2020
VCE
Chemistry
Trial Examination

Kilbaha Education

Quality educational content

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VICTORIAN CERTIFICATE OF EDUCATION
Year 2020

STUDENT NUMBER Letter

Figures									
Words									

CHEMISTRY

Trial Written Examination

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

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 white out liquid/tape.

Materials supplied
- Question and answer book of 27 pages.
- A data book
- Answer sheet for multiple-choice questions.

Instructions
- Write your **student number** in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- 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.

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VCE CHEMISTRY 2020
Trial Written Examination

MULTIPLE-CHOICE ANSWER SHEET

Student Name _____

Student Number _____

Signature _____

If your name or number on this sheet is incorrect, notify the Supervisor.
Use a **PENCIL** for **ALL** entries. For each question, shade the box that indicates your answer.
All answers must be completed like **THIS** example.

A	■	**C**	**D**

Marks will **NOT** be deducted for incorrect answers.
NO MARK will be given if more than **ONE** answer is completed for any question.
If you make a mistake, **ERASE** the incorrect answer. **DO NOT** cross it out.

ONE ANSWER PER LINE **ONE ANSWER PER LINE**

1.	A	B	C	D	16.	A	B	C	D
2.	A	B	C	D	17.	A	B	C	D
3.	A	B	C	D	18.	A	B	C	D
4.	A	B	C	D	19.	A	B	C	D
5.	A	B	C	D	20.	A	B	C	D
6.	A	B	C	D	21.	A	B	C	D
7.	A	B	C	D	22.	A	B	C	D
8.	A	B	C	D	23.	A	B	C	D
9.	A	B	C	D	24.	A	B	C	D
10.	A	B	C	D	25.	A	B	C	D
11.	A	B	C	D	26.	A	B	C	D
12.	A	B	C	D	27.	A	B	C	D
13.	A	B	C	D	28.	A	B	C	D
14.	A	B	C	D	29.	A	B	C	D
15.	A	B	C	D	30.	A	B	C	D

SECTION A – Multiple-choice questions

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.
Choose the response that is **correct** for 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.

Question 1

When biodiesel and petrodiesel properties are compared, it is found that

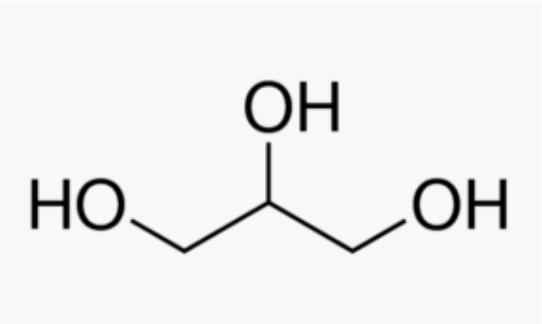
A. the viscosity of biodiesel is greater than the viscosity of petrodiesel.
B. the viscosity of biodiesel is less than the viscosity of petrodiesel.
C. the melting point of biodiesel is less than the melting point of petrodiesel.
D. the melting points and viscosities of biodiesel and petrodiesel are the same.

Question 2

Which one of the following is true about the molecular structure of biodiesel?

A. Biodiesel is a mixture of triglycerides.
B. Biodiesel is a mixture of methyl esters.
C. Biodiesel is a pure triglyceride.
D. Biodiesel is a pure methyl ester.

Question 3



This skeletal formula above shows a molecule with a molar mass of

A. 87 g mol^{-1}.
B. 92 g mol^{-1}.
C. 123 g mol^{-1}.
D. 128 g mol^{-1}.

Question 4

Arachidonic acid is a fatty acid with

A. 0 carbon-carbon double bonds.
B. 2 carbon-carbon double bonds.
C. 4 carbon-carbon double bonds.
D. 6 carbon-carbon double bonds.

Question 5

A half-cell cell is constructed using a Ni(s) electrode in a solution of 1.0 M Ni^{2+}(aq).

Which one of the following half-cells, when connected with the nickel half-cell, would produce a galvanic cell with largest cell potential in which the Ni(s) electrode is negative.

A. Cu^{2+}(aq) / Cu(s)
B. Pb^{2+}(aq) / Pb(s)
C. Cd^{2+}(aq) / Cd(s)
D. Al^{3+}(aq) / Al(s)

Question 6

The function of an enzyme in a catalysed chemical reaction is to lower

A. the ΔH value of the forward reaction only.
B. the ΔH values of both the forward and reverse reactions.
C. the activation energy of the forward reaction only.
D. the activation energies of both the forward and reverse reactions.

Question 7

In the electrolysis of 1.0 M NaCl(aq), Na(s) is **not** produced at the

A. anode because $H_2O(l)$ is a stronger oxidising agent than $Na^+(aq)$.
B. cathode because $H_2O(l)$ is a stronger oxidising agent than $Na^+(aq)$.
C. anode because $H_2O(l)$ is a weaker oxidising agent than $Na^+(aq)$.
D. cathode because $H_2O(l)$ is a weaker oxidising agent than $Na^+(aq)$.

