Name: _____ ( ) Class:_____

PRELIMINARY EXAMINATION
GENERAL CERTIFICATION OF EDUCATION ORDINARY LEVEL

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

31 August 2021
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 **18** printed pages.

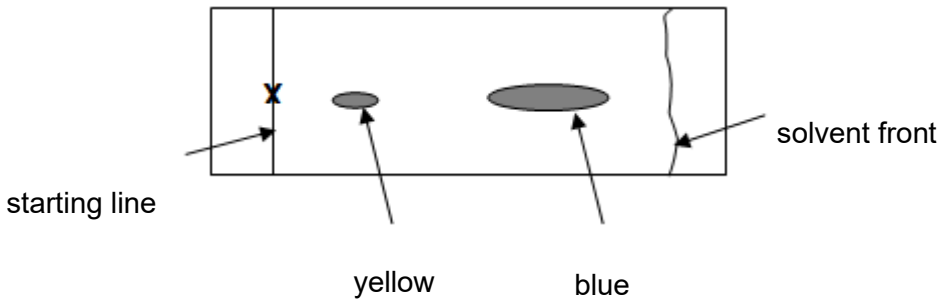
The Periodic Table of Elements

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.).

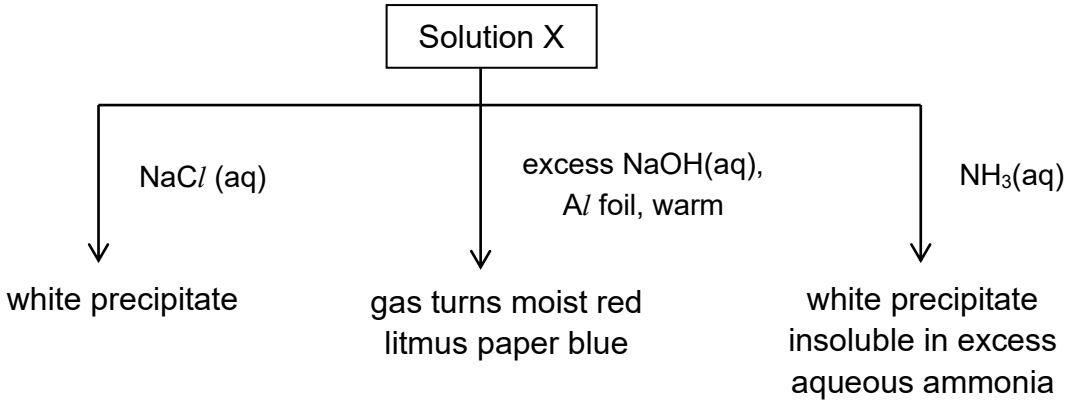
1 The chromatogram of the dyes used for a coloured crayon is shown in the diagram below.



Which of the following statements can be deduced from the chromatogram?

A The colour of the crayon is red.
B The R_f value of the yellow dye is lower than that of the blue dye.
C The yellow dye is more soluble than the blue dye in the solvent used.
D The molecules of the yellow dye are smaller than those of the blue dye.

2 The diagram below shows three reactions of solution X.



What are the ions present in solution X?

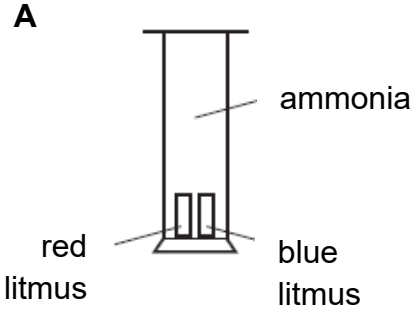
A aluminium ions and nitrate ions
B ammonium ions and chloride ions
C lead(II) ions and ammonium ions
D lead(II) ions and nitrate ions

3 Which one of the following could be used to distinguish aqueous solutions of sodium chloride and sodium iodide?

A aqueous barium chloride
B aqueous silver nitrate
C aqueous sodium hydroxide
D aqueous sulfuric acid

4 Four gases namely, ammonia, chlorine, hydrogen chloride and hydrogen are placed in separate gas jars containing a strip of moist blue litmus paper and moist red litmus paper each. The gases in which gas jar will cause both the moist blue litmus paper and the moist red litmus paper to change colour?

