



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY

0620/13

Paper 1 Multiple Choice

May/June 2012

45 Minutes

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

* 7 0 9 4 4 3 3 8 3 1 3 *

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, 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.

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.

You may use a calculator.

This document consists of **16** printed pages.



1 Which diagram shows the process of diffusion?

A

B

C

D

key

○ } different atoms
● }

2 A student investigates how the concentration of an acid affects the speed of reaction with a 0.5 g mass of magnesium at 30 °C.

The student has a beaker, concentrated acid, water and the apparatus below.

P a balance

Q a clock

R a measuring cylinder

S a thermometer

Which pieces of apparatus does the student use?

A P, Q and R only

B P, Q and S only

C Q, R and S only

D P, Q, R and S

3 Which method is most suitable to obtain zinc carbonate from a suspension of zinc carbonate in water?

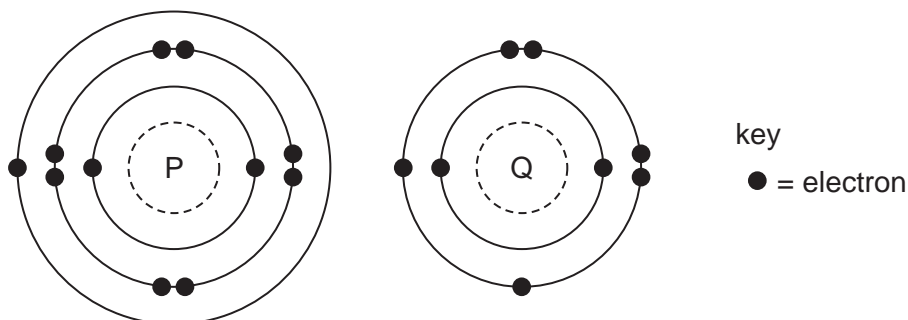
A crystallisation

B distillation

C evaporation

D filtration

- 4 The electronic structures of atoms P and Q are shown.



P and Q react to form an ionic compound.

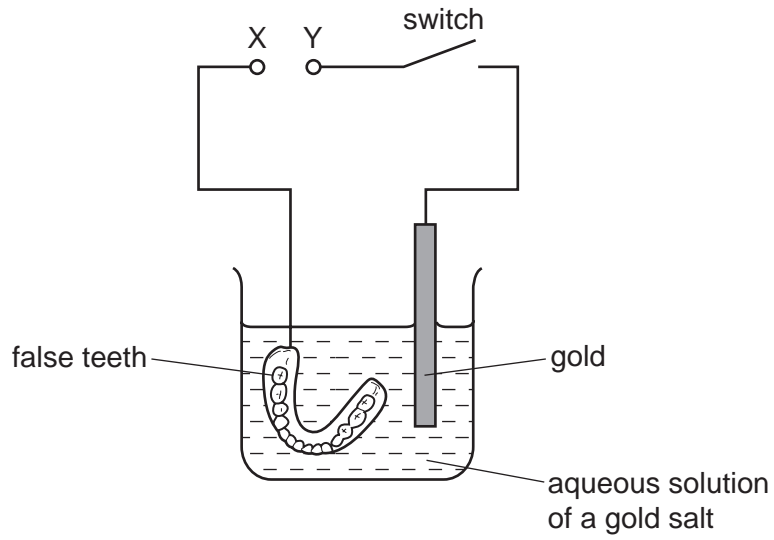
What is the formula of this compound?

- A PQ_2 B P_2Q C P_2Q_6 D P_6Q_2
- 5 An element Y has the proton number 18.
- The next element in the Periodic Table is an element Z.
- Which statement is correct?
- A Element Z has one more electron in its outer shell than element Y.
- B Element Z has one more electron shell than element Y.
- C Element Z is in the same group of the Periodic Table as element Y.
- D Element Z is in the same period of the Periodic Table as element Y.
- 6 Which atom has twice as many neutrons as protons?
- A ^1_1H B ^2_1H C ^3_1H D ^4_2He
- 7 Which is a simple covalent molecule?

	conducts electricity		volatile
	when solid	when molten	
A	✓	✓	x
B	✓	x	✓
C	x	✓	x
D	x	x	✓

10 Winston Churchill, a British Prime Minister, had his false teeth electroplated with gold.

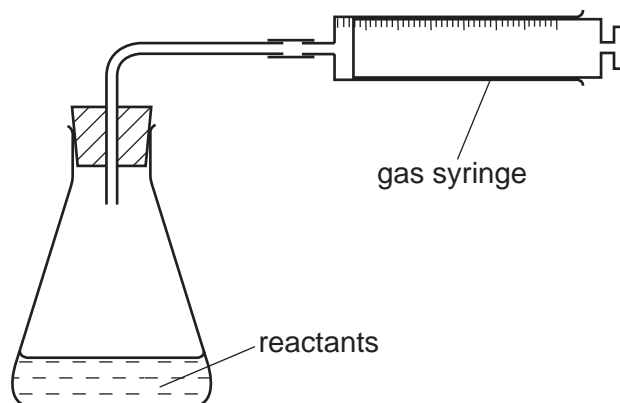
The teeth were coated with a thin layer of carbon and were then placed in the apparatus shown.



