



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

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CHEMISTRY (US)

0439/11

Paper 1 Multiple Choice

October/November 2012

45 Minutes

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

* 6 2 3 7 9 7 3 0 6 1 *

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.

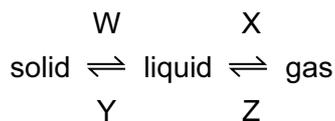
A copy of the Periodic Table is printed on page 16.

You may use a calculator.

This document consists of **15** printed pages and **1** blank page.



- 1 What are the processes W, X, Y and Z in the following diagram?



	W	X	Y	Z
A	condensing	boiling	freezing	melting
B	condensing	freezing	melting	boiling
C	melting	boiling	freezing	condensing
D	melting	freezing	condensing	boiling

- 2 A mixture of sulfur and iron filings needs to be separated. The solubilities of sulfur and iron filings in water and carbon disulfide are shown in the table below.

	solubility in water	solubility in carbon disulfide
sulfur	x	✓
iron filings	x	x

What are possible methods of separating the sulfur and iron filings?

	using water	using carbon disulfide	using a magnet
A	✓	✓	x
B	x	✓	✓
C	✓	x	✓
D	x	✓	x

- 3 Part of the instructions in an experiment reads as follows.

Quickly add 50 cm³ of acid.

What is the best piece of apparatus to use?

- A** a buret
- B** an Erlenmeyer flask
- C** a graduated cylinder
- D** a pipet

- 4 Which statements comparing the properties of electrons, neutrons and protons are correct?

	neutrons and protons are both heavier than electrons	only electrons and neutrons are charged
A	✓	✓
B	✓	x
C	x	✓
D	x	x

- 5 Which row gives the number of electrons in the outer electron shell of fluorine and of neon?

	${}^{19}_{9}\text{F}$	${}^{20}_{10}\text{Ne}$
A	7	8
B	7	10
C	9	8
D	9	10

- 6 In the molecules CH_4 , HCl and H_2O , which atoms use **all** of their outer shell electrons in bonding?

A C and Cl **B** C and H **C** Cl and H **D** H and O

- 7 The table shows the electronic structures of four atoms.

atom	electronic structure
W	2,1
X	2,7
Y	2,8,4
Z	2,8,8

Which two atoms combine to form an ionic compound?

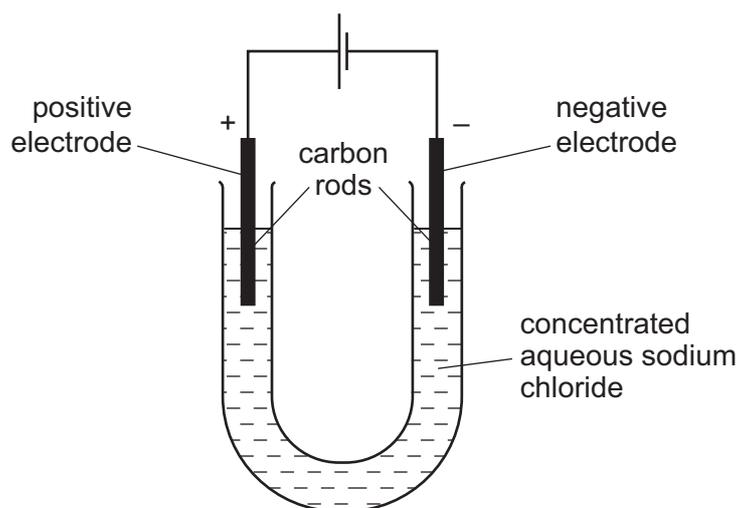
A W and X **B** W and Y **C** X and Y **D** X and Z

8 A compound has the formula $\text{CH}_3\text{CO}_2\text{H}$.

How should the relative molecular mass, M_r , of this compound be calculated?

- A $12 + 1 + 16$
- B $3(12 + 1) + 2(12 + 16) + 1$
- C $(4 \times 12) + (2 \times 1) + 16$
- D $(2 \times 12) + (4 \times 1) + (2 \times 16)$

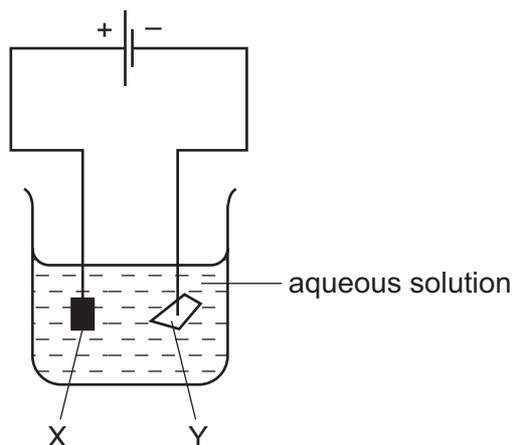
9 The diagram shows the electrolysis of concentrated aqueous sodium chloride.



