



Christ Church  
Grammar School

# Year 12 Chemistry

## Organic Chemistry Test 2019

Time allowed: **solutions** 45 minutes

Name:

Teacher: DGM JT CEM JJF

Mark = ...../47

## SECTION 1

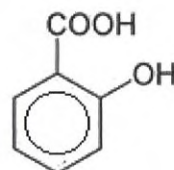
## MULTIPLE CHOICE 10 Questions

10 marks

1. The formula of the isomer of hexane expected to have the lowest boiling point could be written as
- A.  $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_2\text{CH}_3$
  - B.  $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)_2$
  - C.  $\text{CH}_3\text{CH}_2\text{C}(\text{CH}_3)_3$
  - D.  $\text{CH}_3(\text{CH}_2)_4\text{CH}_3$
2. Which one of the following is the empirical formula of 1-propyl pentanoate?
- A.  $\text{C}_8\text{H}_{16}\text{O}_2$
  - B.  $\text{C}_4\text{H}_8\text{O}$
  - C.  $\text{C}_7\text{H}_{14}\text{O}_2$
  - D.  $\text{CH}_2\text{O}$
3. Which one of the following pairs of compounds would produce biodiesel if reacted together, using an appropriate catalyst?
- A. A triglyceride and a strong base.
  - B. A carboxylic acid and a strong oxidising agent.
  - C. An alcohol and a triglyceride.
  - D. A fatty acid and an ester.
4. Which of the following molecules will engage in hydrogen bonding with water?
- I. propanone
  - II. propanal
  - III. propan-2-ol
  - IV. 1-propyl propanoate
  - V. propanamine
- A. all of them
  - B. II, III and V only
  - C. III and V only
  - D. II and III only

5. An oxidation product of 3-methylbutan-2-ol could be
- A. methyl butanone
  - B. 3-methylbutanal
  - C. 3-methylbutanone
  - D. 3-methylbutanoic acid
6. Which of the following is the most likely product when propene and hydrogen bromide gas are reacted together?
- A.  $\text{CH}_3\text{CHBrCH}_2\text{Br}$
  - B.  $\text{CH}_2\text{BrCH}_2\text{CH}_2\text{Br}$
  - C.  $\text{CH}_3\text{CHBrCH}_3$
  - D.  $\text{CH}_3\text{CH}_2\text{CHBr}_2$
7. Which of the following compounds has the highest vapour pressure?
- A.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
  - B.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OHCH}_3$
  - C.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$
  - D.  $\text{CH}_3\text{CH}_2\text{COCH}_3$

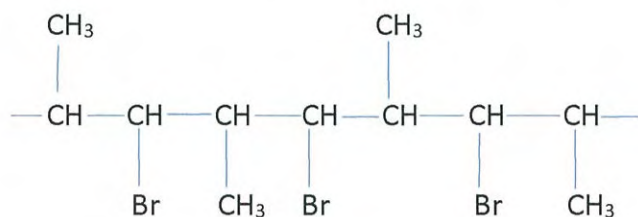
8. Ethyl salicylate can be manufactured from salicylic acid. The structure of salicylic acid is shown to the right.



To convert salicylic acid into aspirin, with what other substance should it be reacted?

- A. ethanol
- B. ethanoic acid
- C. acidified potassium dichromate
- D. sodium hydroxide solution

9. Examine the section of the polymer shown below.



Which one of the following is the correct name for the monomer used to make this polymer?

- A. 1-methyl-2-bromoethene
  - B. 1-bromoprop-2-ene
  - C. 2-bromopropene
  - D. 1-bromopropene
10. An unknown colourless liquid was subjected to a number of tests, the observations of which are shown in the table below.

Test	Observation
The liquid was added to a solution of sodium carbonate	The liquids mixed, but no reaction was observed
The liquid was shaken with bromine water	The bromine water went from orange to colourless
The liquid was mixed with sulfuric acid and a solution of sodium dichromate	The sodium dichromate turned from orange to green

Which of the following represents a possible structure for the unknown liquid?

