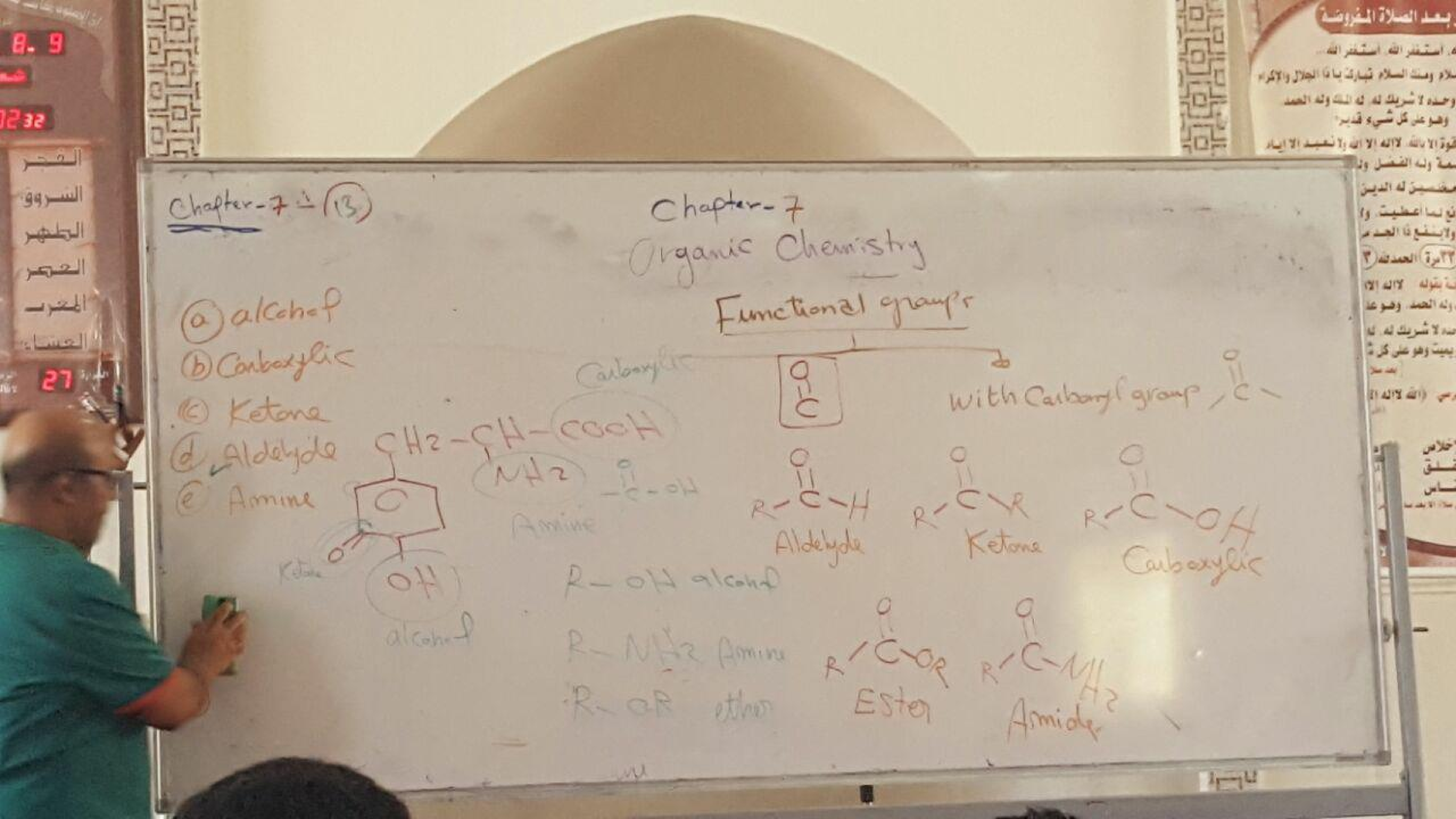
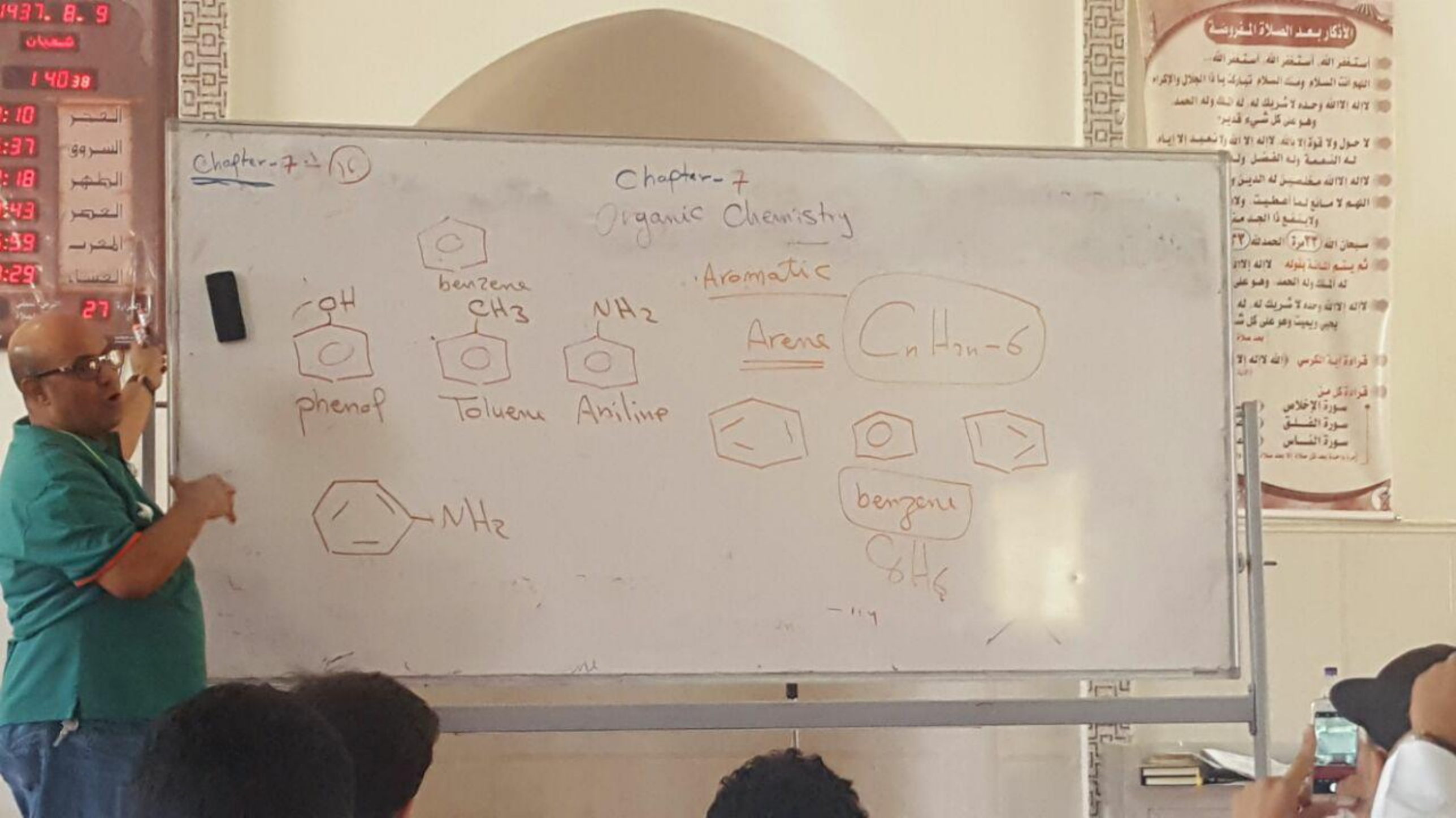