A



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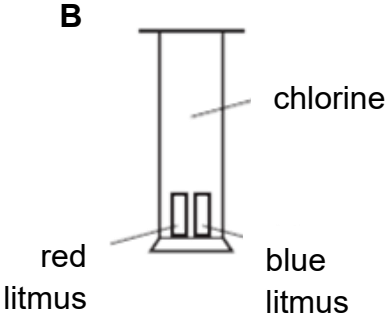
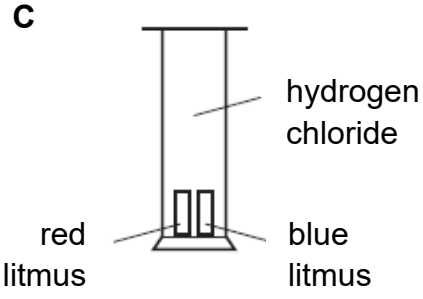
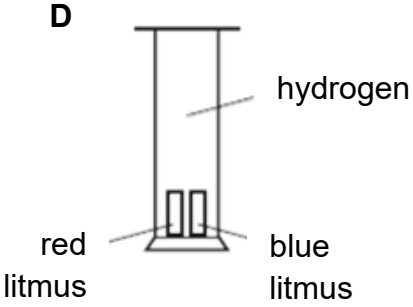


C



D



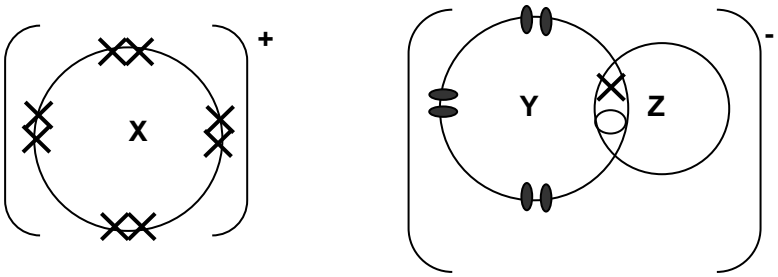
5 A bottle of perfume J was placed 3 metres away from a student. The time taken for the aroma to reach the student was noted. The experiment was repeated with a bottle of perfume K. The time taken for each aroma to reach the student is shown below.

perfume	time taken / s
J	3.4
K	4.6

If the conditions for the two experiments were similar, what conclusion can be made about perfumes J and K?

A There is a larger volume of perfume J than perfume K in the bottle.
B The aroma of perfume J was stronger than the aroma of perfume K.
C The particles in perfume K have higher molecular mass than those in perfume J.
D The particles in perfume K are diatomic whereas particles in perfume J are monatomic.

6 X, Y and Z are three different elements. The following diagram shows the arrangement of the valence electrons in the compound formed from elements X, Y and Z :



Which of the following statements is/are correct?

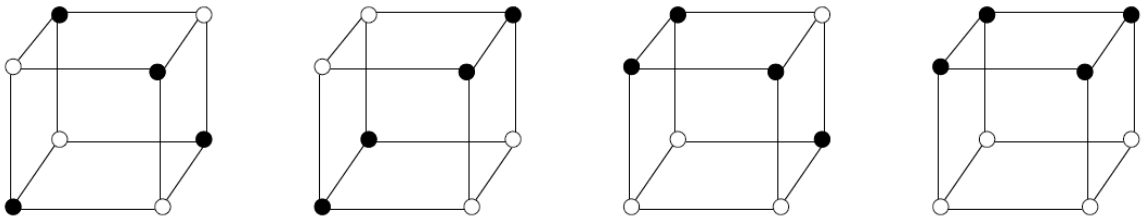
I Element X can be magnesium.
II Element Y belongs to Group VII of the Periodic Table.
III Elements Y and Z are bonded together by strong covalent bonds.

A I, II and III
B I and II only
C II and III only
D III only

7 Which list of substances is placed under the correct headings?

	contains ionic bonds only	contains covalent bonds only	contains both covalent bonds and ionic bonds
A	$Ba(OH)_2(aq)$	$SO_2(g)$	$NH_4Cl(s)$
B	$CaCl_2(s)$	$C_2H_5OH(l)$	$CH_3COOH(l)$
C	$MgF_2(s)$	$HCl(g)$	$Na_2CO_3(s)$
D	$PbO(s)$	$SiO_2(s)$	$Al_2O_3(s)$

8 Which diagram best represents the structure of calcium oxide?



A **B** **C** **D**

9 Lead(IV) chloride has a melting point of -15 °C and boiling point of 50 °C. Which type of structure do you expect lead(IV) chloride to have?

