Name: _____ ( ) Class:_____

PRELIMINARY EXAMINATION
GENERAL CERTIFICATION OF EDUCATION ORDINARY LEVEL

CHEMISTRY **6092/01**
Paper 1 Multiple Choice

2 September 2020
1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class on the Answer Sheet using a soft pencil.

There are forty questions in this paper.
Answer **all** questions.

For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the correct answer and record the corresponding letter using a soft pencil on the separate Answer Sheet.

Amendments may be done using a soft eraser.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
The use of an approved scientific calculator is expected, where appropriate.

A copy of Periodic Table is provided on page 2.
The total number of marks for this paper is 40.

For Examiner's Use	
Total (40)	

This document consists of **20** printed pages.

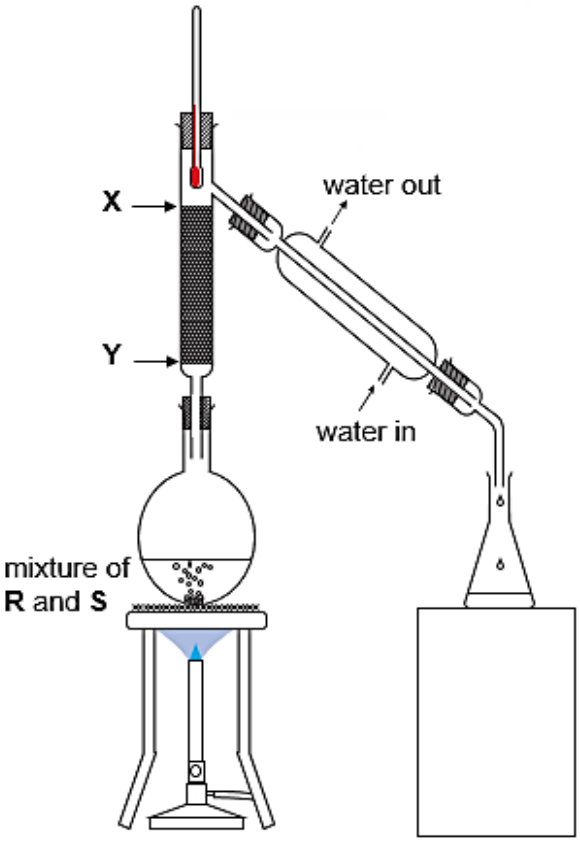
The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	0
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9		**Key** proton (atomic) number atomic symbol name relative atomic mass									5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium -	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57 – 71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89 – 103 actinoids	104 Rf Rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

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

1 The diagram below shows the fractional distillation of two liquids **R** and **S**. **R** has a boiling point of 80 °C and **S** has a boiling point of 120 °C. Which statement(s) about the experiment is/are correct?



1. At 70 °C, the vapour at point **X** contains more **R** than **S**.
2. The temperature at point **Y** is always higher than the temperature at point **X**.
3. At 90 °C, the liquid remaining in the round bottom flask contains **S** only.

A 1 only

B 2 only

C 1 and 2

D 1, 2 and 3

2 A bottle of copper(II) oxide has been contaminated with some solid potassium chloride. How can the potassium chloride be removed from copper(II) oxide?

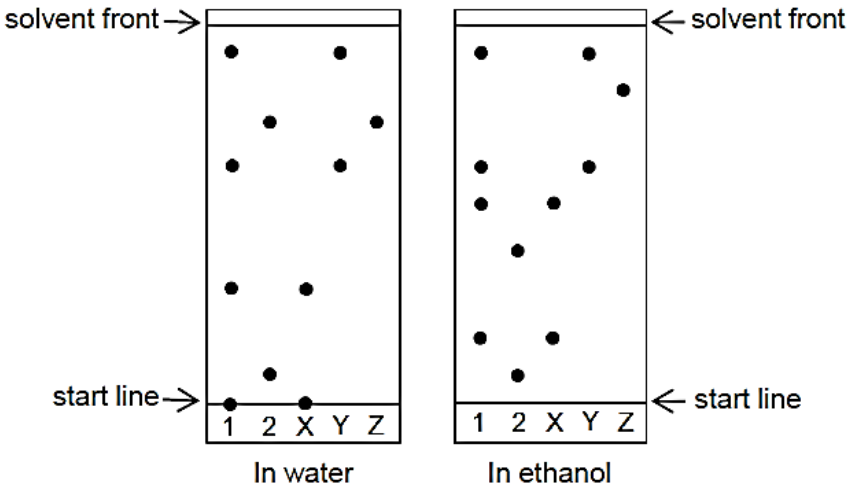
A Add water to the mixture and filter.