Chapter-7 (13)
Chapter-7
Organic Chemistry
Functional groups
(a) alcohol
(b) Carboxylic
(c) Ketone
(d) Aldehyde
(e) Amine
CH2-CH-COOH
NH2
Carboxylic
Amine
Ketone
OH
alcohol
with Carbonyl group
R-C-H Aldehyde
R-C-R Ketone
R-C-OH Carboxylic
R-OH alcohol
R-NH2 Amine
R-OR ether
R-C-OR Ester
R-C-NH2 Amide


Chapter-7
Organic Chemistry
Aromatic
benzene
-OH
CH3
NH2
phenol
Toluene
Aniline
Arene
CnH2n-6
benzene
C6H6
NH2

Chapter-7 ÷ (11)

Chapter-7
Organic Chemistry

- Hydrocarbons
  - Saturated HC
    - Alkanes — C_nH_{2n+2} — methane
    - Cycloalkanes — C_nH_2 — Cyclopropane
  - unsaturated HC
    - Alkenes — C_nH_{2n} — Ethylene
    - Alkynes — C_nH_{2n-2} — Acetylene
    - Aromatic — C_nH_{2n-6} — benzene

1437. 8. 9

13434

4:10

5:37

12:18

3:43

6:59

8:29

27

Chapter-7 ② ①

Chapter-7

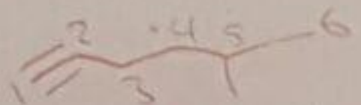
Organic Chemistry

Alkynes

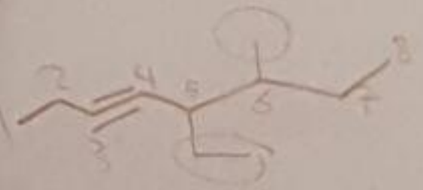
-yne

C_nH_{2n-2}

Unsaturated Hydrocarbons



5-methyl-1-hexyne



5-ethyl, 6-methyl, 3-octyne

$HC \equiv CH$

Acetylene

Chapter-7 ≙ (8)

Chapter-7
Organic Chemistry

$CH_3-CH_2-CH_2-CH_3$ butane C_4H_{10}

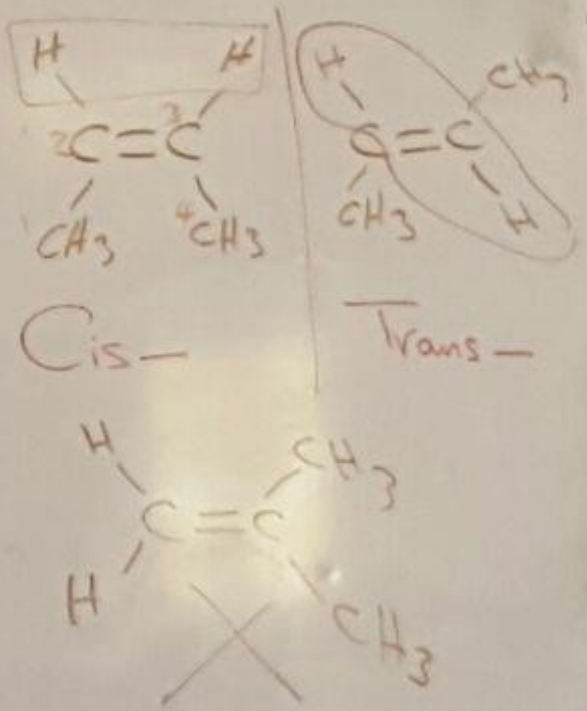
Isomers

$CH_3-CH(CH_3)-CH_3$ 2-methylpropane C_4H_{10}

$CH_3-CH_2-CH_2-CH_2-CH_3$

$CH_3-CH(CH_3)-CH_2-CH_3$

$CH_3-C(CH_3)(CH_3)-CH_3$



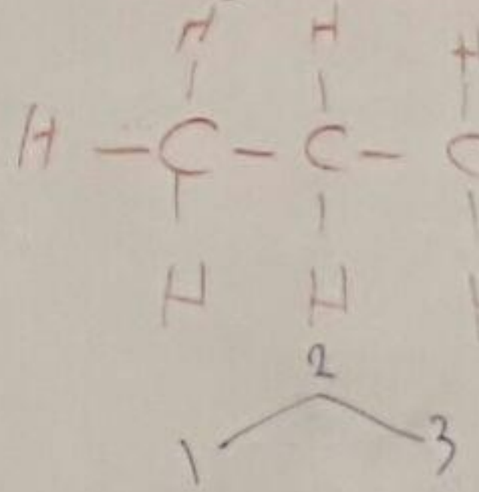
Chapter-7 (3)