Question 8

A possible power system for homes in the future involves the production of hydrogen gas from the electrolysis of water using solar cells and then the storage of this hydrogen gas in a metal hydride for use in a hydrogen-oxygen fuel cell. This hydrogen-oxygen fuel cell would produce a cell voltage closest to

A. 1.77 V
B. 1.23 V
C. 0.83 V
D. 0.68 V

Question 9

If H represents the energy contained in a chemical substance and E_a represents the activation energy of the forward reaction, the energy released or absorbed in a chemical reaction (ΔH) can be calculated from the formula

A. $\Delta H = H(\text{products}) - H(\text{reactants})$
B. $\Delta H = H(\text{reactants}) - H(\text{products}) + E_a$
C. $\Delta H = H(\text{products}) - H(\text{reactants}) + E_a$
D. $\Delta H = H(\text{reactants}) - H(\text{products})$

Question 10

Butane and octane are both common fuels. Compared to the flashpoint of butane, the flashpoint of octane is

A. higher because the dispersion forces between the octane molecules are greater.
B. lower because the dispersion forces between the octane molecules are greater.
C. higher because the dispersion forces between the octane molecules are weaker.
D. lower because the dispersion forces between the octane molecules are weaker.

Question 11

One of the best ways to increase the rate of a chemical reaction is to increase the temperature. The **main reason** that this happens is that the increase in temperature

A. increases the frequency of collisions between the reactants.
B. increases the concentration of the reactants.
C. increases the energy of the reactants.
D. increases the surface area of the reactants.

Question 12

Which one of the following statements about rate of reaction and chemical equilibrium is true?

When an increase in temperature is used to increase the rate of a reaction,

A. the yield of product at equilibrium increases.
B. the yield of product at equilibrium decreases.
C. the yield of product at equilibrium remains the same.
D. more information is required to determine the yield of product.

Question 13

Which one of the following molecules contains a glycosidic link?

A. α-glucose
B. β-fructose
C. α-lactose
D. glycerol

Question 14

The polysaccharides, starch and cellulose have the same molecular formula $(C_6H_{10}O_5)_n$. The human body is able to hydrolyse starch but not cellulose. The main difference in the structures of starch and cellulose is that

A. cellulose has alternating CH_2OH groups on adjacent monomers.
B. starch has a branched molecular structure while cellulose has a linear structure.
C. starch has more glycosidic links.
D. cellulose is a polymer of α-glucose.

Use the following information to answer questions 15,16 and 17.

An unsaturated fatty acid with the formula C_xH_yCOOH reacts with hydrogen gas to produce a saturated fatty acid C_xH_zCOOH. One mole of the unsaturated fatty acid reacts exactly with one mole of hydrogen gas. This hydrogenation reaction is exothermic.

Question 15

The formula of saturated fatty acid could also be written as

A. $C_xH_{x+1}COOH$

B. $C_xH_{2x+1}COOH$

C. $C_xH_{x+2}COOH$

D. $C_xH_{2x+2}COOH$

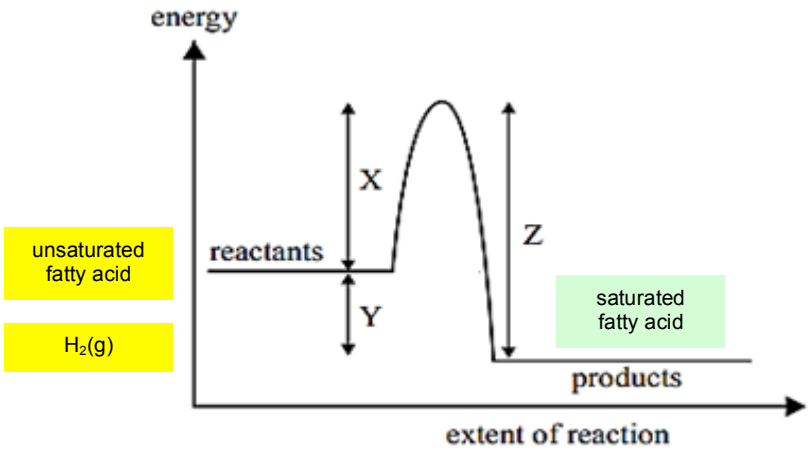
Question 16

The unsaturated fatty acid could be

A. palmitoleic or palmitic.
B. oleic or linoleic.
C. palmitoleic or oleic.
D. arachidic or palmitic.

Question 17

The hydrogenation reaction is shown in the diagram below. Which letter or combination of letters represents the energy released in this reaction?



A. X
B. Y
C. X + Z
D. X +Y + Z

Use the following information to answer questions 18 and 19.

A chemistry student is carrying out a titration analysis to determine the concentration of ethanoic acid in vinegar using a standard solution of sodium hydroxide.

Question 18

Of the following, the best indicator to determine the end point of this titration would be

A. thymol blue.
B. methyl orange.
C. bromothymol blue.
D. phenolphthalein.

Question 19

The equivalence point of this titration occurs when

A. the indicator changes colour.
B. there are equal amounts of NaOH(aq) and CH_3COOH(aq).
C. there is more NaOH(aq) than CH_3COOH(aq).
D. there is less NaOH(aq) than CH_3COOH(aq).

Use the following information to answer questions 20, 21 and 22.

The **Haber process** is the main industrial procedure for the production of ammonia developed in the first decade of the 20th century. The process converts atmospheric nitrogen (N_2) to ammonia (NH_3) by a reaction with hydrogen (H_2) using a metal catalyst.