A a simple molecular structure with weak covalent bonds
B a simple molecular structure with weak Van der Waal's forces of attraction between molecules
C a giant molecular structure with strong covalent bonds between atoms
D a giant ionic crystal lattice structure with strong electrostatic forces of attraction

10 An aqueous solution of $FeSO_4.(NH_4)_2SO_4.6H_2O$ has a concentration of 0.050 mol/dm^3. What is the concentration of the NH_4^+ ions in this solution?

A 0.025 mol/dm^3
B 0.050 mol/dm^3
C 0.100 mol/dm^3
D 0.200 mol/dm^3

11 When a 10 cm^3 sample of a gaseous hydrocarbon was completely burnt in 35 cm^3 of oxygen, the total volume of the products formed was 50 cm^3. Which equation represents the combustion of the hydrocarbon?

A $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$
B $C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(g)$
C $C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g)$
D $2C_2H_6(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(g)$

12 Silver oxide decomposes when heated to give silver and oxygen.

$$2Ag_2O\ (s) \rightarrow 4Ag\ (s) + O_2\ (g)$$

When 55.0 g of a sample of silver oxide is heated gently to constant mass, 46.6 g of solid residue is obtained. What is the percentage purity of silver oxide?

A 22.7%
B 84.7%
C 90.9%
D 91.0%

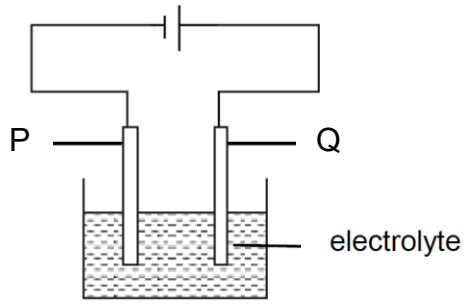
13 If 1.38 g of a gaseous nitrogen oxide occupies 360 cm^3 at room temperature and pressure, what is the molecular formula of this gas?

A NO
B NO_2
C N_2O
D N_2O_4

14 When 2 moles of electrons is passed through the circuit during the electrolysis of an aqueous solution of a cerium salt, 70 g of cerium (A_r of Ce = 140) is deposited at the cathode. Which is likely to be the formula of the cerium ion?

A Ce^{2-}
B Ce^{4-}
C Ce^{2+}
D Ce^{4+}

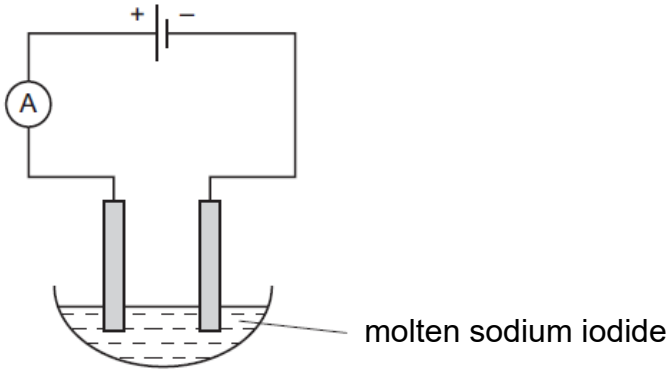
15 An experiment is set up as shown in the diagram below. Both electrodes P and Q are made of graphite.



Which of the following gives the correct results as electrolysis progresses?

	electrolyte	mass of P	mass of Q
A	aqueous copper(II) sulfate	increases	remains unchanged
B	aqueous copper(II) sulfate	remains unchanged	increases
C	aqueous sodium chloride	remains unchanged	increases
D	aqueous sodium chloride	increases	remains unchanged

16 Molten sodium iodide is electrolysed as shown in the diagram.



Which statement/s about the electrolysis is/are correct?

1 Oxidation occurs at the cathode.
2 Violet fumes are observed at the anode.
3 A colourless gas is observed at the cathode.

