



## UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

www.PapaCambridge.com

0439/13 **CHEMISTRY** 

May/June 2012 Paper 1 Multiple Choice

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, highlighters, glue or correction fluid.

Write your name, Center 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.

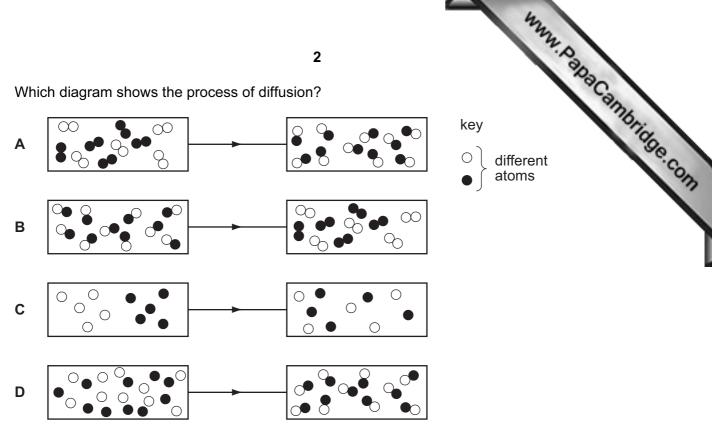
Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

You may use a calculator.



1 Which diagram shows the process of diffusion?



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.

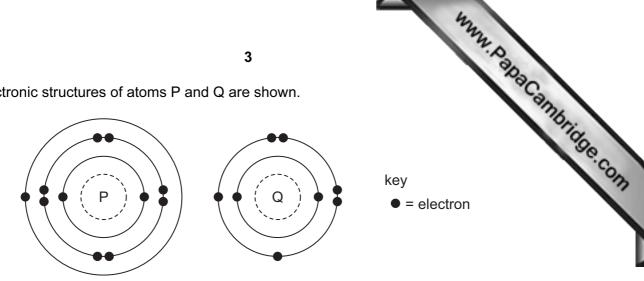
The student has a beaker, concentrated acid, water and the apparatus below.

- Ρ a balance
- Q a clock
- a graduated cylinder
- S a thermometer

Which pieces of apparatus does the student use?

- P, Q and R only
- P, Q and S only В
- Q, R and S only C
- P, Q, R and S
- 3 Which method is most suitable to obtain zinc carbonate from a suspension of zinc carbonate in water?
  - Α crystallization
  - distillation
  - C evaporation
  - D filtration

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  $PQ_2$
- $\mathbf{B} \quad \mathsf{P}_2\mathsf{Q}$
- $\mathbf{C} \quad \mathsf{P}_2\mathsf{Q}_6$
- $P_6Q_2$

5 An element Y has the proton number 18.

The next element in the Periodic Table is an element Z.

Which statement is correct?

- Element Z has one more electron in its outer shell than element Y.
- В Element Z has one more electron shell than element Y.
- С Element Z is in the same group of the Periodic Table as element Y.
- 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** <sup>1</sup>H
- $^{2}_{1}H$
- <sup>4</sup><sub>2</sub>He

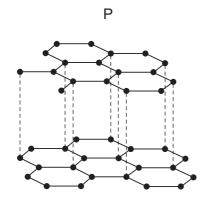
7 Which is a simple covalent molecule?

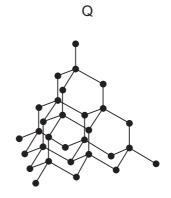
	conducts electricity		volatile	
	when solid when molten		voiatile	
Α	✓	✓	X	
В	✓	x	✓	
С	x	✓	X	
D	x	X	✓	

Mg + 
$$H_2SO_4 \rightarrow MgSO_4 + H_2$$
  
 $M_r$  of  $MgSO_4$  is 120

www.papaCambridge.com Which mass of magnesium sulfate will be formed if 12 g of magnesium are reacted with sulfuric acid?

- **A** 5g
- В 10 g
- **C** 60 g
- 120 g
- 9 The diagrams show the structures of two forms, P and Q, of a solid element.



