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YEAR 12 *Trial Exam Paper*
2022
CHEMISTRY
Written examination

Reading time: 15 minutes
Writing time: 2 hours 30 minutes

STUDENT NAME:

QUESTION AND ANSWER BOOK

Structure of book

Section	*Number of questions*	*Number of questions to be answered*	*Number of marks*
A	30	30	30
B	10	10	90
			Total 120

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers and one scientific calculator.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.

Materials supplied
- Question and answer book of 35 pages
- Data book
- Answer sheet for multiple-choice questions

Instructions
- Write your **name** in the space provided above on this page and on the multiple-choice answer sheet.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.
- All written responses must be in English.

At the end of the examination
- Place the answer sheet for multiple-choice questions inside the front cover of this book.
- You may keep the data book.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

SECTION A – Multiple-choice questions

Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1; an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1

Which of the following processes will produce a product with a high methane content?

A. the reaction between olive oil and methanol

B. fermentation of waste fruit

C. collecting alkanes from the bottom sections of a fractionating column

D. anaerobic digestion of waste fruit

Question 2

The molar mass of the methyl ester of lauric acid is

A. 200 g mol^{-1}

B. 210 g mol^{-1}

C. 214 g mol^{-1}

D. 228 g mol^{-1}

Question 3

Complete combustion of 2 mole of an alkane requires 13 mole of O_2.

The alkane is

A. ethane.

B. propane.

C. butane.

D. pentane.

Question 4

Which one of the following fuel samples will release the **greatest** amount of energy when fully combusted?

A. 100 g of hydrogen gas

B. 200 g of methane gas

C. 220 g of ethane gas

D. 225 g of propane gas

Question 5

Which one of the following statements about activation energy is correct?

A. The sign of the activation energy is always positive.

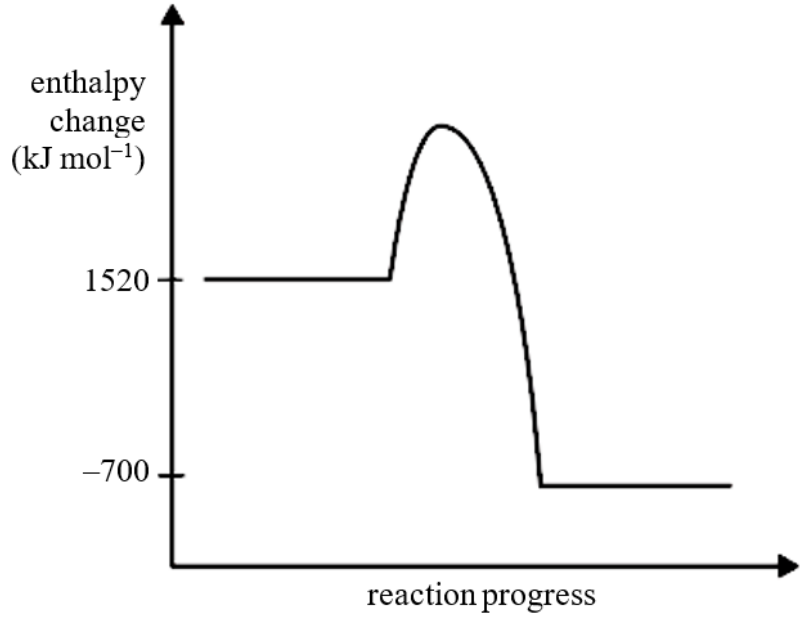
B. The addition of a catalyst speeds up the reaction but does not change the activation energy.

C. The activation energy of the reverse reaction has the same magnitude as the forward reaction.

D. The activation energy of a fuel must be a high value in order for the fuel to be useful.

Question 6

A combustion reaction has the energy profile diagram shown below.



The profile refers to the complete combustion of

A. hydrogen gas.

B. methane gas.

C. propane gas.

D. octane liquid.

Question 7

The thermochemical equation for the formation of nitric oxide is

$N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ $\quad \Delta H = 92$ kJ mol^{-1} $\quad K_c = 0.80$ at 900 °C

The enthalpy and K_c value of the reverse reaction will be

	ΔH kJ mol^{-1}	K_c
A.	–92	–0.80
B.	–92	1.25
C.	–0.011	1.25
D.	0.011	1.25

Question 8

The equation for the decomposition of ammonia gas is

$$2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$$

0.8 mole of NH_3 is added to an empty reactor. The amount of N_2 formed at equilibrium is 0.2 mole.

Which of the following shows the amounts of NH_3 and H_2 at equilibrium?

	Amount of NH_3 (mole)	Amount of H_2 (mole)
A.	0.4	0.2
B.	1.0	0.6
C.	0.4	0.6
D.	1.2	0.2

Question 9

The reaction between carbon monoxide and hydrogen is a reversible exothermic one, as represented in the following equation.

$$CO(g) + 2H_2(g) \rightleftharpoons CH_3OH(g)$$

The temperature of an equilibrium mixture is increased.

The temperature change will

A. decrease the reaction rate and lower the yield of methanol.

B. decrease the reaction rate but increase the yield of methanol.

C. increase the reaction rate and increase the yield of methanol.

D. increase the reaction rate but lower the yield of methanol.

Question 10

When magnesium metal is added to hydrochloric acid, hydrogen gas is evolved. The rate at which the hydrogen gas is evolved can be used to study the rate of this reaction. Two experiments are listed below.

Experiment A: 10 g of magnesium is dropped into 600 mL of 1.0 M HCl.

Experiment B: 10 g of magnesium is dropped into 600 mL of 2.0 M HCl.

In Experiment B

A. hydrogen gas will be evolved at the same rate as that of Experiment A.

B. hydrogen gas will be evolved faster but the same volume will be produced as that of Experiment A.

C. hydrogen gas will be evolved faster but the volume of hydrogen produced will not be double that of Experiment A.

D. hydrogen gas will be evolved faster and the volume of hydrogen produced will be double that of Experiment A.

Question 11

Galvanic cells and electrolytic cells both involve redox reactions. Some aspects of each type of cell are similar and some are different.

Consider the following statements.

I Oxidation occurs at the anode.

II The anode will be negative.

III Electrons travel from the anode to the cathode.

IV The cell produces energy.

V The strongest oxidising agent will react with the strongest reducing agent.

Which one of the following sets of statements is correct for **both** types of cells?