B Add dilute acid to the mixture and filter.

C Add aqueous silver nitrate to the mixture and filter.

D Heat the mixture and allow it to cool.

3 Food dyes 1 and 2 may contain the three harmful substances **X**, **Y** and **Z**. Two chromatograms are developed, one using water as the solvent, and the other using ethanol. The results are shown in the diagram below.



Which of the following statement(s) is/are correct?

1. There is a component in food dye 1 that is insoluble in water but soluble in ethanol.
2. The component in **Z** is more soluble in water than in ethanol.
3. Food dye 2 does not contain any of the three harmful substance.

A 1 only

B 2 only

C 1 and 2

D 1 and 3

4 Element **X** has n protons and forms ions with charge of -2. Element **Y** has (n+1) protons. What could be formed when element **X** reacts with element **Y**?

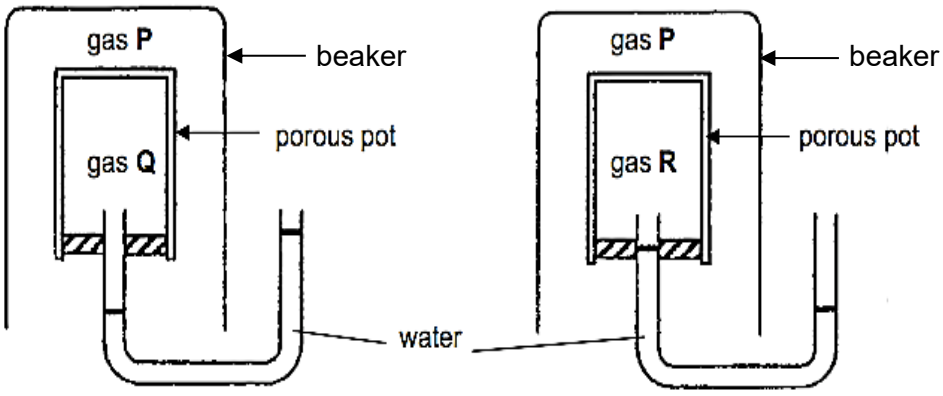
A an ionic compound with formula $\mathbf{X_2Y}$

B an ionic compound with formula $\mathbf{XY_2}$

C a covalent compound with formula $\mathbf{X_2Y}$

D a covalent compound with formula $\mathbf{XY_2}$

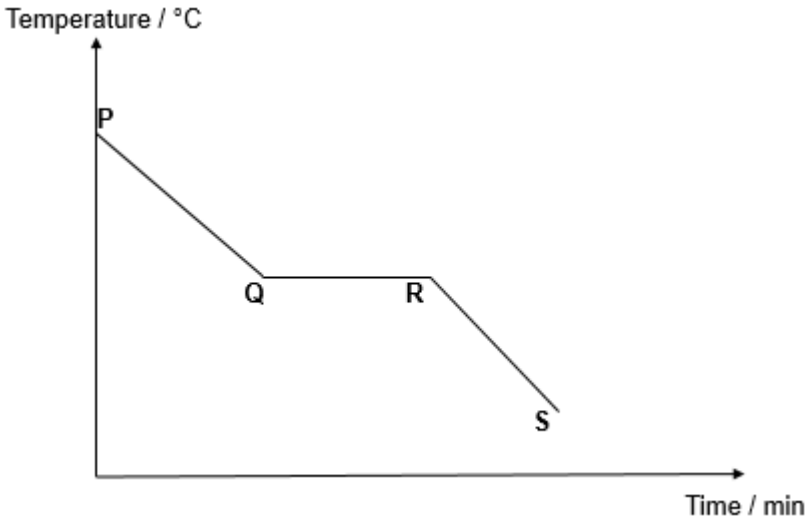
5 The apparatus shown can be used to study the diffusion of gases. Two beakers containing gas **P** were placed over two porous pots containing gases **Q** and **R** respectively. The results are shown.



