Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/12**

Paper 1 Multiple Choice (Core) **February/March 2017**

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 A bottle of aqueous ammonia is placed on a table in a corner of the laboratory.

The stopper is removed and after a few minutes all the students in the room can smell the ammonia.

Which process occurs?

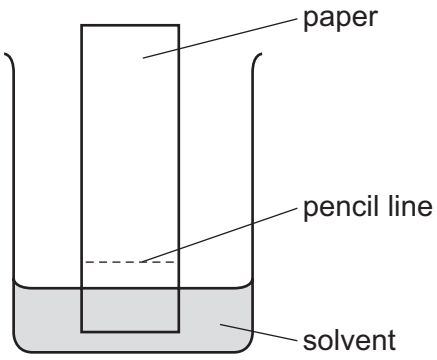
A Brownian motion

B diffusion

C dissolving

D distillation

2 A student is investigating a coloured mixture using chromatography.



Where should the student place the coloured mixture?

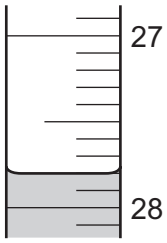
A in the solvent

B just above the pencil line

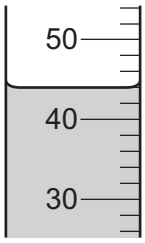
C just below the pencil line

D on the pencil line

3 The diagrams show liquids in a burette and a measuring cylinder.



burette

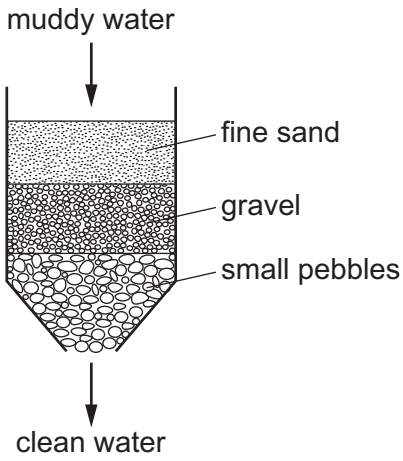


measuring cylinder

Which row shows the correct readings for the burette and the measuring cylinder?

	burette	measuring cylinder
A	27.8	42
B	27.8	44
C	28.2	42
D	28.2	44

4 The diagram shows how muddy water can be purified.



Which process for purifying the muddy water is shown?

A crystallisation

B distillation

C filtration

D solvent extraction

[Turn over

5 The aluminium ion, Al^{3+}, has the same electronic structure as an atom of which noble gas?

A argon

B helium

C krypton

D neon

6 A covalent molecule M contains a total of four shared electrons.

What is M?

A ammonia, NH_3

B hydrogen chloride, HCl

C methane, CH_4

D water, H_2O

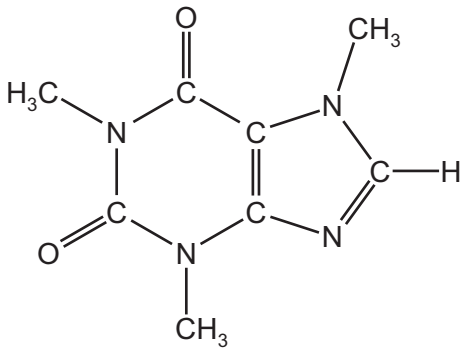
7 Three substances have the properties shown.

- X conducts electricity when solid and when molten.
- Y is soluble in water and the solution conducts electricity.
- Z only conducts electricity when molten.

What are X, Y and Z?

	X	Y	Z
A	Ca	MgO	NaOH
B	Ca	NaOH	MgO
C	MgO	Ca	NaOH
D	MgO	NaOH	Ca

8 Caffeine is a stimulant found in coffee.



caffeine

Which formula represents caffeine?

A $C_7H_{10}N_4O_2$ **B** $C_8H_{10}N_3O_2$ **C** $C_8H_{10}N_4O_2$ **D** $C_8H_{11}N_4O_2$

9 Four substances are electrolysed.

The substances are concentrated aqueous sodium chloride, concentrated hydrochloric acid, molten lead(II) bromide and molten sodium oxide.

Which statement about these electrolysis reactions is correct?

A A colourless gas is formed at the anode when molten sodium oxide is electrolysed.

B A green gas is formed at the cathode when concentrated hydrochloric acid is electrolysed.

C A metal is formed at the anode when molten lead(II) bromide is electrolysed.

D A metal is formed at the cathode when concentrated aqueous sodium chloride is electrolysed.

10 Ammonium chloride is added to 100 cm^3 of water. The temperature changes from 25 °C to 20 °C.

Which type of reaction occurs?

