



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)

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.

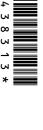
Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

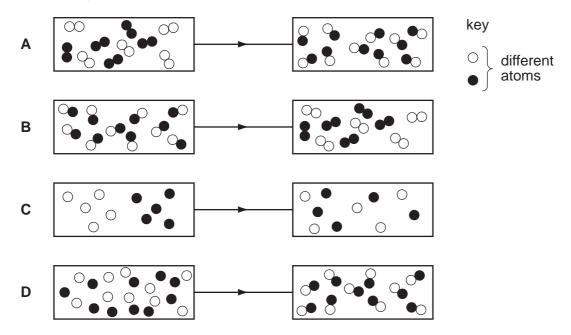
Any rough working should be done in this booklet.

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

You may use a calculator.



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.

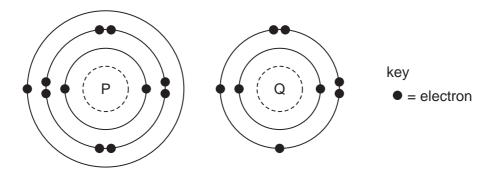
The student has a beaker, concentrated acid, water and the apparatus below.

- 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 PQ₂
- $\mathbf{B} \quad \mathsf{P}_2\mathsf{Q}$
- \mathbf{C} P_2Q_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?

- 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** ¹H
- \mathbf{B} $^{2}_{1}H$
- C 1
- **D** ⁴₂He

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	✓	

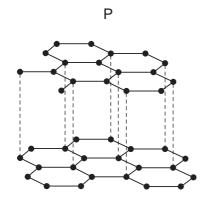
8 The equation for the reaction between magnesium and dilute sulfuric acid is shown.

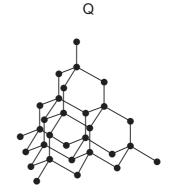
Mg +
$$H_2SO_4 \rightarrow MgSO_4 + H_2$$
 $M_r \text{ of } MgSO_4 \text{ is } 120$

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

- **A** 5g
- **B** 10g
- **C** 60 g
- **D** 120 g

9 The diagrams show the structures of two forms, P and Q, of a solid element.



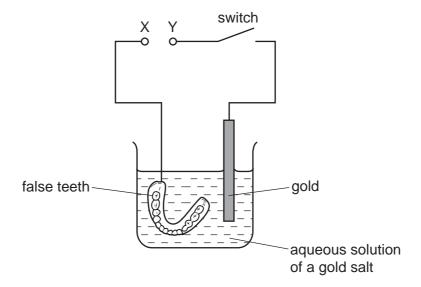


What are suitable uses of P and Q, based on their structures?

	use of solid P	use of solid Q	
A drilling		drilling	
В	lubricating	drilling	
С	drilling	lubricating	
D	lubricating	lubricating	

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

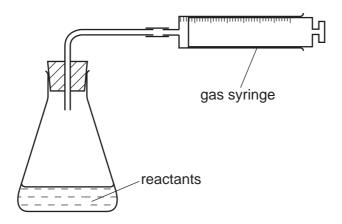
The teeth were coated with a thin layer of carbon and were then placed in the apparatus shown.



Which row is correct?

	terminal X is	the carbon powder could be	
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?

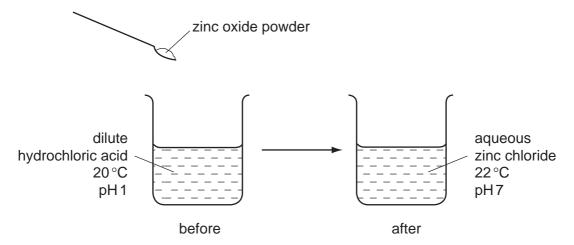
A Mg(s) + 2HC
$$l(aq) \rightarrow MgCl_2(aq) + H_2(g)$$

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

C Fe(s) + CuSO₄(aq)
$$\rightarrow$$
 Cu(s) + FeSO₄(aq)

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

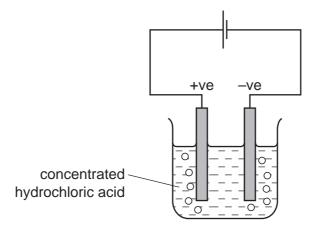
12 The diagram shows the reaction between zinc oxide and dilute hydrochloric acid.



Which terms describe the reaction?

endothermic		neutralisation
Α	✓	✓
В	✓	x
С	×	✓
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)	
Α	colourless	colourless	
В	colourless	yellow-green	
С	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** $VO_2 \rightarrow V_2O_3$
- $\textbf{B} \quad V_2O_5 \ \rightarrow \ VO_2$
- $\boldsymbol{C} \quad V_2O_3 \ \rightarrow \ VO$
- $\textbf{D} \quad V_2O_3 \ \rightarrow \ V_2O_5$

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 aluminium bromide

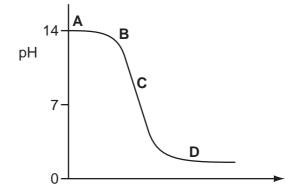
B aluminium chloride

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?



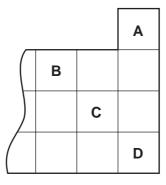
19 Which properties of the element titanium, Ti, can be predicted from its position in the Periodic Table?

	can be used as a catalyst	conducts electricity when solid	has low density	forms coloured compounds
Α	✓	✓	X	✓
В	✓	✓	✓	x
С	✓	×	✓	✓
D	x	✓	✓	✓

20 The diagram shows a section of the Periodic Table.

Which element is described below?