What is produced at each of the electrodes?

	product at cathode	product at anode
A	hydrogen	chlorine
B	hydrogen	oxygen
C	sodium	chlorine
D	sodium	oxygen

- 10 The diagram shows an electrolysis experiment using metals X and Y as electrodes.

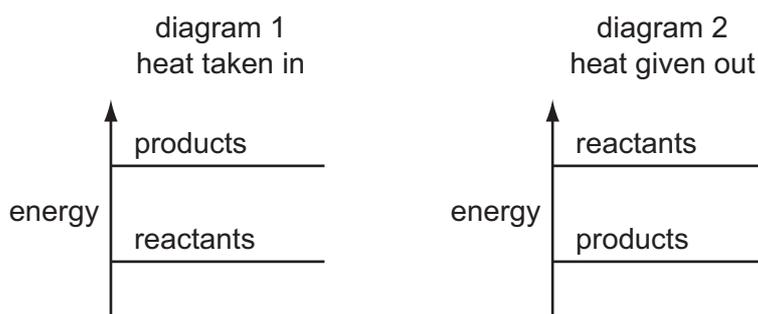


One of the metals becomes coated with copper.

Which metal becomes coated and which aqueous solution is used?

	metal	aqueous solution
A	X	CrCl_3
B	X	CuCl_2
C	Y	CrCl_3
D	Y	CuCl_2

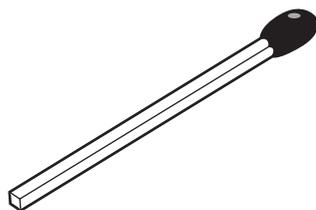
- 11 The diagrams show the difference in energies of the reactants and products in two types of reaction.



Which diagram and which type of energy change apply to a fuel burning in air?

	diagram	type of energy change
A	1	endothermic
B	1	exothermic
C	2	endothermic
D	2	exothermic

12 The diagram shows a match.



By striking the match, a chemical reaction takes place.

Which statements about the chemical reaction are correct?

	type of reaction	reason
A	endothermic	because energy is used to strike the match
B	endothermic	because energy is given out as the match burns
C	exothermic	because energy is used to strike the match
D	exothermic	because energy is given out as the match burns

13 Separate samples of anhydrous and hydrated copper(II) sulfate are heated.



Which shows the correct color changes?

	anhydrous copper(II) sulfate	hydrated copper(II) sulfate
A	blue to white	white to blue
B	no change	blue to white
C	white to blue	blue to white
D	white to blue	no change

14 Which change is an oxidation?

- A** FeO to Fe₂O₃
- B** Fe₂O₃ to FeO
- C** H₂O₂ to H₂O
- D** H₂O to H₂

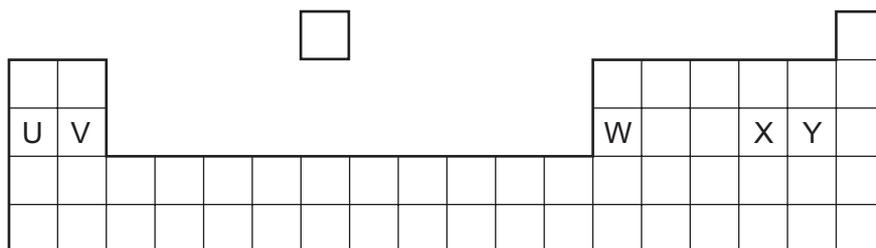
- 15 Which change does **not** increase the speed of reaction between zinc and hydrochloric acid?
- A adding a catalyst
 B decreasing the particle size of the zinc
 C decreasing the temperature
 D using more concentrated acid
- 16 Which of these pairs of aqueous ions **both** react with dilute sulfuric acid to give a visible result?
- A Ba^{2+} and Cl^-
 B Ba^{2+} and CO_3^{2-}
 C NH_4^+ and Cl^-
 D NH_4^+ and CO_3^{2-}
- 17 Element X forms an acidic, covalent oxide.

Which row shows how many electrons there could be in the outer shell of an atom of X?