Which row is correct?

	terminal X is	the carbon powder could be
A	negative	diamond
B	negative	graphite
C	positive	diamond
D	positive	graphite

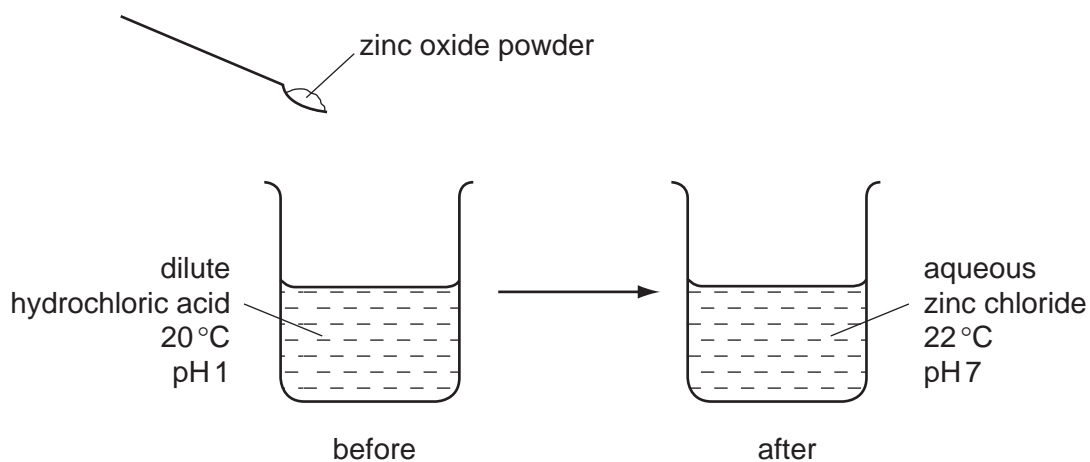
11 The apparatus shown is used to measure the speed of a reaction.



Which equation represents a reaction where the speed can be measured using this apparatus?

- A** $\text{Mg(s)} + 2\text{HCl(aq)} \rightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$
B $\text{HCl(aq)} + \text{NaOH(aq)} \rightarrow \text{NaCl(aq)} + \text{H}_2\text{O(l)}$
C $\text{Fe(s)} + \text{CuSO}_4\text{(aq)} \rightarrow \text{Cu(s)} + \text{FeSO}_4\text{(aq)}$
D $2\text{Na(s)} + \text{Br}_2\text{(l)} \rightarrow 2\text{NaBr(s)}$

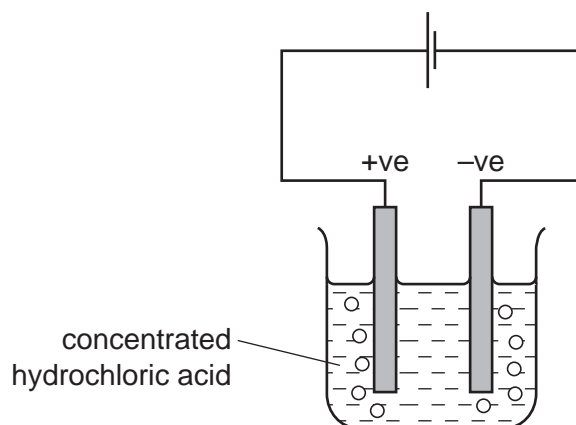
12 The diagram shows the reaction between zinc oxide and dilute hydrochloric acid.



Which terms describe the reaction?

	endothermic	neutralisation
A	✓	✓
B	✓	x
C	x	✓
D	x	x

- 13 The diagram shows that two gases are formed when concentrated hydrochloric acid is electrolysed using inert electrodes.



Which row correctly describes the colours of the gases at the electrodes?

	anode (+ve)	cathode (-ve)
A	colourless	colourless
B	colourless	yellow-green
C	yellow-green	colourless
D	yellow-green	yellow-green

- 14 A gas is escaping from a pipe in a chemical plant.

A chemist tests this gas and finds that it is alkaline.

