



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY

0620/12

Paper 1 Multiple Choice

October/November 2011

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.

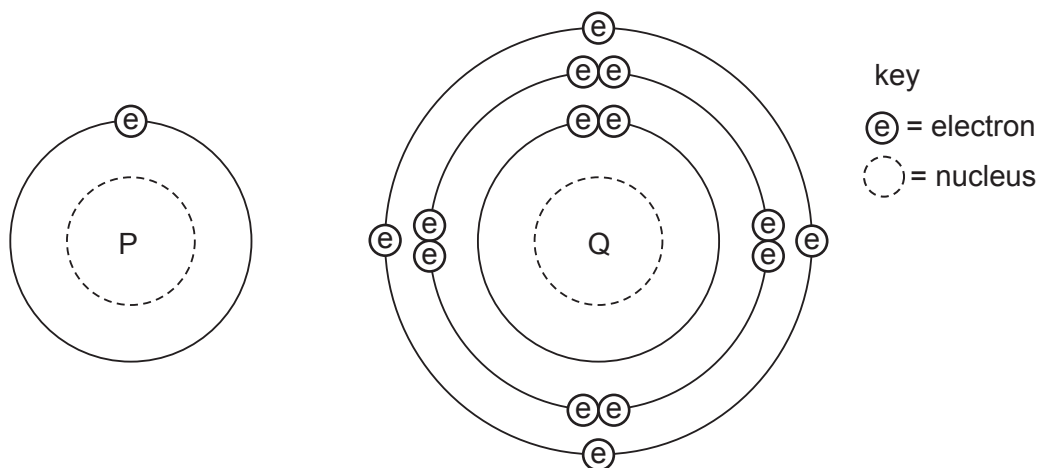
This document consists of **16** printed pages.



1 In which substance are the particles close together and slowly moving past each other?

- A air
- B ice
- C steam
- D water

2 The diagram shows the electronic structures of atoms P and Q.



P and Q combine to form a molecule.

What is the formula of this molecule?

- A PQ_4
- B PQ
- C P_2Q
- D P_4Q

3 A student was provided with only a thermometer, a stopwatch and a beaker.

What could the student measure?

- A 10.5 g solid and 24.8 cm³ liquid
- B 10.5 g solid and 25 °C
- C 24.8 cm³ liquid and 45 seconds
- D 25 °C and 45 seconds

- 4 Two isotopes of helium are ${}^3_2\text{He}$ and ${}^4_2\text{He}$.

Which two diagrams show the arrangement of particles in these two isotopes?

${}^3_2\text{He}$

${}^4_2\text{He}$

key

(e) = electron

(p) = proton

(n) = neutron

○ = nucleus

- 5 Mixture 1 contains sand and water.

Mixture 2 contains salt and water.

Which method of separation could be used to obtain each of the required products from each mixture?

	mixture 1		mixture 2	
	to obtain sand	to obtain water	to obtain salt	to obtain water
A	crystallisation	distillation	filtration	filtration
B	crystallisation	filtration	filtration	distillation
C	filtration	distillation	crystallisation	filtration
D	filtration	filtration	crystallisation	distillation

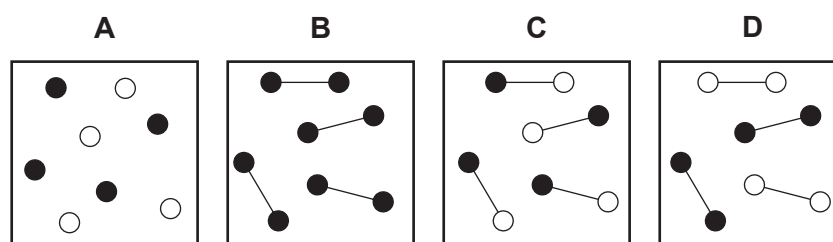
- 6 The relative formula mass, M_r , of copper(II) sulfate, CuSO_4 , is 160.

Which mass of sulfur is present in 160 g of copper(II) sulfate?

- A 16 g B 32 g C 64 g D 128 g

- 7 Two elements, represented by $\bigcirc$ and $\bullet$, form a compound.

