

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

CHEMISTRY 0620/12

Paper 1 Multiple Choice May/June 2010

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 The diagram shows a cup of tea.



Which row describes the water particles in the air above the cup compared with the water particles in the cup?

	moving faster	closer together
Α	✓	✓
В	✓	X
С	x	✓
D	X	X

2 Which row shows the change that takes place when element X gains the new particle shown?

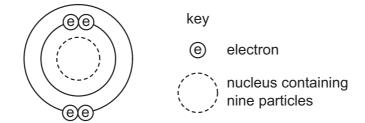
	particle gained	change
Α	electron	an isotope of element X is formed
В	electron	the element one place to the right of X in the Periodic Table is formed
С	proton	an isotope of element X is formed
D	proton	the element one place to the right of X in the Periodic Table is formed

3 The symbols of two atoms may be written as shown.

Which statement about these atoms is correct?

- A They are different elements because they have different numbers of neutrons.
- **B** They are different elements because they have different numbers of protons.
- **C** They are isotopes of the same element because they have the same nucleon number.
- **D** They are isotopes of the same element because they have the same proton number.

4 The diagram shows an atom.



What is the proton number and neutron number of the atom?

	proton number	neutron number
Α	4	5
В	4	9
С	5	4
D	5	9

**5** A fruit drink coloured orange contains a dissolved mixture of red and yellow colouring agents. One of these colouring agents is suspected of being illegal.

Which method could be used to show the presence of this illegal colouring agent?

- **A** chromatography
- **B** distillation
- **C** evaporation
- **D** filtration
- A student carries out an experiment to find how fast 3 cm pieces of magnesium ribbon dissolve in 10 cm<sup>3</sup> samples of sulfuric acid at different temperatures.

Which piece of apparatus does the student not need?

- A balance
- **B** measuring cylinder
- C stop-clock
- **D** thermometer

7 Three electrolysis cells are set up. Each cell has inert electrodes.

The electrolytes are listed below.

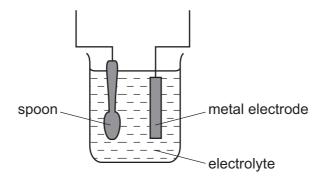
cell 1 aqueous sodium chloride

cell 2 concentrated hydrochloric acid

cell 3 molten lead(II) bromide

In which cells is a gas formed at both electrodes?

- **A** 1 and 2 **B** 1 and 3 **C** 2 only **D** 3 only
- 8 The diagram shows apparatus for plating a spoon with silver.



Which statement is **not** correct?

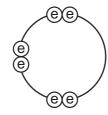
- A Silver would stick to the spoon because it is a very reactive metal.
- **B** The electrolyte would be a silver salt dissolved in water.
- **C** The metal electrode would be made from silver.
- **D** The spoon would be connected to the negative of the power supply.
- **9** Aqueous copper(II) sulfate solution is electrolysed using inert electrodes.

Copper(II) ions (Cu $^{2+}$ ), hydrogen ions (H $^+$ ), hydroxide ions (OH $^-$ ) and sulfate ions (SO $_4^{2-}$ ) are present in the solution.

To which electrodes are the ions attracted during this electrolysis?

	attracted to anode	attracted to cathode
Α	Cu²⁺ and H⁺	OH <sup>-</sup> and SO <sub>4</sub> <sup>2-</sup>
В	Cu <sup>2+</sup> and SO <sub>4</sub> <sup>2-</sup>	H⁺ and OH⁻
С	H <sup>⁺</sup> and OH <sup>⁻</sup>	Cu <sup>2+</sup> and SO <sub>4</sub> <sup>2-</sup>
D	OH <sup>-</sup> and SO <sub>4</sub> <sup>2-</sup>	Cu²⁺ and H⁺

- 10 In which compounds are pairs of electrons shared between atoms?
  - 1 sodium chloride
  - 2 methane
  - 3 lead bromide
  - A 1 only
- **B** 2 only
- **C** 1 and 3
- **D** 1, 2 and 3
- 11 Element X has six electrons in its outer shell.



key

e = electron

How could the element react?

- A by gaining two electrons to form a positive ion
- **B** by losing six electrons to form a negative ion
- C by sharing two electrons with two electrons from another element to form two covalent bonds
- D by sharing two electrons with two electrons from another element to form four covalent bonds
- 12 Hydrogen and chlorine react as shown.

1 molecule of hydrogen + 1 molecule of chlorine - 2 molecules of hydrogen chloride

What is the equation for this reaction?