A 2 only
B 3 only
C 1 and 2 only
D 1 and 3 only

17 Three electrochemical cells are set up using copper metal and three unknown metals, U, V and W as electrodes, immersed in sulfuric acid of the same concentration. The potential differences between the metals are given in the table below.

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

What is the order of decreasing reactivity of the metals, U, V, W and Cu?

A W, Cu, V, U
B W, V, Cu, U
C U, V, Cu, W
D U, Cu, V, W

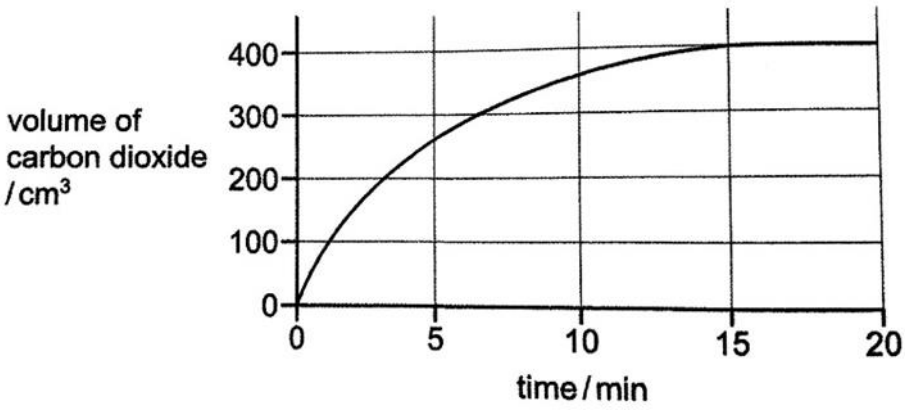
18 When solid X is dissolved in water, an endothermic change takes place. When 5 g of X is dissolved in 1000 cm^3 of water, a temperature change of 5 °C occurs. What is the temperature change when 5 g of X is dissolved in 500 cm^3 of water?

A a decrease of 2.5 °C
B a decrease of 10 °C
C an increase of 2.5 °C
D an increase of 10 °C

19 The table shows details of four experiments in which the same mass of manganese(IV) oxide was added to catalyse the decomposition of 10 cm^3 samples of aqueous hydrogen peroxide. In which experiment was the catalyst most finely powdered?

	concentration of hydrogen peroxide / mol dm^{-3}	temperature of hydrogen peroxide / ^oC	volume of oxygen formed in 10 s / cm^3
A	0.05	20	10
B	0.05	20	15
C	0.05	30	15
D	0.10	20	15

20 In an experiment, excess dilute hydrochloric acid was added to limestone chips. The volume of carbon dioxide released at room temperature was recorded, and the results are shown in the graph below.



Which statement(s) about the reaction is/are true?

I The mass of calcium carbonate in the limestone chips used was 1.67 g.
II The reaction slowed down as time passed.
III The reaction was half completed after about 7.5 minutes.

A I only
B I and II only
C I and III only
D II and III only

21 A reaction takes place in two stages in the presence of a catalyst:

Stage 1: $S_2O_8^{2-}(aq) + 2I^-(aq) + 2Fe^{2+}(aq) \rightarrow 2SO_4^{2-}(aq) + 2I^-(aq) + 2Fe^{3+}(aq)$

Stage 2: $2SO_4^{2-}(aq) + 2I^-(aq) + 2Fe^{3+}(aq) \rightarrow 2SO_4^{2-}(aq) + I_2(aq) + 2Fe^{2+}(aq)$

Which ion is the catalyst in the reaction?

A $Fe^{2+}(aq)$
B $I^-(aq)$
C $SO_4^{2-}(aq)$
D $S_2O_8^{2-}(aq)$

22 Which statement does not explain why the speed of the reaction between zinc and dilute sulfuric acid increases when the acid is warmed?

A The particles are moving faster as they gain more energy.
B The activation energy of the reaction decreases.
C The particles are colliding more frequently.
D More particles have sufficient energy required for the reaction.

