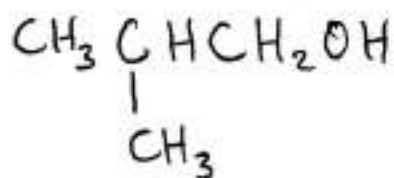


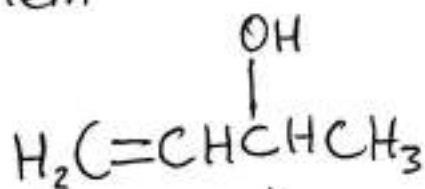
## CHEMISTRY MANUAL

- (a) what is the common name of the alcohol with structure shown below



Ans: 2-methylpropan-1-ol

- (b) Name the alcohol below by the IUPAC system

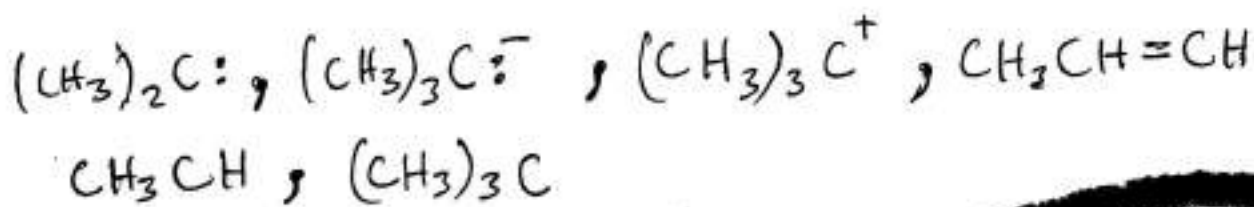


Ans: Butan-3-ene-2-ol

- (a) What physical properties are used to determine the purity of liquids?

Ans: Boiling point, melting point, density, Refractive index, solubility

- (b) Identify each ~~one~~ of the following as  
(1) Carbanion (2) Carbonium ion (3) Carbene



Carbanion:

Carbonium ion:

Carbene:

(a) What type of organic reaction takes place in  
 $\text{CH}_3\text{Br} + \text{OH}^- \longrightarrow \text{CH}_3\text{OH} + \text{Br}^-$

Ans: It is an  $\text{S}_\text{N}2$  reaction  
(substitution nucleophilic bimolecular) reaction

(b) The ability of carbon to form strong bonds with other elements and with itself is known as \_\_\_\_\_  
Ans: Catenation

A compound contains 40% carbon, 6.7% hydrogen and 53.3% oxygen. If the molar mass of the compound is 180. What is the empirical formula?

Solution.

	C	H	O
	40%	6.7%	53.3%
Divide by the R.M.M	$\frac{40}{12}$	$\frac{6.7}{1}$	$\frac{53.3}{16}$
	3.33	6.70	3.33
Divide by the smallest ratio	$\frac{3.33}{3.33}$	$\frac{6.70}{3.33}$	$\frac{3.33}{3.33}$
	1.00	2.01	1.00

The empirical formula is  
 $\text{CH}_2\text{O}$

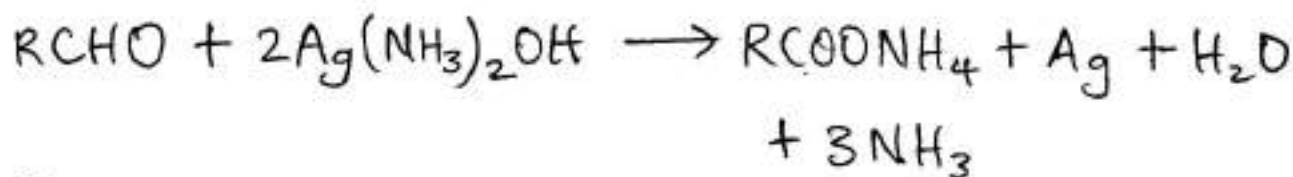
7(a) What is the composition of Lemieux reagent?

Ans: DMPC (2,2-dimethoxypropane) is the main component of Lemieux reagent

(b) What happens when benzaldehyde is treated with Fehling's solution?

Ans: There is no notable or immediate reaction.

8. A sample of urine containing glucose  $C_6H_{12}O_6$  as the only carbonyl compound was treated with ammoniacal silver nitrate solution according to the general equation



If 2.16g of silver metal were deposited, Calculate the amount of glucose in the urine.

{  $C=12$ ,  $H=1$ ,  $O=16$ ,  $Ag=108$  }

Solution.