Which diagram shows molecules of the compound?



- 8 The table describes the structures of four particles.

particle	number of protons	number of neutrons	number of electrons
O	8	8	8
O^{2-}	8	8	X
Na	11	Y	11
Na^+	11	12	Z

What are the correct values of **X**, **Y** and **Z**?

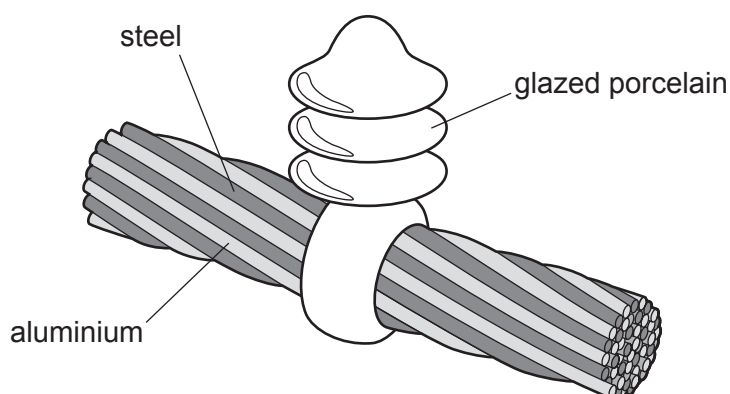
	X	Y	Z
A	9	11	10
B	9	11	11
C	10	12	10
D	10	12	11

- 9 Metals could be extracted from their molten chlorides using electrolysis.

Which substances are formed at each electrode?

	anode	cathode
A	chlorine	hydrogen
B	chlorine	metal
C	hydrogen	metal
D	metal	chlorine

- 10 The diagram shows a section of an overhead power cable.



Which statement explains why a particular substance is used?

- A** Aluminium has a low density and is a good conductor of electricity.
B Porcelain is a good conductor of electricity.
C Steel can rust in damp air.
D Steel is more dense than aluminium.
- 11 Concentrated aqueous potassium bromide solution is electrolysed using inert electrodes.

The ions present in the solution are K^+ , Br^- , H^+ and OH^- .

To which electrodes are the ions attracted during this electrolysis?

	attracted to anode	attracted to cathode
A	Br^- and K^+	H^+ and OH^-
B	Br^- and OH^-	H^+ and K^+
C	H^+ and K^+	Br^- and OH^-
D	H^+ and OH^-	Br^- and K^+

- 12 The sign $\rightleftharpoons$ is used in some equations to show that a reaction is reversible.

Two incomplete equations are given.

	reactants	products
P	$\text{CoCl}_2 + 2\text{H}_2\text{O}$	$\text{CoCl}_2 \cdot 2\text{H}_2\text{O}$
Q	$\text{C} + \text{O}_2$	CO_2

For which of these reactions can a $\rightleftharpoons$ sign be correctly used to complete the equation?

	P	Q
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

- 13 Which fuel needs oxygen in order to produce heat energy and which type of reaction produces the energy?

	fuel	type of reaction
A	a radioactive isotope	endothermic
B	a radioactive isotope	exothermic
C	hydrogen	endothermic
D	hydrogen	exothermic

- 14 Some reactions are listed.

methane + oxygen $\rightarrow$ carbon dioxide + water

sodium + water $\rightarrow$ sodium hydroxide + hydrogen

magnesium + hydrochloric acid $\rightarrow$ magnesium chloride + hydrogen

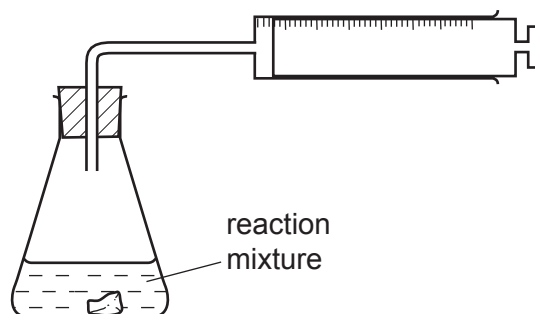
Which word correctly describes all of these reactions?