	1	2	6	7
A	✓	✓	x	x
B	✓	x	✓	x
C	x	x	✓	✓
D	x	✓	x	✓

- 18 Barium hydroxide is an alkali. It reacts with hydrochloric acid.
- How does the pH of the hydrochloric acid change as an excess of aqueous barium hydroxide is added?
- A The pH decreases from 14 and becomes constant at 7.
 B The pH decreases from 14 to about 1.
 C The pH increases from 1 and becomes constant at 7.
 D The pH increases from 1 to about 14.
- 19 A compound is a salt if it
- A can neutralize an acid.
 B contains more than one element.
 C dissolves in water.
 D is formed when an acid reacts with a base.

20 The diagram shows an outline of the Periodic Table.



Which of the elements U, V, W, X and Y would react together in the ratio of 1 : 1?

- A** U and X **B** U and Y **C** V and Y **D** W and X

21 The element rubidium, Rb, is immediately below potassium in the Periodic Table.

It reacts with bromine to form the compound rubidium bromide.

Which descriptions of this compound are correct?

	type of bond	formula	color
A	covalent	RbBr	brown
B	covalent	RbBr ₂	white
C	ionic	RbBr	white
D	ionic	RbBr ₂	brown

22 The table gives information about four elements.

Which element is a transition metal?

	color of element	electrical conductivity of element	color of oxide
A	black	high	colorless
B	colorless	low	white
C	gray	high	red
D	yellow	low	colorless

23 Why are weather balloons filled with helium rather than hydrogen?

- A Helium is found in air.
- B Helium is less dense than hydrogen.
- C Helium is more dense than hydrogen.
- D Helium is unreactive.

24 Some properties of aluminum are listed.

- 1 It has mechanical strength.
- 2 It conducts heat.
- 3 It is resistant to corrosion.
- 4 It has a low density.

Which properties make aluminum useful for making the bodies of aircraft?

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

25 Brass is used in electrical equipment.

It contains two1..... elements. Together they form2..... .

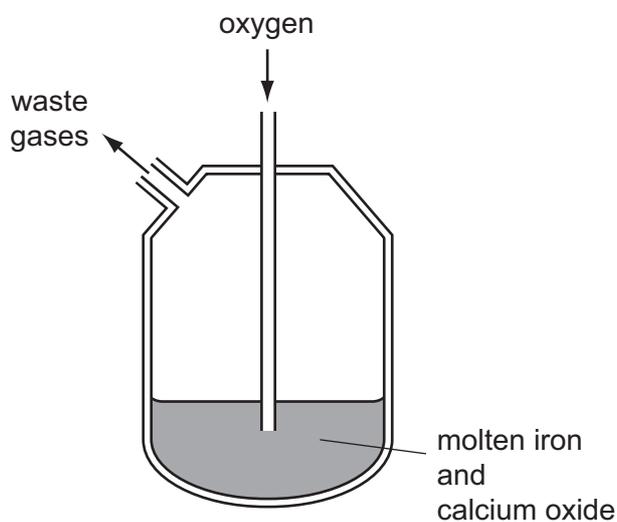
Which words correctly complete gaps 1 and 2?

	1	2
A	metallic	a covalent compound
B	metallic	an alloy
C	non-metallic	a covalent compound
D	non-metallic	an alloy

26 The Basic Oxygen Process converts iron into steel.

In step 1, oxygen is blown into impure molten iron.

In step 2, oxides are removed by reaction with calcium oxide.

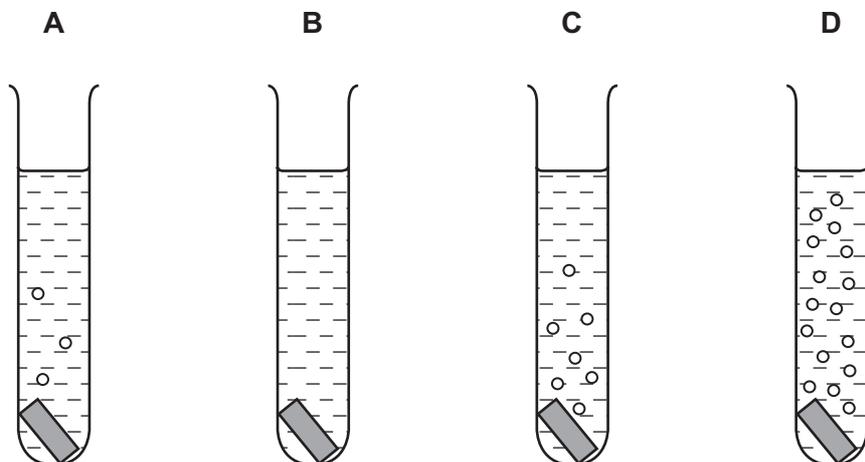


Which chemical reaction takes place in step 1 and which type of oxides are removed in step 2?

