This is a Class 1 exam

Lebanon Evangelical School

for Boys and Girls — Loueizeh - Baabda

Stage Exam 05

27APR2026

Do NOT write in this box. Your MARK will be placed here.

Subject :	Chemistry	
Class :	10A	
Teacher :	Mrs. Saydeh Nasrallah	
Duration :	1 hour	
Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

Answer ALL questions.

1. Acids can undergo neutralisation to form salts.

(a) Complete the sentence by putting a cross in the box next to your answer.

(1)

An acid reacts with a metal oxide to form

☐ **A** a salt + carbon dioxide
☐ **B** a salt + hydrogen
☐ **C** a salt + oxygen
☐ **D** a salt + water

(b) Acids also react with metal carbonates.
The equation for the reaction of calcium carbonate with dilute hydrochloric acid is

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$$

Describe what you would **see** when solid calcium carbonate reacts with dilute hydrochloric acid.

(2)

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(c) Hydrogen and oxygen are produced by the electrolysis of water, acidified with a small amount of dilute sulfuric acid.

(i) Explain what is meant by **electrolysis**.

(2)

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(ii) Describe the test to show that a gas is oxygen.

(2)

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(iii) Describe the test to show that a gas is hydrogen.

(2)

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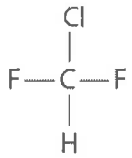
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(Total for Question 1 = 9 marks)

2. (a)(i) Methane, CH_4, is a hydrocarbon.

Chlorodifluoromethane can be formed from methane.
A diagram of one molecule of this compound is



Explain whether or not this molecule is a hydrocarbon.

(2)

.....

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(ii) Chlorodifluoromethane is a gas.
When it is bubbled through bromine water, the orange colour remains.

State what this shows about the structure of this compound.

(1)

.....

.....

.....

(b) Gases in the atmosphere that trap heat from the Sun are known as 'greenhouse gases'.

(i) Give one possible consequence of an increase in the amount of these gases in the atmosphere.

(1)

.....

.....

.....

(ii) Complete the sentence by putting a cross in the box next to your answer.

(1)

Chlorodifluoromethane is a gas that traps heat from the Sun.
Another gas that traps heat from the Sun is

☐ **A** argon
☐ **B** nitrogen
☐ **C** oxygen
☐ **D** water vapour

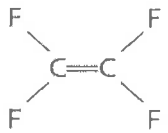
(c) When chlorodifluoromethane, $CHClF_2$, is strongly heated, it decomposes to form tetrafluoroethene, C_2F_4, and hydrogen chloride.

Complete the balanced equation for this reaction.

(2)

$$2CHClF_2 \rightarrow \text{.....} + \text{.....}$$

(d) The structure of a molecule of tetrafluoroethene is



A sample of this gas was kept in a cylinder under high pressure.
The cylinder was left unused for a long time.

When the cylinder was opened no gas remained.
Instead it contained a slippery, waxy, white solid.

(i) State the type of reaction that occurred when tetrafluoroethene gas formed the solid.

(1)

.....

(ii) Deduce the name of the solid formed.

(1)

.....

(Total for Question 2 = 9 marks)

3. (a) Most metals are extracted from rocks found in the Earth's crust.

(i) Iron is extracted from iron oxide.
The iron oxide, Fe_2O_3, is heated with carbon.

Complete the balancing of the equation for this reaction by putting numbers in the spaces provided.

(2)

$$2Fe_2O_3 + 3C \rightarrow \text{.....} Fe + \text{.....} CO_2$$

(ii) Complete the sentence by putting a cross in the box next to your answer.