'A colourless, 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.

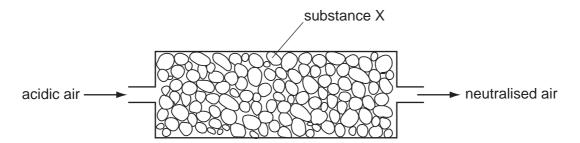
Metal Z does not react with dilute hydrochloric acid.

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 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.

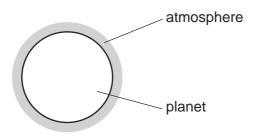
27	Fer	tilisers ne	eed to supp	ly crops wi	ith three m	ain elements		
	Wh	ich comp	ound conta	ins all thre	e of these	elements?		
	Α	H ₃ PO ₄	В	KNO ₃	С	NH ₄ K ₂ PO ₄	D	NH_4NO_3
	_		_					
28	Sor	ne uses	of water are	e listed.				
		1	for drinkin	g				
		2	in chemica	al reactions	3			
		3	in swimmi	ng pools				
		4	in washing	1				
	For	which us	ses is it nec	essary to	chlorinate	the water?		
	Α	1 and 2	В	1 and 3	С	2 and 4	D	3 and 4
			_					
29	Wh	ich is a u	ise of oxyge	en?				
	Α	filling ba	alloons					
	В	filling lig	tht bulbs					
	С	food pre	eservation					
	D	making	steel					
30	Co	al is a fos	scil fuol					
30								
	Wh	ich gas is	s not forme	d when co	al burns?			
		carbon						
	В		monoxide					
	С	methane						
	D	sulfur di	ioxide					

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
Α	✓	✓	✓
В	✓	X	x
С	×	✓	✓
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	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						

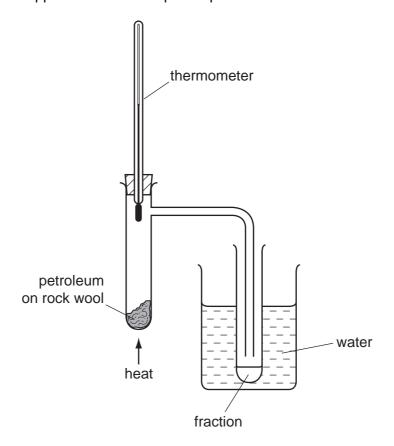
35 Which fraction from the fractional distillation of petroleum does **not** match its correct use?

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

- **36** When a long chain hydrocarbon is cracked, the following products are produced.
 - 1 C₃H₈
 - 2 C₂H₄
 - 3 C₃H₆
 - 4 C₂H₆

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
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	✓	×
С	x	✓
D	x	X

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

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

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DATA SHEET
The Periodic Table of the Elements

			;	72 A 16 A 1	Carbon Nitrogen Oxygen Fi	28 31 32	Si P	num Silicon Phosphorus Sulfur Chlorine 18 14 15 15 16 17 18	73 75 79	Ge As Se	Germanium 32			m Tin Antimony Tellurium lodine 54 55 53 54	207	Pb Bi Po	um Lead Bismuth Polonium Astatine 86 82 83 84 85 85 86			107	HO Fr Tm Yb	Holmium Erbium Thulium 70		
	=		;	= ™	Boron 5	27	A1	Aluminium 13		Zn Ga	Zinc Gallium 30 31	112 115	Cd	Cadmium Indium 48 49		Hg T1	Mercury Thallium 80				a L	Terbium Dysprosium 65		
þ										N.	Nickel Copper	106 108	Pd Ag	lladium 47	195 197	Pt Au	latinum 79			0.07	F. G.	ropium G		
Group			_						59	ပိ	Cobalt 28	103	Rh	Rhodium Pa 45 46	192	<u>-</u>	Iridium P			200	<u> </u>	- 60		
		Hydrogen	-						56	Fe	26	101		Ruthenium 44	190	s _O	Osmium 76				Pm	- F		
									55		Manganese 25		ပ	Technetium 43	186	Re	Rhenium 75			7	<u>ב</u>	Ż 09	238	_
									52	ပ်	Chromium 24	96	Mo	Molybdenum 42	184	>	Tungsten 74			7	- ሷ	Praseodymium 59		
									51	>	Vanadium 23	93	q	Niobium 41	181	Та	Tantalum 73			4	<u>ئ</u>	Cerium 58	232	
									48	F	Titanium 22	91	Zr	Zirconium 40	178	Ξ	Hafnium 72			_			nic mass	
									45	လွ	Scandium 21	68	>	Yttrium 39	139	Гa	Lanthanum 57 *	227	Actinium Actinium	200	Series	series	a = relative atomic mass	
	=			_® e	Beryllium 4	24	Mg	Magnesium 12	40	င္မ	Calcium 20	88	ഗ്	Strontium 38	137	Ba	Barium 56	226	Radium Radium	00	*58-71 Lanthanoid series	190-103 Actinoid series	a	
					Lithium	23	Na	Sodium	39	Y	Potassium 19	85	Rb	Rubidium	133	Cs	Caesium	۱,	Francium		71 L	103		

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

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