What is the correct order of the relative molecular mass of gases **P**, **Q** and **R**?

	highest M_r ⟶		lowest M_r
A	**R**	**P**	**Q**
B	**R**	**Q**	**P**
C	**Q**	**P**	**R**
D	**P**	**Q**	**R**

6 A sample of gas is cooled and the temperature change is as shown.



Which of the following describes the arrangement and movement of the particles in the region **R** to **S**?

	arrangement of particles	movement of particles
A	close together in orderly arrangement	vibrating about fixed position
B	close together in orderly arrangement	moving at high speeds
C	close together in disorderly arrangement	sliding and rolling over each other
D	close together in disorderly arrangement	vibrating about fixed position

7 Which of the following statements describing the product formed from calcium and chlorine are correct?

1. The product has a fixed composition by mass of its elements.
2. The product has the smell of chlorine and the colour of calcium.
3. The product can be separated into simpler substances by physical means.
4. The product melts at a sharp temperature.

A 1 and 2

B 1 and 4

C 2 and 3

D 3 and 4

8 Gallium oxide has the formula Ga_2O_3 while rubidium phosphate has the formula Rb_3PO_4. What is the formula of gallium phosphate?

A $GaPO_4$

B Ga_2PO_4

C Ga_3PO_4

D $Ga_2(PO_4)_3$

9 At room temperature, tin exists as white tin which has a metallic structure. Below 13°C, white tin changes to grey tin which has a giant covalent structure similar to that of diamond. Which of the statements is correct?

A Both types of tin can conduct electricity.

B Both types of tin are soft and malleable.

C White tin is hard while grey tin is soft.

D White tin can conduct electricity while grey tin cannot.

10 A sample of 0.025 mol of the chloride of element **Z** was dissolved in 500 cm^3 of distilled water. 12.5 cm^3 of this solution reacted completely with 25.0 cm^3 of 0.1 mol/dm^3 silver nitrate solution. What is the most likely formula of the chloride?

A **Z**C*l*

B **Z**Cl_2

C **Z**Cl_3

D **Z**Cl_4

11 How many carbon atoms are present in 18 g of glucose, $C_6H_{12}O_6$, where 1 mole of any substance contains 6×10^{23} particles?

A 6.0×10^{22}

B 3.6×10^{23}

C 6.0×10^{23}

D 3.6×10^{24}

12 Carbon disulfide, CS_2, is a volatile flammable liquid. On combustion at room temperature and pressure, CS_2 reacts as follows:

$$CS_2\ (g) + 3O_2\ (g) \rightarrow CO_2\ (g) + 2SO_2\ (g)$$

A 20 cm^3 sample of CS_2 vapour was ignited with 100 cm^3 of oxygen. The final volume of gases after combustion is treated with an excess of an aqueous alkali. What is the percentage volume of gas that dissolves in the alkali?

A 20%

B 40%

C 60%

D 80%

13 Calcium is a mineral that the body needs for numerous functions, including building and maintaining bones and teeth. When 50 g of bone is strongly heated in excess air, 14 g of calcium oxide was obtained. What is the percentage by mass of calcium in the bone?

A 10%

B 14%

C 20%

D 28%

14 Which of the following statements is correct about the elements going from left to right in period 3 of the Periodic Table?

A The metallic properties of the elements increases.

B The tendency of the elements forming positive ions increases.

C The nature of the oxides of the elements changes from acidic to amphoteric to basic.

D The nature of the elements changes from strong reducing agents to strong oxidising agents.

15 An element **W** combines with oxygen to form two gases with the formulae **W**O and **W**O_2. **W**O does not react with acids nor alkalis while **W**O_2 reacts only with alkalis to form salt and water. What does this suggest about element **W**?

A It is a halogen.

B It is an alkali metal.

C It is a metal in Group II.

D It is a non-metal in Group V.