What is this gas?

- A** ammonia
 - B** chlorine
 - C** hydrogen
 - D** sulfur dioxide
- 15 The element vanadium, V, forms several oxides.

In which change is oxidation taking place?

- A** $\text{VO}_2 \rightarrow \text{V}_2\text{O}_3$
- B** $\text{V}_2\text{O}_5 \rightarrow \text{VO}_2$
- C** $\text{V}_2\text{O}_3 \rightarrow \text{VO}$
- D** $\text{V}_2\text{O}_3 \rightarrow \text{V}_2\text{O}_5$

16 Dilute hydrochloric acid is added to a solid, S.

A flammable gas, G, is formed. Gas G is less dense than air.

What are S and G?

	solid S	gas G
A	copper	hydrogen
B	copper carbonate	carbon dioxide
C	zinc	hydrogen
D	zinc carbonate	carbon dioxide

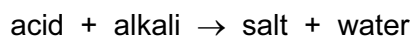
17 The results of three tests on a solution of compound X are shown in the table.

test	result
aqueous sodium hydroxide added	white precipitate formed, soluble in excess
aqueous ammonia added	white precipitate formed, insoluble in excess
acidified silver nitrate added	white precipitate formed

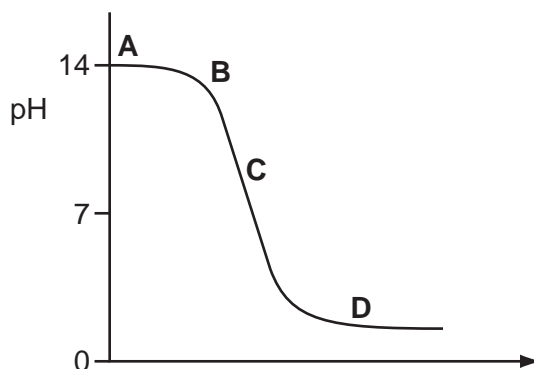
What is compound X?

- A** aluminium bromide
- B** aluminium chloride
- C** zinc bromide
- D** zinc chloride

18 The graph shows how the pH changes as an acid is added to an alkali.



Which letter represents the area of the graph where both acid and salt are present?



- 19 Which properties of the element titanium, Ti, can be predicted from its position in the Periodic Table?

	can be used as a catalyst	conducts electricity when solid	has low density	forms coloured compounds
A	✓	✓	✗	✓
B	✓	✓	✓	✗
C	✓	✗	✓	✓
D	✗	✓	✓	✓

- 20 The diagram shows a section of the Periodic Table.

Which element is described below?

'A colourless, unreactive gas that is denser than air.'

			A
	B		
		C	
			D

- 21 Element X is below iodine in the Periodic Table.

Which row correctly shows the physical state of element X at room temperature and its reactivity compared with that of iodine?

	physical state of element X at room temperature	reactivity compared with that of iodine
A	gas	less reactive
B	solid	less reactive
C	gas	more reactive
D	solid	more reactive

22 Which property is shown by **all** metals?

- A They are extracted from their ores by heating with carbon.
- B They conduct electricity.
- C They form acidic oxides.
- D They react with hydrochloric acid to form hydrogen.

23 Five elements have proton numbers 10, 12, 14, 16 and 18.

What are the proton numbers of the three elements that form oxides?

- A 10, 12 and 14
- B 10, 14 and 18
- C 12, 14 and 16
- D 14, 16 and 18

24 Metal X reacts violently with water.

Metal Y reacts slowly with steam.

Metal Z does not react with dilute hydrochloric acid.

What is the correct order of reactivity of these metals, most reactive first?

- A $X \rightarrow Y \rightarrow Z$
- B $X \rightarrow Z \rightarrow Y$
- C $Z \rightarrow X \rightarrow Y$
- D $Z \rightarrow Y \rightarrow X$

25 Which statement about the extraction of iron from its ore is correct?

- A Iron is more difficult to extract than zinc.
- B Iron is more difficult to extract than copper.
- C Iron is easy to extract because it is a transition metal.
- D Iron cannot be extracted by reduction with carbon.

26 Which statement about the uses of metals is correct?

- A Aluminium is used in the manufacture of aircraft as it has a high density.
- B Aluminium is used to make food containers as it conducts electricity.
- C Stainless steel for cutlery is made by adding other elements to iron.
- D Stainless steel is used to make chemical reactors as it corrodes readily.

27 Fertilisers need to supply crops with three main elements.

Which compound contains all three of these elements?