1 mole of  $RCHO$  reacts to produce 2 moles of  $Ag$  (silver)

$$\text{Moles of } Ag = \frac{\text{Mass of } Ag}{\text{Molar mass of } Ag} = \frac{2.16}{107.87} = 0.02 \text{ mole}$$

$$\text{Molar mass of Glucose} = (6 \times 12 + 12 \times 1 + 6 \times 16) = 180g$$

$$\begin{aligned} \text{Amount of glucose} &= \text{moles of glucose} \times \text{Molar mass of glucose} \\ &= 0.02 \times 180 = 3.6 \text{ grams.} \end{aligned}$$

9(a) Explain why propanol boils at a higher temperature than the corresponding hydrocarbons

Ans: It occurs due to the presence of hydrogen bonding and polarity in propanol's molecular structure.

(b) What reasons can be ~~given~~ performed to explain the fact that hexanol is not soluble in water

Ans: 1) Hydrophobic Nature:

2) Hydrogen Bonding

3) Size of the Alkyl Chain

4) Differences in Polarity

10 Which alcohol is formed by reacting

(a)  $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_3$  with  $\text{B}_3\text{H}_6$  then  $\text{H}_2\text{O}_2$   
OH ?

Ans: 2-methyl-1-butanol

(b)  $(\text{CH}_3)_2\text{CHCH}=\text{CH}_2$  with dilute  $\text{H}_2\text{SO}_4$   
Ans: 2-methyl-2-butanol

11(a) Arrange the following amines according to their relative base strength

I.  $\text{NH}_3$  II  $(\text{C}_6\text{H}_5)\text{NH}_2$  III  $(\text{C}_6\text{H}_5)_3\text{N}$  IV  $\text{C}_6\text{H}_5\text{NH}_3^+$

Ans: ~~From the~~  $\text{NH}_3$  (weakest),  $\text{C}_6\text{H}_5\text{NH}_3^+$ ,  $(\text{C}_6\text{H}_5)_2\text{NH}$ ,  $(\text{C}_6\text{H}_5)_3\text{N}$  (strongest)

(b) Which test can be used to distinguish among liquid  $\text{RNH}_2$ ,  $\text{R}_2\text{NH}$  and  $\text{R}_3\text{N}$ ?

Ans: Hinsberg test

12(a) Which of the following molecules are polar?

$\text{F}_2$ ,  $\text{HF}$ ,  $\text{BrCl}$ ,  $\text{CH}_4$ ,  $\text{CHCl}_3$ ,  $\text{CH}_3\text{OH}$

Ans:  $\text{BrCl}$ ,  $\text{CHCl}_3$ ,  $\text{HF}$ ,  $\text{CH}_3\text{OH}$  are polar.

(b) Find the oxidation number of the C in  $\text{HCOOH}$

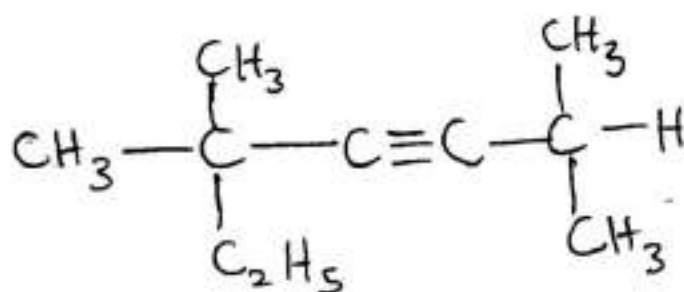
Ans: +2  
 $(+1) + \text{C} + (-2) + (-2) + (+1) = 0$   
 $\text{C} = 4 - 2 = +2$

(c) Which of the following species are nucleophiles?

(i)  $\text{H}\ddot{\text{O}}:^-$  (ii)  $:\text{C}\equiv\text{N}:^-$  (iii)  $\text{BF}_3$  (iv)  $\text{AlCl}_3$

(v)  $\text{H}_2\text{O}$  (vi)  $:\text{NH}_3$  (vii)  $\text{H}_3\text{C}:^-$  (viii)  $\text{H}_2\text{C}$

13(a) What is the systematic IUPAC name of



Ans: 2,5,5 trimethylhept-3-yne.

(b) Explain why alkynes are more reactive than alkenes towards electrophilic addition

Ans: (i) Triple bond: Alkynes contain triple bond while alkenes have double bonds.

(ii) Electrons Density: The presence of two pi bonds in alkynes means there is a higher electron density in the area of triple bond.

(iii) Bond Strength: The pi bonds in alkynes are weaker than those in alkenes due to the side to side overlap of p orbitals.

14(a) In the reaction below, what does W represent

$$\text{RCOR}' + 4[\text{H}] \xrightarrow{\text{W}} \text{RCH}_2\text{R}' + \text{H}_2\text{O}$$

Ans: W represents Platinum (Pt)

(b) What factors control nucleophilic attack on the carbonyl functional group?

Ans: The factor that primarily controls nucleophilic attack on the carbonyl functional group is the electrophilicity of the carbonyl carbon atom.