The equilibrium can be represented by the equation:

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) \quad \Delta H = -91 \text{ kJ mol}^{-1}$

Question 20

If the concentration of ammonia at equilibrium is ***X*** and the concentration of nitrogen at equilibrium is ***Y*** and the equilibrium constant at a fixed temperature Is ***Z***, then the concentration of hydrogen at equilibrium is given by

A. $\sqrt{\frac{X^3}{YZ}}$

B. $\sqrt{\frac{YZ}{X^3}}$

C. $\sqrt[3]{\frac{YZ}{X^2}}$

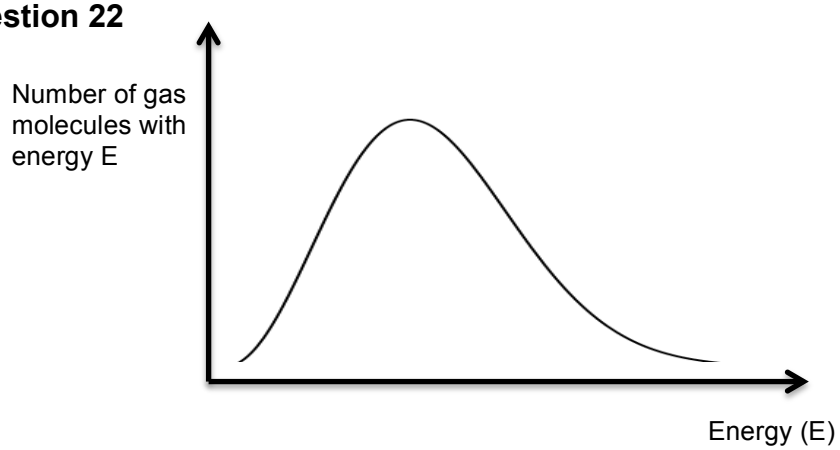
D. $\sqrt[3]{\frac{X^2}{YZ}}$

Question 21

The best yield of ammonia in this reaction would be obtained by using

A. low temperatures and high pressures.
B. low temperatures and low pressures.
C. high temperatures and high pressures.
D. high temperatures and low pressures.

Question 22



The diagram above shows the distribution of nitrogen and hydrogen gas molecules at 373 K. If the temperature were increased to 575 K, the maximum point on the graph would

A. shift to the right and have a lower value.
B. shift to the left and have a lower value.
C. shift to the right and have a higher value.
D. shift to the left and have a higher value.

Question 23

Which one of the following best describes the energy changes that occur when liquid water freezes and ice is formed according to the equation: $H_2O(l) \rightarrow H_2O(s)$

A. ΔH is positive as the potential energy of the system increases.
B. ΔH is positive as the potential energy of the system decreases.
C. ΔH is negative as the potential energy of the system increases.
D. ΔH is negative as the potential energy of the system decreases.

Question 24

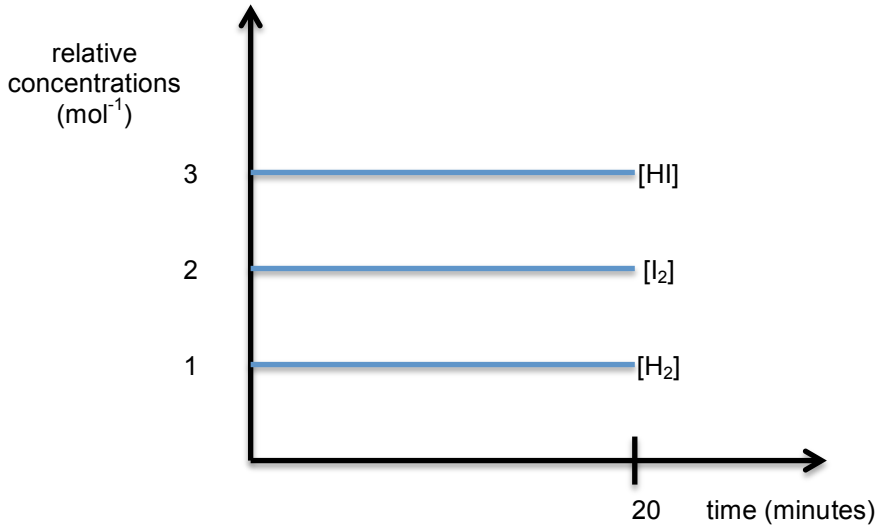
A current of 8.65 A is passed through a 0.5 L aqueous solution of 3.0 M copper(II) nitrate. Inert electrodes are used. How long will it take for all of the copper to be deposited at the cathode?

A. 2.3 hours
B. 4.6 hours
C. 9.3 hours
D. 18.6 hours

Question 25

Hydrogen gas and iodine gas combine in an equilibrium system to produce hydrogen iodide gas according to the equation: $H_2(g) + I_2(g) \rightleftharpoons 2HI(g) \quad \Delta H = -9 \text{ kJ mol}^{-1}$

The graph below shows the **initial** equilibrium concentrations of $H_2(g)$, $I_2(g)$ and HI(g) in a 1.0 L container.