(1)

When the iron oxide reacts with carbon to form iron and carbon dioxide

- ☐ **A** carbon is reduced and iron oxide is reduced
- ☐ **B** carbon is oxidised and iron oxide is oxidised
- ☐ **C** carbon is reduced and iron oxide is oxidised
- ☐ **D** carbon is oxidised and iron oxide is reduced

(b) Gold is used to make some items of jewellery.
Gold alloys, rather than pure gold, are often used in items of jewellery.
The table shows some information about the properties of two types of gold.

type of gold / carats	relative strength	Cost / £ / g
18	medium	16
24	low	22

Use the information in the table to explain why gold alloys, rather than pure gold, are often used in items of jewellery.

(2)

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(c) The table shows four metals in the order in which they appear in the reactivity series, from the most to the least reactive.
The methods of extraction for three of these metals from their ores are given.

Metal	Method of extraction
Sodium	
Aluminium	Electrolysis
Iron	Heating with carbon
Gold	Found uncombined

(i) Suggest the method used to extract sodium from its ore.

(1)

.....

(ii) Explain why this method has to be used.

(2)

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(Total for Question 3 = 8 marks)

4. (a) Excess dilute sulfuric acid is added to a solid sample of a copper compound.

A gas is given off and a blue solution is formed.

(i) The gas turns limewater cloudy.
Explain how this result is used to identify the anion in the copper compound.

(2)

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(ii) When sodium hydroxide solution is added to the blue solution, a pale blue precipitate is formed.
Give the name or the formula of the pale blue precipitate.

(1)

.....

(iii) The blue solution contains sulfate ions.
Barium chloride solution is added to this blue solution.
A white precipitate of barium sulfate forms.

Write the ionic equation, including state symbols, for this reaction.

(2)

.....

(b) A colourless solution contains a halide ion.
Describe a test to show which of the halide ions, chloride, Cl^-, bromide, Br^-, or iodide, I^-, is present in the colourless solution.

(4)

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(Total for Question 4 = 9 marks)

5. (a) Sulfur dioxide combines with oxygen to form sulfur trioxide in an exothermic reaction.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$$

The reaction can reach equilibrium.

At 2 atmospheres pressure, 450 °C and using a vanadium(V) oxide catalyst, the equilibrium yield of sulfur trioxide, SO_3, is 96%.

(i) When a temperature higher than 450 °C is used, the equilibrium yield of sulfur trioxide decreases. All the other conditions are unchanged.

Explain why the equilibrium yield of sulfur trioxide decreases.

(2)

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(ii) When a pressure higher than 2 atmospheres is used, the equilibrium yield of sulfur trioxide increases. All the other conditions are unchanged.

Explain why the equilibrium yield of sulfur trioxide increases.

(2)

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(iii) Which of the following shows the effect of adding a catalyst on the rate of the forward reaction and on the rate of the reverse reaction?

Put a cross in the box next to your answer.

(1)

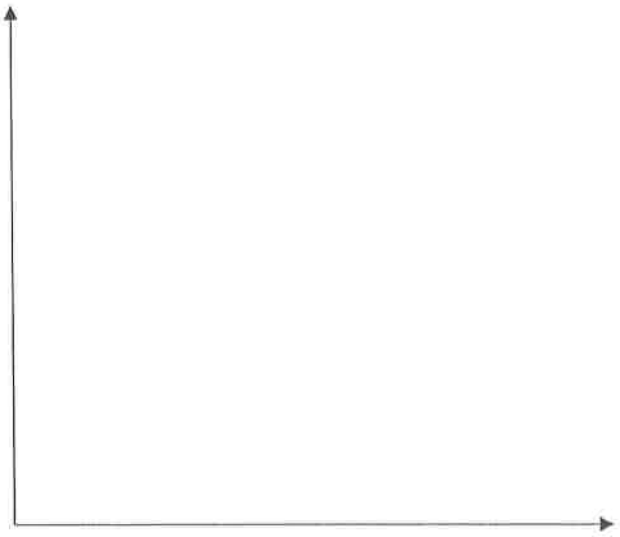
	effect of a catalyst on	
	rate of forward reaction	rate of reverse reaction
☐ A	decreases	decreases
☐ B	decreases	increases
☐ C	increases	decreases
☐ D	increases	increases

(b) The reaction is exothermic. The energy change for the reaction is –200 kJ.mol^{-1}.