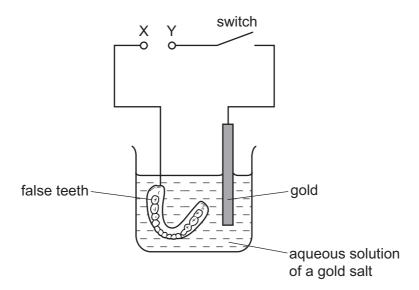


What are suitable uses of P and Q, based on their structures?

	use of solid P	use of solid Q	
A drilling		drilling	
<b>B</b> lubricating		drilling	
C drilling		lubricating	
D	lubricating	lubricating	

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

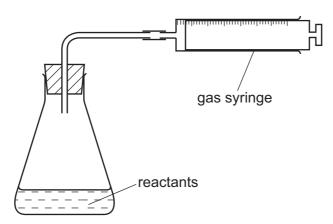
www.PapaCambridge.com The teeth were coated with a thin layer of carbon and were then placed in the apparatus si



Which row is correct?

	terminal X is	the carbon powder could be
Α	negative	diamond
В	negative	graphite
С	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?

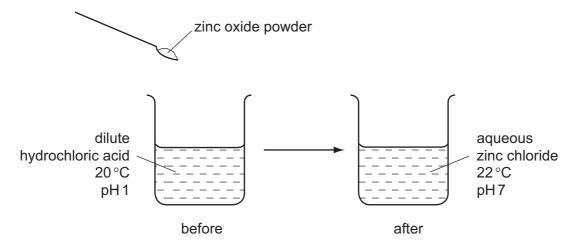
**A** Mg(s) + 2HC
$$l(aq) \rightarrow MgCl_2(aq) + H_2(g)$$

**B** 
$$HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H2O(I)$$

**C** Fe(s) + CuSO<sub>4</sub>(aq) 
$$\rightarrow$$
 Cu(s) + FeSO<sub>4</sub>(aq)

**D** 
$$2Na(s) + Br_2(l) \rightarrow 2NaBr(s)$$

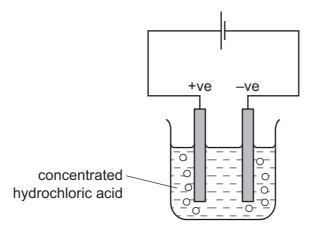
12 The diagram shows the reaction between zinc oxide and dilute hydrochloric acid.



Which terms describe the reaction?

	endothermic	neutralization
Α	✓	✓
В	✓	x
С	x	✓
D	X	X

www.papaCambridge.com 13 The diagram shows that two gases are formed when concentrated hydroch. electrolyzed using inert electrodes.



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

	anode (+ve)	cathode (-ve)	
A colorless		colorless	
В	colorless	yellow-green	
С	yellow-green	colorless	
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?

- ammonia
- В chlorine
- hydrogen
- **D** sulfur dioxide

**15** The element vanadium, V, forms several oxides.

In which change is oxidation taking place?

- $A VO_2 \rightarrow V_2O_3$
- $\textbf{B} \quad V_2O_5 \ \rightarrow \ VO_2$
- $\boldsymbol{C} \quad V_2O_3 \ \rightarrow \ VO$
- $\textbf{D} \quad V_2O_3 \ \rightarrow \ V_2O_5$

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
Α	copper	hydrogen
В	copper carbonate	carbon dioxide
С	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 aluminum bromide

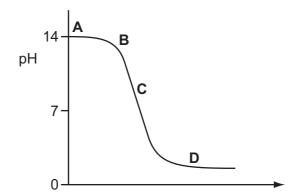
B aluminum chloride

**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?

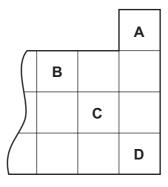


Which Table		e element titanium, Ti,	<b>9</b> can be predicted	from its position	N. P. A. D. C. COM. P. A. C.
	can be used as a catalyst	conducts electricity when solid	has low density	forms colored compounds	Sie Con
Α	✓	✓	X	✓	13
В	✓	✓	✓	X	
С	✓	×	✓	✓	
D	X	✓	✓	✓	

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

Which element is described below?

