ORGANIC CHEMISTRY 2

MARKING SCHEME

1. You put CH_3CH_2OH in a test tube and also CH_3COOH in another test tube.
- Add Sodium carbonate to each of the test-tubes and note the observations ✓ 1
- In the test tube with CH_3COOH, a loud hissing sound (efferrescence) is herd, whilt in the test tube with CH_3CH_2OH there will be no efferescence ✓ ½
N/B: Allow other alternative correct explanations

2. Monomer molecular mass

$CH_2 = CH$
$\quad\quad\quad \| \checkmark ½$
$\quad\quad\quad CN$

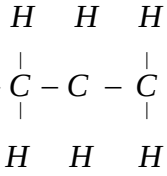
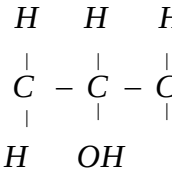
3C + 3H + 1N
3 x 12 + 3 x 1 + 1 x 14
36 + 3 + 14 = 53 ✓ ½

$$\frac{53n}{53} = \frac{5194}{53} \checkmark ½$$

$$n = 98 \checkmark ½$$

Hence there are 98 monomers.

3. B ✓ 1 because it does not contain the carboxyl group (-COO) that combines with the Mg2+ ions to form scum ✓ 1

4. (a) propane:  (1mk) propan -2- ol:  (1mk)

(b) Bubble the two gases separately through acidified potassium manganate (VII) (1mk)

Propene decolourizes it but not propane. (1mk)

Alt: Bubble the two gases separately through bromine (liquid or water) in the dark

(1mk) propene decolourizes but not propane

5. (a) $(HCO_2)_n = 90$

$(1 + 12 + 16 \times 2)n = 90$ (½ mk)

$45n = 90$

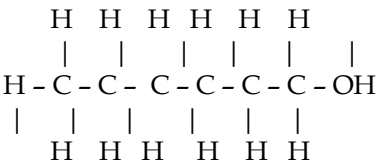
$$n = {}^{90}\!/_{45} = 2 \quad \&(HCO_2) \times 2 = H_2C_2O_4$$ (½ mk)

Molecula formula of G = $H_2C_2O_4$ (1mk)

J---Alcohol (1m)

G—Ester (1m)

6. i)



(1)

ii) Concentrated sulphuric acid (1)
Temperature of 180° C (1)

7. a)The boiling point of the alkanols increase with the increase in number of carbon atoms(1)

b) Presence of the hydrogen bond in alkanols makes their boiling points to be higher than those corresponding alkane (1)

c) Pentan-l – ol (1)

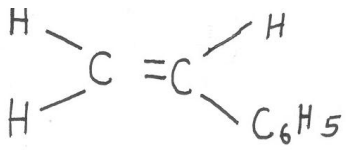
8.a) Vulcanization of rubber is the process of adding sulphur to rubber then heating

a. It is harder ;
It is tougher ;
It is less flexible; ***Any two*** ***2 mks***

9. (a) (i) ethanol [1]
CH3-CH2-OH [1]
propanoic acid [1]
CH3-CH2-COOH [1]
independent marking, no ecf
accept C2H5
not – HO
(ii) type of compound – salt / sodium carboxylate / alkanoate [1]
not soap / sodium stearate etc
use – soap / cleaning / detergent [1]

(iii) terylene / PET / Dacron / diolen / mylar / crimplene [1]
(b) (i) polyamide / amide / peptide / polypeptide [1]
(ii) correct amide linkage NHCO then CONH [1]
cond to mark 1, 2 monomers (different shading in box) [1]
cond continuation (to ONE correct linkage) [1]
OR nylon 6
only one linkage – NHCO [1]
cond only one monomer [1]
cond continuation (to correct linkage) [1]
(iii) use locating agent [1]
measure distance travelled by sample / travelled by solvent front [1]
cond this is Rf = 0.5 [1]
for mark 3, either mark 1 or mark 2 must be awarded
accept run a chromatogram of glycine [1]
compare with sample
same position [1] max [2]

10. a)



✓**1**

b) RMM of monomer = (8 x 12) + (8 x 1)
= 96 + 8
= 104✓1

$\therefore$ NO of monomers = $\frac{18.096}{104}$ ✓½
= 174✓½

11. (a) (i) Q = conc. Sulphuric acid/ $H_2SO_{4(l)}$ reject sulphuric acid, dilute sulphuric acid, H_2SO_4/ $H2SO_{4(aq)}$
R – Calcium carbide ✔ / CaC_2

(ii) $CaC_{2(s)} + H_2O_{(l)} \longrightarrow Ca(OH)_{2(s)} + C_2H_{2(g)}$

(iii) Chloroethane ✔1 $H-C(H)=C(H)-H$ ✔1 reject condensed formula.