- A.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
- B.  $\text{CH}_2(\text{OH})\text{CH}_2\text{CHCH}_2\text{COOH}$
- C.  $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}_2\text{CHCH}_2$
- D.  $\text{CH}_3\text{CH}_2\text{CHCHCH}_2\text{CHO}$



## SECTION 2

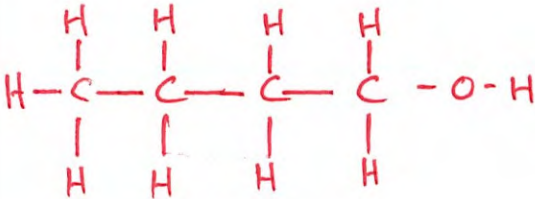
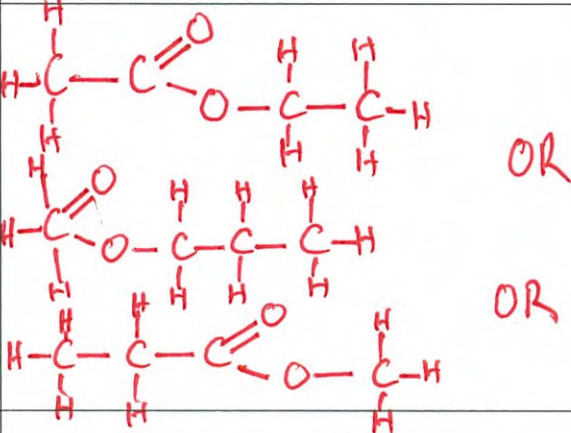
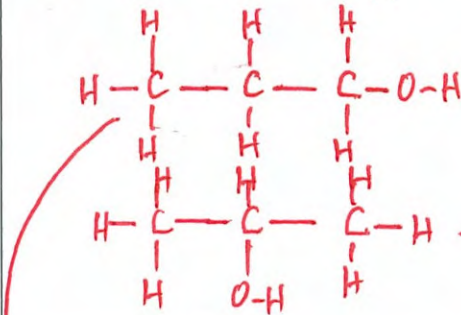
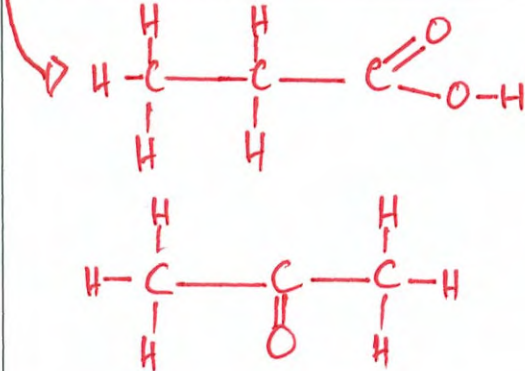
## SHORT ANSWERS

37 marks

## Question 11

4 marks

Draw the structural formulae of the following compounds, showing **ALL** bonds and atoms:

Name	Structure
(a)  Draw an alcohol that can be oxidised to butanal	
(b)  Draw a compound with the molecular formula $C_4H_8O_2$ and a fruity odour	
(c)  Draw a product formed when propene is hydrated	
(d)  Draw the compound formed when your product from '(c)' is <u>completely</u> oxidised with acidified dichromate	

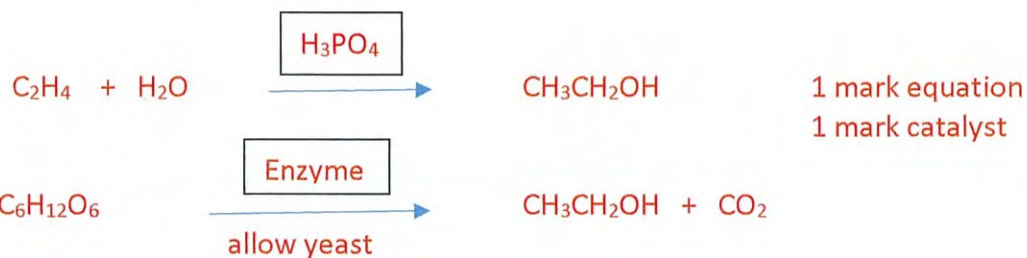
## Question 12

7 marks

Write a chemical equation/s to show how the following organic products could be made. Include relevant catalysts.

