.

Which process is used to separate the petroleum into groups of similar hydrocarbons?

A combustion

B cracking

C fractional distillation

D reduction

36 Which two compounds are molecules which both contain a double bond?

A ethane and ethanoic acid

B ethane and ethanol

C ethene and ethanoic acid

D ethene and ethanol

37 Which statement about any homologous series is correct?

A The first member contains one carbon atom only.

B The members all contain carbon and hydrogen only.

C The members all contain the same functional group.

D The members all contain the same number of carbon atoms.

38 Ethanol can be formed by:

1 fermentation

2 reaction between steam and ethene.

Which of these processes use a catalyst?

	1	2
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

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

A It is insoluble in water.

B It reacts with sodium hydroxide to form a salt.

C It reacts with some metals to form hydrogen gas.

D It is a carboxylic acid.

40 Some information about poly(ethene) is given.

- Poly(ethene) is used to make plastic bags.
- Poly(ethene) plastic bags in landfill sites do not readily decompose.
- Poly(ethene) molecules contain carbon and hydrogen atoms.

Which statement about poly(ethene) is correct?

A It is biodegradable.

B It is combustible.

C It is unsaturated.

D It reacts with water.

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.).