16 Caesium is an element in Group I of the Periodic Table. The following statements are made about caesium.

1. Caesium is soft and can be cut easily with a knife.
2. Caesium conducts electricity only in the solid state.
3. Caesium is a stronger reducing agent than rubidium.
4. Caesium reacts explosively with water to form an acidic solution.

Which statements about caesium are true?

A 1 and 2

B 1 and 3

C 1, 2 and 3

D 2, 3 and 4

17 Gas **X** is bubbled through aqueous sodium chloride and sodium iodide respectively. The following observations are made.

sodium chloride:	no visible change
sodium iodide:	cololurless solution turns brown spontaneously

What is the identity of **X**?

A ammonia

B chlorine

C fluorine

D hydrogen

18 In which of the following reactions does hydrogen behave as an oxidising agent?

A $H_2 + Cl_2 \rightarrow 2HCl$

B $2Na + H_2 \rightarrow 2NaH$

C $N_2 + 3H_2 \rightarrow 2NH_3$

D $C_2H_4 + H_2 \rightarrow C_2H_6$

19 The reaction between copper and concentrated nitric acid is shown below.

$$Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$$

Which statement(s) about this reaction is/are **incorrect**?

1. HNO_3 is a reducing agent.
2. Cu gains electrons during the reaction.
3. The oxidation state of nitrogen in $Cu(NO_3)_2$ is -5.
4. The oxidation state or oxygen remains unchanged during the reaction.

A 1 and 3

B 1 and 4

C 1, 2 and 3

D 2, 3 and 4

20 Small portions of aqueous potassium iodide and acidified potassium manganate(VII) solution are added to four solutions. The colour changes observed are as shown below.

solution	potassium iodide	acidified potassium manganate (VII)
1	no visible change	purple to colourless
2	no visible change	no visible change
3	colourless to brown	purple to colourless
4	colourless to brown	no visible change

Which solution(s) contain(s) a reducing agent only?

A 1 only

B 4 only

C 1 and 2

D 3 and 4

21 Which of the following methods is/are best able to distinguish an aqueous solution of ethanoic acid, CH_3COOH from dilute hydrochloric acid, HC*l* of the same concentration?

1. litmus paper
2. electrical conductivity
3. volume of carbon dioxide produced per minute when excess copper(II) carbonate is added

A 1 only

B 1 and 2

C 2 and 3

D 1, 2 and 3

22 Which of the following reagents are most suitable for the preparation of potassium sulfate?

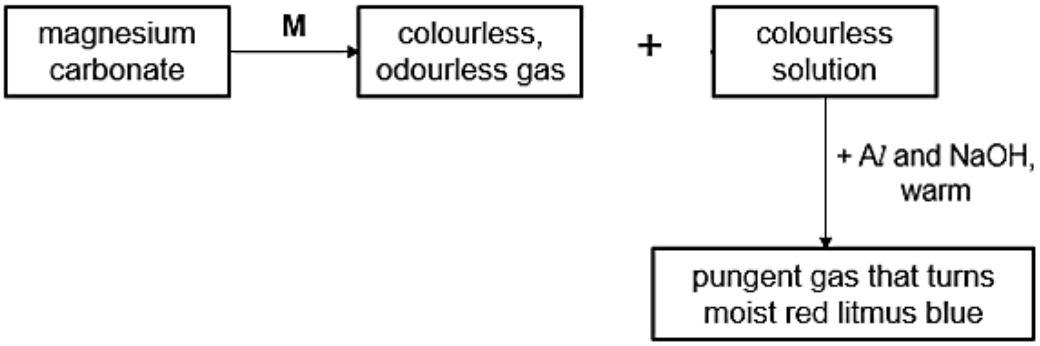
A potassium and dilute sulfuric acid

B potassium hydroxide and dilute sulfuric acid

C potassium chloride with dilute sulfuric acid

D potassium carbonate and sodium sulfate solution

23 The diagram shows a reaction scheme.



What is the identity of **M**?