- A** combustion
- B** endothermic
- C** exothermic
- D** neutralisation

15 Which type of reaction always forms a salt and water?

- A exothermic
- B neutralisation
- C oxidation
- D polymerisation

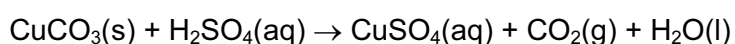
16 An experiment to determine the rate of a chemical reaction could be carried out using the apparatus shown.



Which reaction is being studied?

- A $\text{Cl}_2 + 2\text{KBr} \rightarrow 2\text{KCl} + \text{Br}_2$
- B $\text{Mg} + \text{H}_2\text{SO}_4 \rightarrow \text{MgSO}_4 + \text{H}_2$
- C $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{NaNO}_3 + \text{AgCl}$
- D $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$

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



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

Which conditions would always increase the speed of this chemical reaction?

- 1 Increase the concentration of the reactants.
- 2 Increase the size of the pieces of copper(II) carbonate.
- 3 Increase the temperature.
- 4 Increase the volume of sulfuric acid.

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

- 18 The table shows some properties of two elements in Group VII of the Periodic Table.

element	state at 20 °C	density / g per cm ³	melting point / °C
chlorine	gas	0.0032	–101
bromine	liquid	3.1	–7

Which properties is fluorine likely to have?

	state at 20 °C	density / g per cm ³	melting point / °C
A	gas	0.0017	–220
B	gas	0.17	–188
C	liquid	0.0017	–220
D	liquid	0.17	–188

- 19 Statement 1: Helium is a reactive gas.

Statement 2: Helium can be used to fill balloons.

Which is correct?

- A** Both statements are correct and statement 2 explains statement 1.
- B** Both statements are correct but statement 2 does not explain statement 1.
- C** Statement 1 is correct but statement 2 is incorrect.
- D** Statement 2 is correct but statement 1 is incorrect.

- 20 An alloy contains copper and zinc.

Some of the zinc has become oxidised to zinc oxide.

What is the result of adding an excess of dilute sulfuric acid to the alloy?

- A** A blue solution and a white solid remains.
- B** A colourless solution and a pink / brown solid remains.
- C** The alloy dissolves completely to give a blue solution.
- D** The alloy dissolves completely to give a colourless solution.

21 An element has the following properties.

- It forms coloured compounds.
- It acts as a catalyst.
- It melts at 1539 °C.

In which part of the Periodic Table is the element found?

- A** Group I
B Group IV
C Group VII
D transition elements

22 The results of three tests on a solution of compound **X** are shown.

test	result
aqueous sodium hydroxide added	white precipitate formed, soluble in excess
aqueous ammonia added	white precipitate formed, soluble in excess
dilute hydrochloric acid added	bubbles of gas

What is compound **X**?

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

23 Which property is **not** characteristic of a base?

- A** It reacts with a carbonate to form carbon dioxide.
B It reacts with an acid to form a salt.
C It reacts with an ammonium salt to form ammonia.
D It turns universal indicator paper blue.

- 24** A liquid turns white anhydrous copper sulfate blue and has a boiling point of 103°C .

Which could be the identity of the liquid?

- A** alcohol
- B** petrol
- C** salt solution
- D** pure water

- 25** Alloy X is strong and has a low density.

Alloy Y is heavy but is resistant to corrosion.

Which could be uses of X and Y?

	bridge supports	aircraft	overhead cables
A	X	X	Y
B	X	Y	Y
C	Y	X	X
D	Y	Y	X

- 26** Which statements are correct?

- 1 Metals are often used in the form of alloys.
- 2 Stainless steel is an alloy of iron.
- 3 Alloys always contain more than two metals.

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

- 27** Which statement is true about **all** metals?

- 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.

28 A metal is extracted from hematite, its oxide ore.

What is the metal and how is the oxide reduced?