- A H_3PO_4 B KNO_3 C $\text{NH}_4\text{K}_2\text{PO}_4$ D NH_4NO_3

28 Some uses of water are listed.

- 1 for drinking
- 2 in chemical reactions
- 3 in swimming pools
- 4 in washing

For which uses is it necessary to chlorinate the water?

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

29 Which is a use of oxygen?

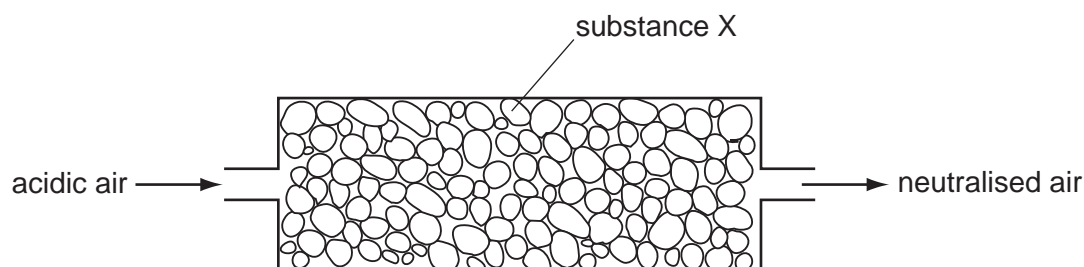
- A filling balloons
- B filling light bulbs
- C food preservation
- D making steel

30 Coal is a fossil fuel.

Which gas is **not** formed when coal burns?

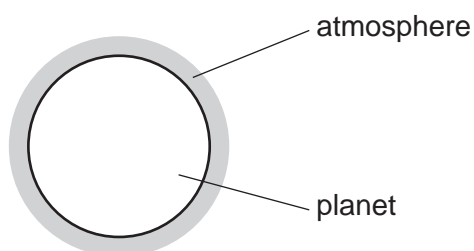
- A carbon dioxide
- B carbon monoxide
- C methane
- D sulfur dioxide

- 31 Air containing an acidic impurity was neutralised by passing it through a column containing substance X.



What is substance X?

- A calcium oxide
 - B sand
 - C sodium chloride
 - D concentrated sulfuric acid
- 32 A new planet has been discovered and its atmosphere has been analysed.



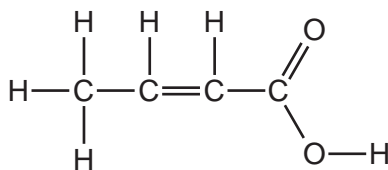
The table shows the composition of the atmosphere.

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

33 The structure of a compound is shown.



Which functional groups are present in this compound?

	alcohol	alkene	carboxylic acid
A	✓	✓	✓
B	✓	x	x
C	x	✓	✓
D	x	x	✓

34 Gas X is a waste gas from digestion in animals.

Gas Y is formed when gas X is burnt with a small amount of oxygen.

Gas Z is formed when gas X is burnt with an excess of oxygen.

What are X, Y and Z?

	X	Y	Z
A	carbon dioxide	methane	carbon monoxide
B	carbon monoxide	methane	carbon dioxide
C	methane	carbon dioxide	carbon monoxide
D	methane	carbon monoxide	carbon dioxide

35 Which fraction from the fractional distillation of petroleum does **not** match its correct use?

	fraction	use
A	fuel oil	domestic heating
B	kerosene	jet fuel
C	naphtha	making roads
D	refinery gas	for heating and cooking

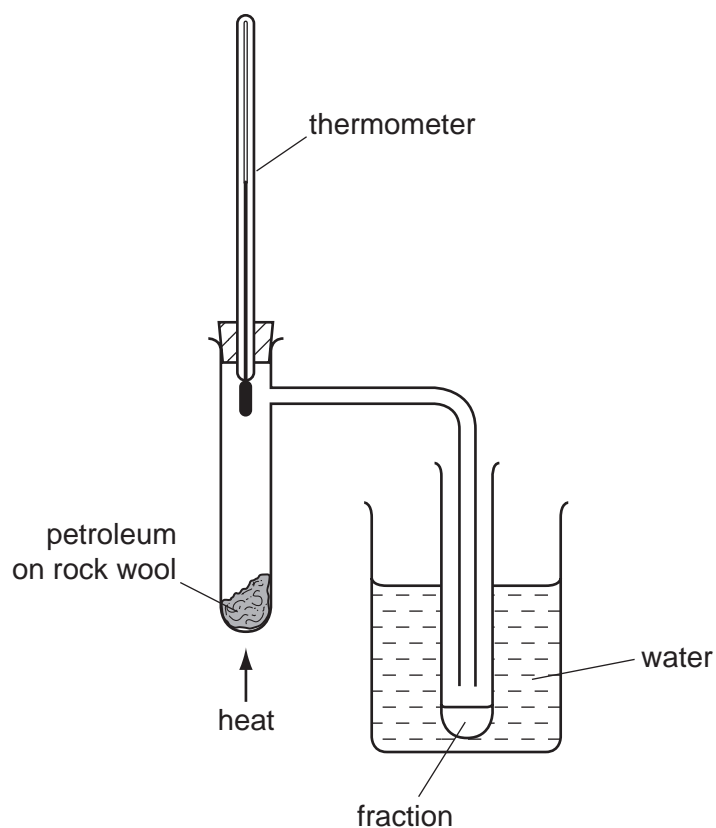
36 When a long chain hydrocarbon is cracked, the following products are produced.