A. statement numbers I and II

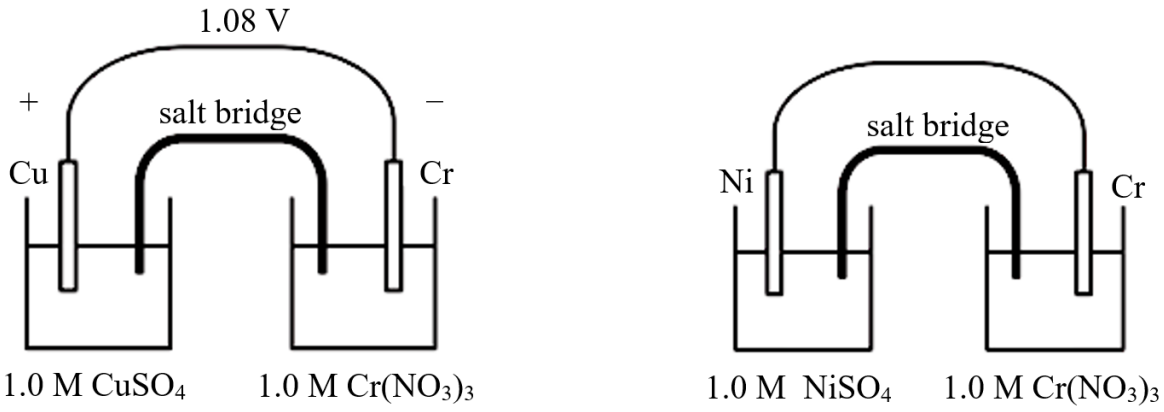
B. statement numbers I, III and V

C. statement numbers III, IV and V

D. statement numbers I, III and IV

Use the following information to answer Questions 12 and 13.

A galvanic cell is set up from copper and chromium half-cells. The voltage produced is 1.08 V. The chromium half-cell is then connected to a nickel half-cell.



Question 12

In the nickel–chromium cell, the cell voltage will be

A. 0.49 V, with nickel as the positive electrode.

B. 0.49 V, with chromium as the positive electrode.

C. 0.83 V, with nickel as the positive electrode.

D. 1.33 V, with chromium as the positive electrode.

Question 13

The half-equation and standard electrode potential for chromium is

A. $Cr^{2+}(aq) + 2e^- \rightarrow Cr(s)$ +0.49 V

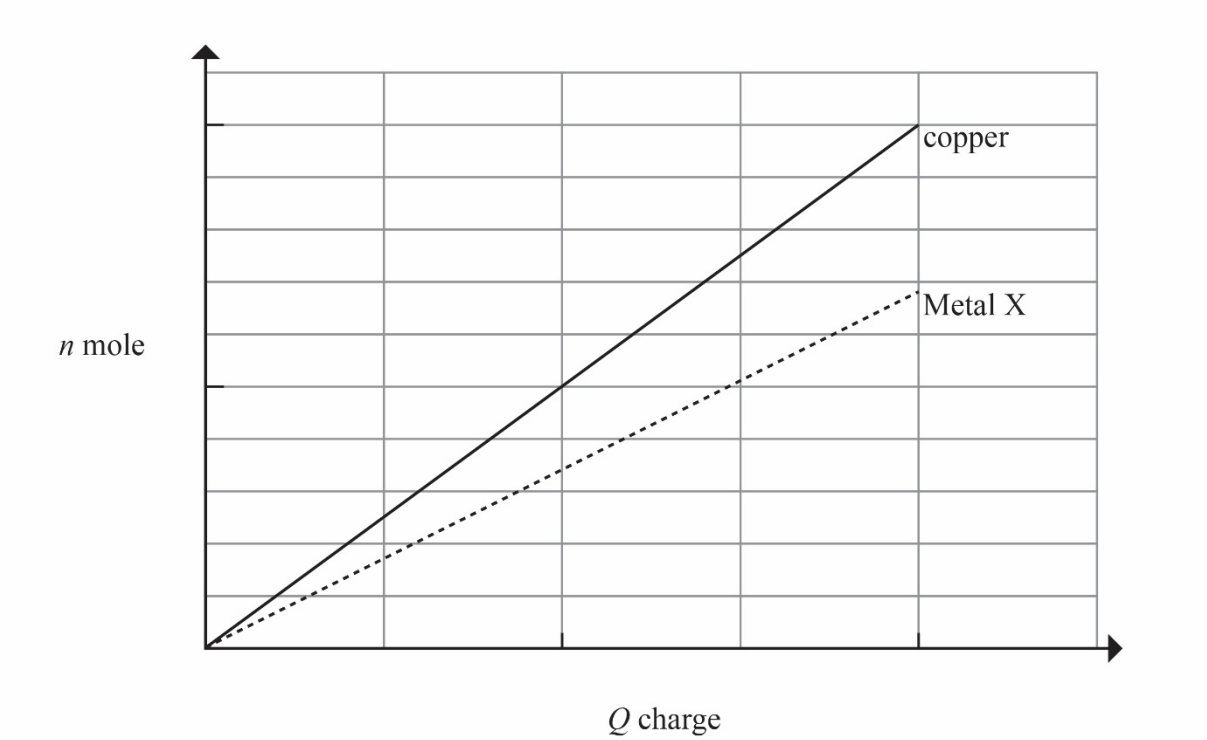
B. $Cr^{3+}(aq) + 3e^- \rightarrow Cr(s)$ –0.74 V

C. $Cr^{3+}(aq) + 3e^- \rightarrow Cr(s)$ –1.08 V

D. $Cr^{3+}(aq) + 3e^- \rightarrow Cr(s)$ +1.08 V

Question 14

The graph below shows the amount of charge that must be passed through an electrolytic cell to deposit a certain number of mole of metal. The solid line was produced from electrolysis of a solution of copper sulfate, $CuSO_4$. The dashed line shows the amount of metal produced from a cell containing ions of Metal X.



The electrolyte containing Metal X could be

A. 1.0 M LiCl

B. 1.0 M $ZnCl_2$

C. $AlCl_3(l)$

D. 1.0 M $AlCl_3$

Question 15

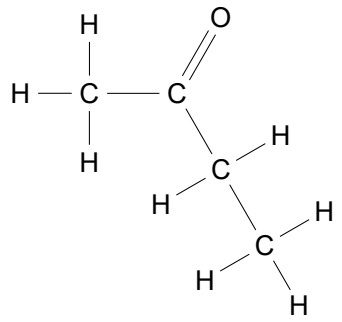
3.12 g of chromium is electroplated onto the surface of a bathroom tap using a solution of chromium (III) nitrate.

Which of the following current and time settings could have produced this mass of plated chromium?

	Current (A)	Time (s)
A.	57.9	100
B.	115	100
C.	57.9	200
D.	174	100

Question 16

Consider the following molecule.



The molecule shown could be formed from

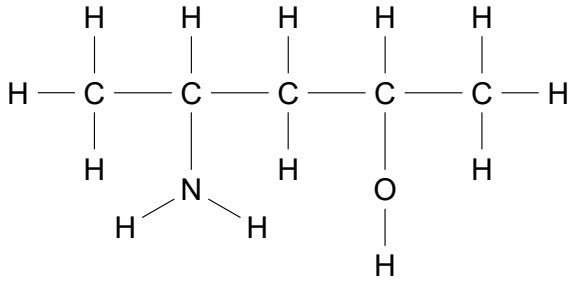
A. a condensation reaction between methanol and propanoic acid.

B. oxidation of butanoic acid.

C. oxidation of butan-2-ol.

D. a substitution reaction on butan-2-ol.

Question 17



The IUPAC name for this molecule is

A. 2-aminopentan-4-ol.

B. 4-aminopentan-2-ol.

C. 2-hydroxy-4-aminobutane.

D. 2-methy-4-hydroxybutane.

Question 18

Consider the following types of intermolecular forces or bonds.