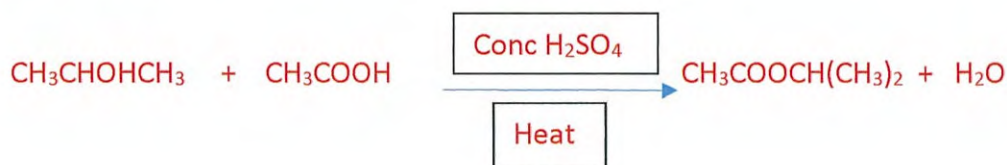
(a) ethanol

2 marks



(b) 2-propyl ethanoate

2 marks



(c) propanone

3 marks

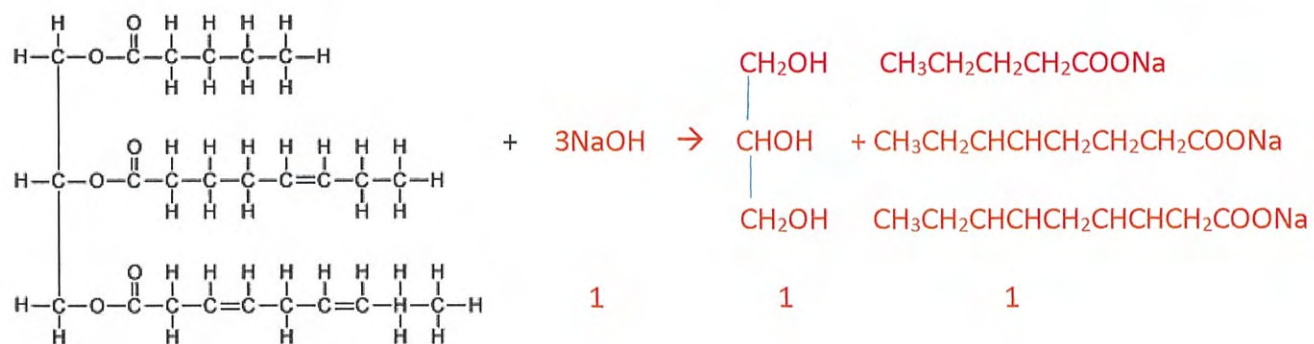
Oxidation	
$\text{CH}_3\text{CHOHCH}_3 \rightarrow \text{CH}_3\text{COCH}_3 + 2\text{H}^+ + 2\text{e}^-$	1
Reduction	
$\text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^- \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$ <u>or</u>	0
$\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{e}^- \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$	
Overall	
$5\text{CH}_3\text{CHOHCH}_3 + 2\text{MnO}_4^- + 6\text{H}^+ \rightarrow 2\text{Mn}^{2+} + 5\text{CH}_3\text{COCH}_3 + 8\text{H}_2\text{O}$ <u>or</u>	2
$3\text{CH}_3\text{CHOHCH}_3 + \text{Cr}_2\text{O}_7^{2-} + 8\text{H}^+ \rightarrow 3\text{CH}_3\text{COCH}_3 + 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$	

## Question 13

7 marks

- (a) Using the following triglyceride as a starting material, to write a reaction to show how a soap is formed.

3 marks

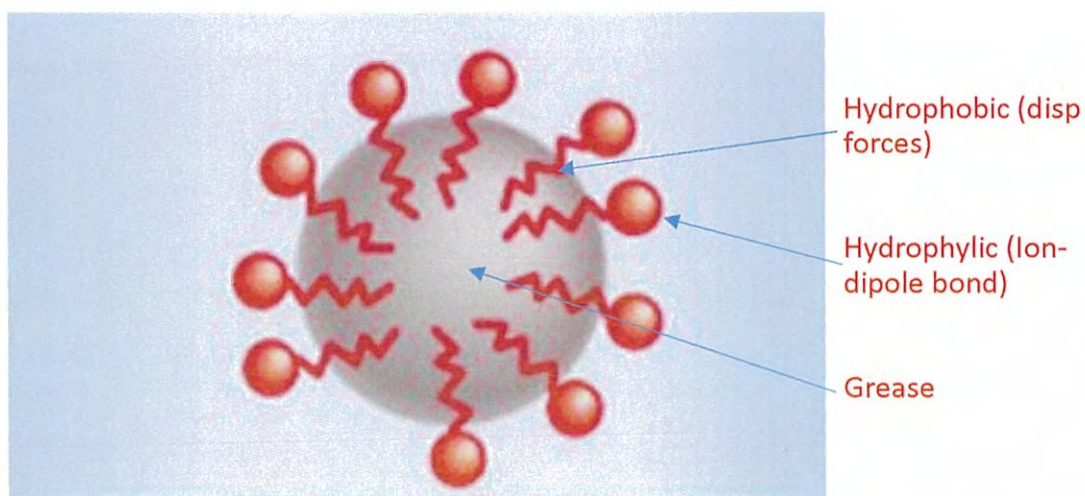


- (b) With the aid of a diagram, describe how a soap is able to remove grease from a surface. Your response must include reference to relevant intermolecular forces. 4 marks