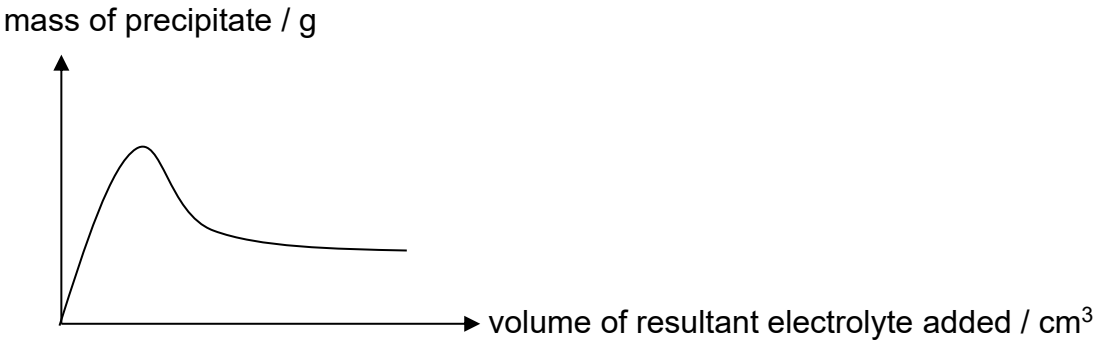
A aqueous ammonia

B dilute nitric acid

C dilute sulfuric acid

D dilute hydrochloric acid

24 In an experiment, electrolysis of concentrated potassium chloride was carried out using inert electrodes. The resultant electrolyte was then added to an aqueous solution of an unknown sample. The graph below shows the mass of the precipitate formed as the resultant electrolyte was being added.



Which of the following cations could have been in the unknown sample?

A Cu^{2+}

B Fe^{2+}

C Pb^{2+}

D Zn^{2+}

25 Which of the following statements is correct?

A A catalyst decreases the activation energy and makes the reaction proceed slower.

B In a combustion reaction, the products have less energy than the reactants.

C Melting and boiling are examples of physical changes that are exothermic.

D In an exothermic reaction, energy absorbed in breaking bonds is greater than the energy released in forming bonds.

26 The reaction between hydrogen and bromine to form hydrogen bromide can be written as follows:

$$H_2 + Br_2 \rightarrow 2HBr$$

type of bond	bond energy kJ/mol
H – H	436
Br – Br	193
H – Br	366

Use the bond energies shown to calculate the energy change that takes place when 1 mole of hydrogen bromide is formed according to the above equation.

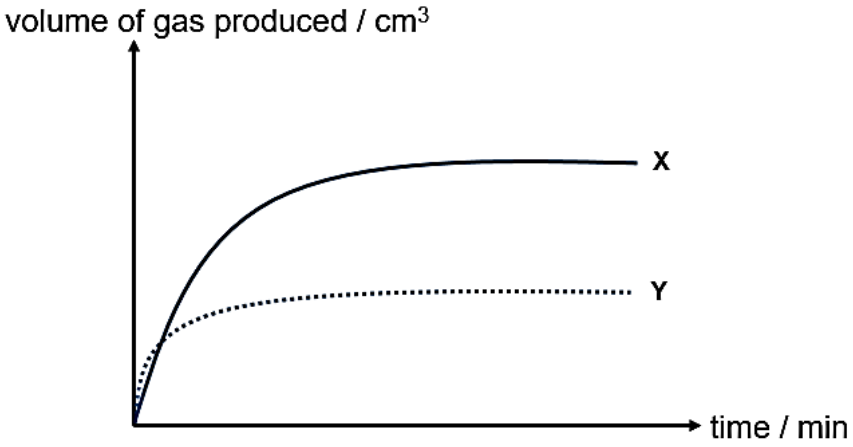
A −51.5 kJ/mol

B −103 kJ/mol

C +51.5 kJ/mol

D +131.5 kJ/mol

27 In the graph shown below, curve X represents the reaction between 2 g of zinc granules and excess dilute sulfuric acid at 25°C. Which of the following changes would produce curve Y?



A Using 1 g of zinc granules at 25 °C

B Using 2 g of zinc granules at 35 °C

C Using 1 g of zinc powder at 25 °C

D Using 2 g of zinc powder at 35 °C

28 Magnesium carbonate reacts with dilute hydrochloric acid. Which solution would give the fastest initial rate of reaction?