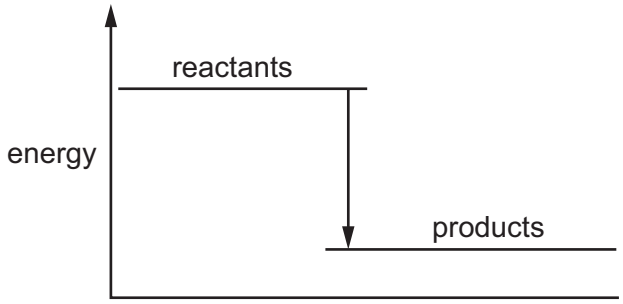
A endothermic

B exothermic

C freezing

D neutralisation

11 A diagram for the energy change during an exothermic reaction is shown.



For which reactions would this be an appropriate diagram?

1 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

2 $2H_2 + O_2 \rightarrow 2H_2O$

3 $C + O_2 \rightarrow CO_2$

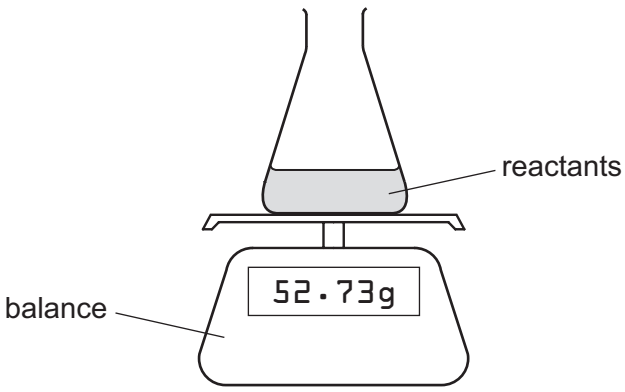
A none of them

B 1 and 2 only

C 2 and 3 only

D all of them

12 The diagram shows the apparatus used to measure the rate of a chemical reaction.



For which reaction can the rate be measured using this apparatus?

A $2Na + Cl_2 \rightarrow 2NaCl$

B $NaOH + HCl \rightarrow NaCl + H_2O$

C $Na_2O + 2HCl \rightarrow 2NaCl + H_2O$

D $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$

13 Copper(II) carbonate reacts with dilute sulfuric acid.

$$CuCO_3(s) + H_2SO_4(aq) \rightarrow CuSO_4(aq) + CO_2(g) + H_2O(l)$$

The rate of the reaction can be changed by varying the conditions.

Which changes always increase the rate of this chemical reaction?

1 increasing the concentration of sulfuric acid

2 increasing the size of the pieces of copper(II) carbonate

3 increasing the temperature

4 increasing the volume of sulfuric acid

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

14 In which reaction is the first substance in the equation oxidised?

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

B $4FeO + O_2 \rightarrow 2Fe_2O_3$

C $SnO_2 + 2H_2 \rightarrow Sn + 2H_2O$

D $ZnCO_3 \rightarrow ZnO + CO_2$

15 The equation for the effect of heat on hydrated sodium carbonate is as shown.

$$Na_2CO_3.10H_2O(s) \rightleftharpoons Na_2CO_3(s) + 10H_2O(g)$$

Statements made by four students about the reaction are given.

P Anhydrous sodium carbonate is formed.

Q Steam is formed.

R There is a colour change from blue to white.

S The reaction is reversible.

Which students' statements are correct?

A P, Q and R only

B P, Q and S only

C Q, R and S only

D P, Q, R and S

[Turn over

16 Which reaction is a neutralisation reaction?

A $AgNO_3 + HCl \rightarrow AgCl + HNO_3$

B $CaCO_3 \rightarrow CaO + CO_2$

C $4Na + O_2 \rightarrow 2Na_2O$

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

17 Elements W and X are metals.

Elements Y and Z are non-metals.

The oxides of W, X, Y and Z all form solutions when added to water.

Which statement is correct?

A The solution of the oxide of element W turns blue litmus red.

B The solution of the oxide of element X fizzes when sodium carbonate is added.

C The solution of the oxide of element Y has a pH greater than pH 7.

D The solution of the oxide of element Z fizzes when powdered magnesium is added.

18 A student is given an unknown solution.

Which two tests provide evidence that the solution is copper(II) sulfate?

