

Task 6: Organic Chemistry – Structures, Properties and Reactions Test

[55 Marks]

Name: _____

Teacher: _____

Answers to M/C questions (Please indicate with a cross, X, the correct choice)

(13 marks)

1. a) ~~b~~ c) d)

2. a) b) ~~c~~ d)

3. ~~a~~ b) c) d)

4. a) b) c) ~~d~~

5. a) b) ~~c~~ d)

6. ~~a~~ b) c) d)

7. a) b) c) ~~d~~

8. ~~a~~ b) c) d)

9. a) b) ~~c~~ d)

10. ~~a~~ b) c) d)

11. a) ~~b~~ c) d)

12. ~~a~~ b) c) d)

13. a) b) c) ~~d~~

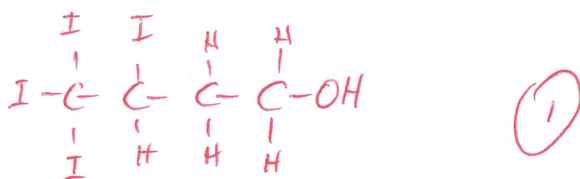
Part 2: Short Answer Questions

(37 Marks)

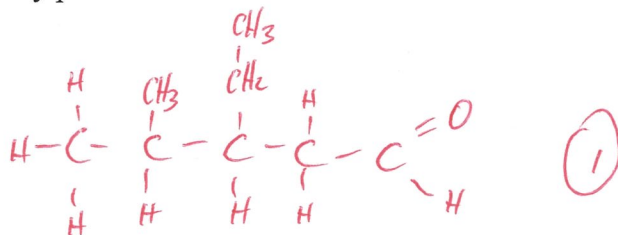
1. For each of the following organic compounds, draw its **full** structural formula, showing **all** bonds.

(4 marks)

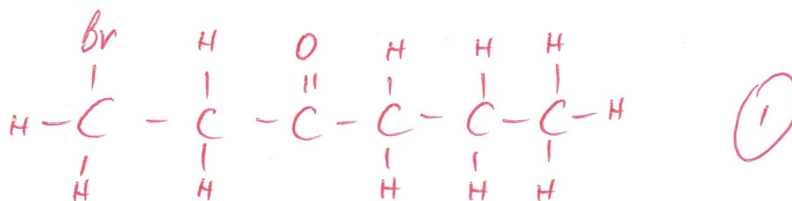
- (i) 3,4,4,4-tetraiodobutan-1-ol



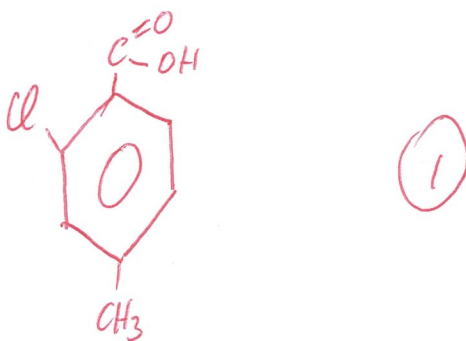
- (ii) 3-ethyl-4-methylpentanal



- (iii) 1-bromohexan-3-one

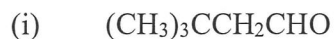


- (iv) 2-chloro-4-methylbenzoic acid

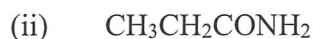


2. Give the correct IUPAC name for each of the following compounds.

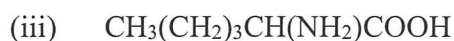
(4 marks)



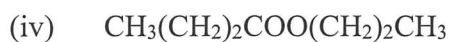
Name: 3,3-dimethylbutanal (1)



Name: propanamide (1)



Name: 2-aminohexanoic acid (1)

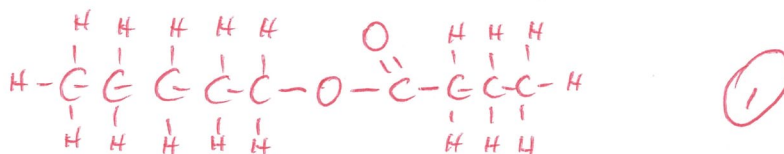


Name: propyl butanoate (1)

3. One of the main esters found in ripe pineapple is "pentylbutanoate".

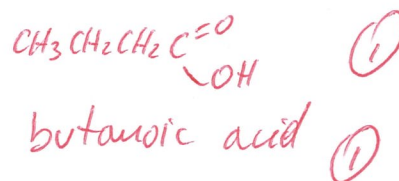
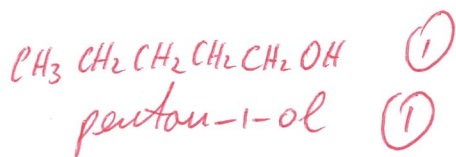
(i) Draw the full structural formula of this ester.

(1 mark)



(ii) Draw and name the two major organic compounds needed to make this ester.

(4 marks)



4. Alcohols can be oxidized by strong oxidizing agents like acidified potassium dichromate, ($K_2Cr_2O_7$), to form a range of different organic products. Primary (1°) alcohols can be partially oxidized to aldehydes or fully oxidized to carboxylic acids. Secondary (2°) alcohols can only be oxidized to ketones.

Draw and name the products of each of the following alcohols when they are treated as described below.

- (i) Propan-1-ol is partially oxidised by $K_2Cr_2O_7$ (2 marks)



- (ii) The product of (i) above is then further oxidised with more $K_2Cr_2O_7$ (2 marks)



- (iii) Pentan-2-ol is oxidised by $K_2Cr_2O_7$ (2 marks)



5. Consider the following substances; butanal ($CH_3CH_2CH_2CHO$), butanoic acid ($CH_3CH_2CH_2COOH$) and ethyl ethanoate ($CH_3CH_2OOCCH_3$).