On the axes below

- add a label to the y-axis
- draw the reaction profile for this reaction
- label the energy change and the activation energy for the reaction.

(3)



Progress of reaction

(Total for Question 5 = 8 marks)

6. This question is about molecules containing two atoms.

(a) In an experiment, hydrochloric acid is reacted with zinc.
The volume of gas produced is measured by collecting the gas in an upturned measuring cylinder over water.

Give a method of collecting and measuring the gas that would give a more accurate volume of gas.

(1)

.....

(b) Iodine reacts with hydrogen to form hydrogen iodide, HI.
Hydrogen iodide has similar chemical properties to hydrogen chloride, HCl.

Explain whether or not a solution of hydrogen iodide in water conducts electricity.

(2)

.....

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(c) Chlorine gas is bubbled through a colourless solution of potassium bromide, KBr.
The mixture turns orange.
Give the name of the substance that causes the orange colour.

(1)

.....

(d) Hydrogen iodide reacts with oxygen to form water and iodine.
The equation for this reaction is

$$4HI + O_2 \rightarrow 2H_2O + 2I_2 \qquad \Delta H = -467 \text{ kJ.mol}^{-1}$$

$$4\ H—I + O=O \rightarrow 2\ H—O—H + 2\ I—I$$

The table below shows values of some of the bond energies.

Bond	Bond energy in kJ.mol^{-1}
H—I	299
O=O	
O—H	464
I—I	151

Using all the data listed above, calculate a value of the O=O bond energy.
Include a unit in your answer.

(4)

O=O Bond Energy = ...

(Total for Question 6 = 8 marks)

7. Solutions of lead(II) nitrate and sodium sulfate react together to form the insoluble salt lead(II) sulfate.

(a) A student wrote this plan to prepare a pure dry sample of lead(II) sulfate.

step **1** pour some lead(II) nitrate solution into a beaker
step **2** add sodium sulfate solution until the reaction is complete
step **3** filter the mixture
step **4** heat the filtrate to evaporate some of the water
step **5** cool the filtrate and remove the crystals

(i) How will the student know when the reaction in step **2** is complete?

(1)

.....

.....

.....

(ii) Which compound could the student use in this preparation instead of sodium sulfate?

(1)

☐ **A** lead(II) hydroxide
☐ **B** nitric acid
☐ **C** sodium hydroxide
☐ **D** sulfuric acid

(iii) State why the student should not have included steps **4** and **5** in his plan.

(1)

.....

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.....

(iv) Suggest replacement steps to obtain a pure dry sample of lead(II) sulfate.

(2)

step **4** .....

.....

step **5** .....

.....

(v) Lead(II) carbonate cannot be used instead of lead(II) nitrate in this preparation. This is because lead(II) carbonate

(1)

☐ **A** contains ionic bonding
☐ **B** has a high relative formula mass
☐ **C** is insoluble in water
☐ **D** is toxic

(b) The equation for the reaction in the student's plan is

$$Pb(NO_3)_2(aq) + Na_2SO_4(aq) \rightarrow PbSO_4(s) + 2NaNO_3(aq)$$

(i) Deduce the amount of each reactant needed to form 0.150 mol of lead(II) sulfate.

(1)

$Pb(NO_3)_2$ ..... mol

Na_2SO_4 ..... mol

(ii) What volume of 0.500 mol/dm^3 lead(II) nitrate solution is needed to form 0.150 mol of lead(II) sulfate?

(2)

volume = ...

(Total for Question 7 = 9 marks)

TOTAL FOR PAPER = 60 MARKS

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 H hydrogen 1										4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
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	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	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	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 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	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112–116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

** The lanthanoids (atomic numbers 58–71) and the actinoids (atomic numbers 90–103) have been omitted.*

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

Answer ALL questions.