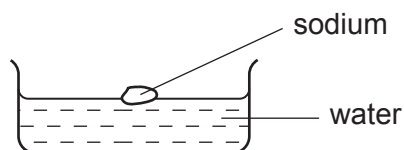
	metal	method of reduction
A	Al	electrolysis
B	Al	heating with carbon
C	Fe	electrolysis
D	Fe	heating with carbon

29 A chemical engineer plans to produce hydrochloric acid.

Which metal is best for the reaction container?

- A** copper
- B** iron
- C** magnesium
- D** zinc

30 When sodium reacts with water, a solution and a gas are produced.



The solution is tested with litmus paper and the gas is tested with a splint.

What happens to the litmus paper and to the splint?

	litmus paper	splint
A	blue to red	glowing splint relights
B	blue to red	lighted splint 'pops'
C	red to blue	glowing splint relights
D	red to blue	lighted splint 'pops'

31 Iron is a metal that rusts in the presence of oxygen and water.

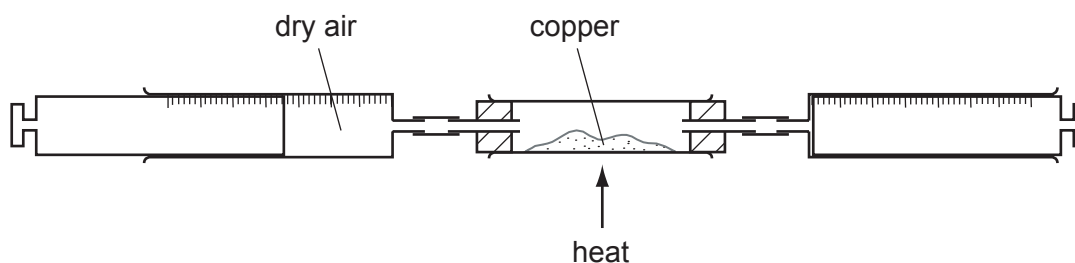
Mild steel is used for1..... and is prevented from rusting by2..... .

Stainless steel is prevented from rusting by3..... it with another metal.

Which words correctly complete gaps 1, 2 and 3?

	1	2	3
A	car bodies	greasing	covering
B	car bodies	painting	mixing
C	cutlery	greasing	covering
D	cutlery	painting	mixing

32 Dry air is passed over hot copper until all the oxygen has reacted.



The volume of gas at the end of the reaction is 120 cm^3 .

What is the starting volume of dry air?

- A** 132 cm^3 **B** 150 cm^3 **C** 180 cm^3 **D** 600 cm^3

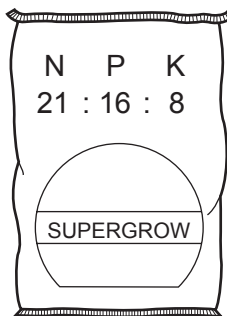
33 In which row is the air pollutant **not** correctly matched with its source?

	air pollutant	source
A	carbon monoxide	incomplete combustion of fuels
B	lead compounds	burning petrol in cars
C	nitrogen oxides	decomposing vegetation
D	sulfur dioxide	burning coal and other fossil fuels

34 Which pollutant gas is produced by the decomposition of vegetation?

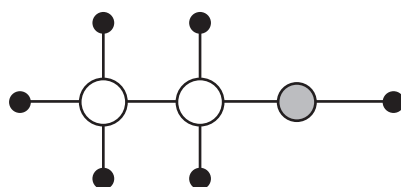
- A carbon monoxide
- B methane
- C nitrogen oxide
- D sulfur dioxide

35 Which combination of chemical compounds could be used to produce the fertiliser shown?



- A NH_4NO_3 , $\text{Ca}_3(\text{PO}_4)_2$
- B NH_4NO_3 , $\text{CO}(\text{NH}_2)_2$
- C NH_4NO_3 , K_2SO_4 , $(\text{NH}_4)_2\text{SO}_4$
- D $(\text{NH}_4)_3\text{PO}_4$, KCl

36 The diagram represents the molecule of an organic compound.



key

○ = carbon

● = oxygen

● = hydrogen

What is the name of the compound?