Chapter-7
Organic Chemistry

- C-C Single bond **Alkanes** C_nH_{2n+2}

- CH_4 methane
  C_2H_6 ethane
  C_3H_8 propane
  C_4H_{10} butane
  C_5H_{12} pentane
  C_6H_{14} hexane
  C_7H_{16} heptane
  C_8H_{18} octane
  C_9H_{20} nonane
  $C_{10}H_{22}$ decane

$CH_3-CH_2-CH_3$ propane C_3H_8 ✓



Saturated HC

Chapter-7 ÷ (7)

Chapter-7

Organic Chemistry

C_nH_{2n}

Alkenes

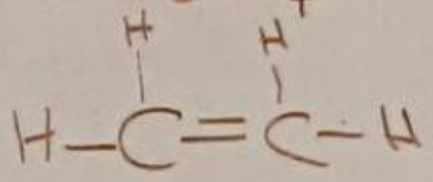
$H_2C=CH_2$

Ethene

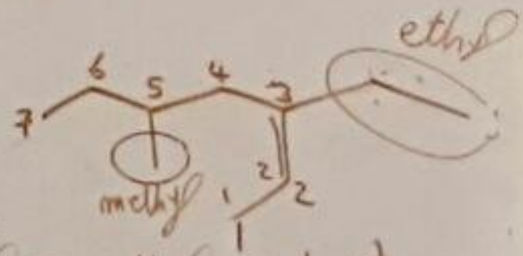
(ethylene)

Unsaturated hydrocarbons

C_2H_4



5-methyl-1-hexene



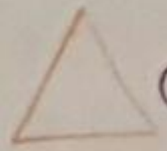
3-ethyl, 5-methyl-2-heptene

-hept-2-ene

$C_{10}H_{22}$

Chapter-7 ⑤

Chapter-7
Organic Chemistry


C_3H_6 cyclopropane

C_4H_8 cyclobutane

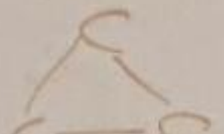
C_5H_{10} cyclopentane

C_6H_{12} cyclohexane

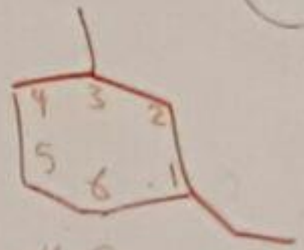
Cycloalkanes

C-C-C

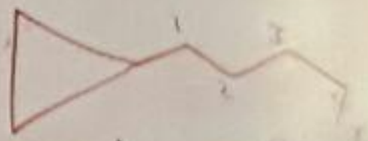
C_nH_{2n}



$C_3H_8 \rightarrow C_3H_6$



1-ethyl, 3-methyl cyclohexane


cyclopropyl ethene

methyl cyclopropane

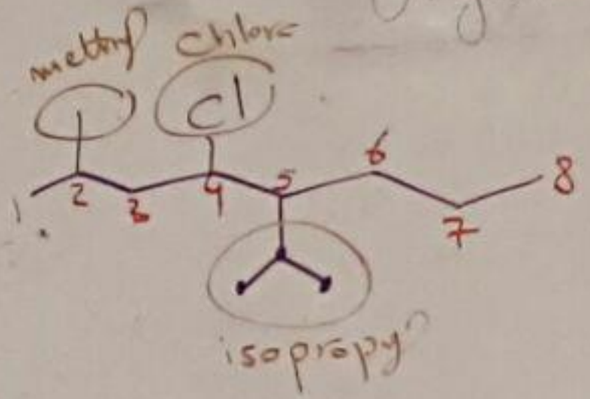
1-ethyl, 2-methyl, cyclopropane

3)

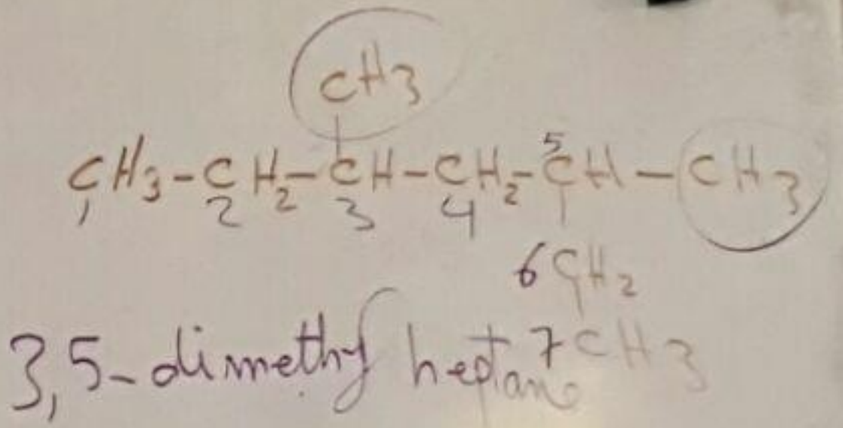
Chapter-7 ÷ (5)