Soap ion has a hydrophobic tail and a hydrophilic head 1

The hydrophobic portion will form dispersion forces with grease 1

The hydrophilic head will form ion-dipole bonds with water 1



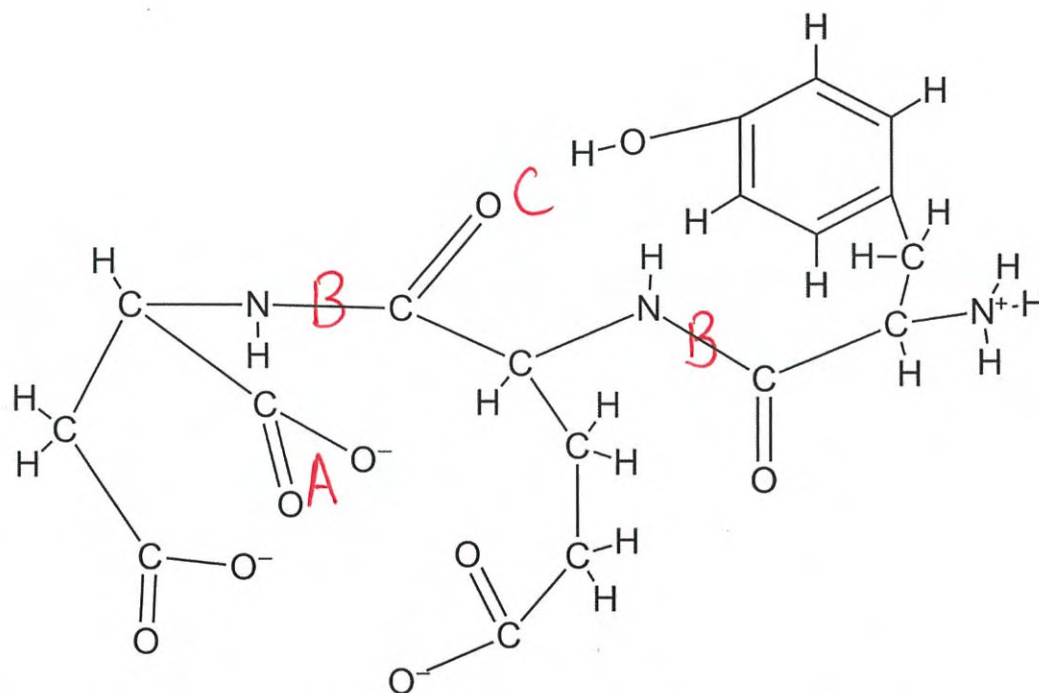
- 1 for including hydrophobic and hydrophilic labels in correct orientation



## Question 14

8 marks

Below is a structural diagram of a tripeptide.



- (a) Name the three  $\alpha$  amino acids that form the tripeptide. 3 mark

Tyr – Glu – Asp 3

Minus 1 for incorrect amino acids

- (b) What pH environment is the tripeptide in? Explain your answer 2 marks

Neutral 1

Zwitterion form 1

- (c) On the above diagram label with;