1. Acids can undergo neutralisation to form salts.

(a) Complete the sentence by putting a cross in the box next to your answer. (1)

An acid reacts with a metal oxide to form

- ☐ **A** a salt + carbon dioxide
- ☐ **B** a salt + hydrogen
- ☐ **C** a salt + oxygen
- ☒ **D** a salt + water ✓ (1)

(b) Acids also react with metal carbonates.
The equation for the reaction of calcium carbonate with dilute hydrochloric acid is

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$$

Describe what you would **see** when solid calcium carbonate reacts with dilute hydrochloric acid. (2)

Bubbles would be seen ✓ (1)

Solid disintegrates. ✓ (1)

(c) Hydrogen and oxygen are produced by the electrolysis of water, acidified with a small amount of dilute sulfuric acid.

(i) Explain what is meant by **electrolysis**.

(2)

It's the process during which an electrolyte is broken down into its elements using electricity (2)

(ii) Describe the test to show that a gas is oxygen.

(2)

It re-ignites a glowing splint (2)

(iii) Describe the test to show that a gas is hydrogen.

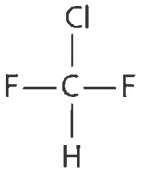
(2)

It burns with a pop sound. (2)

(Total for Question 1 = 9 marks)

2. (a)(i) Methane, CH_4, is a hydrocarbon.

Chlorodifluoromethane can be formed from methane.
A diagram of one molecule of this compound is



Explain whether or not this molecule is a hydrocarbon.

(2)

It's formed of halogens, Carbon and hydrogen (1), therefore it's not a hydrocarbon (1)

(ii) Chlorodifluoromethane is a gas.
When it is bubbled through bromine water, the orange colour remains.

State what this shows about the structure of this compound.

(1)

It's a saturated organic compound (1)

(b) Gases in the atmosphere that trap heat from the Sun are known as 'greenhouse gases'.

(i) Give one possible consequence of an increase in the amount of these gases in the atmosphere.

(1)

Anthropogenic activities (1)

(ii) Complete the sentence by putting a cross in the box next to your answer.

(1)

Chlorodifluoromethane is a gas that traps heat from the Sun.
Another gas that traps heat from the Sun is

- ☐ **A** argon
- ☐ **B** nitrogen
- ☐ **C** oxygen
- ☒ **D** water vapour ✓ (1)

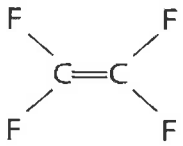
(c) When chlorodifluoromethane, $CHClF_2$, is strongly heated, it decomposes to form tetrafluoroethene, C_2F_4, and hydrogen chloride.

Complete the balanced equation for this reaction.

(2)

$2CHClF_2 \rightarrow$ ..... C_2F_4 ..... + ... $2HCl$ ..... (2)

(d) The structure of a molecule of tetrafluoroethene is



A sample of this gas was kept in a cylinder under high pressure.
The cylinder was left unused for a long time.

When the cylinder was opened no gas remained.
Instead it contained a slippery, waxy, white solid.

(i) State the type of reaction that occurred when tetrafluoroethene gas formed the solid.

(1)

..... Polymerisation ..... ✓ (1)

(ii) Deduce the name of the solid formed.

(1)

..... Poly(tetrafluoroethene) ..... ✓ (1)

(Total for Question 2 = 9 marks)

3. (a) Most metals are extracted from rocks found in the Earth's crust.

(i) Iron is extracted from iron oxide.
The iron oxide, Fe_2O_3, is heated with carbon.

Complete the balancing of the equation for this reaction by putting numbers in the spaces provided.

(2)

$$2Fe_2O_3 + 3C \rightarrow \text{.....4.....}\ Fe + \text{.....3.....}\ CO_2$$ (2)

(ii) Complete the sentence by putting a cross in the box next to your answer.