I ionic bonds

II hydrogen bonds

III covalent bonds

IV dispersion forces

V dipole-to-dipole bonds

Which of the following lists all the types of intermolecular bonds or forces present between the molecules in liquid propanal (CH_3CH_2CHO)?

A. II and III

B. II and IV

C. IV and V

D. II, IV and V

Question 19

A molecule is known to be a structural isomer of propanoic acid. It does not contain a broad infra-red (IR) absorption over 2500 cm^{-1}. It has three hydrogen environments.

The molecule could be

A. propanone (CH_3COCH_3).

B. ethyl methanoate.

C. methyl ethanoate.

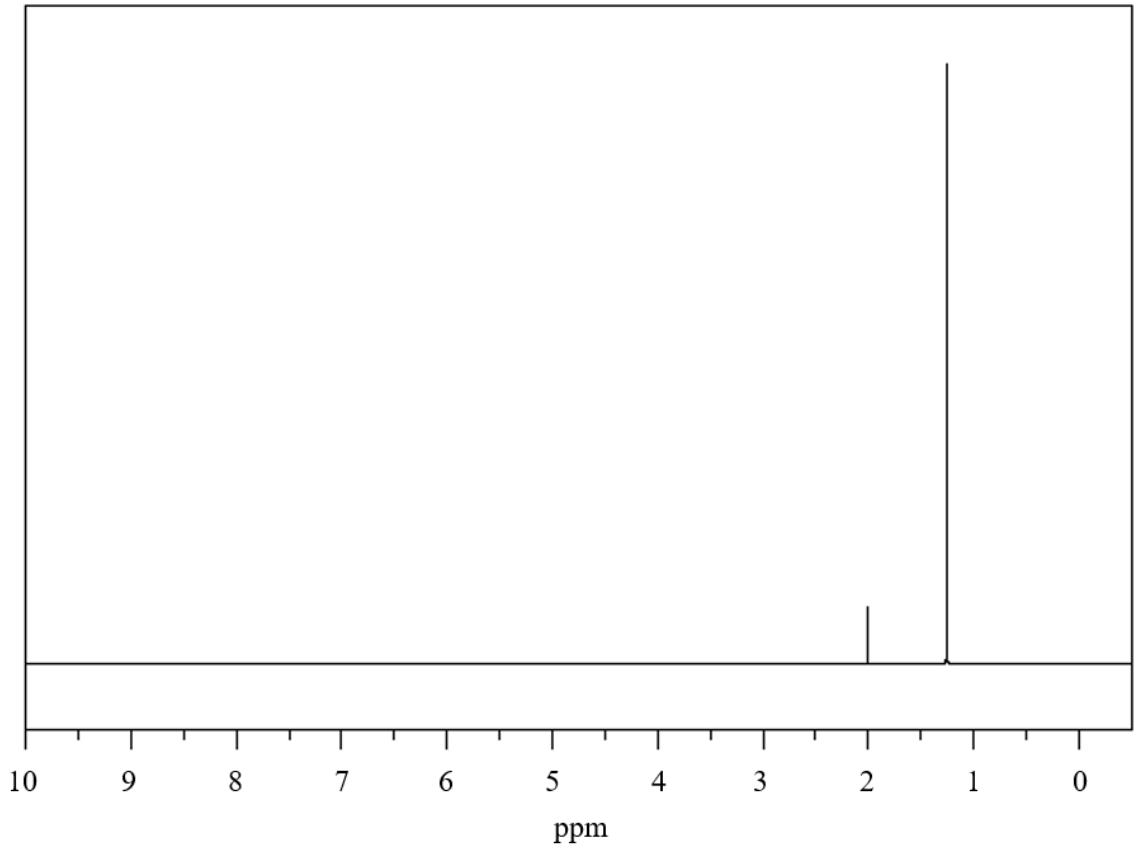
D. propen-2-ol.

Use the following information to answer Questions 20 and 21.

A laboratory has samples of different alcohols with the molecular formula $C_4H_{10}O$.

Question 20

The ^1H NMR for one of the samples in shown below.



Data: SDBS Web, <https://sdbs.db.aist.go.jp>,
National Institute of Advanced Industrial Science and Technology

The semi-structural formula for the alcohol that matches the spectrum is

A. $(CH_3)_3COH$

B. $CH_3CH(OH)CH_2CH_3$

C. $CH_3CH(CH_3)CH_2OH$

D. $CH_3CH_2CH_2CH_2OH$

Question 21

A sample of one of the alcohols is heated strongly with an excess of dichromate ions ($Cr_2O_7^{2-}$) in acid conditions and a colour change occurs. When Na_2CO_3 is added to the reaction product, no gas is evolved.

The alcohol could be

A. butan-1-ol.

B. 2-methylpropan-2-ol.

C. butan-2-ol.

D. 2-methylpropan-1-ol.

Question 22

The most suitable acid-base indicator to use in the titration of hydrochloric acid with ethanamine is

A. phenol red.

B. bromophenol blue.

C. bromothymol blue.

D. phenolphthalein.

Question 23

A mixture of liquids is injected into a high-performance liquid chromatography (HPLC) column to study its effectiveness in separating the components. The column uses a non-polar stationary phase with a polar solvent. The components in the mixture are ethanol, hexane, 1-chloroheptane and heptan-1-ol.

The likely order of these components eluting, from shortest to longest retention time, is

A. ethanol, hexane, heptan-1-ol, 1-chloroheptane.

B. ethanol, heptan-1-ol, 1-chloroheptane, hexane.

C. ethanol, hexane, 1-chlorohexane, heptan-1-ol.

D. hexane, 1-chloroheptane, heptan-1-ol, ethanol.

Question 24

'Chew your food carefully' is a common directive for children. There is, however, some scientific support for this directive.

The metabolism of which one of the following food categories will be the most immediately impacted by more thorough chewing of food?

A. fats

B. protein

C. dietary fibre

D. starch

Question 25

Lemon juice can be squeezed over freshly cut banana to limit the rate at which the banana turns brown.

Which one of the following is the most likely mechanism for this?

A. The lemon juice increases the activation energy of the browning reaction.

B. The lemon juice forms a waterproof barrier between the banana and air.

C. The acidity of the lemon juice lowers the effectiveness of the enzyme that causes browning.

D. The lemon juice hydrolyses proteins in the banana before they react with air.

Question 26

Corn, potatoes and legumes are all high in starch content. Legumes, however, differ from corn and potatoes in that the starch is present as amylose rather than amylopectin.

In a comparison between legumes and potatoes, it would be expected that the

A. impact of legumes on blood sugar levels will be less rapid than that by potatoes.

B. energy density of legumes would be much less than that of potatoes.

C. legumes will not be as sweet as potatoes.

D. legumes would soften in water more quickly than potatoes.

Use the following information to answer Questions 27 and 28.