- A ethane
- B ethanoic acid
- C ethanol
- D ethene

37 When glucose is fermented, ethanol is formed together with

- A carbon dioxide.
- B ethene.
- C methane.
- D oxygen.

38 The table shows the composition of four different types of petroleum (crude oil).

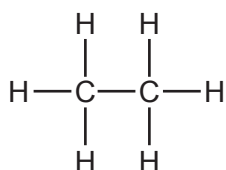
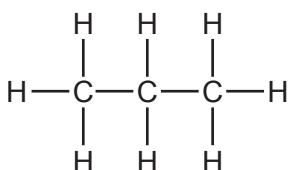
fraction	Arabian Heavy /%	Arabian Light /%	Iranian Heavy /%	North Sea /%
gasoline	18	21	21	23
kerosene	11.5	13	13	15
diesel	18	20	20	24
fuel oil	52.5	46	46	38

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

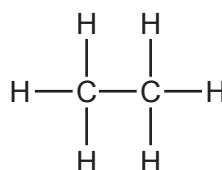
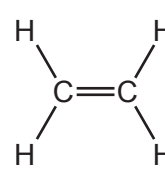
- A Arabian Heavy
- B Arabian Light
- C Iranian Heavy
- D North Sea

39 Which pair of compounds are members of the same homologous series?

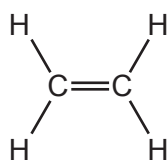
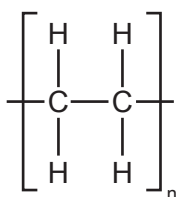
A



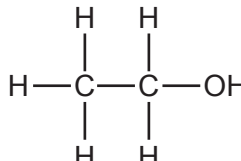
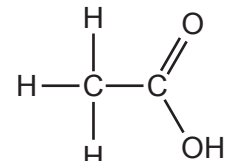
B



C



D



40 Petroleum is a very important raw material that is separated into more useful products.

Which terms describe petroleum and the method used to separate it?

	petroleum is a	method used to separate petroleum
A	compound	cracking
B	compound	fractional distillation
C	mixture	cracking
D	mixture	fractional distillation

DATA SHEET
The Periodic Table of the Elements

Group																							
I	II											III	IV	V	VI	VII	0						
												1 H Hydrogen 1											
7 Li Lithium 3	9 Be Beryllium 4																						
23 Na Sodium 11	24 Mg Magnesium 12																						
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	84 Kr Krypton 36							
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	101 Ru Ruthenium 44	101 Rh Rhodium 45	103 Pd Palladium 46	106 Ag Silver 47	108 Cd Cadmium 48	112 In Indium 49	115 Sn Tin 50	119 Sb Antimony 51	122 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54							
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	222 Rn Radon 86							
87 Fr Francium	88 Ra Radium	89 Ac Actinium																					
58-71 Lanthanoid series																							
90-103 Actinoid series																							
175 Lu Lutetium 71																							
173 Yb Ytterbium 70																							
169 Tm Thulium 69																							
167 Er Erbium 68																							
165 Ho Holmium 67																							
162 Dy Dysprosium 66																							
159 Tb Terbium 65																							
157 Gd Gadolinium 64																							
152 Eu Europium 63																							
150 Sm Samarium 62																							
144 Nd Neodymium 60																							
141 Pr Praseodymium 59																							
140 Ce Cerium 58																							
238 U Uranium 92																							
236 Pu Plutonium 94																							
234 Th Thorium 90																							
232 Pa Protactinium 91																							
230 Th Thorium 90																							
228 Ra Radium 88																							
226 Fr Francium 87																							
227 Ac Actinium 89																							
227 Fr Francium 87																							
226 Ra Radium 88																							
227 Ac Actinium 89																							
228 Th Thorium 90																							
232 U Uranium 92																							
238 Pu Plutonium 94																							
244 Pu Plutonium 94																							
244 Cf Californium 98																							
254 Es Einsteinium 99																							
254 Fm Fermium 100																							
258 Md Mendelevium 101																							
259 No Nobelium 102																							
261 Lr Lawrencium 103																							