	chemical reaction in step 1	type of oxides removed in step 2
A	carbon is converted to carbon dioxide	acidic
B	carbon is converted to carbon dioxide	basic
C	iron is converted to iron(III) oxide	acidic
D	iron is converted to iron(III) oxide	basic

27 Pieces of copper, iron, magnesium and zinc are added to separate test-tubes containing dilute hydrochloric acid.

Which test-tube contains iron and dilute hydrochloric acid?



28 Which processes are used in the treatment of water?

- A filtration and chlorination
- B filtration and reduction
- C neutralization and chlorination
- D neutralization and reduction

29 A factory burns coal with a high sulfur content.

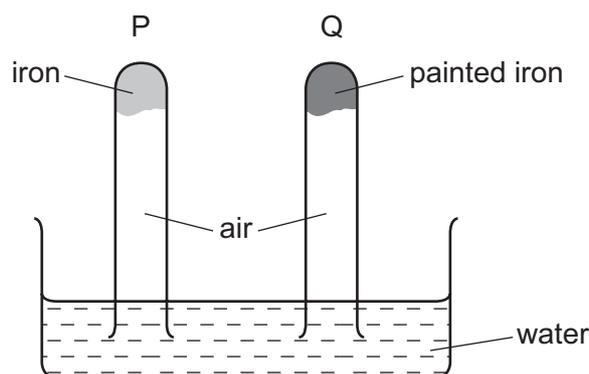
Which pollutant is **most** likely to lead to the death of trees?

- A carbon dioxide
- B carbon monoxide
- C lead compounds
- D sulfur dioxide

30 What is the correct order of abundance of the gases in the air?

- A nitrogen → oxygen → argon → carbon dioxide
- B nitrogen → oxygen → carbon dioxide → argon
- C oxygen → nitrogen → argon → carbon dioxide
- D oxygen → nitrogen → carbon dioxide → argon

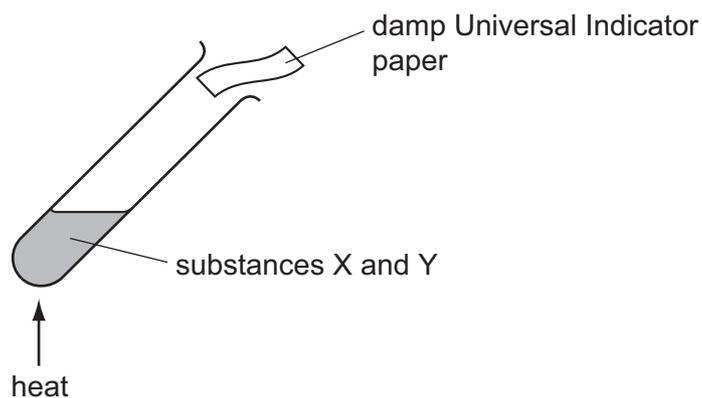
31 The diagram shows an experiment to investigate how paint affects the rusting of iron.



What happens to the water level in tubes P and Q?

	tube P	tube Q
A	falls	rises
B	no change	rises
C	rises	falls
D	rises	no change

32 The diagram shows two substances, X and Y, being heated together.

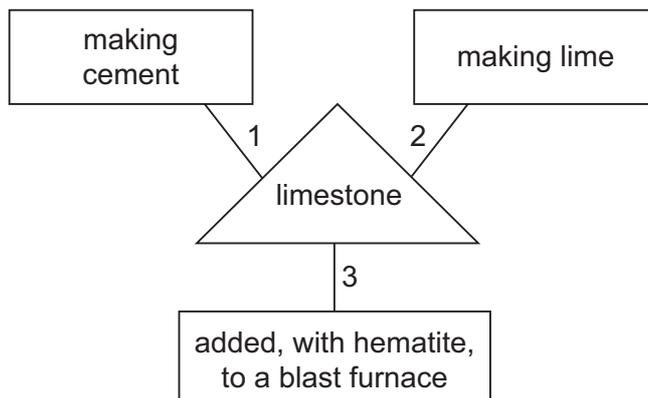


The Universal Indicator paper turns blue during the experiment.

What are substances X and Y?