The composition of some key nutrients in a cashew nut is shown in the table below.

Nutrient	Percentage (%) by mass
protein	21
carbohydrate	25
oleic acid-based fats	44
linoleic acid-based fats	10

Question 27

The amount of energy released by the complete combustion of a 1.5 g cashew nut will be closest to

A. 27 kJ

B. 30 kJ

C. 35 kJ

D. 41 kJ

Question 28

The number of carbon-to-carbon double bonds in a triglyceride formed from linoleic acid will be

A. 1

B. 2

C. 6

D. 9

Question 29

Which one of the following is most likely to lower the amount of energy that a human can extract from a muesli bar? Assume the same mass is consumed in each alternative.

A. replacing the sucrose with an equivalent mass of aspartame

B. replacing some glucose with dietary fibre

C. replacing some sucrose with monounsaturated oil

D. removing all sweeteners from the product

Question 30

A student completing a titration task is running short of time and decides to use a 50 mL measuring cylinder instead of the 20 mL pipette supplied, to prepare the aliquots required.

Compared to the pipette, the measuring cylinder has

A. less uncertainty, which will lead to both reduced precision and accuracy.

B. greater uncertainty, which will affect the validity of the results.

C. a systematic error, which will affect the accuracy but not the precision.

D. greater uncertainty, which will lead to both reduced precision and accuracy.

END OF SECTION A
TURN OVER

SECTION B

Instructions for Section B

Answer **all** questions in the spaces provided.

Give simplified answers to all numerical questions, with an appropriate number of significant figures; unsimplified answers will not be given full marks.

Show all working in your answers to numerical questions; no marks will be given for an incorrect answer unless it is accompanied by details of the working.

Ensure chemical equations are balanced and that the formulas for individual substances include an indication of state, for example, $H_2(g)$, NaCl(s).

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1 (9 marks)

Natural gas can be used to produce electrical energy in a gas-fired power station or in a fuel cell.

A conventional gas-fired power station uses the expansion of hot gases to generate electricity, whereas a more modern, combined-cycle power station is also able to convert water to steam to improve the energy efficiency.

Conventional methane fuel cells convert methane to hydrogen gas and then react the hydrogen at the anode. A solid oxide methane fuel cell (SOFC) uses methane directly at the anode and does not require the methane to be converted to hydrogen gas.

The efficiency of each form of electricity generation is shown in the table below.

Device	Percentage (%) energy efficiency
conventional gas-fired power station	42
combined-cycle gas power station	55
conventional methane fuel cell	62
SOFC	71

a. Give **one** reason for the higher efficiency of fuel cells compared to a gas-fired power station. Explain your answer.

2 marks

b. Write a balanced overall equation for the reaction of methane in an SOFC.

1 mark

_____

c. **i.** Assuming natural gas to be 100% methane, calculate the mass of methane required to produce 1.0 MJ of electrical energy in a conventional gas-fired power station.

2 marks

_____

_____

_____

_____

ii. Assuming natural gas to be 100% methane, calculate the mass of methane required to produce 1.0 MJ of electrical energy in an SOFC.

1 mark

_____

iii. Calculate the mass of CO_2 formed in the production of 1.0 MJ of energy in a conventional gas-fired power station.

2 marks

_____

_____

_____

d. Describe **one** method that can be used to produce methane in a sustainable way.

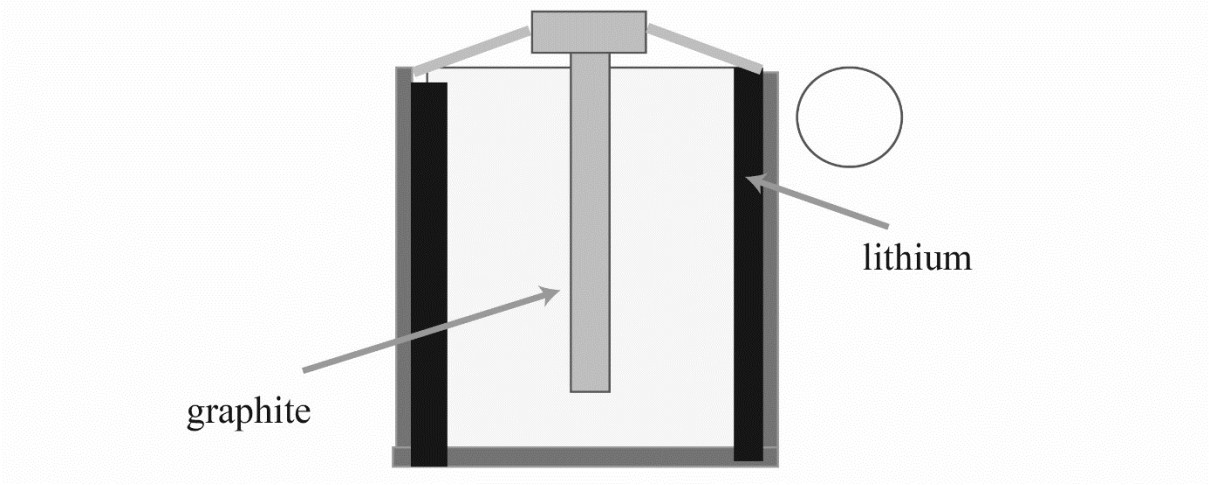
1 mark

_____

_____

Question 2 (9 marks)

A key feature of emerging battery technology is the inclusion of lithium and ionic compounds that contain lithium ions. One such cell is the lithium thionyl chloride ($SOCl_2$) primary cell. It is popular in high power applications because it has the highest operating voltage of any commercial cell (3.6 V) and it does not self-discharge over time. A diagram of the cell is shown below.



The overall equation for this cell is

$$4Li + 2SOCl_2 \rightarrow 4LiCl + S + SO_2$$

States are not shown because the electrolyte is not aqueous.

a. **i.** Write the half-equations for the reactions occurring in this cell.

2 marks

Anode _____

Cathode _____

ii. In the circle provided on the right of the cell diagram, write the polarity of the lithium electrode.

1 mark

b. This cell has many specialty applications, but it is too expensive for general purpose sales. Two of the reasons for its high cost are:

- the electrolyte needs to be able to dissolve SO_2 gas
- the seal of the casing around the cell needs to be particularly strong.

i. Explain why SO_2 needs to be soluble in the electrolyte.

1 mark

_____

_____

ii. State **one** reason for the battery casing needing to be very secure.

1 mark

_____

_____

c. The voltage produced in fuel cells is much lower than that of the lithium thionyl chloride cell and the cost is very similar. Despite the lower voltage, fuel cells are often preferred to the lithium thionyl chloride cell.

Suggest **one** advantage of selecting a fuel cell.

1 mark

_____

_____

d. The mass of lithium in a particular cell is 3.40 g.

Calculate the maximum time, in seconds, the cell could operate for with a current of 4.12 A.

