UNIT 1 SELF-QUIZ

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1. False: Carbonyl groups are present in alcohols, aldehydes, ketones, and esters. They are not present in ethers.
2. True
3. False: The formation of an alcohol when an alkene reacts with water in the presence of an acid is an example of an addition reaction.
4. False: Benzene *does not react* readily with bromine in addition reactions. *Bromine can only be added to a benzene ring by substitution reactions.*
5. False: When methanol and vinegar are allowed to react, *methyl ethanoate* and water are produced from the esterification reaction.
6. True
7. False: 1,2-dibromoethane can be produced from the *addition* reaction of bromine with ethene.
8. False: Polybutene is formed from addition reaction of butene monomers, and the polymer chain consists of carbon atoms single bonded to each other, with ethyl groups attached to *alternate* carbon atoms in the chain.
9. False: Condensation polymers such as *nylon* may have physical properties such as flexibility and strength as a result of the degree of crosslinkages present in the polymer. *(Polystyrene and polypropylene are addition polymers.)*
10. True
11. (d)
12. (e)
13. (b)
14. (e)
15. (d)
16. (c)
17. (c)
18. (d)
19. (d)
20. (a)
21. (c)
22. (d)
23. (c)
24. (b)
25. (e)
26. (e)

UNIT 1 REVIEW

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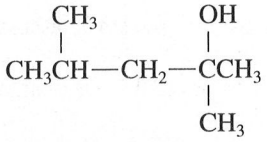
Understanding Concepts

1. (a) alcohol
   (b) carboxylic acid
   (c) aldehyde
   (d) ether
   (e) amine
   (f) ketone
   (g) ester
   (h) amide
   (i) ketone
   (j) carboxylic acid
2. (a) carbonyl
   (b) carbonyl
   (c) hydroxyl
   (d) carbon–carbon double bond

(e) carbonyl (amide linkage)
(f) (ether linkage)
(g) carbonyl (ester linkage)

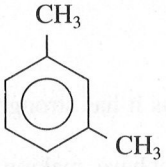
3. (a) 2,4-dimethyl-2-pentanol



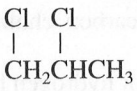
(b) 1,2-ethandiol

$HOCH_2CH_2OH$

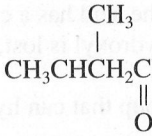
(c) 1,3-dimethylbenzene



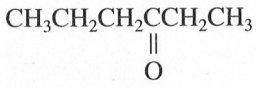
(d) 1,2-dichloropropane



(e) 2-methylbutanal



(f) 3-hexanone



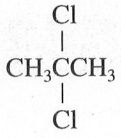
(g) ethoxypropane

$CH_3CH_2CH_2OCH_2CH_3$

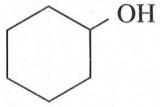
(h) 2-aminoethanoic acid

H_2NCH_2COOH

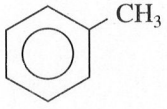
(i) 2,2-dichloropropane



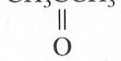
(j) cyclohexanol



4. (a) toluene (methylbenzene)



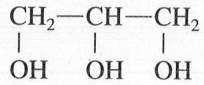
(b) acetone (propanone)



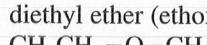
(c) acetic acid (ethanoic acid)

(d) formaldehyde (methanal)

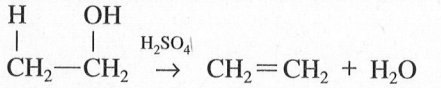
(e) glycerol (1,2,3-propantriol)



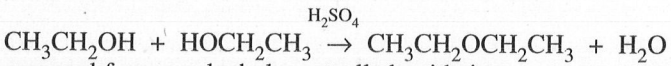
(f) diethyl ether (ethoxyethane)



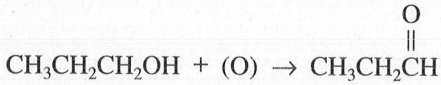
5. (a) carbonyl group; carbon–carbon double bond; hydroxyl group
   (b) carboxyl group
   (c) amino group
6. (a) ethoxyethane, propanone: The carbonyl group in the ketone makes it more polar and thus it has stronger intermolecular attractions.
   (b) ethanal, ethanoic acid: The acid has an additional hydroxyl group that the aldehyde does not have, making it more polar and capable of hydrogen bonding; thus, the acid has stronger intermolecular attractions.
   (c) ethanol, 1-pentanol: Both molecules have a polar hydroxyl group, but the longer hydrocarbon chain in the pentanol increases its intermolecular van der Waals attractions.
7. (a) benzene, benzoic acid: The carboxyl group in benzoic acid makes it more polar and capable of hydrogen bonding with water; thus, the acid is more soluble in water.
   (b) methyl ethanoate, ethanoic acid: The ester is less soluble in water than is the acid because the acid has a carbonyl group and a hydroxyl group capable of hydrogen bonding with water, but in the ester, the hydroxyl is lost, having been bonded in the ester linkage; thus, the acid is more soluble in water.
   (c) 2-butanone, 2-butanol: The ketone has a carbonyl group, but the alcohol has a hydroxyl group that can hydrogen bond with water and is therefore more soluble in water.
8. (a) ethene from ethanol: dehydration, elimination



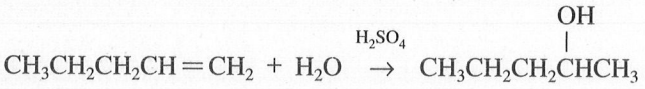
   (b) ethoxyethane from ethanol: dehydration, condensation