1 adding dilute hydrochloric acid

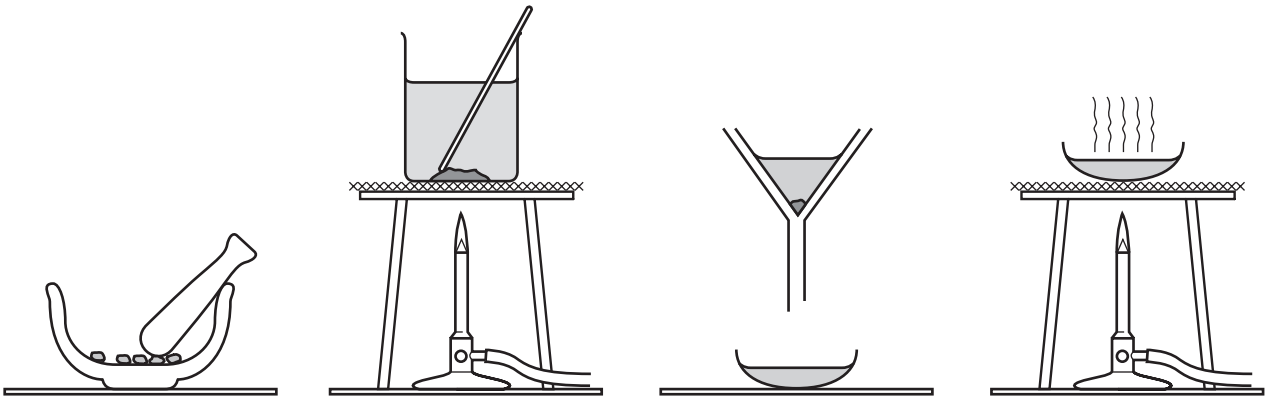
2 adding aqueous sodium hydroxide

3 adding dilute nitric acid, then silver nitrate solution

4 adding dilute nitric acid, then barium nitrate solution

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

19 The diagram shows the steps in the preparation of a salt.



step 1 step 2 step 3 step 4

Which salt is prepared by this method?

A barium sulfate

B copper(II) sulfate

C potassium sulfate

D sodium sulfate

20 Which property of elements increases across a period of the Periodic Table?

A metallic character

B number of electron shells

C number of outer shell electrons

D tendency to form positive ions

21 The noble gases are in Group VIII of the Periodic Table.

Which statement explains why noble gases are unreactive?

A They all have eight electrons in their outer shells.

B They all have full outer shells.

C They are all gases.

D They are all monoatomic.

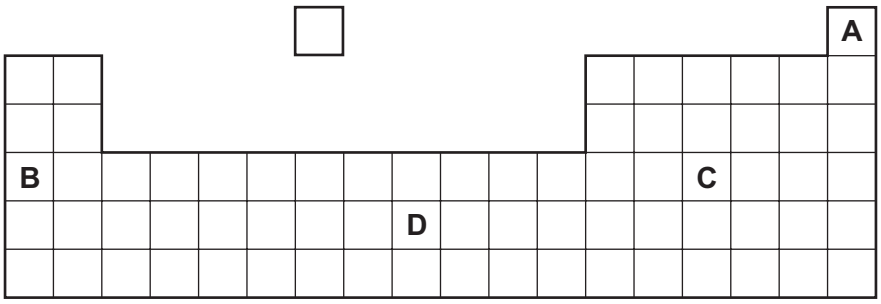
22 Which compound is made from elements which are **all** in the same period?

A $Al_2(SO_4)_3$ **B** C_2H_5OH **C** $LiNO_3$ **D** Na_3AlF_6

[Turn over

23 Part of the Periodic Table is shown.

Which element is used as a catalyst?



24 Which statement about **all** metals is correct?

A They are attracted to a magnet.

B They are weak and brittle.

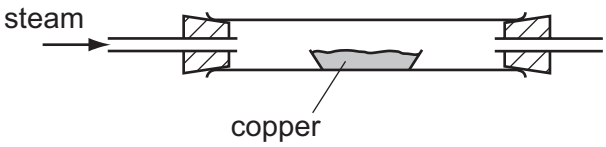
C They may be used to form alloys.

D They react with water.

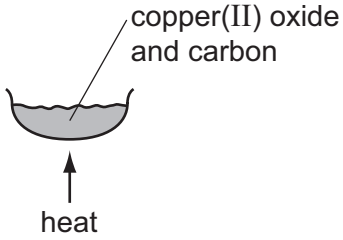
25 Two experiments are carried out.

In experiment 1, copper is heated with steam.

In experiment 2, copper(II) oxide is heated with carbon.



experiment 1



experiment 2

Which row describes what happens in experiments 1 and 2?

	experiment 1	experiment 2
A	no reaction	no reaction
B	no reaction	reaction
C	reaction	no reaction
D	reaction	reaction

26 Which metal is commonly used to form alloys with a non-metallic element?

A copper

B iron

C magnesium

D zinc

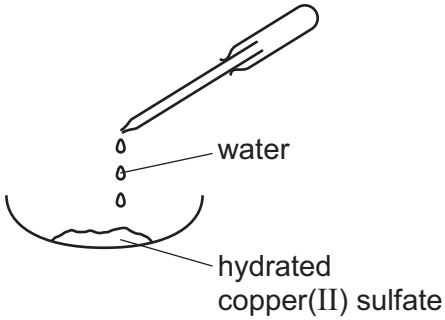
27 Steel is made by adding ..... 1 ..... to molten iron to remove ..... 2 ..... from the iron.