- 1 C_3H_8
- 2 C_2H_4
- 3 C_3H_6
- 4 C_2H_6

Which products would decolourise bromine water?

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

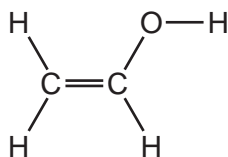
37 The diagram shows apparatus used to separate petroleum into four fractions.



Which fraction contains the smallest hydrocarbon molecules?

fraction	boiling point range / °C
A	up to 70
B	70 to 120
C	120 to 170
D	over 170

38 PVA is a polymer. The monomer has the structure shown.



To which homologous series does this compound belong?

	alcohols	alkenes
A	✓	✓
B	✓	x
C	x	✓
D	x	x

39 Ethanol is an important chemical produced by the1..... of2..... .

Which words correctly complete gaps 1 and 2?

	1	2
A	combustion	ethane
B	combustion	glucose
C	fermentation	ethane
D	fermentation	glucose

40 Which equation represents incomplete combustion of ethane?

- A** $C_2H_6 + O_2 \rightarrow 2CO + 3H_2$
- B** $C_2H_6 + 2O_2 \rightarrow 2CO_2 + 3H_2$
- C** $2C_2H_6 + 5O_2 \rightarrow 4CO + 6H_2O$
- D** $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

DATA SHEET
The Periodic Table of the Elements

		Group													
		I	II	III	IV	V	VI	VII	0						
		1 H Hydrogen 1													
7	9														
Li Lithium 3	Be Beryllium 4														
23	24														
Na Sodium 11	Mg Magnesium 12														
39	40														
K Potassium 19	Ca Calcium 20	45	48	51	52	55	56	59	59	64	65				
		Sc Scandium 21	Ti Titanium 22	V Vanadium 23	Cr Chromium 24	Mn Manganese 25	Fe Iron 26	Co Cobalt 27	Ni Nickel 28	Cu Copper 29	Zn Zinc 30				
85	88	89	91	93	96	101	101	103	106	108	112				
Rb Rubidium 37	Sr Strontium 38	Y Yttrium 39	Zr Zirconium 40	Nb Niobium 41	Mo Molybdenum 42	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Ag Silver 47	Cd Cadmium 48					
133	137	139	178	181	184	190	190	192	195	197	201				
Cs Caesium 55	Ba Barium 56	La Lanthanum 57	Hf Hafnium 72	Ta Tantalum 73	W Tungsten 74	Os Osmium 76	Ir Iridium 77	Pt Platinum 78	Au Gold 79	Hg Mercury 80					
	226	227													
Fr Francium 87	Ra Radium 88	Ac Actinium 89													
		*58-71 Lanthanoid series													
		†90-103 Actinoid series													
		<table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">a</td> <td style="padding: 2px;">X</td> </tr> <tr> <td style="padding: 2px;">Key</td> <td style="padding: 2px;">b</td> </tr> </table>										a	X	Key	b
a	X														
Key	b														
		a = relative atomic mass													
		X = atomic symbol													
		b = proton (atomic) number													
		140	141	144	150	152	157	159	162	165	167				
		Ce Cerium 58	Pr Praseodymium 59	Nd Neodymium 60	Pm Promethium 61	Sm Samarium 62	Gd Gadolinium 64	Tb Terbium 65	Dy Dysprosium 66	Ho Holmium 67	Er Erbium 68				
		232	238	238	238	238	238	238	238	238	238				
		Th Thorium 90	Pa Protactinium 91	U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100				
		169	173	173	173	173	173	173	173	173	173				
		Tm Thulium 69	Yb Ytterbium 70	Lu Lutetium 71	No Nobelium 102	Md Mendelevium 101	Lr Lawrencium 103								
		84	85	86	86	86	86	86	86	86	86				
		Po Polonium 84	At Astatine 85	Rn Radon 86											

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

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