Chapter-7

Organic Chemistry



4-Chloro, 5-isopropyl, 2-methyl octane



3,5-dimethyl heptane

isopropyl

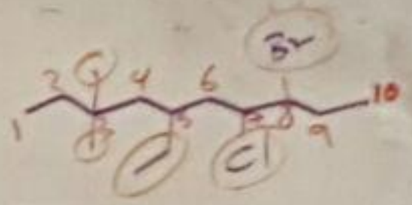
$C_{10}H_{22}$

Chapter-7 ⇒ (4)

Chapter-7

Organic Chemistry

Nomenclatures of Alkanes



prefix — parent → suffix

C

– ane

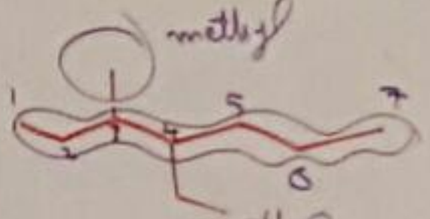
CH_4 CH_3 – methyl

C_2H_6 C_2H_5 – ethyl

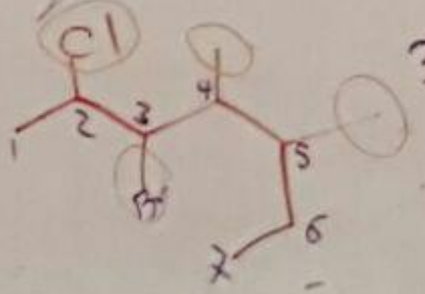
pr-pyl

$CH_3-CH_2-CH_2-$

propyl



4-ethyl, 3-methyl heptane



3, bromo, 2-Chloro, 4,5-di methyl heptine

CH_3-CH-
CH_3

Isopropyl

C_6H_{22}

3-bromo, 7-chloro, 5-ethyl, 3,3-dimethyl decane

Chapter-7 ÷ (2)

ⓐ C_6H_{14} Alkane
ⓑ C_6H_{10} Alkyne
ⓒ C_6H_{12} Alkene
ⓓ C_6H_6 Aromatic

Chapter-7

Organic Chemistry

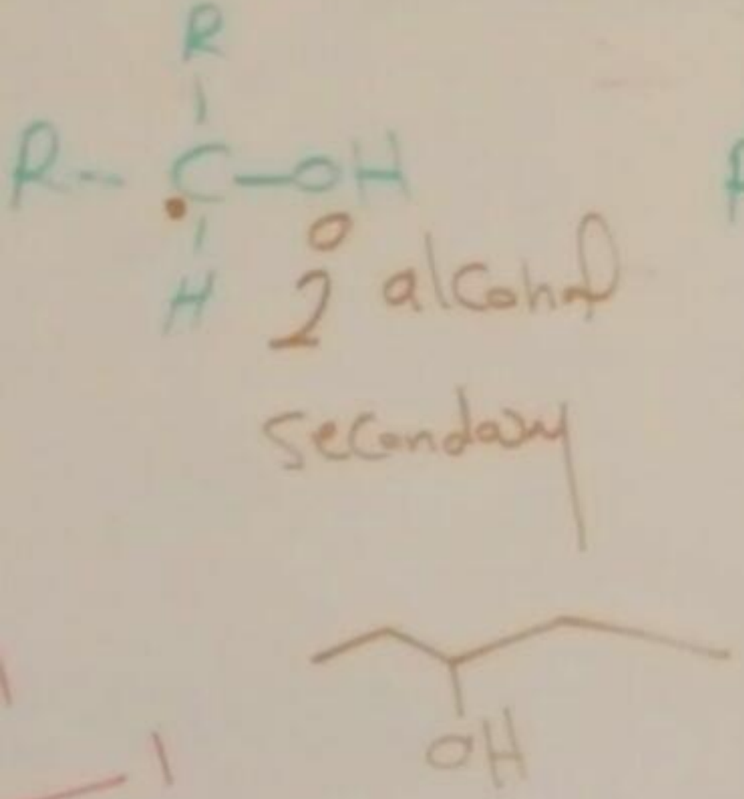
Hydrocarbons

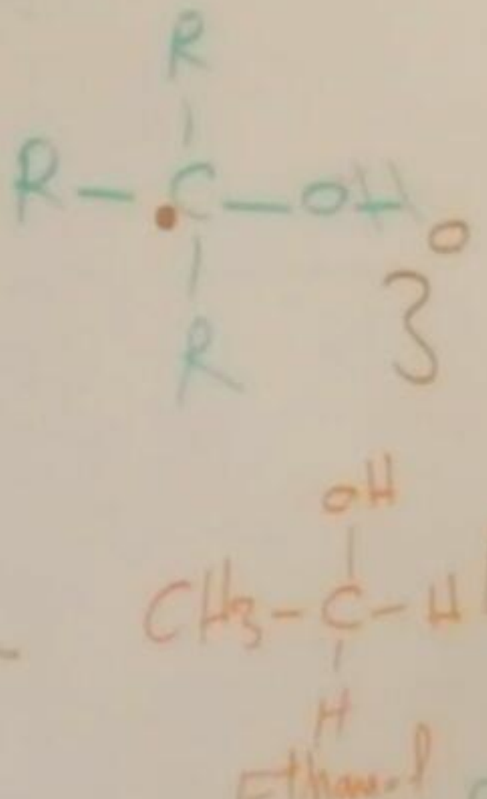
Hydrogen + Carbon

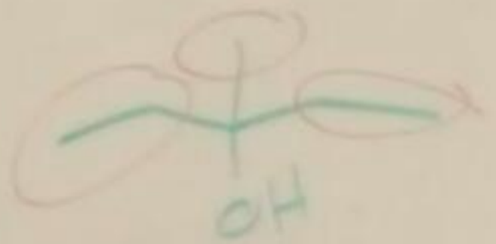
	Alkanes	Alkenes	Alkynes	Aromatic
	-C-C single	C=C double	C≡C	
suffix	-ane	-ene	-yne	-ring
General formula	C_nH_{2n+2}	C_nH_{2n}	C_nH_{2n-2}	C_nH_{n-6}
First member	methane CH_4, Ethane C_2H_6	C_2H_4 Ethene (Ethylene)	C_2H_2 $HC\equiv CH$ Ethyne (Acetylene)	C_6H_6 benzene