(1)

When the iron oxide reacts with carbon to form iron and carbon dioxide

- ☐ **A** carbon is reduced and iron oxide is reduced
- ☒ **B** carbon is oxidised and iron oxide is oxidised
- ☒ **C** carbon is reduced and iron oxide is oxidised
- ☒ **D** carbon is oxidised and iron oxide is reduced ✓(1)

(b) Gold is used to make some items of jewellery.
Gold alloys, rather than pure gold, are often used in items of jewellery.
The table shows some information about the properties of two types of gold.

type of gold / carats	relative strength	Cost / £ / g
18	medium	16
24	low	22

Use the information in the table to explain why gold alloys, rather than pure gold, are often used in items of jewellery.

(2)

18 carat gold has high relative strength compared to the 24 carat gold, Therefore not easily broken. ✓(1)
Added to the above, 18 carat gold is cheaper than 24 carat gold ✓(1)

(c) The table shows four metals in the order in which they appear in the reactivity series, from the most to the least reactive.
The methods of extraction for three of these metals from their ores are given.

Metal	Method of extraction
Sodium	
Aluminium	Electrolysis
Iron	Heating with carbon
Gold	Found uncombined

(i) Suggest the method used to extract sodium from its ore.

Electrolysis ✓ (1) (1)

(ii) Explain why this method has to be used.

Sodium is more reactive than Carbon, therefore it can't be displaced by C. ✓ (2) (2)

(Total for Question 3 = 8 marks)

4. (a) Excess dilute sulfuric acid is added to a solid sample of a copper compound.

A gas is given off and a blue solution is formed.

(i) The gas turns limewater cloudy.
Explain how this result is used to identify the anion in the copper compound.

(2)

The gas that turned limewater milky is carbon dioxide (1). This infers that the anion present is carbonate, CO_3^{2-} (1)

(ii) When sodium hydroxide solution is added to the blue solution, a pale blue precipitate is formed.
Give the name or the formula of the pale blue precipitate.

(1)

$Cu(OH)_2$ (1)

(iii) The blue solution contains sulfate ions.
Barium chloride solution is added to this blue solution.
A white precipitate of barium sulfate forms.

Write the ionic equation, including state symbols, for this reaction.

(2)

$Ba^{2+}(aq) + SO_4^{2-}(aq) \longrightarrow BaSO_4(s)$ (1) (1)

(b) A colourless solution contains a halide ion.
Describe a test to show which of the halide ions, chloride, Cl^-, bromide, Br^-, or iodide, I^-, is present in the colourless solution.

(4)

Add drops of $HNO_3(aq)$ onto a sample of the solution placed in a test tube (1)

Add to the mixture in the test tube few cm^3 of $AgNO_3(aq)$ (1)

A precipitate forms whose colour indicates which halide is present (1)

If the precipitate is white → Cl^- present

If the precipitate is creamy → Br^- present

If the precipitate is yellow → I^- present (1)

(Total for Question 4 = 9 marks)

5. (a) Sulfur dioxide combines with oxygen to form sulfur trioxide in an exothermic reaction.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$$

The reaction can reach equilibrium.

At 2 atmospheres pressure, 450 °C and using a vanadium(V) oxide catalyst, the equilibrium yield of sulfur trioxide, SO_3, is 96%.

(i) When a temperature higher than 450 °C is used, the equilibrium yield of sulfur trioxide decreases. All the other conditions are unchanged.

Explain why the equilibrium yield of sulfur trioxide decreases.

(2)

Increasing temperatures on a dynamic equilibrium, and according Le Châtelier, favours the endothermic reaction (1) In this case, the backward reaction is endothermic, therefore increasing temperature decreases the yield of SO_3 gas. (1)

(ii) When a pressure higher than 2 atmospheres is used, the equilibrium yield of sulfur trioxide increases. All the other conditions are unchanged.