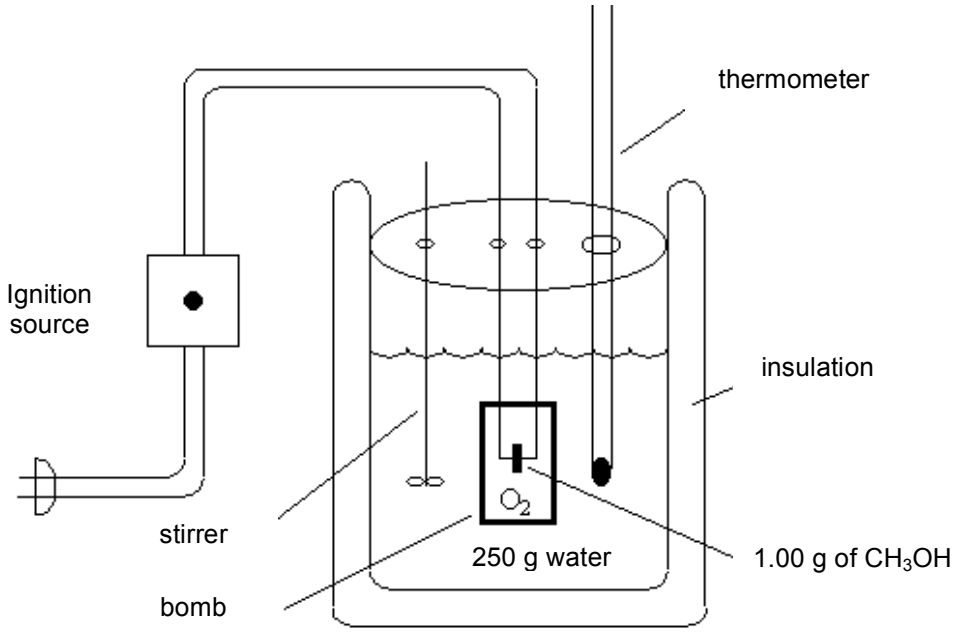


At time 20 minutes, the volume of the container is reduced from 1.0 L to 0.5 L at constant temperature. Which one of the following sets of equilibrium concentrations would apply when a new equilibrium is established?

A. $[H_2] = 1, [I_2] = 2, [HI] = 3$
B. $[H_2] = 2, [I_2] = 3, [HI] = 4$
C. $[H_2] = 2, [I_2] = 3, [HI] = 5$
D. $[H_2] = 2, [I_2] = 4, [HI] = 6$

Use the following information to answer questions 26 and 27.

1.00 g of methanol reacts completely with oxygen gas in the bomb calorimeter shown below. The mass of water in the calorimeter is 250 g.



Adapted from http://www.chem.hope.edu/~polik/Chem345-2000/bombcalorimetry.htm

Question 26

The balanced equation for this reaction is

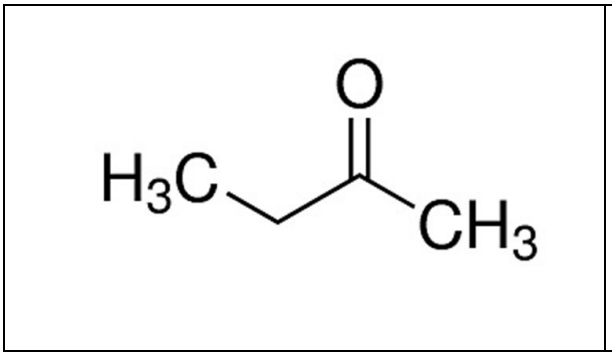
A. $CH_3OH(l) + O_2(g) \rightarrow CO_2(g) + H_2O(g)$
B. $2CH_3OH(l) + 2O_2(g) \rightarrow 2CO_2(g) + 3H_2O(g)$
C. $CH_3OH(l) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$
D. $2CH_3OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 4H_2O(g)$

Question 27

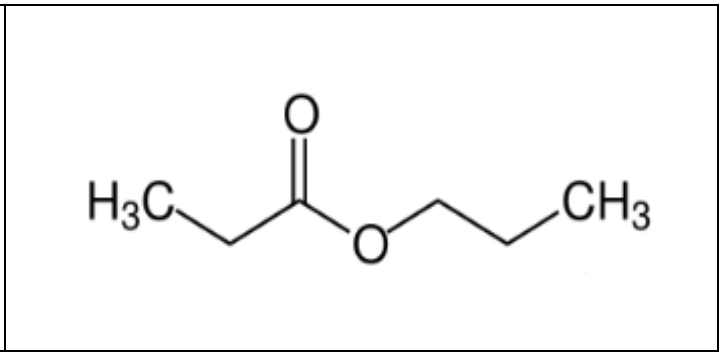
Using the value of the heat of combustion of methanol from the Data Book, the temperature rise occurring during this combustion reaction is closest to

A. 0.22 ^oC.
B. 21.7 ^oC.
C. 22.7 ^oC.
D. 227 ^oC.

Question 28



Molecule A



Molecule B

The number of peaks in a ^{13}C NMR spectrum for the two molecules shown above are

A. Molecule A = 3 peaks; Molecule B = 5 peaks
B. Molecule A = 3 peaks; Molecule B = 6 peaks
C. Molecule A = 4 peaks; Molecule B = 5 peaks
D. Molecule A = 4 peaks; Molecule B = 6 peaks

Question 29

An equilibrium system exists according to the relationship shown below.

$$4A(g) + B(g) \rightleftharpoons 2C(g) + 5D(g) \quad K_c = 100$$

The **correct units** of the equilibrium constant K_c are

A. M^0
B. M^1
C. M^2
D. M^3

Question 30

A 0.0500 M standard solution of purple permanganate ions (MnO_4^-) is used to determine the concentration of $Fe^{2+}(aq)$ in a solution. This is a redox titration in which the MnO_4^- is reduced to the colourless $Mn^{2+}(aq)$ ions in the presence of hydrogen ions, $H^+(aq)$, while the $Fe^{2+}(aq)$ is oxidised to $Fe^{3+}(aq)$.The titration is complete when there is a permanent faint pink colour in the solution. The volume of permanganate ions required to react exactly with 25.00 mL of $Fe^{2+}(aq)$ is 19.60 mL. The concentration of $Fe^{2+}(aq)$ is

A. 0.039 M
B. 0.078 M
C. 0.196 M
D. 0.235 M

END OF SECTION A

Instructions for Section B

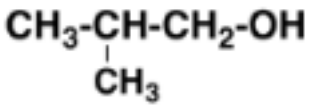
Answer all questions in the spaces provided.