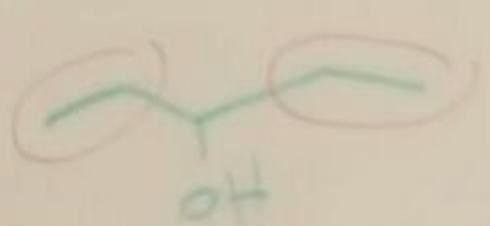
Organic Chemistry

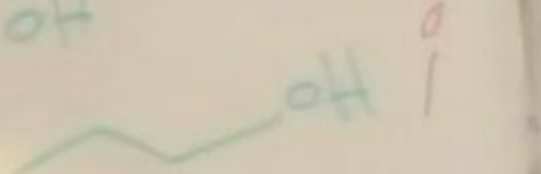
Alcohol — OH

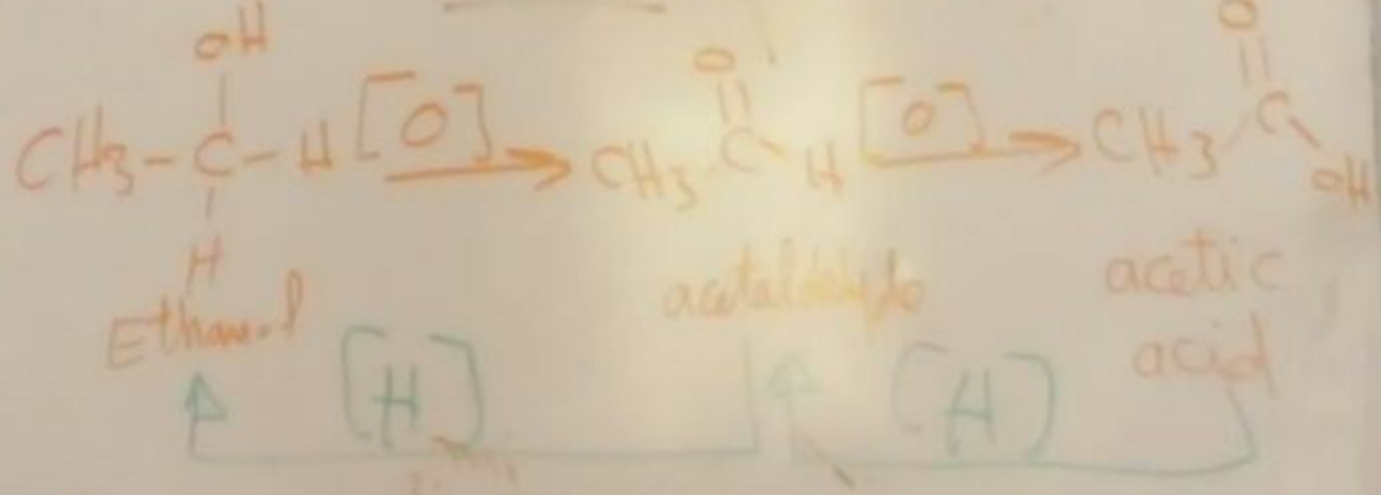












سبحان الله (٣٣مرة) الحمدلله (٣٤

يختم المائة بقوله لاإله إلا

له الملك وله الحمد وهو على

إلا الله وحده لا شريك له. له

يحيي ويميت وهو على كل ش

بعد صلاة

قراءة آية الكرسي (الله لاإله إلا

الآية

قراءة كل من

سورة الإخلاص

سورة الفلق

سورة الناس

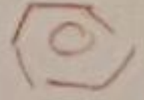
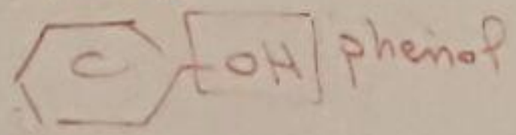
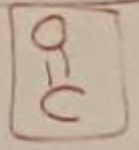
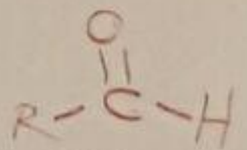
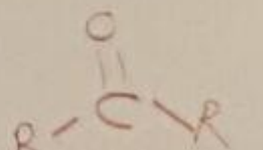
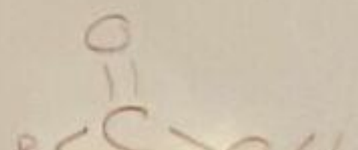
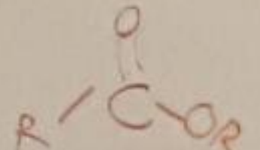
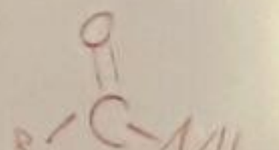
واحدة بعد كل صلاة الا بعد صلا

Chapter-7 ÷ (12)

Chapter-7

Organic Chemistry

Functional group's

- without Carbonyl group $\rangle C=O$
  - ① CH_4 — CH_3-OH alcohol ($R-OH$)
  -  —  phenol
  - ② Amine or Amine — $CH_4 \rightarrow CH_3NH_2$
  - ③ CH_3-O-CH_3 Ether ($R-O-R$)
- 
- with Carbonyl group $\rangle C=O$
  -  Aldehyde
  -  Ketone
  -  Carboxylic
  -  Ester
  -  Amide

Chapter-7 ∴ (17)