(iv) Polymerization. ✔1
(v) Artificial leather for clothing/ shoe/ handbags ✔1
-crates ✔1
- insulation for electric cables and wires ✔1
(b) (i) Soap. ✔1

(ii) Concentrated NaCl/ Brine/ $NaCl_{(l)}$ ✔ 1
(iii) To precipitate out the soap ✔ 1
(iv) potassium hydroxide/ $KOH_{(aq)}$ ✔ 1
(v) – Cleansing agent is made up of non- polar (hydrocarbon) and polar (head) ✔ ½
- When mixed with oil /grease, the hydrocarbon part is attracted to it. ✔ ½ while the polar
part stays in water ✔ ½
- The oil particles are broken and carried off to the solution. ✔ 1

12. a) i) I Polymerisation✓1
II Fermentation✓1

ii) Step I – Reagent – Hydrogen✓ ½
- Condition – Nickel or platinum✓ ½
Step II – Reagent – Conc. Sulphuric acid✓ ½
- Condition – Heat✓ ½
Step V - Reagent – Potassium permanganate✓ ½
- Condition – Acidified✓ ½

b)i) $CH_3CH_2COOH + CH_3CH_2OH \xrightarrow[H_2SO_4]{\text{Conc.}} CH_3CH_2COOHCH_2CH_3 + H_2O$ ✓ ½

$2CH_3CH_2CH_2OH + 2K \longrightarrow 2CH_3CH_2CH_2OK + H_2$ ✓ 1

ii) x – Potassium propoxide✓ 1
L- Ethylpropanoate✓ 1

c) - C_3H_6 Decolouries acidified potassium permanganate while C_3H_8 do not(2mks)
- C_3H_6 decolouries bromine liquid while C_3H_8 do not
- C_3H_6 burns with a sooty flame while
C_3H_8 burns with non- sooty flame

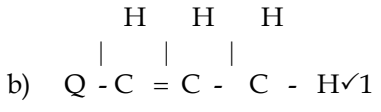
d) i) RFM of C_3H_6 = 42 ✓
42n = 42000 ✓
n = $\frac{42000}{42}$ ✓
= 1000 ✓ (2mks)

ii) Non - biodegradable✓ 1

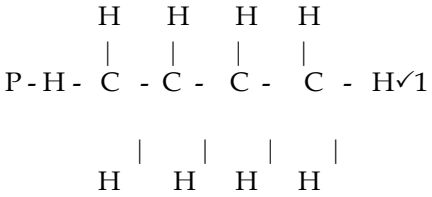
13. i) a. Q - C_3H_6// CH_2CHCH_3 ✓1

P - C_4H_{10}// $CH_3CH_2CH_2CH_3$ ✓1

b) Q



P



c) Ethanol ✓ ½ and Conc. Sulphuric ✓ ½ acid — 1 mk acc. Correct formula of the pds

d) Polypropene ✓1

e) Its non- biodegradable ✓1

ii) a)

	Carbon	hydrogen	Oxygen
mass ✓ ½	64.86	13.51	100 – 78.37 = 21.63
RAM	12	1	16
Moles	$\frac{64.86}{12}$ = 5.405	$\frac{13.51}{1}$ = 13.51	$\frac{21.63}{16}$ = 1.352 ✓ ½
Mole ratio	$\frac{5.405}{1.352}$ = 4	$\frac{13.51}{1.352}$ = 10	$\frac{1.352}{1.352}$ = 1 ✓ ½

Empirical formula $C_4H_{10}O$

Molecular formula ($C_4H_{10}O$✓ ½) n

n= $\frac{74}{74}$ ✓ ½ = 1

Molecular formula = $C_4H_{10}O$✓ ½ — 3mks

b) Alcohols / Alkanols ✓ 1

c) $2C_4H_{10}O_{(l)} + 2Na_{(s)} \longrightarrow 2C_4H_9ONa_{(aq)} + H_{2(aq)}$ — 1 mk

d) Displacement ✓ 1

e) i) Butanoic acid ✓ ***1*** ***1 mk Name only***

ii) Colour changes from purple to colourless// potassium manganate (VII) is decolourised✓ 1

14. a) i) I C
II A
III B
IV D
V E

2 ½ mks

ii) A

½ mk

b) i) K Ethylpropaoate
L Propene

2mks

ii) The solution is decolourised

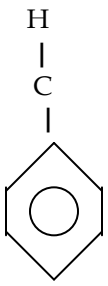
1mk

iii) Ethyne
1mk

iv) I Conc. H_2SO_4
II H+, $KMnO_{4(aq)}$ / H^+,$K_2Cr_2O_{7(aq)}$ 2mks
III H_2
IV Cl_2

v) I Dehydration
II Oxidation
III Addition
IV Subtraction / Chlorination
2mks

c) i)



1mk

ii) $\left[(8 \times 12) + (8 \times 1) \right]$ n = 104,000

(96 + 8)n = 104,000

104n = 104,000

n= 1000 3mks

iv) Poor conductor of electricity 1mk