To obtain full marks for your responses you should

- give simplified answers with an appropriate number of significant figures for all numerical questions; unsimplified answers will not be given full marks.
- show all working in your answers to numerical questions. No credit will be given for an incorrect answer unless it is accompanied by details of the working.
- make sure all chemical equations are balanced and that the formulas for individual substances include an indication of state; for example, $H_2(g)$; NaCl(s)

Question 1 (13 marks)

a. Write the IUPAC systematic name for each of the following organic compounds.



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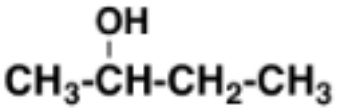

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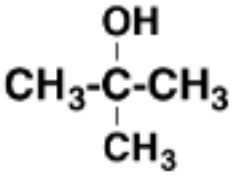


_____

(3 x 1 = 3 marks)

b. Which one of the compounds above is a tertiary alcohol?

_____

(1 mark)

Question 1 (continued)

c. Which of the two compounds $CH_3CHCH_3CH_2OH$ and $CH_3CH_2CH_2CH_3$ would you expect to have the higher boiling point? Give a reason for your answer.

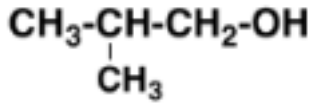
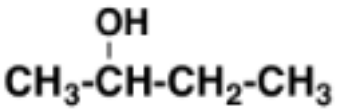
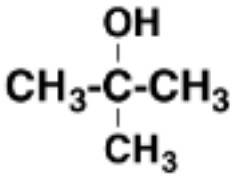
_____

_____

_____

(2 marks)

d. Complete the following table for each of these three compounds to show the number of peaks that would be found in the spectra for ^{13}C NMR and low resolution ^{1}H NMR.

Compound	**Number of Peaks** ^{13}C NMR	**Number of Peaks** ^{1}H NMR
		
		
		

(3 x 1 = 3 marks)

e. Which compound shown above would **not** show any splitting pattern in a high resolution ^{1}H NMR spectrum? Give a reason for your answer.

_____

_____

_____

(2 marks)

Question 1 (continued)

f. Explain why the examination of the infra-red spectra of these three compounds would **not** be a suitable way of identifying them.

_____

_____

_____

(2 marks)

Question 2 (5 marks)

Methionine is an essential amino acid in humans. High levels of methionine can be found in eggs, meat, and fish. It forms the dipeptide Ala-Met with the amino acid alanine.

a. Draw the structure of the zwitter ion of Ala-Met in the space below and circle the peptide link that joins the two amino acids.

(2 marks)

b. What name is given to the reaction by which this dipeptide is formed?

_____

(1 mark)

c. A polypeptide is formed when many amino acids are joined together with peptide links. This is called the primary structure of the polypeptide. Describe the bonding that occurs in the secondary structure of a polypeptide.

_____

_____

_____

(2 marks)

Question 3 (10 marks)

A chemist wishes to synthesise the ester **methyl ethanoate**. She has available to her methane gas, ethene gas and a large number of inorganic reagents.

a. Describe, in outline, without technical detail, the steps that would be needed to achieve this synthesis.

(5 marks)

b. Identify one substitution reaction used in this synthesis.

(1 mark)

c. Identify one addition reaction used in this synthesis.

(1 mark)

d. Identify one oxidation reaction used in this synthesis.

(1 mark)

Question 3 (continued)

e. Draw the structure of **methyl ethanoate** and circle the ester functional group.

(2 marks)

Question 4 (7 marks)

When methane gas burns completely in excess oxygen, carbon dioxide and water are formed but when the amount of oxygen is limited, carbon monoxide is produced instead of carbon dioxide.

a. Write a balanced chemical equation for the combustion of methane in a limited amount of oxygen gas.

_____

(1 mark)

Oxygen gas and carbon monoxide gas react with the protein haemoglobin (Hb) in the red blood cells according to the two competing equilibria shown below.

$$Hb(aq) + 4O_2(aq) \rightleftharpoons Hb(O_2)_4(aq)$$

$$Hb(aq) + 4CO(aq) \rightleftharpoons Hb(CO)_4(aq)$$

b. Write a balanced equation showing the equilibrium that exists between $Hb(O_2)_4(aq)$, $O_2(aq)$, $CO(aq)$ and $Hb(CO)_4(aq)$.

_____

_____

(2 marks)

Question 4 continued)

c. Write the equilibrium constant expression for this equation.

_____

_____

_____

_____

(1 mark)

d. Suggest one way of increasing the concentration of $Hb(O_2)_4(aq)$ in this equilibrium.

_____

_____

(1 mark)

e. Explain, with reference to collision theory, why decreasing the volume of the solution containing this equilibrium would **not** change the position of equilibrium.