Chapter-7

Organic Chemistry

Esters

$$R-\overset{\overset{O}{\|}}{C}-O-R'$$

$$R-\overset{\overset{O}{\|}}{C}-OH + HO-R'$$

acid + alcohal

hydrolysis → acid + alcohal

H_2O

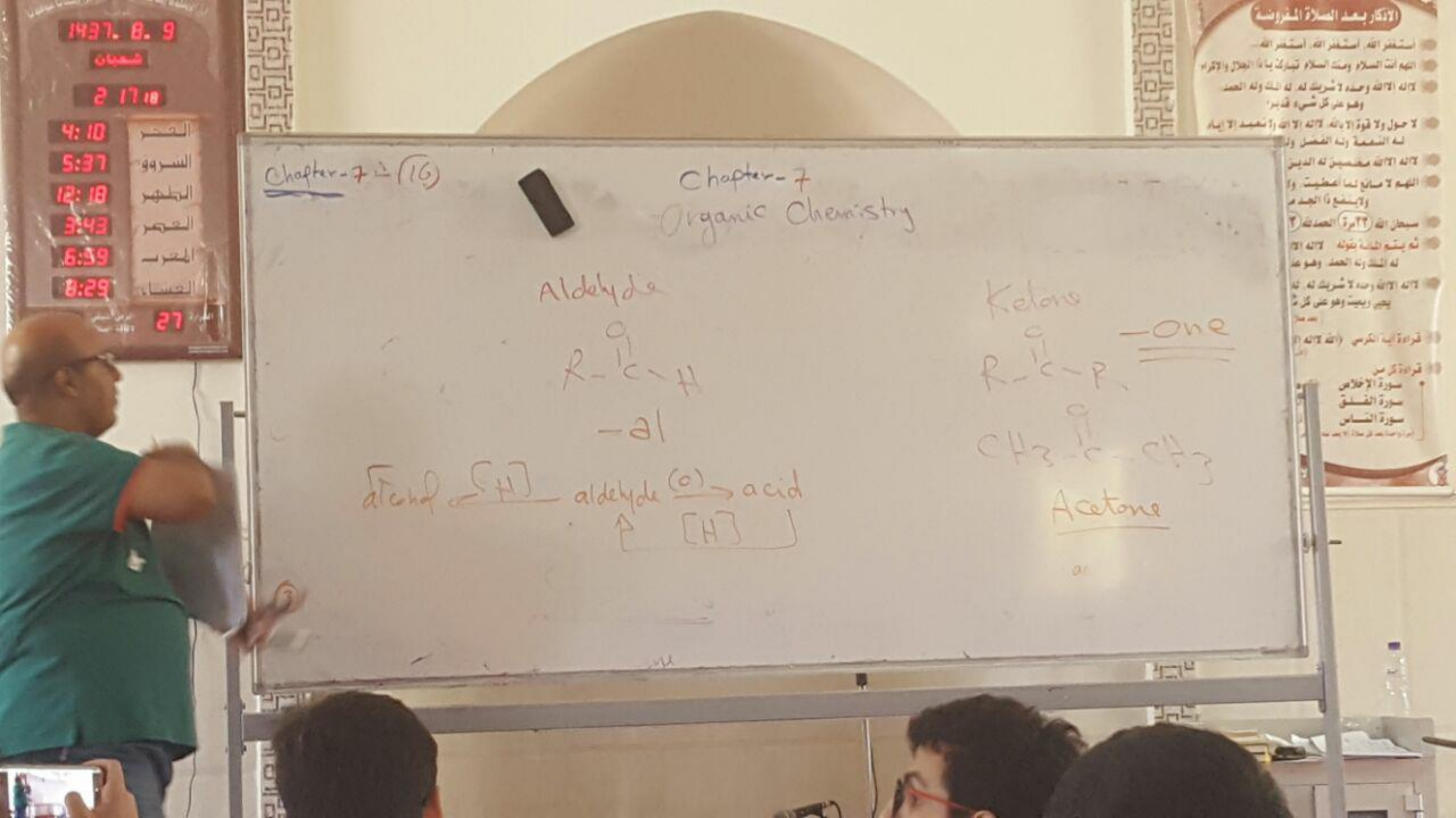
Alkali

$$R-\overset{\overset{O}{\|}}{C}-O-R$$

Ester

Saponification

NaOH → Soap


1437. 8. 9
شعبان
2 17 18
الفجر 4:10
الشروق 5:37
الظهر 12:18
العصر 3:43
المغرب 6:59
العشاء 8:29
27
الأذكار بعد الصلاة المفروضة
Chapter-7 ⇐ (16)
Chapter-7
Organic Chemistry
Aldehyde
R-C(=O)-H
-al
alcohol [H] aldehyde (O) acid
[H]
Ketone
-one
R-C(=O)-R
CH3-C(=O)-CH3
Acetone

Chapter-7 ∴ /20

Chapter-7

Biochemistry

Nucleic acids

↓

Nucleotides

↓

- Nitrogenous base
  - → Adenine A DNA/RNA
  - → Guanine G DNA/RNA
  - → Cytosine C DNA/RNA
  - → Thymine T DNA only
  - → Uracil U RNA only
- Sugar
  - → Ribose (RNA)
  - → Deoxyribose (DNA)
- phosphate

↓ DNA

↓ RNA

Chapter-7 ≈ 20

Chapter-7

Biochemistry

Lipids

$CH_2OH + HOOC-R_1$

$CH.OH + HOOC-R_2$ (Esterification)

$CH_2OH + HOOC-R_3$

Glycerol 3 Fatty acids

$CH_2-O-C(=O)-R_1$

$CH-O-C(=O)-R_2$

$CH_2-O-C(=O)-R_3$

Triglycerides

Lipids

- oils
  - Liquid
  - Unsaturated
- Fats
  - Solid
  - sat. FA

الأذكار بعد الصلاة المفروضة

استغفر الله، أستغفر الله، أستغفر الله.

