POLYMERS (Part 1) TUTORIAL

Structure and naming

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- 1 Give the IUPAC name for each compound.
 - (a) CH₃CH(CH₃)CH₂CH(OH)CH₃ 4-methylpentan-2-ol

(c)
$$Cl \rightarrow CH_3$$

1-chloro-4-methylcyclohexane

- 2 Draw the skeletal formula of each compound.
 - (a) 2,2,4-trimethylhexane



(c) 2,4-dibromomethylbenzene



(e) 1-ethyl-3,3-dimethylcyclopentane



- (b) CH₂=CHCH=CHBr 1-bromobuta-1,3-diene
- (d) CH₃CH(CO₂H)CH₂CH₃ 2-methylbutanoic acid
- (b) nona-1,3,5-triene



(d) 4-hydroxylheptan-3-one



(f) 2-amino-3-ethyl-2-methylpentane



3 For each part, the name given is **incorrect**. Draw the skeletal formula for each and give its correct IUPAC name.



Type of reaction

4 Classify each reaction as *addition, elimination, condensation, oxidation, reduction* or *substitution.*



Balancing equation for organic redox reaction

- **5** Balance each equation with either [O] or [H]. Add H₂O whenever necessary.
 - (a) $CH_3CH_2OH \longrightarrow CH_3CHO$ $CH_3CH_2OH + [O] \longrightarrow CH_3CHO + H_2O$
 - (b) $CH_3CH_2CONH_2 \longrightarrow CH_3CH_2CH_2NH_2$ $CH_3CH_2CONH_2 + 4[H] \longrightarrow CH_3CH_2CH_2NH_2 + H_2O$
 - (c) $CH_3CH=CHCH_3 \longrightarrow 2CH_3CO_2H$ $CH_3CH=CHCH_3 + 4[O] \longrightarrow 2CH_3CO_2H$
 - (d) $CH_3CO_2CH_3 \longrightarrow CH_3CH_2OH + CH_3OH$

 $\mathsf{CH}_3\mathsf{CO}_2\mathsf{CH}_3 + \mathsf{4[H]} \longrightarrow \mathsf{CH}_3\mathsf{CH}_2\mathsf{OH} + \mathsf{CH}_3\mathsf{OH}$

Constitutional Isomerism (Structural Isomerism)

7

6 A halogenoalkane has the molecular formula C₃H₅Cl₃.

Which are the possible names of the isomers of this compound?





8 α -*Farnesene* is a constituent of the natural wax found on apples. It is also responsible for the characteristic odour of green apples.



9 Low fat sunflower spreads which are high in polyunsaturated contain esters of linoleic acid.

 $CH_3(CH_2)_4CH=CHCH_2CH=CH(CH_2)_7CO_2H$

On the lid of a brand of spread, it is claimed that the spread contains virtually no *trans* fatty acid. Which isomer does **not** contain a *trans* linkage that could be present in the spread?



10 Draw all the structural isomers of the hydrocarbon C₄H₈ and give their IUPAC names. One of these structural isomers also exists as a pair of *cis-trans* isomers. Identify this isomer and draw the *cis-* and *trans-* isomers.



Application Question

11 Poor processing or storage of wine can lead to the build-up of certain compounds that can spoil the flavour and aroma of the wine. The structures of three such compounds are shown below.



- (a) Give the molecular formula for A, B and C respectively.
 A: C₂H₄O
 B: C₂H₄O₂
 C: C₄H₈O₂
- (b) State the functional group(s) present in A, B and C respectively.
 A: Aldehyde
 B: Carboxylic acid
 - C: Ester
- (c) Use the table of characteristic values for infra-red absorption in the *Data Booklet* to answer this part.
 With reference to the structures of A, B and C, identify an infra-red absorption range that will be shown by:
 - (i) B only. 2500-3000 cm⁻¹ (O–H of COOH)
 - (ii) C but not A. 1050-1330 cm⁻¹ (C–O of ester)
 - (iii) all three compounds (other than absorptions due to C–H bond).
 1710-1730 cm⁻¹ (C=O)
 The overlapping range for C=O aldehyde, carboxylic acid and ester