- **A**  $2H + 2Cl \rightarrow 2HCl$
- **B**  $2H + 2Cl \rightarrow H_2Cl_2$
- **C**  $H_2 + Cl_2 \rightarrow 2HCl$
- **D**  $H_2 + Cl_2 \rightarrow H_2Cl_2$
- **13** Which name is given to mixtures of metals?
  - A alloys
  - **B** compounds
  - C ores
  - **D** salts

14 Iron is extracted from iron oxide using carbon monoxide as shown in the equation.

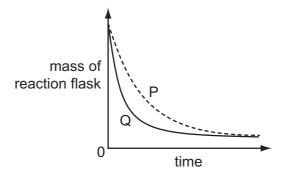
iron oxide + carbon monoxide → iron + carbon dioxide

What does the equation show?

- **A** Carbon monoxide is oxidised to carbon dioxide.
- **B** Carbon monoxide is reduced to carbon dioxide.
- **C** Iron is oxidised to iron oxide.
- **D** Iron oxide is oxidised to iron.
- **15** A student investigates the rate of reaction between marble chips and hydrochloric acid.

The loss in mass of the reaction flask is measured.

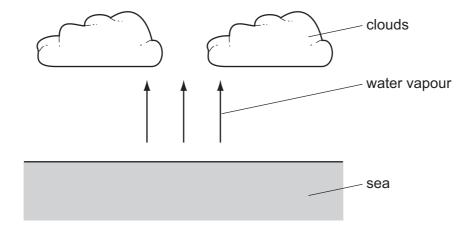
The graph shows the results of two experiments, P and Q.



Which change explains the difference between P and Q?

- A A catalyst is added in P.
- **B** A higher temperature is used in P.
- **C** Bigger marble chips are used in Q.
- **D** Hydrochloric acid is more concentrated in Q.

**16** Clouds are formed when water vapour evaporates from the sea.



What is the energy change and what name is given to the type of change when water evaporates?

	energy change	type of change
Α	energy given out	endothermic
В	energy given out	exothermic
С	energy taken in	endothermic
D	energy taken in	exothermic

- 17 Which process is **not** exothermic?
  - A burning a fossil fuel
  - **B** obtaining lime from limestone
  - C radioactive decay of <sup>235</sup>U
  - D reacting hydrogen with oxygen
- 18 When pink cobalt(II) sulfate crystals are heated, they form steam and a blue solid.

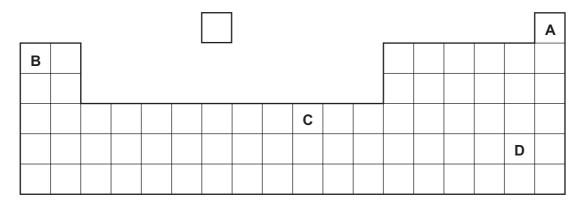
When water is added to the blue solid, it turns pink and becomes hot.

Which terms describe the pink cobalt(II) sulfate crystals and the reactions?

	pink cobalt sulfate	reactions
Α	aqueous	irreversible
В	aqueous	reversible
С	hydrated	irreversible
D	hydrated	reversible

**19** An element melts at 1455 °C, has a density of 8.90 g/cm<sup>3</sup> and forms a green chloride.

Where in the Periodic Table is this element found?



**20** An excess of copper(II) oxide is added to dilute sulfuric acid to make crystals of hydrated copper(II) sulfate.

The processes listed may be used to obtain crystals of hydrated copper(II) sulfate.

- 1 concentrate the resulting solution
- 2 filter
- 3 heat the crystals
- 4 wash the crystals

Which processes are needed and in which order?

- **A** 1, 2, 3 and 4
- **B** 1, 2, 4 and 3
- **C** 2, 1, 2 and 3
- **D** 2, 1, 2 and 4
- 21 Which is **not** a property of Group I metals?
  - **A** They are soft and can be cut with a knife.
  - **B** They corrode rapidly when exposed to oxygen in the air.
  - **C** They produce an acidic solution when they react with water.
  - **D** They react rapidly with water producing hydrogen gas.

**22** Aqueous sodium hydroxide is added to a solid, X, and the mixture is heated.

A green precipitate is formed and an alkaline gas is given off.

Which ions are present in X?

- **A**  $NH_{4}^{+}$  and  $Fe^{2+}$
- $\textbf{B} \quad \text{NH}_{\text{4}}^{^{+}} \text{ and Fe}^{\text{3+}}$
- C OH<sup>-</sup> and Fe<sup>2+</sup>
- **D** OH<sup>-</sup> and Fe<sup>3+</sup>
- 23 An aqueous solution of the organic compound methylamine has a pH greater than 7.