3 marks

_____

_____

_____

_____

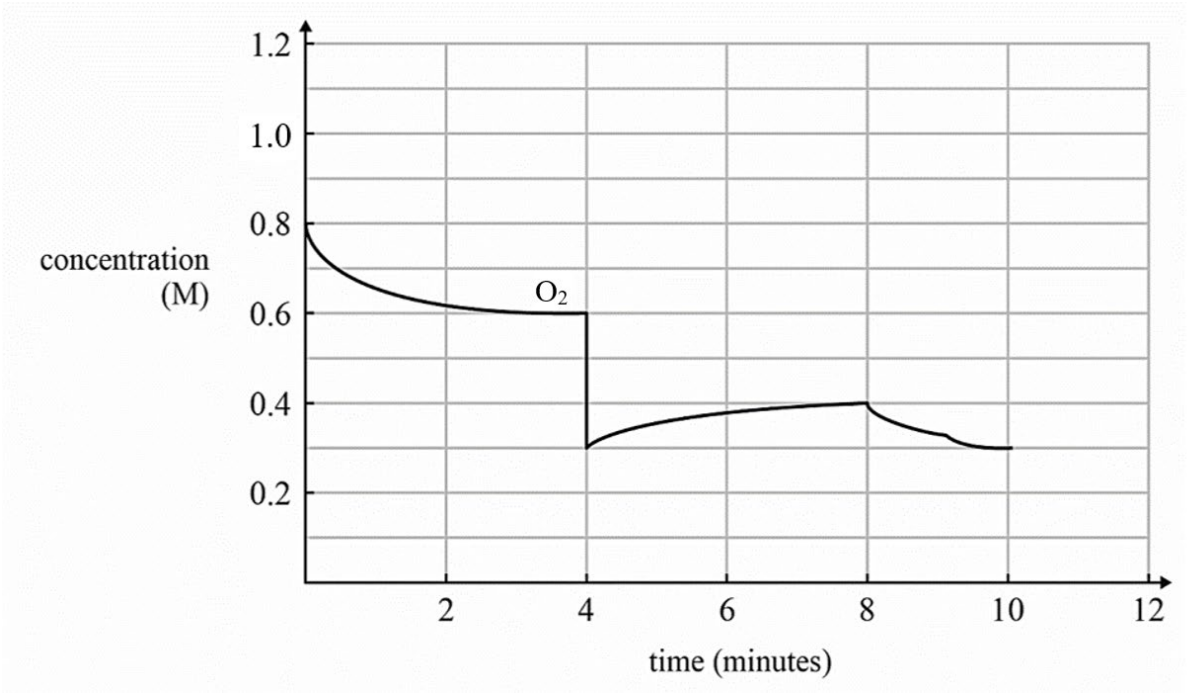
Question 3 (10 marks)

Sulfur dioxide, SO_2, and O_2 gas form an equilibrium with sulfur trioxide, SO_3. The equation is

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) \qquad \Delta H < 0$$

Equal amounts of SO_2, O_2 and SO_3 are added to an empty 2.0 L reactor at 300 °C and the reaction is allowed to proceed. The system reaches equilibrium after 4 minutes.

The concentration of O_2 gas is drawn on the axes below.



a. Use the same axes to draw the concentrations of both SO_2 and SO_3 gas for the first 4 minutes.

2 marks

b. Calculate the value of K_c at 300 °C for this reaction.

3 marks

c. At the 4 minute mark, the volume of the reactor is doubled.

Use the O_2 concentration on the original graph on page 18 to determine the concentration of both the SO_2 and SO_3 at the 8 minute mark, when equilibrium is re-established.

2 marks

d. At the 8 minute mark, the temperature of the system is altered. A catalyst is then added to the system at the 9 minute mark.

i. Use the graph provided on page 18 to determine if the temperature increased or decreased. Justify your response.

2 marks

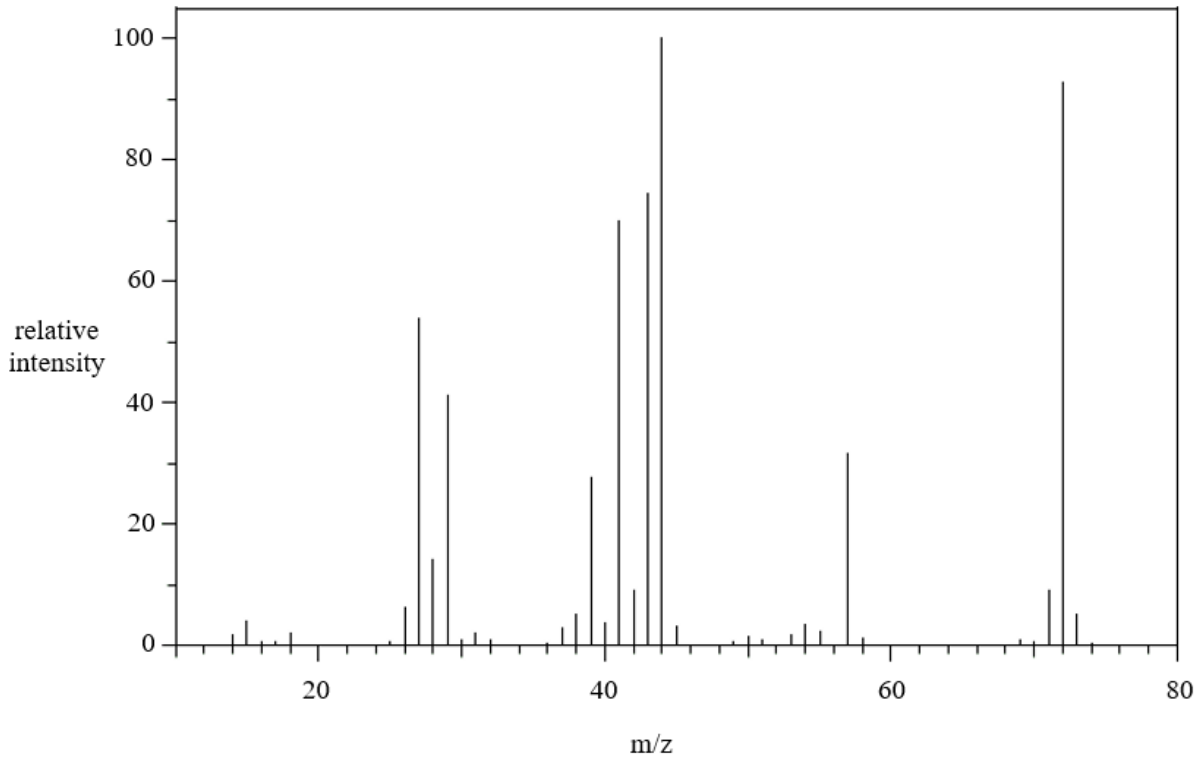
ii. State the impact that the addition of the catalyst would have on the system.

1 mark

Question 4 (10 marks)

The spectral information below refers to an organic molecule that contains only carbon, hydrogen and oxygen. A sample of this substance is labelled Molecule B.

The mass spectrum of Molecule B is shown below.