أنت السلام ومنك السلام تباركت يا ذا الجلال والإكرام

لا إله إلا الله وحده لا شريك له، له الملك وله الحمد

وهو على كل شيء قدير"

لا حول ولا قوة إلا بالله، لا إله إلا الله ولا نعبد إلا إياه

له النعمة وله الفضل و

له إلا الله مخلصين له الدين

لو كره لا مانع لما أعطيت، و

ولا ينفع ذا الجد م

سبحان الله (٣٣ مرة) الحمد لله (٣

يختم المائة بقوله: لا إله إلا

له الملك وله الحمد، وهو ع

له إلا الله وحده لا شريك له، له

يحيي ويميت وهو على كل

بعد صلا

آية الكرسي (الله لا إله إ

سورة الإخلاص

سورة الفلق

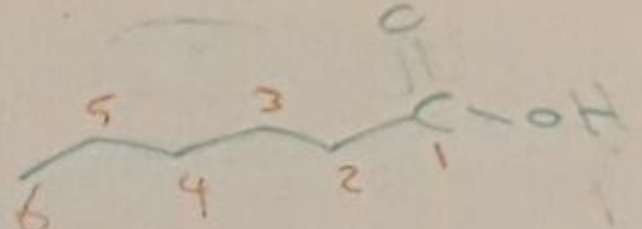
سورة الناس

Chapter-7 ⇒ (18)

Chapter-7

Organic Chemistry

Carboxylic acid



hexanoic acid

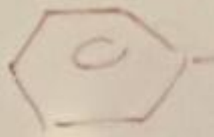
$R-\overset{O}{\overset{\|}{C}}-OH$

$R-COOH$

$R-CO_2H$

Amine

$R-NH_2$



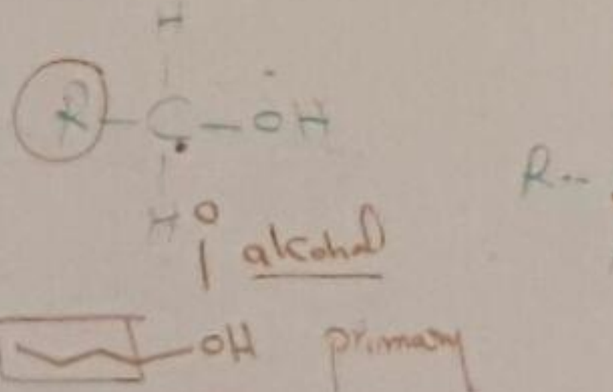
Amide $R-\overset{O}{\overset{\|}{C}}-NH_2$

③

Chapter-7 (14)

Chapter-7
Organic Chemistry

Alcohol —OH



الأذكار بعد الصلاة المفروضة

استغفر الله، أستغفر الله، أستغفر الله.
اللهم أنت السلام ومنك السلام تباركت يا ذا الجلال والإكرام.
لا إله إلا الله وحده لا شريك له، له الملك وله الحمد
وهو على كل شيء قدير.
لا حول ولا قوة إلا بالله، لا إله إلا الله ولا نعبد إلا إياه
له النعمة وله الفضل وله
لا إله إلا الله مخلصين له الدين و
اللهم لا مانع لما أعطيت، ولا
ولا ينفع ذا الجد منك
سبحان الله (٣٣ مرة) الحمد لله (٣٣
ثم يتم المائة بقوله: لا إله إلا
له الملك وله الحمد، وهو على
لا إله إلا الله وحده لا شريك له، له
يحيي ويميت وهو على كل ش
بعد صلاة
قراءة آية الكرسي (الله لا إله إلا
الله
قراءة كل من:
سورة الإخلاص (
سورة الفلق (
سورة الناس (

Chapter-6

Quantifying Heat and work

specific heat capacity (C_s)

The quantity of heat required to change the temp. of 1 gram of the substance by 1°C.

Unit C_s = J / g.°C

$q = m_{mass} \times C_s \times \Delta T$

Heat capacity (C)

The quantity of heat required to change the temp. of the system by 1°C.

Heat cap. Unit = J / °C

Chapter-7

Chapter-7
Biochemistry

Nucleic acids

- DNA
- RNA

Nucleotides

- Nitrogenous base
- Sugar
  - Ribose (RNA)
  - Deoxyribose (DNA)
- phosphate

Nitrogenous base:

- Adenine A DNA/RNA
- Guanine G DNA/RNA
- Cytosine C DNA/RNA
- Thymine T DNA only
- Uracil U RNA only

Chapter-7 Δ (20

Chapter-7
Biochemistry

Lipids

$CH_2OH + HOOC-R_1$
$CHOH + HOOC-R_2$ (Esterification)
$CH_2OH + HOOC-R_3$
Glycerol 3 Fatty acids

$CH_2-O-C(=O)-R_1$
$CH-O-C(=O)-R_2$
$CH_2-O-C(=O)-R_3$

Triglycerides

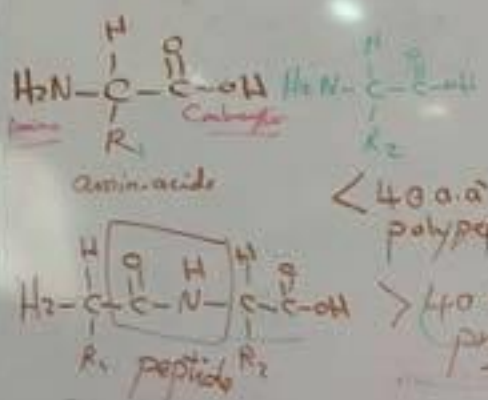
Lipids

Oils
Liquid
Unsaturated

Fats
Solid
Sat. FA

Chapter-7 ☆☆

Chapter-7
Biochemistry

- proteins
  - Amino acids
  - 20
  - 
  - amino acids
  - < 40 a.a polypeptides
  - > 40 a.a proteins
- Carbohydrates
  - glucose
  - Monosaccharides
    - Ribose } 5C
    - Deoxyribose }
    - glucose } 6C
    - galactose }
    - Fructose }
  - Disaccharides
    - → Sucrose (Table sugar) glucose + Fructose
    - → Lactose (Milk sugar) glucose + galactose
    - → Maltose (Malt sugar) glucose + glucose
  - polysaccharides
    - Animal Glycogen
    - plant
      - starch digestable
      - Cellulose Non-dig.
- Lipids
  - Glycerol + fatty acids
- Nucleic acids
  - nucleotides
    - Nitrogenous base
    - sugar
    - phosphate