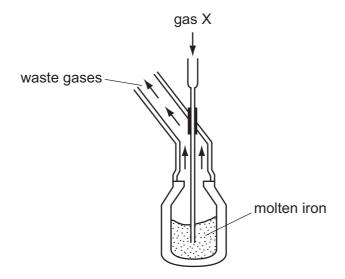
Which statement about methylamine is correct?

- **A** It neutralises an aqueous solution of sodium hydroxide.
- **B** It reacts with copper(II) carbonate to give carbon dioxide.
- **C** It reacts with hydrochloric acid to form a salt.
- **D** It turns blue litmus red.
- **24** The positions in the Periodic Table of four elements are shown.

Which element is **most** likely to form an acidic oxide?

Α										
	В									
									С	
										D

25 The diagram shows the manufacture of steel.



What is gas X?

- A carbon dioxide
- **B** chlorine
- C hydrogen
- **D** oxygen
- 26 A student added dilute hydrochloric acid to four metals and recorded the results.

Not all of the results are correct.

	res	ults
	metal	gas given off
1	copper	yes
2	iron	yes
3	magnesium	no
4	zinc	yes

Which two results are correct?

**A** 1 and 3

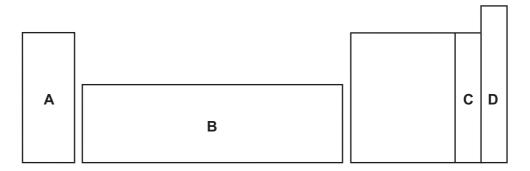
**B** 1 and 4

**C** 2 and 3

**D** 2 and 4

27 An element does not conduct electricity and exists as diatomic molecules.

In which area of the Periodic Table is the element to be found?



**28** Copper, iron and zinc are all used as pure metals.

Which of these three metals are also used in alloys?

	copper	iron	zinc
Α	✓	✓	✓
В	✓	✓	X
С	X	✓	✓
D	X	X	✓

29 Solutions of a halogen and a sodium halide are mixed.

Which mixture darkens in colour because a reaction occurs?

- A bromine and sodium chloride
- B bromine and sodium fluoride
- C chlorine and sodium fluoride
- D chlorine and sodium iodide
- **30** Some properties of four elements are shown in the table.

Which element is a metal?

	melting point/°C	electrical conductivity when liquid	electrical conductivity when solid
Α	<b>–7</b>	low	low
В	801	high	low
С	1535	high	high
D	3550	low	low

31 The diagram shows three types of item.



Which method of rust prevention can be used for all three types of item?

- A coating with plastic
- B covering with grease
- **C** galvanising
- D using stainless steel
- **32** Aluminium is an important metal with many uses.

Some of its properties are listed.

- 1 It is a good conductor of heat.
- 2 It is a reactive metal.
- 3 It has a low density.
- 4 It has an oxide layer that prevents corrosion.

Which set of properties help to explain the use of aluminium for cooking and storing food?

- **A** 1, 2 and 3
- **B** 1, 2 and 4
- **C** 1, 3 and 4
- **D** 2, 3 and 4
- 33 To grow roses, a fertiliser containing nitrogen, phosphorus and potassium is needed.

For the best flowers, the fertiliser should contain a high proportion of potassium.

Which fertiliser is best for roses?

fertiliser	proportion by mass					
	N	K				
Α	9	0	25			
В	13	13	20			
С	29	5	0			
D	29	15	5			

34	Wh	h statements about water are correct?
		1 Water is treated with chlorine to kill bacteria.
		2 Household water may contain salts in solution.
		3 Water is used in industry for cooling.
		4 Water for household use is filtered to remove soluble impurities.
	Α	I, 2 and 3 <b>B</b> 1 and 4 <b>C</b> 2, 3 and 4 <b>D</b> 1, 2, 3 and 4
35	Wh	h statement about methane is <b>not</b> correct?
	Α	t is a liquid produced by distilling petroleum.
	В	t is produced as vegetation decomposes.
	С	t is produced by animals such as cows.
	D	t is used as a fuel.
36	Wh	h compound in polluted air can damage stonework and kill trees?
	Α	carbon dioxide
	В	carbon monoxide
	С	ead compounds
	D	sulfur dioxide
37	Die	el, petrol and bitumen are all
	Α	uels.
	В	nydrocarbons.
	С	ubricants.

D waxes.

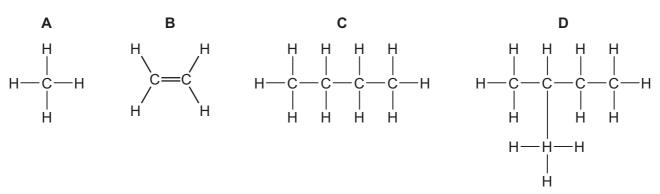
38 A macromolecule is a very large molecule.

