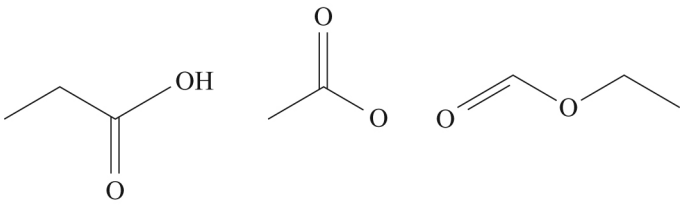
Chapter 14: Introduction to organic chemistry

Homework marking scheme

1 a i Structural isomers have the same molecular formula [1]
but different structural formulae. [1]

ii CH_3CH_2COOH [1]
CH_3COOCH_3 [1]
$HCOOCH_2CH_3$ [1]

iii [3]



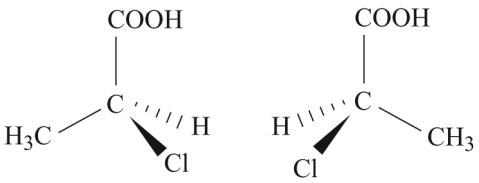
b $C_3H_6O_2 + \frac{7}{2}O_2 \rightarrow 3CO_2 + 3H_2O$ [1]

There are 3 mol of CO_2 formed from 1 mol of the compound [1]
therefore, volume of CO_2 = 3 × volume of compound = 3 × 60 = 180 cm^3. [1]

c i Stereoisomers have the same structural formula [1]
but different arrangements of atoms in space. [1]

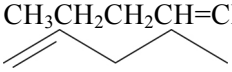
ii Optical isomerism. [1]
If one of the hydrogens in the $–CH_2–$ group of the carboxylic acid is replaced by chlorine then $CH_3CHClCOOH$ (2-chloropropanoic acid) is formed. [1]
This compound has a chiral carbon. [1]

iii



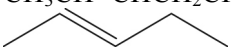
correct structures for both isomers [1]
correct three-dimensional representation of both molecules [1]
correct mirror images of each other. [1]

2 **a** $CH_3CH_2CH_2CH=CH_2$; pent-1-ene [2]



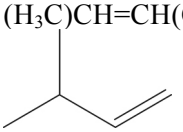
[1]

$CH_3CH=CHCH_2CH_3$; pent-2-ene [2]



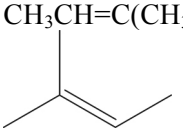
[1]

$(H_3C)CH=CH(CH_3)CH_3$; 2-methylbut-1-ene [2]



[1]

$CH_3CH=C(CH_3)CH_3$; 2-methylbut-2-ene [2]

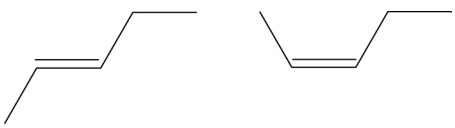


[1]

b **i** A double bond so that rotation cannot take place [1]
and different groups on each carbon of the C=C. [1]

ii pent-2-ene [1]

iii



trans-pent-2-ene cis-pent-2-ene

iv 1 mark for each skeletal formula [2]
1 mark for each correct name [2]
The names must be assigned to the correct structures.