- A ammonium nitrate and hydrochloric acid
 - B ammonium nitrate and sodium hydroxide
 - C sodium carbonate and hydrochloric acid
 - D sodium carbonate and sodium hydroxide
- 33 Carbon dioxide is produced when dilute hydrochloric acid reacts with
- A calcium sulfate.
 - B carbon.
 - C copper(II) carbonate.
 - D limewater.

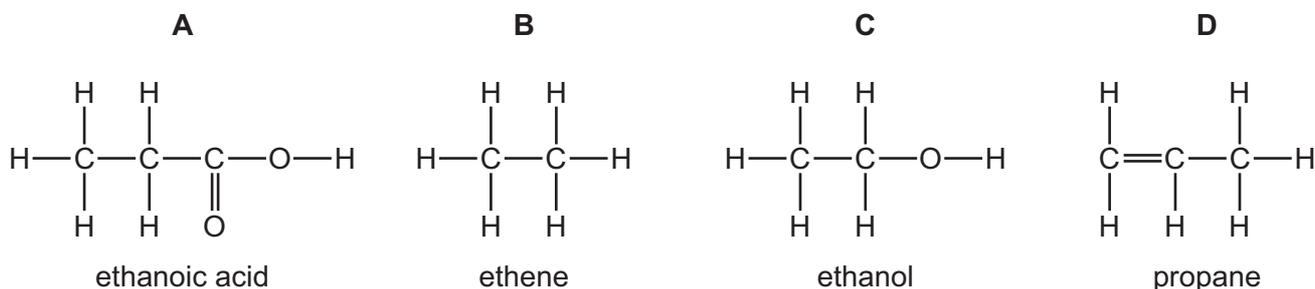
34 A student is asked to draw a diagram showing the uses of limestone.



Which numbered lines show a correct use of limestone?

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

35 Which structure is correctly named?



36 Which properties of the different compounds in petroleum enable its separation into fractions?

- 1 boiling point
- 2 chain length
- 3 chemical reactivity
- 4 solubility in water

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

37 Alkenes have the general formula C_nH_{2n} .

Which of the following is an alkene?

- A** CH_2 **B** CH_4 **C** C_3H_6 **D** C_6H_6

38 Bitumen is a substance obtained from the fractional distillation of petroleum.

Which row describes its boiling point and the size of its molecules?

	boiling point	size of molecules
A	high	large
B	high	small
C	low	large
D	low	small

39 A hydrocarbon X is cracked to make Y and hydrogen.

Compound Z is formed by the addition polymerization of Y.

To which homologous series do X, Y and Z belong?

	alkane	alkene
A	X, Y and Z	–
B	X and Y	Z
C	X and Z	Y
D	Y and Z	X

40 Which row is correct for ethanol?

	burns	made by fermentation
A	✓	✓
B	✓	x
C	x	✓
D	x	x

DATA SHEET
The Periodic Table of the Elements

		Group															
I	II	III	IV	V	VI	VII	0					0					
1 H Hydrogen											2 He Helium						
3 Li Lithium	4 Be Beryllium	5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon	11 B Boron	12 C Carbon	13 Al Aluminum	14 N Nitrogen	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon		
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon
55 Cs Caesium	56 Ba Barium	57 La Lanthanum	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon
87 Fr Francium	88 Ra Radium	89 Ac Actinium											103 Lr Lawrencium				
		*58-71 Lanthanoid series												102 No Nobelium			
		†90-103 Actinoid series												101 Md Mendelevium			
		Key												100 Fm Fermium			
		a = relative atomic mass												99 Es Einsteinium			
		X = atomic symbol												98 Cf Californium			
		b = proton (atomic) number												97 Bk Berkelium			
														96 Cm Curium			
														95 Am Americium			
														94 Pu Plutonium			
														93 Np Neptunium			
														92 U Uranium			
														91 Pa Protactinium			
														90 Th Thorium			
														89 Pr Praseodymium			
														88 Ce Cerium			
														87 Pm Promethium			
														86 Sm Samarium			
														85 Eu Europium			
														84 Gd Gadolinium			
														83 Tb Terbium			
														82 Dy Dysprosium			
														81 Ho Holmium			
														80 Er Erbium			
														79 Tm Thulium			
														78 Yb Ytterbium			
														77 Lu Lutetium			
														76 Hf Hafnium			
														75 Ta Tantalum			
														74 W Tungsten			
														73 Re Rhenium			
														72 Os Osmium			
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														0 Pb Lead			
														0 Bi Bismuth			
														0 Po Polonium			
														0 At Astatine			
														0 Rn Radon			

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

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