Macromolecules can be made by joining smaller molecules together. This is called polymerisation.

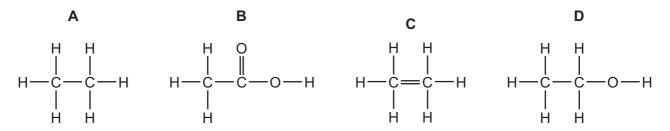
Which row in the table describes the formation of a polymer?

	monomer	polymer
Α	ethane	poly(ethane)
В	ethene	poly(ethene)
С	ethane	poly(ethene)
D	ethene	poly(ethane)

39 Which structure shows a compound that belongs to a different homologous series to propane?



**40** Which structure is **incorrect**?



15

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DATA SHEET
The Periodic Table of the Elements

Group	0	4 Helium	20 <b>Ne</b> Neon	40 <b>Ar</b> Argon	84 Krypton	36	131 <b>X</b>	Xenon 54	-	Radon 86		175 <b>Lu</b> Lutetium 71	<b>Lr</b> Lawrencium 103
	IIΛ		19 <b>F</b> Fluorine	35.5 <b>C1</b> Chlorine	80 <b>Br</b> Bromine	35	127	lodine 53	•	At Astatine 85		173 <b>Yb</b> Ytterbium 70	Nobelium
	I		16 Oxygen 8	32 <b>S</b> Sulfur	79 <b>Se</b> Selenium	34	128 <b>7</b>	Tellurium 52	ı	Po Polonium 84		169 <b>Tm</b> Thulium 69	Md Mendelevium 101
	^		14 <b>N</b> Nitrogen 7	31 Phosphorus	75 <b>As</b> Arsenic	33	122 <b>7</b>	Antimony 51	209	Bismuth 83		167 <b>Er</b> Erbium 68	Fm Fermium
	//		12 <b>C</b> Carbon 6	28 Siicon	73 <b>Ge</b> Germanium	32	119	50 Tin	207	Pb Lead		165 <b>Ho</b> Holmium 67	Ensteinium
	Ш		11 Boron 5	27 <b>A1</b> Auminium 13	70 <b>Ga</b>	31	115	Indium 49	204	<b>T1</b> Thallium 81		162 <b>Dy</b> Dysprosium 66	Cf Californium 98
					65 <b>Zn</b> Zinc	30	112	Cadmium 48	201	Hg Mercury 80		159 <b>Tb</b> Terbium 65	Berkelium 97
					Copper	29	108	Silver 47	197	Au Gold		157 <b>Gd</b> Gadolinium 64	Cm Curium
					S9 Nickel	28	106 <b>D</b>	Palladium 46	195	<b>Pt</b> Platinum 78		152 <b>Eu</b> Europium 63	Am Americium 95
					Cobalt	27	103	Rhodium 45	192	Ir Iridium 77		150 <b>Sm</b> Samarium 62	Pu Plutonium 94
		1 <b>H</b> Hydrogen			56 Fe	26	101	Ruthenium 44	190	Osmium 76		<b>Pm</b> Promethium 61	Neptunium
					Manganese	25	Ļ	<sub>T</sub> 43	186	<b>Re</b> Rhenium 75		Neodymium 60	238 Unanium
					52 Cr	24	96 <b>Z</b>	Molybdenum 42	184	Tungsten 74		141 Pr Praseodymium 59	Pa Protactinium 91
					51 Vanadium	23	88 <b>Z</b>	Niobium 41	181	<b>Ta</b> Tantalum 73		140 <b>Ce</b> Cerium	232 <b>Th</b> Thorium
					48	22	91	Zirconium 40	178	72			nic mass bol nic) number
					Scandium	21	% <b>&gt;</b>	Yttrium 39	139	La Lanthanum 57 *	Ac Actinium 89	l series eries	a = relative atomic mass  X = atomic symbol b = proton (atomic) number
	=		9 <b>Be</b> Beryllium	24 Mg Magnesium	Calcium	20	® 0	Strontium 38	137	<b>Ba</b> Barium 56	226 <b>Ra</b> Radium 88	*58-71 Lanthanoid series 190-103 Actinoid series	» × °
	_		7 Lithium	23 <b>Na</b> Sodium	39 <b>K</b> Potassium	19	85	Rubidium 37	133	Cs Caesium 55	Francium 87	*58-71 L	Key

pro possible Evo

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).

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