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



**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	
Α	gas	less reactive	
В	solid	less reactive	
С	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**  $X \rightarrow Z \rightarrow Y$
- $\textbf{C} \quad Z \to X \to Y$
- **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 Aluminum is used in the manufacture of aircraft as it has a high density.
  - **B** Aluminum 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	Fertilizers need to supply crops with three main elements.
	Which compound contains all three of these elements?

B KNO<sub>3</sub>

- C NH<sub>4</sub>K<sub>2</sub>PO<sub>4</sub>
- NH<sub>4</sub>NO<sub>3</sub>

www.PapaCambridge.com

- 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

A  $H_3PO_4$ 

**B** 1 and 3

**C** 2 and 4

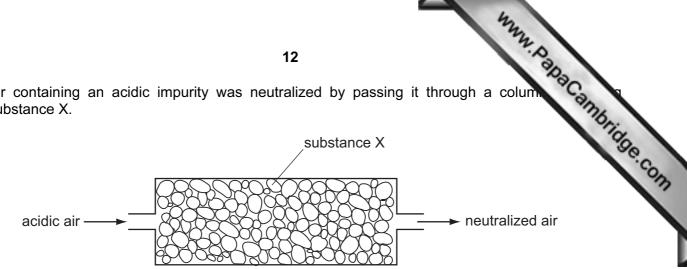
**D** 3 and 4

- 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?

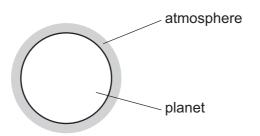
- A carbon dioxide
- B carbon monoxide
- **C** methane
- **D** sulfur dioxide

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



What is substance X?

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



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?

- Α carbon dioxide and oxygen
- В carbon dioxide only
- C nitrogen and oxygen
- nitrogen only

Which functional groups are present in this compound?

	alcohol	alkene	carboxylic acid
Α	✓	✓	<b>✓</b>
В	✓	X	x
С	X	✓	✓
D	X	X	✓

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

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

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

What are X, Y and Z?

	Х	Υ	Z		
Α	carbon dioxide	methane	carbon monoxide		
В	carbon monoxide	methane	carbon dioxide		
С	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?

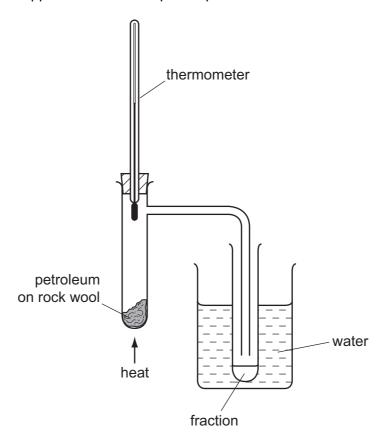
	fraction	use			
Α	fuel oil	domestic heating			
В	kerosene	jet fuel			
С	naphtha	making roads			
D	refinery gas	for heating and cooking			

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

Which products would decolorize bromine water?

- A 1 and 4
- **B** 2 and 3
- 2 only
- 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				
Α	up to 70				
В	70 to 120				
С	120 to 170				
D	over 170				

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

$$C = C$$

To which homologous series does this compound belong?

	alcohols	alkenes			
Α	✓	✓			
В	✓	X			
С	X	✓			
D	X	x			

**39** Ethanol is an important chemical produced by the .....1..... of .....2......

Which words correctly complete gaps 1 and 2?

	1	2			
Α	combustion	ethane			
В	combustion	glucose			
С	fermentation	ethane			
D	fermentation	glucose			