(i) **A:** the C (carboxyl)- terminal 1 mark

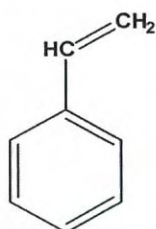
(ii) **B:** a peptide bond 1 mark

(iii) **C:** where a hydrogen bond could form within the tripeptide. 1 mark

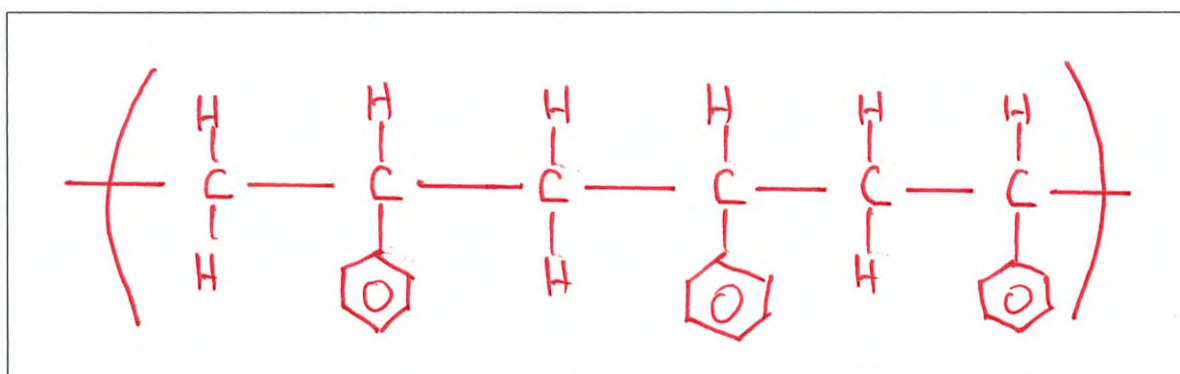
## Question 15

5 marks

The diagram below shows the benzene derivative, styrene.



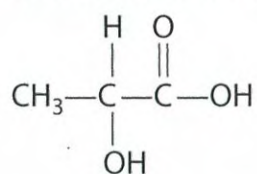
- (a) In the space below, draw 3 repeating units, showing the polymer that can be formed. 2 marks



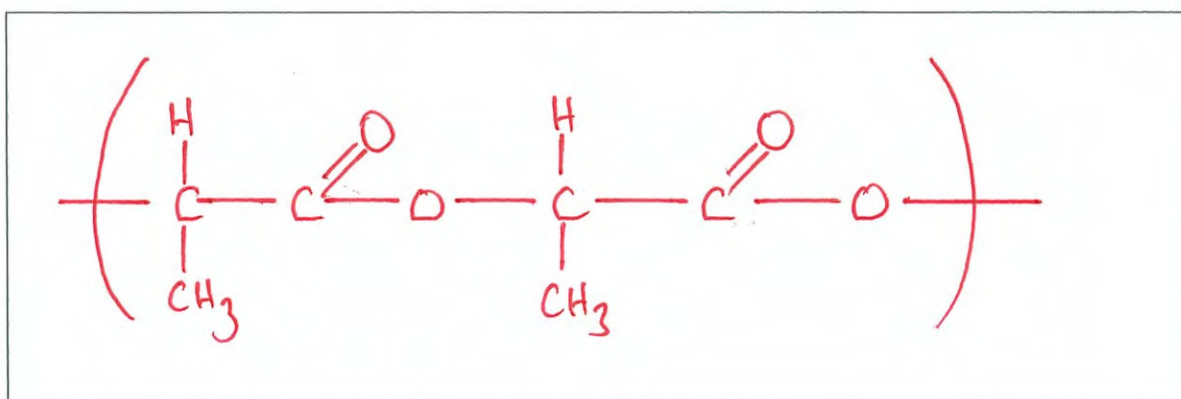
- (b) What is the name given to the type of reaction used to make this polymer? 1 mark

Addition 1

The diagram below shows the structure of lactic acid, which can form a polymer.



- (c) Draw a structure of the polymer formed from lactic acid showing 2 repeating units. 2 marks



Question 16

6 marks

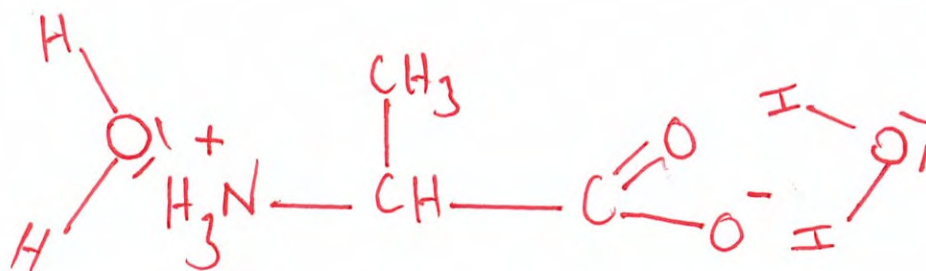
- (a) The  $\alpha$  amino acid alanine is highly soluble in water. Account for why this is the case. 4 marks

In water alanine will form a zwitterion 1

Water will form ion-dipole bonds with the zwitterion functional groups 1

This occurs because the energy needed to break the hydrogen bonds in water is compensated for by the energy released when water forms ion-dipole bonds with the zwitterion 2

- (b) Draw a diagram of the structure of alanine in water and show how water molecules would orientate with the functional groups of alanine. 2 marks



1 correct structure of alanine

1 orientation of water

END OF TEST