A 40 g of HC*l* in 1000 cm^3 of water

B 30 g of HC*l* in 500 cm^3 of water

C 20 g of HC*l* in 1000 cm^3 of water

D 10 g of HC*l* in 500 cm^3 of water

29 Which of the following statements are true?

1. Catalysed and uncatalysed reactions proceed through the same reaction pathway.
2. Reactions are faster at higher temperature because of lower activation energies.
3. Reactions are faster when a catalyst is added due to larger fraction of particles having sufficient energy to react.
4. Reactions are faster at higher concentrations because reactant particles collide more frequently.

A 1 and 2

B 3 and 4

C 1, 2 and 4

D 2, 3 and 4

30 Ammonia is produced through Haber process. The reaction is as follows:

$$N_2 + 3H_2 \rightleftharpoons 2NH_3 \qquad \Delta H = \text{negative}$$

Which statement about the reaction is correct?

A Energy is absorbed from the surroundings when ammonia is formed.

B When 3 dm^3 of H_2 and 3 dm^3 of N_2 were added together, the final reaction mixture contains NH_3, N_2 and H_2.

C There is an increase in volume when ammonia is formed.

D The conditions required for reaction are 450 atm and 250 °C.

31 Catalytic converters are used in the removal of harmful pollutants from exhaust gases. Which equation shows the reaction taking place in the catalytic converter?

A $2C + 2NO \rightarrow N_2 + 2CO$

B $CO_2 + NO \rightarrow CO + NO_2$

C $CO + NO_2 \rightarrow CO_2 + NO$

D $2CO + 2NO \rightarrow 2CO_2 + N_2$

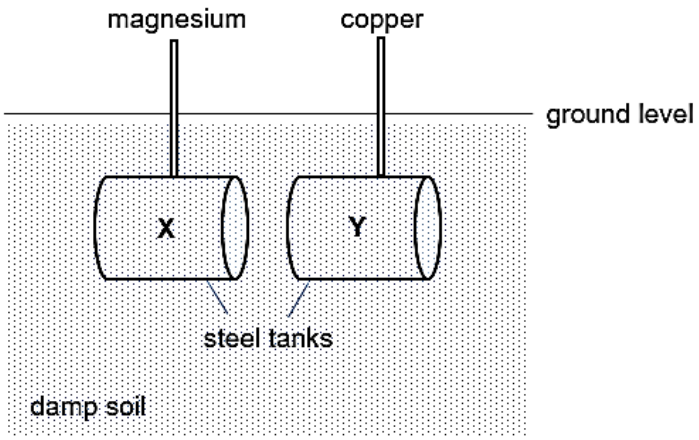
32 The table below gives the relative concentrations of polluting gases in the air in four different industralised cities. In which city are limestone buildings most threatened by pollution?

	sulfur dioxide	nitrogen dioxide	ozone
A	17	46	23
B	32	33	30
C	38	40	11
D	45	14	21

33 Metal **W** reacts with dilute hydrochloric acid. It is used in the building of bridges and beams in buildings. Metal **Y** is commonly attached on ship hulls to prevent rusting. Metal **Z** reacts rapidly with water to produce a colourless, odourless gas. Which method of extraction of the metals from their ores is most likely to be used in the industry?

	W	**Y**	**Z**
A	heat with carbon	heat with carbon	electrolysis of molten ore
B	heat with hydrogen	heat with hydrogen	electrolysis of molten ore
C	heat with carbon	heat with hydrogen	heat with hydrogen
D	electrolysis of molten ore	heat with carbon	heat with hydrogen

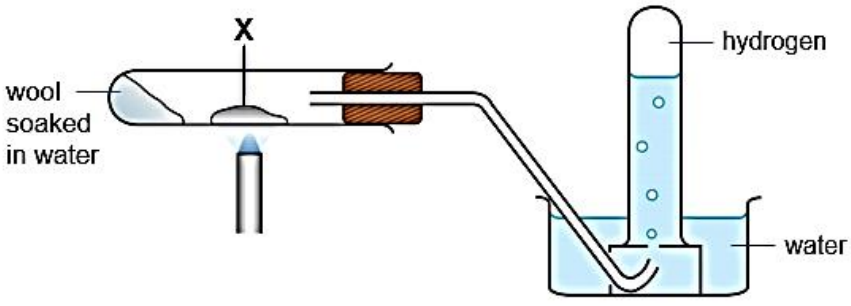
34 An investigation was carried out to determine the suitability of various metals in the protection of underground steel tanks from rusting. Metal tubes were attached to the underground steel tanks as shown.