23 Sodium sulfite, Na_2SO_3, reacts with acidified potassium manganate(VII) to form sodium sulfate, Na_2SO_4.. The manganate(VII) half-equation can be written as:

$$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$$

Which of the following describes the changes?

	reducing agent	colour change of potassium manganate(VII)
A	sodium ions	purple to brown
B	sodium ions	purple to colourless
C	sulfite ions	purple to brown
D	sulfite ions	purple to colourless

24 Citric acid is a weak acid. 20.0 cm^3 of 1.0 mol/dm^3 of citric acid is completely neutralised by 30.0 cm^3 of 2.0 mol/dm^3 of aqueous sodium hydroxide. Which statement(s) about citric acid is/are true?

I It is a tribasic acid.
II It turns Universal Indicator from green to red.
III It can conduct electricity.

A I only
B I and II only
C I and III only
D II and III only

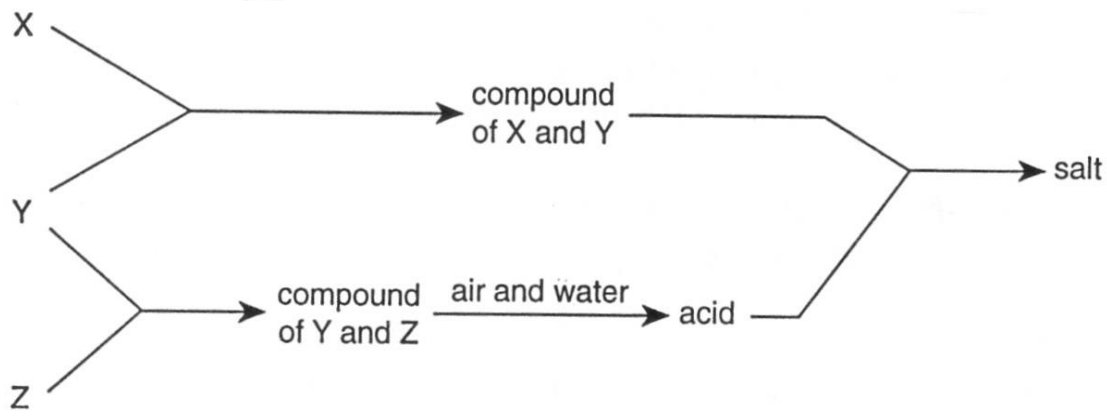
25 The table gives information about the solubilities of the hydroxides, carbonates and sulfates of calcium, sodium and nickel(II):

	hydroxide	carbonate	sulfate
calcium	slightly soluble	insoluble	slightly soluble
sodium	soluble	soluble	soluble
nickel(II)	insoluble	insoluble	soluble

What is the best way of making nickel(II) carbonate?

A Shake solid nickel(II) hydroxide with aqueous sodium hydroxide and pass in carbon dioxide.
B Shake solid nickel(II) sulfate and solid calcium carbonate with water.
C Shake nickel(II) sulfate with water and add aqueous sodium carbonate.
D Shake aqueous nickel(II) sulfate with solid calcium hydroxide and pass in carbon dioxide.

26 The flow diagram shows how a salt used as a fertiliser could be made starting from three elements X, Y and Z.



What are the elements X, Y and Z?

	X	Y	Z
A	oxygen	nitrogen	hydrogen
B	hydrogen	oxygen	nitrogen
C	hydrogen	nitrogen	oxygen
D	nitrogen	hydrogen	oxygen

27 Francium, Fr, is an element in the same group of the Periodic Table as lithium, sodium and potassium. Which statement about francium is likely to be correct?

A It forms a carbonate Fr_2CO_3.
B It forms coloured compounds.
C It reacts slowly with cold water.
D It is produced from the electrolysis of aqueous francium chloride.

28 An element T forms an ion, T^{2+}, which has an electronic arrangement 2.8.8.
Which statement(s) concerning T is/are correct?

I T is an alkali metal.
II T forms a basic oxide with oxygen.
III T is in Period 4 of the Periodic Table.

