

TRIAL TEST 4: ORGANIC CHEMISTRY



Time allowed: 70 minutes

Section 1 – Multiple Choice

20 marks

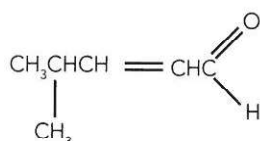
Total marks: 80

Section 2 – Short & Extended Answer

60 marks

SECTION 1 – MULTIPLE CHOICE (20 MARKS)

1. Consider the compound whose structural formula is drawn below:



The IUPAC name for this molecule would need to indicate that the functional groups it contained included:

- (a) a double bond and an aldehyde group.
 - (b) an alkyl group and an alcohol group.
 - (c) an alkyl group and a carboxyl group.
 - (d) a double bond and a carboxyl group.
2. From the list of 5 names below, pick the combination that are isomers of each other.

I butanoic acid

II butan-2-ol

III ethyl ethanoate

IV butanal

V butanone

- (a) I and II
- (b) II and III
- (c) III and IV
- (d) IV and V

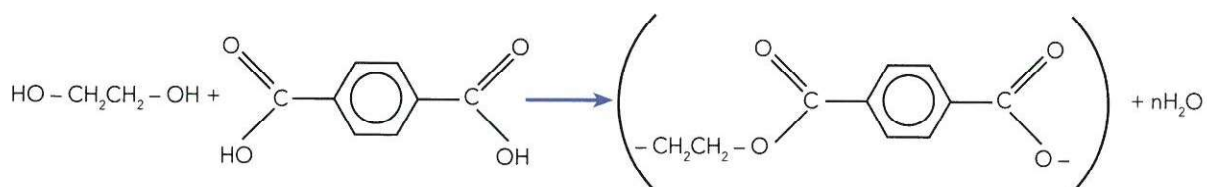
3. Three important types of chemical reaction are:

I Condensation polymerisation

II Addition polymerisation

III Esterification

The equation for the production of terylene is:



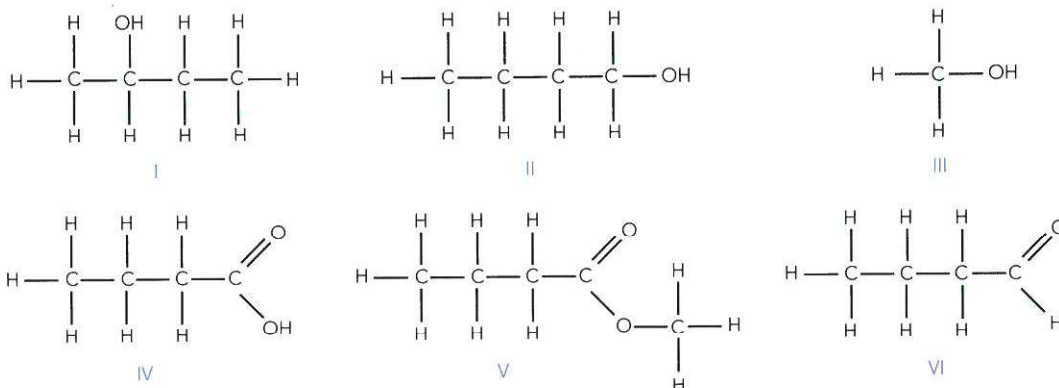
This reaction could be classified as a type:

- (a) I reaction only.
- (b) II reaction only.
- (c) I and III reaction.
- (d) II and III reaction.

4. Which of the following lists contains empirical formulae **only**.

- | | | | |
|-----|------------------|------------|--------------|
| (a) | C_2H_6 | $CuSO_4$ | Mn_2O_3 |
| (b) | HO | C_2H_3O | $N_2H_8SO_4$ |
| (c) | OF_2 | CCl_4 | C_6H_6 |
| (d) | $Pt_2N_2H_6Cl_2$ | AgN_2H_6 | CaO_2H_2 |

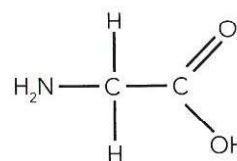
Use the structural formulae drawn below to answer questions 5 to 7.



5. The substances which are polar but **do not** exhibit hydrogen bonding are:
- IV & VI
 - I, IV, V & VI
 - IV & V
 - V & VI
6. The substance that would react with acidified $KMnO_4$ to form an isomer of VI is:
- I
 - II
 - III
 - IV
7. The two substances that could be used to produce a third from the list are:
- III & VI
 - II & IV
 - III & IV
 - V & VI
8. A compound containing only C, H and O was found to be composed of 77.38% oxygen and 19.36% carbon.
- The compound would be carboxylic acid as it contains carbon, oxygen and a very small amount of hydrogen.
 - To determine the molecular formula of the compound, it would be necessary to vaporise a known mass of the compound to determine the percentage of hydrogen present.
 - The compound would be a carboxylic acid or an ester, more information would be needed to determine which.
 - The compound has an empirical formula O_3CH_2 .
9. Consider the molecule shown.