Data: SDBS Web, <https://sdbs.db.aist.go.jp>,
National Institute of Advanced Industrial Science and Technology

a. **i.** What is the likely molecular formula of Molecule B if it contains three carbon atoms?

1 mark

_____

ii. What is the likely molecular formula of Molecule B if it contains four carbon atoms?

1 mark

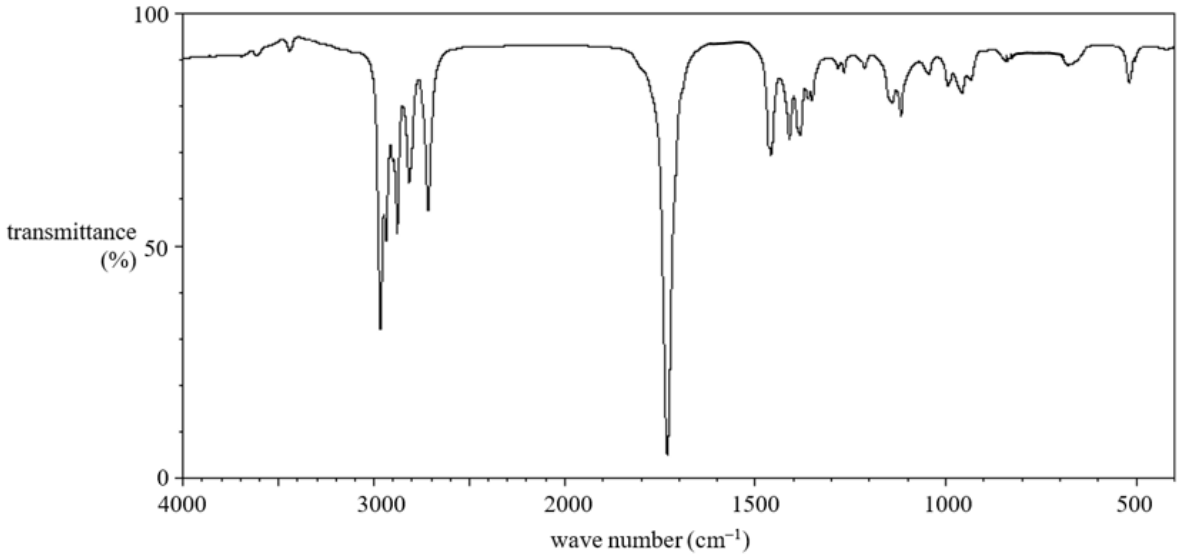
_____

iii. State which molecular formula offers the greater number of possible isomers. Justify your answer.

1 mark

_____

b. The infra-red (IR) spectrum of Molecule B is shown below.



Data: SDBS Web, <https://sdbs.db.aist.go.jp>,
National Institute of Advanced Industrial Science and Technology

Give **two** conclusions that you can draw from this spectrum about the possible structures of Molecule B.

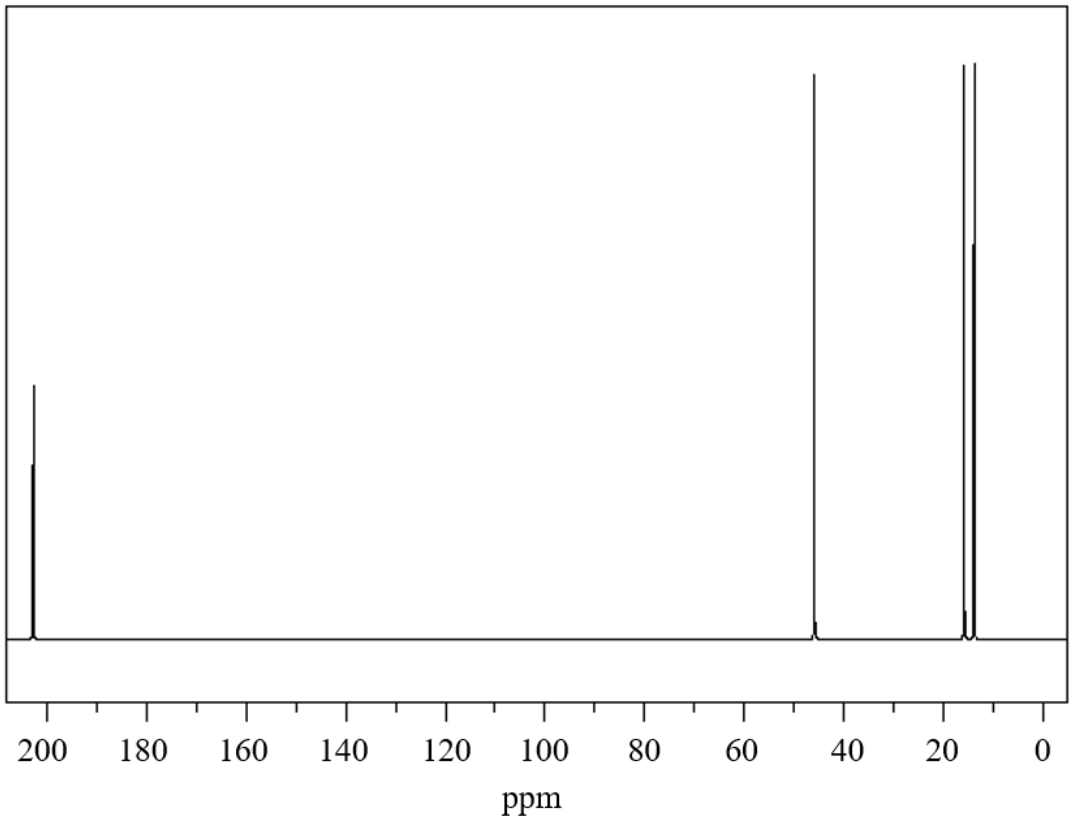
2 marks

_____

_____

_____

c. The ^{13}C NMR spectrum for Molecule B is shown below.