A I and II only
B I and III only
C II and III only
D I , II and III only

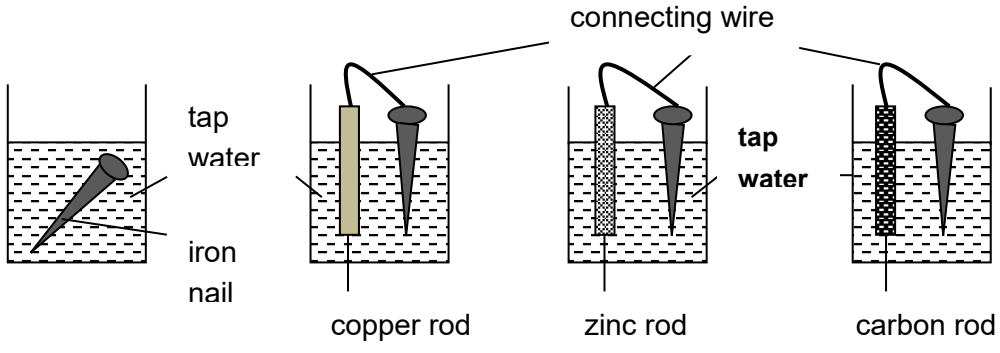
29 Four physical properties of elements, W, X and Y are given in the table below.

element	W	X	Y
melting point / °C	-7	63	-189
boiling point / °C	58	766	-186
colour	reddish-brown	silvery	colourless
density / g cm^{-3}	3.1	0.86	1.7×10^{-3}

Which group of the Periodic Table do elements W, X and Y belong to?

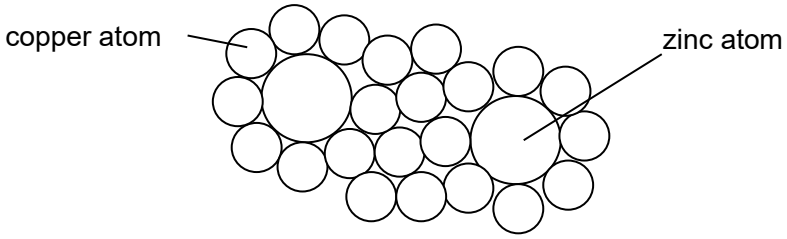
	W	X	Y
A	Group 0	Group I	Group VII
B	Group I	Group VII	Group 0
C	Group VII	Group I	Group 0
D	Group VII	Group 0	Group I

30 Which iron nail will undergo corrosion most readily?



A **B** **C** **D**

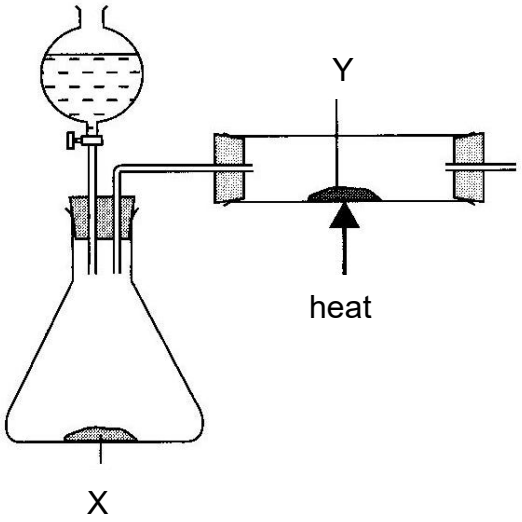
31 The structure of brass is shown below.



What is the purpose of adding zinc to copper?

A to make the packing of atoms more compact
B to strengthen the metallic bonds between copper atoms
C to prevent layers of copper atoms from sliding over each other easily
D to prevent the 'sea of electrons' from moving freely in the metal lattice

32 The apparatus below was set up to reduce a black metal oxide Y.



Dilute hydrochloric acid was slowly added to solid X in the conical flask. The gas produced was passed through a heated glass tube containing solid Y. At the end of the reaction a pink solid was left in the glass tube. What are the possible identities of X and Y?

	X	Y
A	calcium carbonate	copper(II) oxide
B	calcium oxide	lead(II) oxide
C	magnesium	copper(II) oxide
D	zinc	lead(II) oxide

33 The following reactions occur in the upper levels of the earth's atmosphere. Which reaction protects us from excess ultra-violet radiation?