Explain why the equilibrium yield of sulfur trioxide increases.

(2)

According to Le Châtelier, increasing pressure favours the reaction (1) yielding less number of particles, which is in this case, the production of SO_3 gas. (1)

(iii) Which of the following shows the effect of adding a catalyst on the rate of the forward reaction and on the rate of the reverse reaction?

Put a cross in the box next to your answer.

(1)

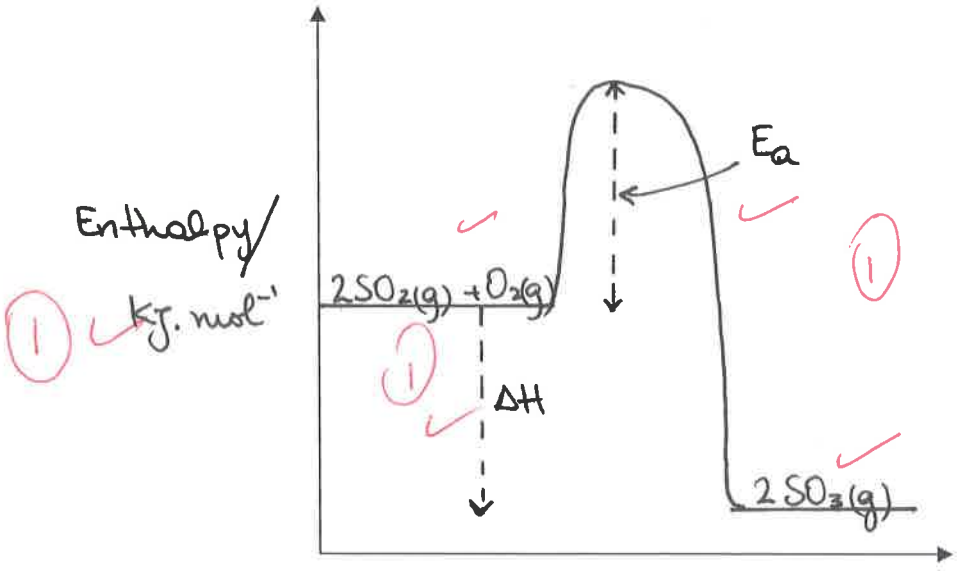
	effect of a catalyst on	
	rate of forward reaction	rate of reverse reaction
☐ A	decreases	decreases
☐ B	decreases	increases
☐ C	increases	decreases
☒ D	increases	increases

(b) The reaction is exothermic. The energy change for the reaction is –200 kJ.mol^{-1}.

On the axes below

- add a label to the y-axis
- draw the reaction profile for this reaction
- label the energy change and the activation energy for the reaction.

(3)



(Total for Question 5 = 8 marks)

6. This question is about molecules containing two atoms.

(a) In an experiment, hydrochloric acid is reacted with zinc.
The volume of gas produced is measured by collecting the gas in an upturned measuring cylinder over water.

Give a method of collecting and measuring the gas that would give a more accurate volume of gas.

(1)

using a gas syringe ✓(1)

(b) Iodine reacts with hydrogen to form hydrogen iodide, HI.
Hydrogen iodide has similar chemical properties to hydrogen chloride, HCl.

Explain whether or not a solution of hydrogen iodide in water conducts electricity.

(2)

Hydrogen iodide, like hydrogen chloride, reacts with H_2O forming H^+ and I^- ✓(1) These charged particles can carry a charge whenever a potential difference is applied. ✓(1)

(c) Chlorine gas is bubbled through a colourless solution of potassium bromide, KBr.
The mixture turns orange.
Give the name of the substance that causes the orange colour.

(1)

Bromine solution ✓(1)

(d) Hydrogen iodide reacts with oxygen to form water and iodine.
The equation for this reaction is

$$4HI + O_2 \rightarrow 2H_2O + 2I_2 \qquad \Delta H = -467 \text{ kJ.mol}^{-1}$$

$$4\ H—I + O=O \rightarrow 2\ H—O—H + 2\ I—I$$

The table below shows values of some of the bond energies.