Stainless steel is ..... 3 ..... resistant to corrosion than mild steel.

Which words complete the gaps 1, 2 and 3?

	1	2	3
A	basic oxides	acidic impurities	less
B	basic oxides	carbon	more
C	oxygen	acidic impurities	less
D	oxygen	carbon	more

28 Water is added to hydrated copper(II) sulfate.



Which colour change takes place?

A blue to pink

B blue to white

C no change

D white to blue

[Turn over

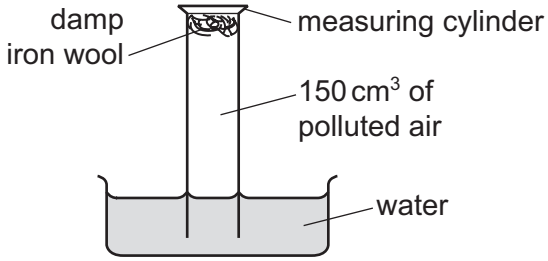
29 Two reactions, X and Y, produce carbon dioxide.

$$CH_4 \xrightarrow{X} CO_2 \xleftarrow{Y} CaCO_3$$

Which types of reaction are X and Y?

	X	Y
A	combustion	combustion
B	combustion	thermal decomposition
C	thermal decomposition	combustion
D	thermal decomposition	thermal decomposition

30 An experiment to find the percentage of oxygen in 150 cm^3 of polluted air is shown.



The apparatus is left for one week.

After this time, the volume of gas in the measuring cylinder is 122 cm^3.

What is the percentage of oxygen, to the nearest whole number, in the polluted air?

A 19% **B** 21% **C** 28% **D** 81%

31 Ammonia is produced when a mixture of ammonium chloride and substance X is heated.

What is substance X?

A ammonium sulfate

B barium chloride

C calcium hydroxide

D silver nitrate

32 Which row is correct for both carbon dioxide and methane?

	causes climate change	produced by burning fuels	produced by living organisms
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

33 Which statements about sulfur dioxide are correct?

1 It dissolves in water to produce a solution with a pH less than pH 7.

2 It is used as a food preservative.

3 It changes potassium manganate(VII) from colourless to purple.

4 It is produced by the combustion of sulfur-containing fossil fuels.

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

34 A student carried out two experiments.

experiment 1 The student heated a sample of limestone very strongly. A white powder formed.

experiment 2 The white powder from experiment 1 was cooled. The student then added a small quantity of cold water to the powder. Large quantities of steam were produced.

Which statement is **not** correct?

A An endothermic reaction occurred in experiment 1.

B An exothermic reaction occurred in experiment 2.

C Thermal decomposition occurred in experiment 1.

D Thermal decomposition occurred in experiment 2.

35 Which substance has a main constituent that contains **only one** carbon atom per molecule?

A bitumen

B gasoline

C natural gas

D petroleum

[Turn over

36 The table shows the composition of four different types of petroleum.

fraction	Arabian Heavy / %	Arabian Light / %	Iranian Heavy / %	North Sea / %
gasoline	18	21	21	23
kerosene	11	15	13	15
diesel oil	18	21	20	24
fuel oil	53	43	46	38

Which type of petroleum is best for the motor vehicle industry?

A Arabian Heavy

B Arabian Light

C Iranian Heavy

D North Sea

37 Ethanol is a fuel used in cars. It can be made from petroleum.

$C_4H_{10} \rightarrow C_2H_4 + C_2H_6$ cracking

$C_2H_4 + H_2O \rightarrow C_2H_5OH$ producing ethanol

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

Compounds of how many homologous series appear in these equations?

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

38 Ethanol is produced from either ethene or sugar.

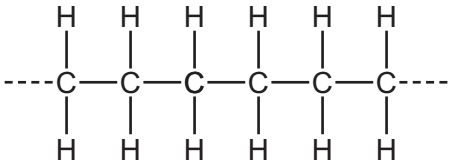
Which type of chemical reaction is used in each case?

	ethene → ethanol	sugar → ethanol
A	addition	fermentation
B	addition	fractional distillation
C	distillation	fermentation
D	distillation	fractional distillation

39 Which type of hydrocarbon reacts rapidly with aqueous bromine and what is the colour change of the aqueous bromine?

	type of hydrocarbon	colour change of the aqueous bromine
A	alkane	brown to colourless
B	alkane	colourless to brown
C	alkene	brown to colourless
D	alkene	colourless to brown

40 The diagram shows the structure of an important product.



This product is formed by ..... 1 ..... of an ..... 2 ..... .

Which words complete gaps 1 and 2?

	1	2
A	addition polymerisation	alkane
B	addition polymerisation	alkene
C	cracking	alkane
D	cracking	alkene

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.).