A $O + O \rightarrow O_2$
B $O_2 \rightarrow O + O$
C $O_3 \rightarrow O_2 + O$
D $O_2 + O \rightarrow O_3$

34 Which particle is found in a solution of propanoic acid?

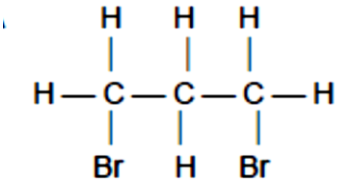
A $C_2H_5COO^-$
B $C_2H_5COO^+$
C $C_3H_7COO^-$
D $C_3H_7COO^+$

35 In which chemical reaction does the named product have a higher relative molecular mass than the reactant?

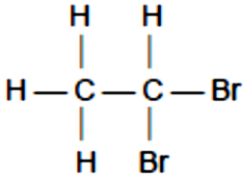
A the formation of ethanol from glucose
B the formation of propene from octane
C the formation of carbon dioxide from butane
D the formation of dichloromethane from methane

36 Which compound could be formed when an alkene reacts with aqueous bromine?

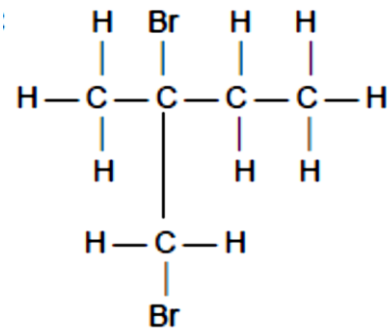
A



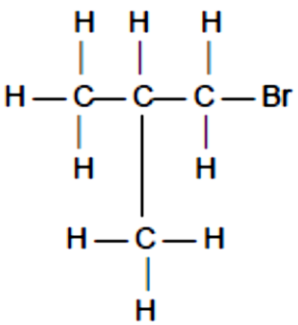
B



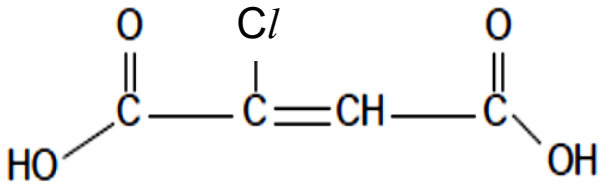
C



D



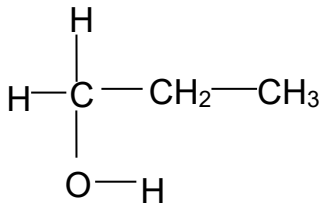
37 The diagram below shows the structural formula of chloromaleic acid.



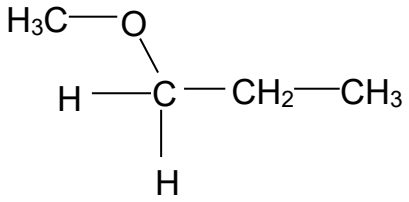
Which of the following statements is **not** correct?

A It forms an ester with propanol.
B It undergoes substitution reaction with halogens in darkness.
C It turns aqueous bromine from reddish brown to colourless.
D When reacted with magnesium ribbon, it gives off a gas which extinguishes a lighted splint with a 'pop' sound

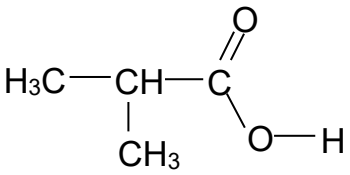
38 Which compound could be formed when an alkene reacts with steam?



A



B



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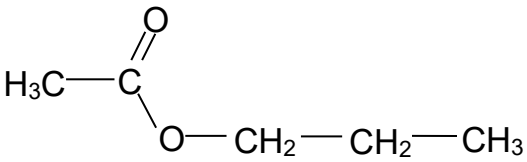


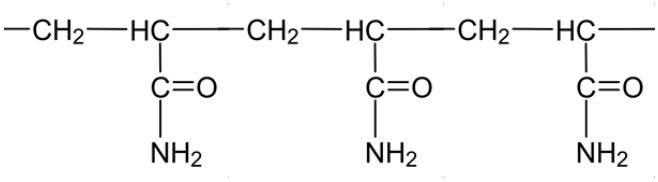
D

39 Which esters have molecular formula $C_3H_6O_2$?

1 methyl ethanoate
2 ethyl propanoate
3 ethyl methanoate
4 propyl methanoate

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

40 Polyacrylamide is used to manufacture soft contact lenses. Part of the polymer is shown below.



Which statements about polyacrylamide are correct?

1 It contains amide linkages.
2 The molecular formula of its monomer is C_3H_5NO.
3 It is an addition polymer.

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

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