_____

_____

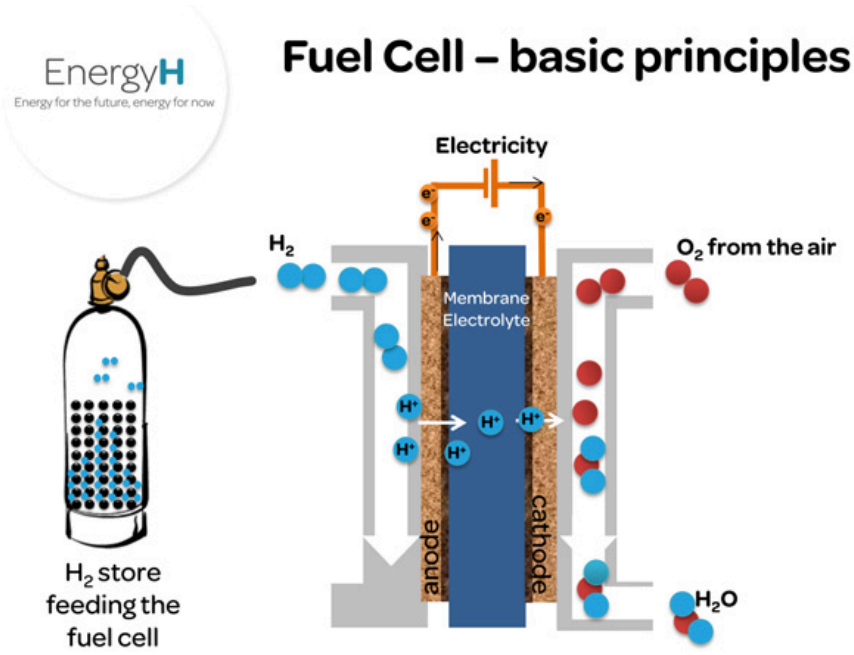
_____

_____

(2 marks)

Question 5 (10 marks)

The Energy Research Centre at The University of New South Wales (UNSW) reckons it is ready to produce the world's first hydrogen batteries for households as soon as early 2021. The key to the system is the use of metal alloy hydrides to store hydrogen gas produced from the electrolysis of water. This hydrogen gas is then used in a fuel cell to produce electricity for domestic use. This is shown in the diagram below.



http://www.merlin.unsw.edu.au/energyh/about-hydrogen-energy/

a. Write a balanced chemical half-equation for the **production** of hydrogen gas from pure water in an electrolytic cell.

_____

(1 mark)

b. What is the name of the electrode at which the hydrogen is produced?

_____

(1 mark)

c. Name one sustainable way the electricity used to produce this hydrogen gas could be obtained.

_____

(1 mark)

Question 5 (continued)

d. Calculate the mass of hydrogen gas that would be stored in 12 hours if a current of 5.5 amps flowed through the electrolytic cell.

_____

_____

_____

_____

(3 marks)

e. Write the overall equation for the chemical reaction occurring in the fuel cell when it is discharging to produce electricity.

_____

(1 mark)

f. It has been suggested by some that methane gas would be a better choice than hydrogen for use in a domestic fuel cell. Write the overall equation for the chemical reaction occurring in a methane fuel cell when it is discharging to produce electricity.

_____

(1 mark)

g. List one advantage and one disadvantage of using methane in a domestic fuel cell.

Advantage of methane

_____

(1 mark)