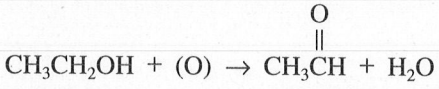
   (c) propanal from an alcohol: controlled oxidation



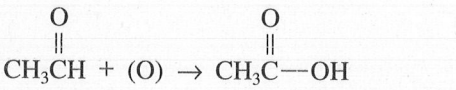
   (d) a secondary pentanol from an alkene: addition, hydration



   (e) acetic acid from an alcohol: controlled oxidation



ethanol ethanal



ethanal ethanoic (acetic) acid

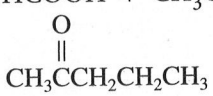
(f) methoxymethane from methanol: condensation

$CH_3OH + HOCH_3 \rightarrow CH_3OCH_3 + H_2O$

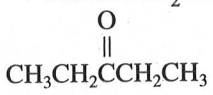
(g) ethyl formate from ethanol and methanoic acid: esterification

$HCOOH + CH_3CH_2OH \rightarrow HCOOCH_2CH_3$

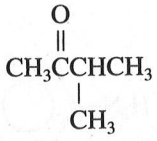
9. (a)



2-pentanone

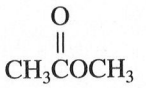


3-pentanone



3-methylbutanone

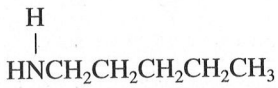
(b)



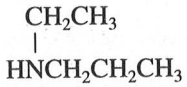
methyl ethanoate

ethyl methanoate

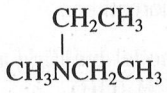
(c)



n-pentylamine
(1-aminopentane)

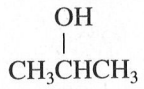


ethylpropylamine
N-ethyl-1-aminopropane

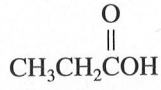


diethylmethylamine
N-ethyl-*N*-methyl-1-aminoethane

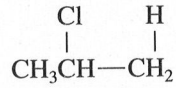
10. (a) hydrogenation



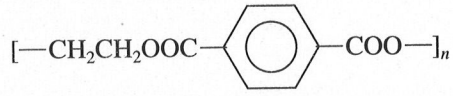
(b) controlled oxidation



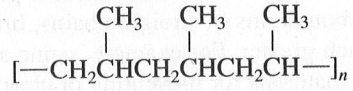
(c) addition, hydrohalogenation



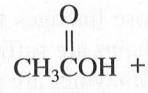
(d) condensation, polymerization



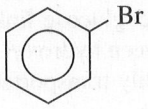
(e) addition, polymerization



(f) hydrolysis



(g) substitution, halogenation



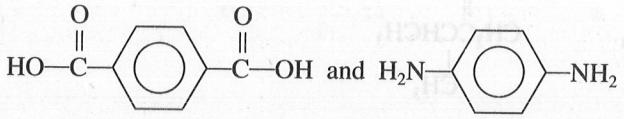
11. (a) $HOCH_2CH_2COOH$ (condensation polymerization)
3-hydroxypropanoic acid

(b) $CH_3CH{=}CH_2$ (addition polymerization)
propene

(c) 

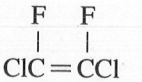
(condensation polymerization)

propanedioic acid and 1,3-propandiol

(d) 

(condensation polymerization)

1,4-dicarboxylbenzene, 1,4-diaminobenzene
(1,4-dibenzoic acid)

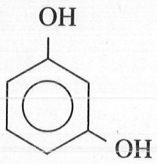
(e) 

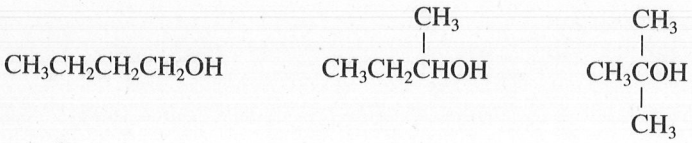
(addition polymerization)

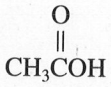
1,2-dichloro-1,2-difluoroethene

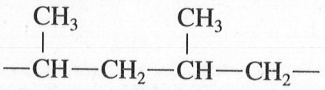
12. (Sample structures of model-building activity)

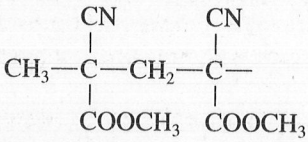
(a) $CH_2(OH)CH(OH)CH_2(OH)$

(b) 

(c) 

(d) 

(e) 

13. 

14. In inorganic compounds, the combining ratio of elements is restricted; so a limited number of compounds is possible. In organic compounds, carbon can form four bonds, and bond with other carbon atoms in straight chains, branched chains, or cyclic structures; thus, the possibilities for new compounds are much greater. For example, name specific examples of: new medicines, new synthetic materials for medical procedures, materials for preventing or cleaning up hazardous spills, materials for safety equipment or clothing.

15. (a) Starch is used in plants for energy storage and source. The orientation of the glucose–glucose linkages favours intrachain hydrogen bonds between hydroxyl groups, resulting in a helical structure. These chains are sufficiently small to make these polysaccharides soluble in water, and easily transported in the organism. Enzymes are present to break down starch into glucose.

(b) Glycogen is used in animals for energy storage and source. The orientation of the glucose–glucose linkages is similar to that in starch, with more branching, and favouring intrachain hydrogen bonds between hydroxyl groups, resulting in a helical structure. Similar to starch, glycogen is also soluble in water, and easily transported in the organism. Enzymes are present in animals to break down glycogen into glucose.