Which of the following correctly shows the reactions occurring at steel tanks **X** and **Y**?

	steel tank **X**	steel tank **Y**
A	$Fe \rightarrow Fe^{2+} + 2e$	$Fe \rightarrow Fe^{2+} + 2e$
B	$Fe \rightarrow Fe^{2+} + 2e$	$Cu \rightarrow Cu^{2+} + 2e$
C	$Mg \rightarrow Mg^{2+} + 2e$	$Fe \rightarrow Fe^{2+} + 2e$
D	$Mg \rightarrow Mg^{2+} + 2e$	$Cu \rightarrow Cu^{2+} + 2e$

35 The diagram shows an experiment to produce and collect hydrogen gas.



What could be **X**?

A copper

B copper(II) oxide

C zinc

D zinc oxide

36 Which of the following best explains why recycling ensures that metals will be available in the future?

A Dumping of metals in landfill sites is unsightly and contributes to land pollution.

B Recycling is less costly than extraction of metals from their ores.

C Recycling reduces the environmental damage caused by mining for metal ores.

D There are finite amount of metal ores in the Earth's crust.

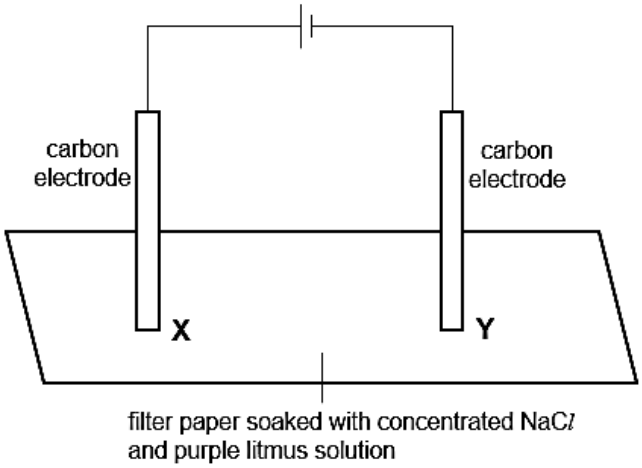
37 Three electrochemical cells are set up using copper metal as one electrode and U, V or W as the other electrode. The electrodes are immersed in aqueous sodium nitrate of the same concentration. The potential differences between the metals are given in the table.

electrochemical cell	metals used	voltage / V	negative electrode
1	Cu, U	−0.45	Cu
2	Cu, V	+1.11	V
3	Cu, W	+2.71	W

Which of the following correctly lists the metals in order of increasing reactivity?

	least reactive ⟶ most reactive			
A	U	V	Cu	W
B	U	Cu	V	W
C	W	V	Cu	U
D	W	Cu	V	U

38 With reference to the diagram below, what would be observed on the filter paper at **X** and **Y** after a current is passed through for a few minutes?



	X	Y
A	blue	purple
B	blue	red
C	white	red
D	white	blue

39 The heat reflecting sheets of some space rockets are gold-plated, using the electroplating process. Which electrodes and electrolyte would be used to gold-plate the heat shield?

	negative electrode	positive electrode	electrolyte
A	carbon	heat shield	gold(III) carbonate
B	gold	heat shield	gold(III) nitrate
C	heat shield	gold	gold(III) nitrate
D	heat shield	carbon	gold(III) carbonate

40 The same current was passed through aqueous dilute sodium chloride and molten magnesium oxide in two separate electrolytic cells. 1.0 g of hydrogen gas was obtained in the first cell. What is the mass of magnesium obtained in the second cell?

A 1.0 g

B 6.0 g

C 12.0 g

D 24.0 g

-- End of Paper –