Bond	Bond energy in kJ.mol^{-1}
H—I	299
O=O	
O—H	464
I—I	151

Using all the data listed above, calculate a value of the O=O bond energy.
Include a unit in your answer.

(4)

$\Delta H = \Sigma E_{broken} - \Sigma E_{formed}$ ✓ (1)

$\Delta H = 4 \times E_{(H-I)} + E_{(O=O)} - 4 \times E_{(O-H)} - 2 \times E_{(I-I)}$ ✓ (1)

$\Rightarrow E_{(O=O)} = \Delta H - 4 \times E_{(H-I)} + 4 E_{(O-H)} + 2 \times E_{(I-I)}$

$\Rightarrow E_{(O=O)} = -467 - 4 \times 299 + 4 \times 464 + 2 \times 151$

$\Rightarrow E_{(O=O)} = +495$

(1) : sign + units ✓ (1)

O=O Bond Energy = +495 kJ.mol^{-1}

(Total for Question 6 = 8 marks)

7. Solutions of lead(II) nitrate and sodium sulfate react together to form the insoluble salt lead(II) sulfate.

(a) A student wrote this plan to prepare a pure dry sample of lead(II) sulfate.

step 1 pour some lead(II) nitrate solution into a beaker
step 2 add sodium sulfate solution until the reaction is complete
step 3 filter the mixture
step 4 heat the filtrate to evaporate some of the water
step 5 cool the filtrate and remove the crystals

(i) How will the student know when the reaction in step 2 is complete?

(1)

The height of the precipitate formed remains constant. ✓ (1)

(ii) Which compound could the student use in this preparation instead of sodium sulfate?

(1)

- ☐ **A** lead(II) hydroxide
- ☐ **B** nitric acid
- ☐ **C** sodium hydroxide
- ☒ **D** sulfuric acid ✓ (1)

(iii) State why the student should not have included steps 4 and 5 in his plan.

(1)

lead (II) sulfate is insoluble in water (1) ✓, therefore it should have been collected using filtration

(iv) Suggest replacement steps to obtain a pure dry sample of lead(II) sulfate.

(2)

step 4 filter the mixture using reduced pressure filtration ✓ (1)

step 5 Rinse with deionised water, and dab with dry filter paper. ✓ (1)

(v) Lead(II) carbonate cannot be used instead of lead(II) nitrate in this preparation. This is because lead(II) carbonate

(1)

☐ **A** contains ionic bonding
☐ **B** has a high relative formula mass
☒ **C** is insoluble in water
☐ **D** is toxic

(1) ✓

(b) The equation for the reaction in the student's plan is

$$Pb(NO_3)_2(aq) + Na_2SO_4(aq) \rightarrow PbSO_4(s) + 2NaNO_3(aq)$$

(i) Deduce the amount of each reactant needed to form 0.150 mol of lead(II) sulfate.

(1)

$Pb(NO_3)_2$ ..... 0.150 ..... ✓ mol

Na_2SO_4 ..... 0.150 ..... ✓ mol

(1)

(ii) What volume of 0.500 mol/dm^3 lead(II) nitrate solution is needed to form 0.150 mol of lead(II) sulfate?

(2)

$n_{PbSO_4} = n_{Pb(NO_3)_2} = 0.150$ mol

$[Pb(NO_3)_2] = \frac{n}{V}$ ✓

$\Rightarrow V = \frac{0.150}{0.500} = 0.3\ dm^3$

(2)

volume = ...0.3 dm^3... ✓

(Total for Question 7 = 9 marks)

TOTAL FOR PAPER = 60 MARKS

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
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	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	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	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **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	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112–116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The lanthanoids (atomic numbers 58–71) and the actinoids (atomic numbers 90–103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.