- (i) State the most significant type of intermolecular forces that would be present in each of the substances above. (3 marks)

Butanal:

Dipole-dipole (1)

Butanoic acid:

H-bonding (1)

Ethyl ethanoate:

Dipole-dipole (1)

- (ii) Using relevant chemical theory, explain which one of the substances listed above would be expected to have the highest boiling point. (2 marks)

Butanoic acid has the highest B.P. - (1)

This is due to its ability to exhibit

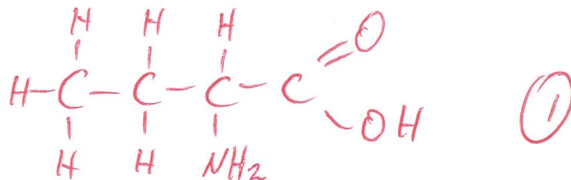
H-bonding I.M. forces which is stronger than the dipole-dipole exhibited by the other two! (1)

* Accept similar explanation!

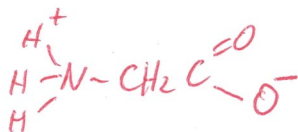
6. 2-aminobutanoic acid has the molecular formula $C_4H_9NO_2$.

(i) Draw the full structural formula for this amino acid.

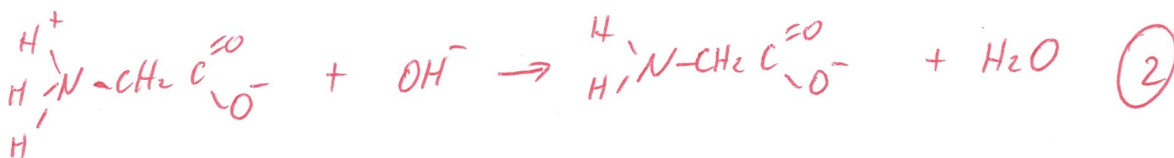
(1 mark)



(ii) Glycine is an amino acid commonly forming the building block of many proteins. It has the molecular formula NH_2CH_2COOH . Glycine is able to readily form a charged, (but overall neutral), structure called a "Zwitterion". Draw the full structure of this "ion" and show how it is then able to behave as a buffer, upon the addition of some dilute base like NaOH.



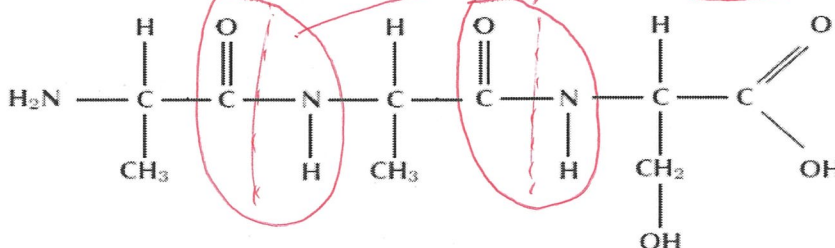
(3 marks)



* No water molecule or other minor omission = (-1 mark)

7. Examine the polypeptide structure drawn below.

peptide bond
* (either one) (1)



(i) With reference to the structure shown above, complete the primary sequence of the amino acids in the spaces below using the standard three letter abbreviations, as given on the Chemistry Data Booklet. (One is done for you).

ala - ala - ser

(2)

(2 marks)

- (ii) On the same diagram above, clearly indicate the location of one peptide bond by **circling** the relevant section on the molecule drawn.
In the space below, also write a clear description of a peptide bond.

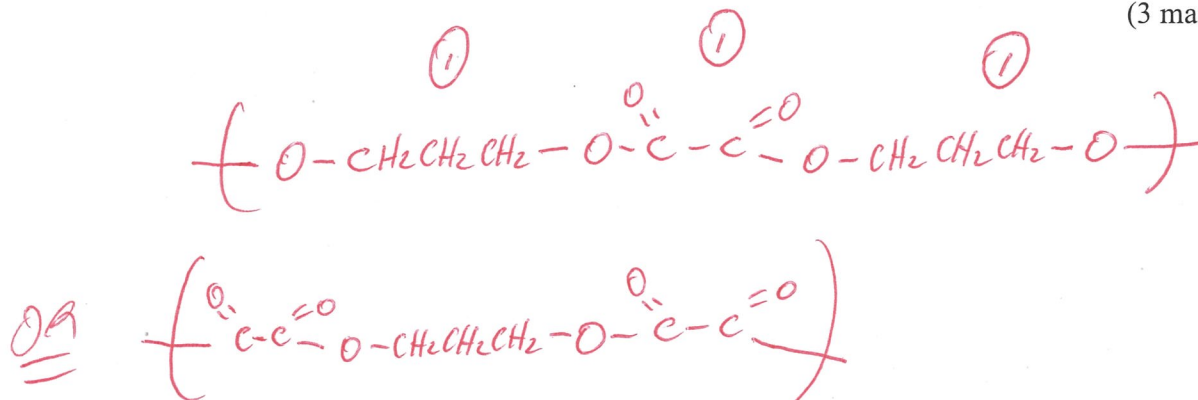
(3 marks)

A peptide bond is the "Link" that forms when the nitrogen atom in the amino group links to the carbon of the carboxyl group and a water molecule is eliminated. (1) (1)

8. Using 1,3-propanediol ($\text{CH}_2\text{OHCH}_2\text{CH}_2\text{OH}$) and oxalic acid (HOOCCOOH) as monomer units,

- (i) draw the structure of the polymer that can be formed. (Show at least two units of one monomer and one unit of the other in the structure that you have drawn).

(3 marks)



- (ii) What type of polymerisation process is this? Condensation. (1) (1 mark)

End of Test