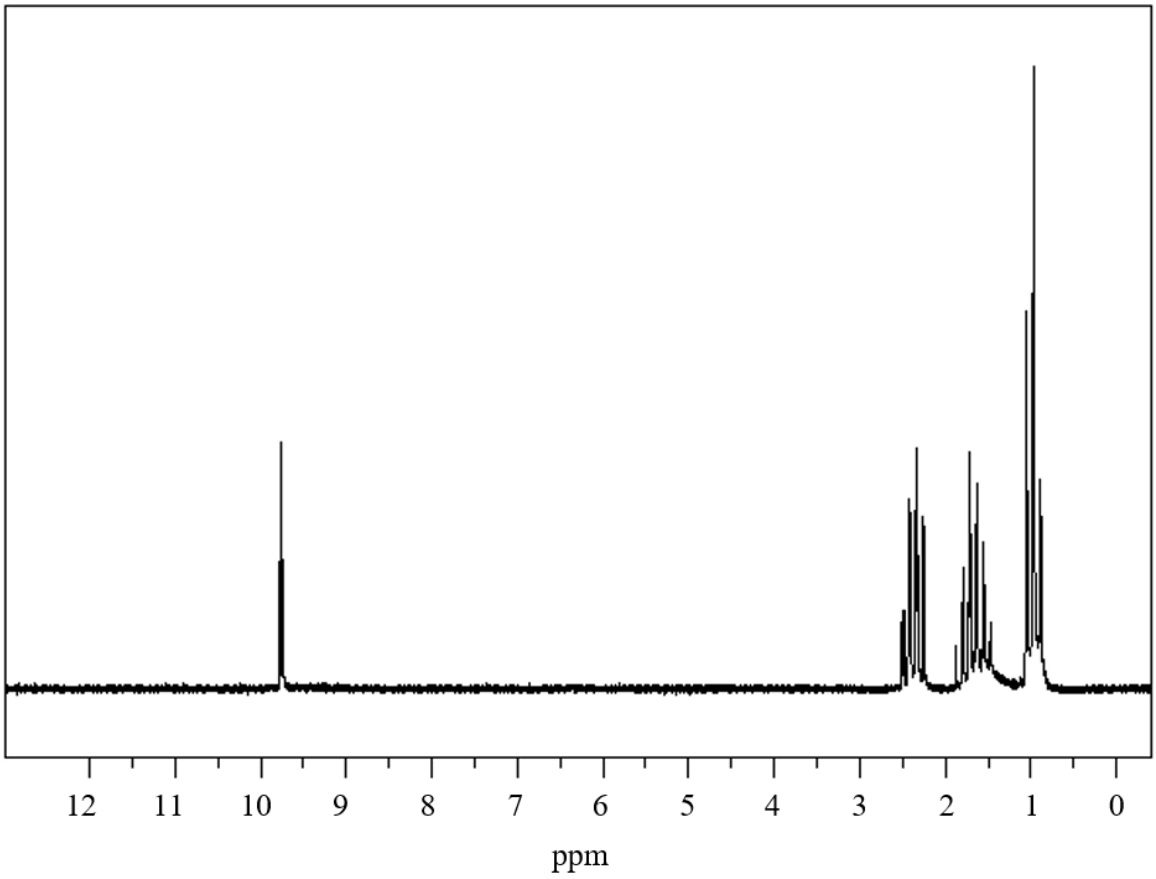


Data: SDBS Web, <https://sdbs.db.aist.go.jp>,
National Institute of Advanced Industrial Science and Technology

Based on the information provided, state the molecular formula of Molecule B. Justify your conclusion.

2 marks

d. The ^{1}H NMR spectrum for Molecule B is shown below.



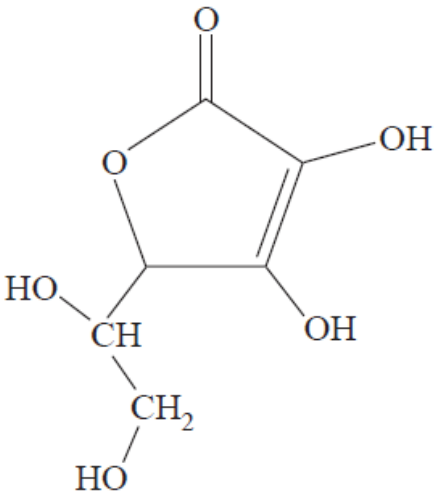
Data: SDBS Web, <https://sdbs.db.aist.go.jp>,
National Institute of Advanced Industrial Science and Technology

Use the ^{1}H NMR spectrum above to identify Molecule B. Justify your answer using data from the ^{1}H NMR.

3 marks

Question 5 (10 marks)

The structure of ascorbic acid (vitamin C) is shown below.



a. **i.** What determines if a substance is a vitamin?

1 mark

ii. State whether vitamin C is essential or non-essential. Justify your answer.

1 mark

b. Vitamins are classified as water-soluble or fat-soluble.

i. State which category vitamin C belongs to. Justify your response.

1 mark

ii. Explain how vitamin C's solubility or lack of solubility influences the recommended intake of vitamin C in humans.

2 marks

c. Vitamin C is an effective antioxidant.

i. What is an antioxidant?

1 mark

_____

_____

ii. Explain how vitamin C can act as an antioxidant.

1 mark

_____

_____

d. A text states that vitamin C has two enantiomers, of which only one is effective in the human body.

Explain what is meant by the statement 'vitamin C has two enantiomers'.

2 marks

_____

_____

_____

e. Ascorbic acid can be oxidised to dehydroascorbic acid, $C_6H_6O_6$.

Write a balanced half-equation for this reaction.

1 mark

_____

Question 6 (6 marks)

Cysteine and lysine are both 2-amino acids.

a. **i.** State which of cysteine and lysine forms the higher pH solution when mixed with water.

1 mark

_____

ii. State which of cysteine and lysine can lead to covalent bonding in the tertiary structure of a protein. Explain your answer by drawing and naming the covalent bond that will form.

2 marks

_____

_____

b. Draw the zwitterion of lysine.

1 mark

c. **i.** Draw one of the dipeptides formed when lysine reacts with cysteine.

1 mark

ii. Explain why there are two possible dipeptides that can be formed from the reaction between lysine and cysteine.

1 mark

_____

_____

Question 7 (9 marks)

Propene is an important organic chemical. Although there are few uses for propene itself, it is used as a building block for the manufacturing of many other chemicals.

a. **i.** How will the boiling point of propene compare to the boiling points of propane and propan-1-ol?

2 marks

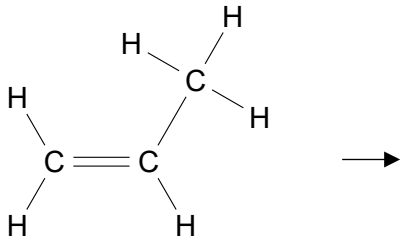
ii. State whether propene will be soluble in water. Explain your answer.

2 marks

b. Propene can react with itself to form the polymer polypropene.

Use the space provided to draw a segment of a polypropene molecule.

1 mark



c. A sample of propene can react with steam and an acid catalyst to form two different products.

Use the space provided to draw and name both products.

2 marks

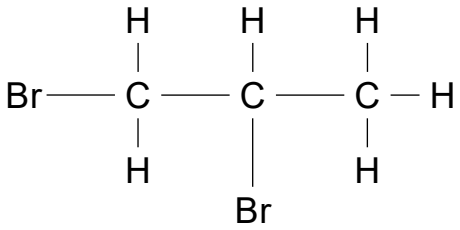
d. State whether propene has cis and trans isomers. Explain your answer.

1 mark

_____

_____

e. A molecule is shown below.



Write a balanced equation for the formation of this molecule from propene. States are not required.