This molecule would be best identified as:

- a carboxylic acid
- a primary amine
- an α -amino acid
- an amino aldehyde

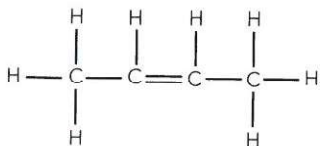


10. Which of the following compounds would you expect to be most soluble in water?
- propane
 - propanal
 - propanone
 - propan-1-ol

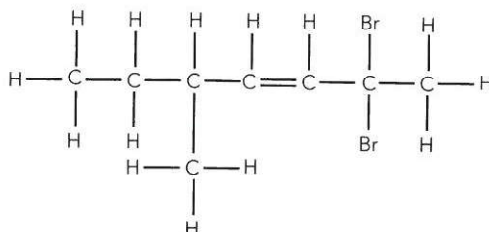
SECTION 2 – SHORT AND EXTENDED ANSWER (60 MARKS)

11. Use IUPAC rules to name the following compounds.

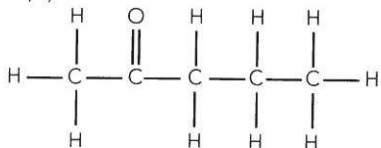
(a)



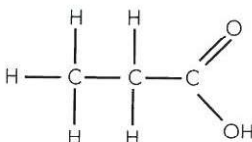
(b)



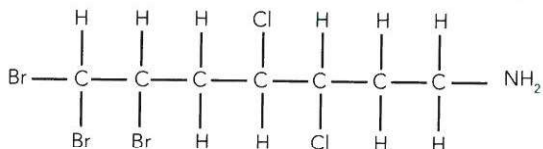
(c)



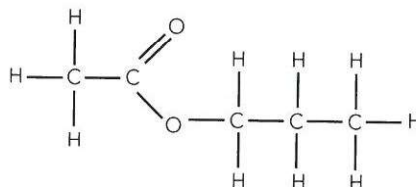
(d)



(e)



(f)



[12 marks]

12. Draw the structural formula for each of the following compounds.

(a) 1,2-dichloroethane

(b) *trans*-but-2-ene

(c) *cis*-2,3-diiodopent-2-ene

(d) pentan-1-amine (or pentanamine)

(e) 3,4-dimethylheptanal

(f) propyl butanoate

[12 marks]

13. Write the balanced equation for each of the following reactions:

(a) propene + chlorine gas

(b) butane + excess oxygen gas

(c) ethane + bromine (in presence of suitable catalyst)

[6 marks]

14. Use half equations to write balanced equations for the following reactions and name the organic product produced.

(a) Acidified potassium dichromate and propanal

OXIDATION:

REDUCTION:

REDOX:

NAME:

(b) Acidified potassium permanganate and butan-2-ol

OXIDATION:

REDUCTION:

REDOX:

NAME:

[8 marks]

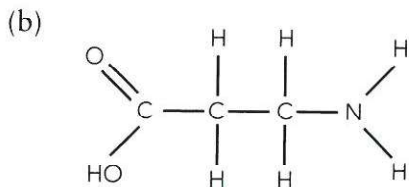
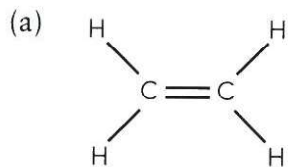
15. Draw the structural formula and name the organic product of the following reactions:

(a) ethanol + propanoic acid
(with concentrated H_2SO_4 as catalyst)

(b) heptan-1-ol + butanoic acid
(with concentrated H_2SO_4 as catalyst)

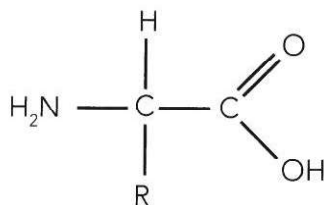
[4 marks]

16. Draw a section of the polymer chain formed when the following monomers are polymerised. You need to draw at least 4 monomer units in your polymer.



[4 marks]

17. The general formula of an α -amino acid can be written as:



Write the formula to show the ions formed when:

- (a) It is dissolved in an acidic solution

- (b) It is dissolved in a basic solution

[4 marks]

18. A 0.467 g sample of nicotine was burnt in excess oxygen to produce 1.266 g of carbon dioxide and 0.3589 g of water vapour.

A second sample of the nicotine, weighing 0.362 g was analysed and found to contain 0.06263 g of nitrogen.

A third sample of the nicotine, weighing 0.964 g was vaporised in a 0.0500 L container and found to exert a pressure of 544 kPa at a temperature of 277°C.

Determine the empirical and molecular formulae of the nicotine.