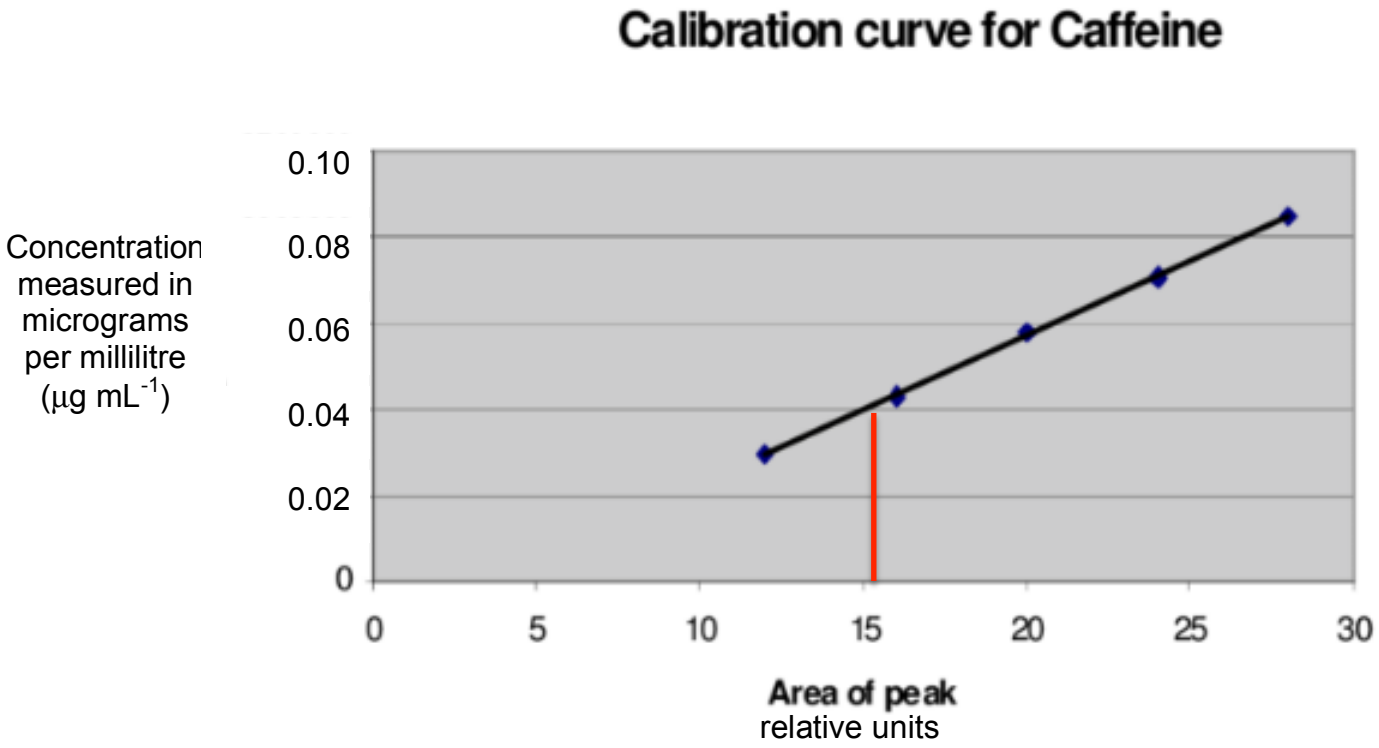
Disadvantage methane

_____

(1 mark)

Question 6 (8 marks)

Caffeine is a chemical present in coffee, tea and energy drinks. The calibration curve below for caffeine, $C_8H_{10}N_4O_2$,was obtained in a series of measurements using High Performance Liquid Chromatography (HPLC).



Modified from https://www.researchgate.net/figure/Calibration-curve-for-Caffeine_fig1_268424051

a. Explain how a calibration curve is constructed and why it is necessary before analysing an unknown sample.

(3 marks)

Question 6 (continued)

b. A sample containing an unknown quantity of caffeine was analysed using HPLC and an area peak of 15 was obtained. Calculate the concentration of caffeine in the sample in grams per litre ($g\ L^{-1}$).

(3 marks)

c. Use your answer in **part b**. to calculate how many mol of caffeine would be present in a 25 mL short black takeaway coffee.

(2 marks)

Question 7 (6 marks)

Bananas are often used by people to maintain energy during a long sporting exercise such as a 5 set game of tennis.

One web site gives the following breakdown on food groups in a banana.

Constituent	water	protein	carbohydrates	fats	fibre
Mass per 100 g	76.8	1.2	18.8	0.2	3.0

a. Calculate the energy content of a 125 g banana.

_____

_____

_____

_____

(2 marks)

An analytical chemist wanted to measure experimentally the energy content of a banana.

b. A slice of banana weighing 2.100 g was burnt in a bomb calorimeter producing a temperature rise of 2.55 ^{o}C. The combustion of 0.215 g of butane in the same calorimeter produced a temperature rise of 4.25 ^{o}C. Calculate the energy content of the 125 g banana from these data.

_____

_____

_____

_____

_____

(4 marks)

Question 8 (20 marks)

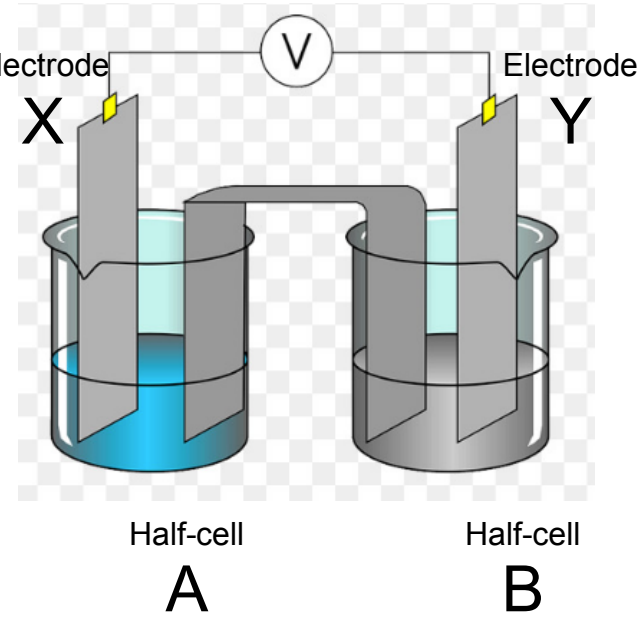
A student set out to investigate the corrosion of iron in the presence of various metals. He had the following half-cells available:

$Cu^{2+}(aq)/Cu(s)$, $Fe^{2+}(aq)/Fe(s)$, $Zn^{2+}(aq)/Zn(s)$, $Fe^{3+}(aq)/Fe^{2+}(aq)$ (graphite electrodes),.

In each of the half-cells the solid metal (where present) was the electrode.

He set up six galvanic cells using the arrangement shown below.

The colours shown do **not** indicate the chemicals present.



Modified from: https://www.subpng.com/png-5ftvip/

a. Name two variables that the student should control to make sure that his experimental results can be accurately compared.

Variable 1 _____ Variable 2 _____

(2 x 1 = 2 marks)

b. Complete the following table to identify the anode, predicted cell voltage and expected direction of electron flow through the external circuit in each cell.