1 mark

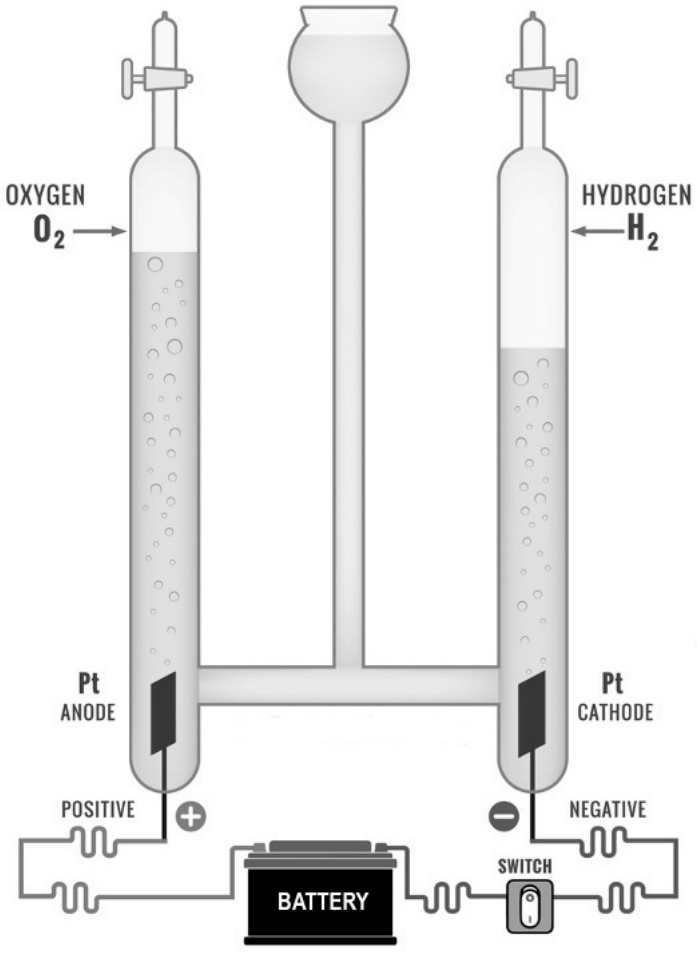
_____

_____

Question 8 (8 marks)

The emergence of the hydrogen industry has led to a renewed interest in the electrolysis of water. Hydrogen can be prepared on a small scale through the careful use of a Hoffman voltameter, the equipment shown in the diagram below. The voltameter features

- a long cylinder on each side to capture gas produced
- taps at the top of each cylinder to release gas
- an electrolyte and reservoir of 0.1 M NaCl
- electrodes at the bottom of each cylinder that can be connected to a power supply.



a. Use the spaces below to write half-equations for the reactions occurring during the electrolysis of water.

2 marks

Anode _____

Cathode _____

b. A student using this apparatus records a current of 1.4 A, a voltage of 7.6 V and a room temperature of 21 °C.

i. Calculate the volume of hydrogen gas that will be produced under these conditions in 10.0 minutes. Assume the gas pressure is 120 kPa.

4 marks

ii. Calculate the volume of oxygen produced in this time. Assume the same conditions.

1 mark

c. This apparatus has been associated with some serious laboratory accidents.

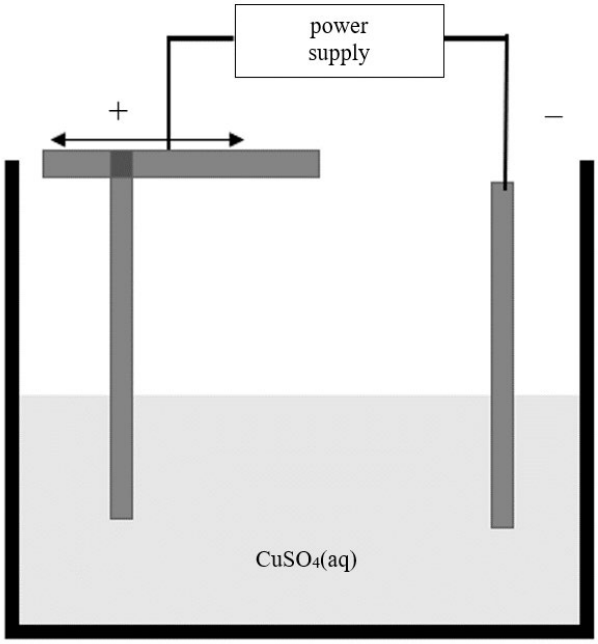
Identify a safety risk associated with the use of a Hoffman voltameter.

1 mark

Question 9 (10 marks)

A student sets up an experiment to test the effect of changing the electrode separation distance in an electrolytic cell. The experimental set-up and student data are shown below.

Effect of changing the electrode separation distance in an electrolytic cell



Hypothesis

The mass of metal obtained will not be affected by the electrode separation distance.

Experimental set-up

Both electrodes are copper. New copper electrodes of the same dimensions were used for each trial.

Voltage left on 5.00 V for the entire experiment.

Time for each trial: 4.00 minutes

Results

Trial	Electrode separation (cm)	Anode mass loss (g)
1	10.0	1.24
2	10.0	1.23
3	10.0	1.24
4	8.0	1.32
5	6.0	1.36
6	4.0	1.39
7	2.0	1.41

Conclusion

The data has proven the hypothesis to be incorrect.

a. **i.** Identify the independent variable in this experiment.

1 mark

_____

ii. Identify the dependent variable in this experiment.

1 mark

_____

b. Refer to the data provided to explain the precision of the student's results.

1 mark

_____

_____

c. Using your knowledge of Faraday's laws, discuss the student's conclusion.

3 marks

_____

_____

_____

_____

_____

d. Another student suggests that the mass increase would be due to the increasing concentration of copper ions in the solution due to the reaction at the anode.

Is this a valid suggestion? Justify your answer.

2 marks

_____

_____

_____

e. Yet another student suggests that silver is a less reactive metal and that the electrolysis of a silver nitrate solution, $AgNO_3(aq)$, of the same concentration could be trialled.

If the same amount of charge is used, describe the mass loss of a silver anode compared with the mass loss of a copper anode.

2 marks

_____

_____

Question 10 (9 marks)

One of the key aspects of counterfeit or illegal alcohol is that producers distill the alcohol more cheaply and quickly using dangerous shortcuts in the process, such as adding water and methanol, also known as methyl alcohol, which is highly toxic. Methanol is not intended for human consumption and can cause liver damage, blindness and death if consumed.

Source: https://theconversation.com/counterfeit-alcohol-sometimes-containing-jet-fuel-or-embalming-fluid-is-a-growing-concern-for-tourists-abroad-119706

a. High-performance liquid chromatography (HPLC) can be used to analyse alcoholic beverages for both ethanol content and for the presence of unwanted alcohols. Most testing facilities use a polar solvent and a non-polar stationary phase, a set-up referred to as reverse phase HPLC.

You have been asked to provide a testing laboratory with advice on how to use HPLC to analyse alcoholic drinks.

Describe how HPLC can be used to test alcoholic drinks for

- the presence of unwanted alcohols
- the ethanol concentration.

In your answer, you should explain how HPLC separates methanol from ethanol.

6 marks

b. A fellow student suggests the use of IR spectroscopy instead of HPLC for the analysis involving

- the detection of methanol contamination
- determining the concentration of the ethanol.

Discuss the suitability of IR spectroscopy for this task.

3 marks

END OF QUESTION AND ANSWER BOOK