40 Which equation represents incomplete combustion of ethane?

$$\textbf{A} \quad C_2H_6 \ + \ O_2 \ \rightarrow \ 2CO \ + \ 3H_2$$

**B** 
$$C_2H_6 + 2O_2 \rightarrow 2CO_2 + 3H_2$$

$$\textbf{C} \quad 2C_2H_6 \ + \ 5O_2 \ \rightarrow \ 4CO \ + \ 6H_2O$$

$$D \quad 2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$$

The Periodic Table of the Elements DATA SHEET

					1	6				my	Dana Cambridge Com
						· · · · · · · · · · · · · · · · · · ·		1			apa,
	0	4 <b>He</b> Helium	20 <b>Ne</b> Neon 10	40 <b>Ar</b> Argon	84 <b>Kr</b> Krypton 36	131 <b>Xe</b> Xenon 54	Radon 86		Lutetium 7.1	Lr Lawrencium 103	California
			19 Fluorine	35.5 <b>C1</b> Chlorine	80 <b>Br</b> Bromine 35	127 <b>T</b> lodine	At Astatine 85		173 <b>Yb</b> Ytterbium 70	Nobelium 102	Se. COM
	>		16 Oxygen 8	32 <b>S</b> Sulfur 16	79 Selenium 34	128 <b>Te</b> Tellurium 52	Po Polonium 84		169 <b>Tm</b> Thulium	Md Mendelevium 101	
	>		14 Nitrogen 7	31 <b>P</b> Phosphorus 15	75 <b>As</b> Arsenic 33	Sb Antimony 51	209 <b>Bi</b> Bismuth 83		167 <b>Er</b> Erbium 68	Fm Fermium 100	I
	2		12 Carbon 6	28 <b>Si</b> Silicon 14	73 <b>Ge</b> Germanium	Sn Tin	207 <b>Pb</b> Lead		165 <b>Ho</b> Holmium 67	Einsteinium	(r.t.p.).
	=		11 Boron 5	27 <b>A1</b> Aluminum 13	70 <b>Ga</b> Gallium 31	115 <b>In</b> Indium	204 <b>T (</b> Thallium		162 <b>Dy</b> Dysprosium 66	<b>Cf</b> Californium 98	pressure
					65 <b>Zn</b> Zinc 30	112 <b>Cd</b> Cadmium 48	201 <b>Hg</b> Mercury		159 <b>Tb</b> Terbium 65	<b>BK</b> Berkelium 97	The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).
					64 <b>Cu</b> Copper 29	108 <b>Ag</b> Siver 47	197 <b>Au</b> Gold		157 <b>Gd</b> Gadolinium 64	Cm Currium	n tempera
Group					S9  Nickel	106 <b>Pd</b> Palladium 46	195 <b>Pt</b> Platinum 78		152 <b>Eu</b> Europium 63	Am Americium 95	n³ at roor
Gre					59 <b>Co</b> Cobalt 27	103 <b>Rh</b> Rhodium 45	192 <b>Ir</b> Iridium		Samarium 62	<b>Pu</b> Plutonium	is is 24 dr
		T Hydrogen			56 <b>Fe</b> Iron 26	Ru Ruthenium 44	190 <b>Os</b> Osmium 76		Pm Promethium 61	Neptunium	of any ga
					55 <b>Mn</b> Manganese 25	Tc Technetium 43	186 <b>Re</b> Rhenium 75		144 <b>Ne</b> Odymium 60	238 <b>U</b> Uranium 92	one mole
					52 <b>Cr</b> Chromium 24	96 <b>Mo</b> Molybdenum 42	184 <b>W</b> Tungsten 74		Pr Praseodymium 59	<b>Pa</b> Protactinium 91	olume of c
					51 V Vanadium 23	93 <b>Nb</b> Niobium 41	181 <b>Ta</b> Tantalum 73		140 <b>Ce</b> Cerium 58	232 <b>Th</b> Thorium	The ×
					48 <b>Ti</b> Titanium	2r Zirconium 40	178 <b>Hf</b> Hafnium * 72			nic mass bol nic) number	
					45 Sc Scandium 21	89 <b>&lt;</b> Yttrium 39	139 <b>La</b> Lanthanum 57 *	Ac Actinium 189	series eries	a = relative atomic mass  X = atomic symbol b = proton (atomic) number	
	=		9 <b>Be</b> Beryllium	24 Mg Magnesium	40 <b>Ca</b> Calcium 20	Sr Strontium	137 <b>Ba</b> Barium 56	226 <b>Ra</b> Radium 88	*58-71 Lanthanoid series 190-103 Actinoid series	а <b>Х</b> Ф	
	_		7 Lithium	23 <b>Na</b> Sodium	39 K Potassium 19	Rb Rubidium 37	133 <b>Cs</b> Caesium 55	Fr Francium 87	*58-71 Le	Key	

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.