Half-cell A	Half-cell B	Anode (X or Y)	Predicted cell voltage (V)	Expected direction of electron flow in external circuit (A to B or B to A)
$Cu^{2+}(aq)/Cu(s)$	$Fe^{2+}(aq)/ Fe(s)$			
$Cu^{2+}(aq)/Cu(s)$	$Zn^{2+}(aq)/Zn(s)$			
$Cu^{2+}(aq)/Cu(s)$	$Fe^{3+}(aq)/Fe^{2+}(aq)$			
$Fe^{2+}(aq)/Fe(s)$	$Zn^{2+}(aq)/Zn(s)$			
$Fe^{2+}(aq)/Fe(s)$	$Fe^{3+}(aq)/Fe^{2+}(aq)$			
$Zn^{2+}(aq)/Zn(s)$	$Fe^{3+}(aq)/Fe^{2+}(aq)$			

(6 x 1 = 6 marks)

Question 8 (continued)

c. **i.** Write a balanced overall equation for the cell

$Cu^{2+}(aq) / Cu(s) // Fe^{2+}(aq) / Fe(s)$

_____

(1 mark)

ii. Write a balanced overall equation for the cell

$Fe^{2+}(aq) / Fe(s) // Zn^{2+}(aq) / Zn(s)$

_____

(1 mark)

The corrosion of iron is a major economic cost to countries around the world. This corrosion occurs rapidly along coastlines where the air is saturated with salt spray from the oceans. If steel (containing iron) is connected to copper sheeting in a building, the copper turns green over time and the steel suffers extensive corrosion.

d. Explain why iron corrodes more rapidly in the presence of salty water.

_____

_____

_____

_____

(2 marks)

e. Explain why steel corrodes more rapidly when it is in contact with copper.

_____

_____

_____

_____

(2 marks)

Question 8 (continued)

f. **Using the results of the student's investigation**, recommend one way in which the corrosion of iron could be decreased . Give a chemical explanation for your recommendation.

_____

_____

_____

_____

(2 marks)

g. A friend tells the student that he should use the half-cell $Na^+(aq)$ / Na(s) in his investigation. Comment on this suggestion.

_____

_____

_____

_____

(2 marks)

h. Describe another different half-cell the student could choose to further his investigation. Give a reason for your choice.

_____

_____

_____

_____

(2 marks)

Question 9 (7 marks)

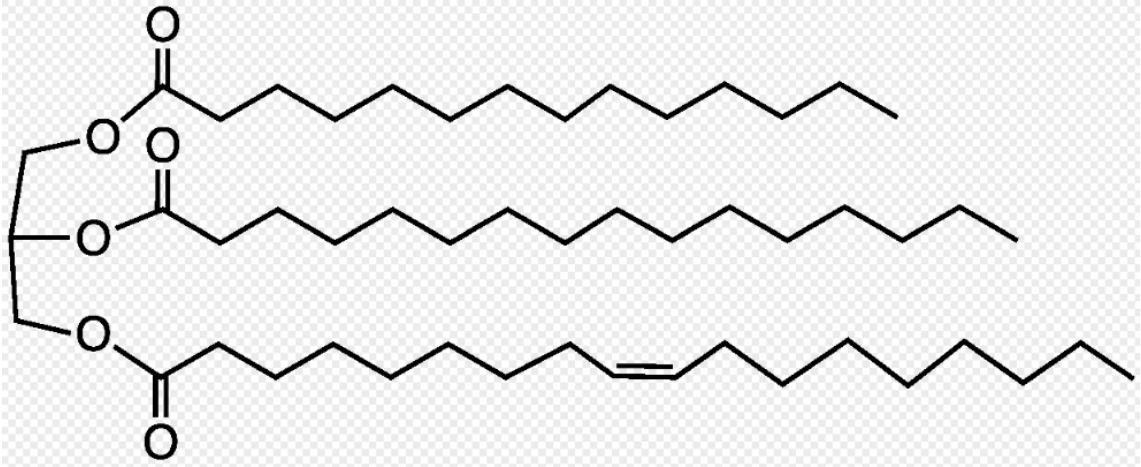
Butterfat is composed mainly of triglycerides.

a. What is the name of the molecule that reacts with fatty acids to form the triglycerides found in butterfat?

_____

(1 mark)

Below is the structure of a triglyceride made up of three different fatty acids.



https://en.wikipedia.org/wiki/Butterfat

b. What is the name of the monounsaturated fatty acid in this structure?

_____

(1 mark)

c. Give the molecular formula for this triglyceride.

_____

(1 mark)

d. What is the name **and** chemical formula of a compound that can be used to produce biodiesel from triglycerides?

_____

(1 mark)

Question 9 (continued)

e. What is the name **and** chemical formula of a compound that can be used to catalyse the production of biodiesel from triglycerides?

_____

(1 mark)

f. Explain why biodiesel produced from plant oil usually has a lower melting point than biodiesel produced from fats obtained from animals.

_____

_____

_____

_____

(2 marks)

Question 10 (4 marks)

When biodiesel, represented by the typical component $C_{17}H_{34}O_2(l)$, burns completely in oxygen gas, carbon dioxide gas and water vapour are produced.

Calculate the volume of carbon dioxide produced at SLC when 1.00 kg of biodiesel burns completely in oxygen.

(4 marks)

End of question and answer book

2020 Kilbaha VCE Chemistry Trial Examination

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