Chapter-7 (2)

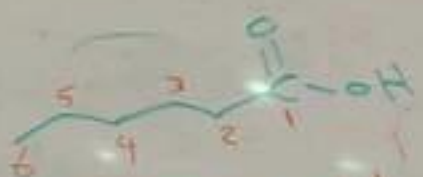
Chapter-7
Organic Chemistry

Carboxylic acid

$R-\overset{O}{\overset{\|}{C}}-OH$

$R-COOH$

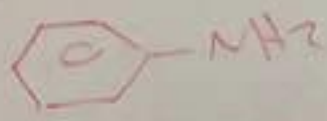
$R-CO_2H$



hexanoic acid

Amine

$R-NH_2$



Amide $R-\overset{O}{\overset{\|}{C}}-NH_2$

③

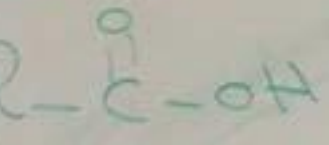
Chapter-7 (18)

Chapter-7

Organic Chemistry

Carboxylic acid

hexanoic acid



R-COOH

$R-CO_2H$

(3)

Chapter-7 (17)

Chapter-7
Organic Chemistry

Esters

$R-\overset{O}{\overset{\|}{C}}-O-R'$

$R-\overset{O}{\overset{\|}{C}}-OH + HO-R'$

acid + alcohol

hydrolysis → acid + alcohol
H_2O

$R-\overset{O}{\overset{\|}{C}}-O-R$

Ester

Alkali
NaOH → Soap

Saponification

③

Chapter-7 (10)

Chapter-7
Organic Chemistry

Aldehyde

$R-\overset{O}{\overset{\|}{C}}-H$

-al

alcohol $\xleftarrow{[H]}$ aldehyde $\xrightarrow{(O)}$ acid

$\uparrow$ [H]

Ketone

-one

$R-\overset{O}{\overset{\|}{C}}-R$

$CH_3-\overset{O}{\overset{\|}{C}}-CH_3$

Acetone

③

Chapter-7 (14)

Chapter-7
Organic Chemistry

Ethers

$R-O-R$

CH_3-O-CH_3
dimethyl ether

$C_2H_5-O-CH_3$
Ethyl methyl Ether

$CH_3-OH + HO-CH_3$
alcohol alcohol

$\xrightarrow{-H_2O}$

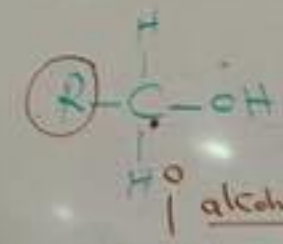
CH_3-O-CH_3

(3)

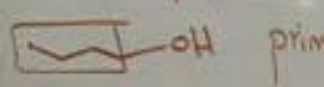
Chapter-7 ← (14)

Chapter-7
Organic Chemistry

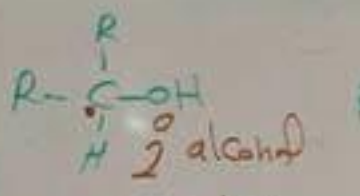
Alcohol — OH



1° alcohol

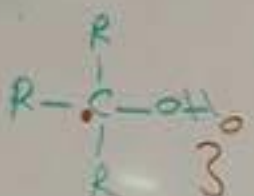


primary

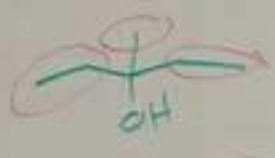


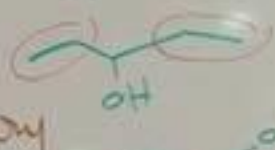
2° alcohol

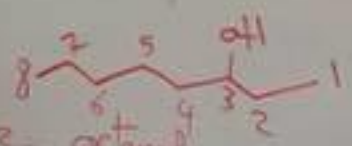
secondary



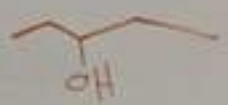
3° tertiary

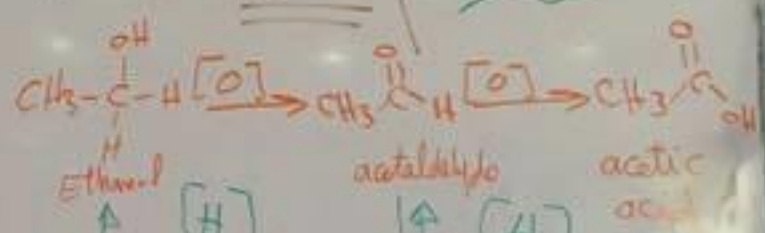






3- octanol





③

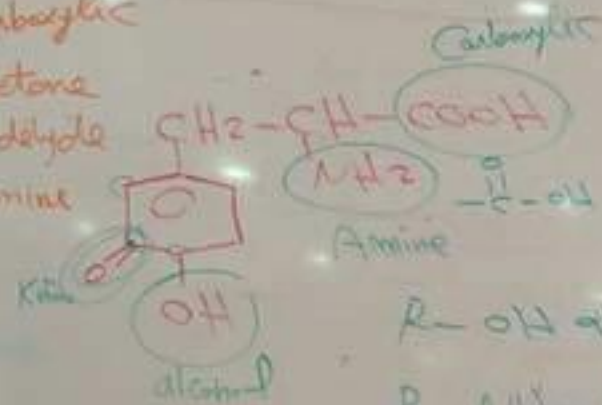
Chapter-7 ← (13)

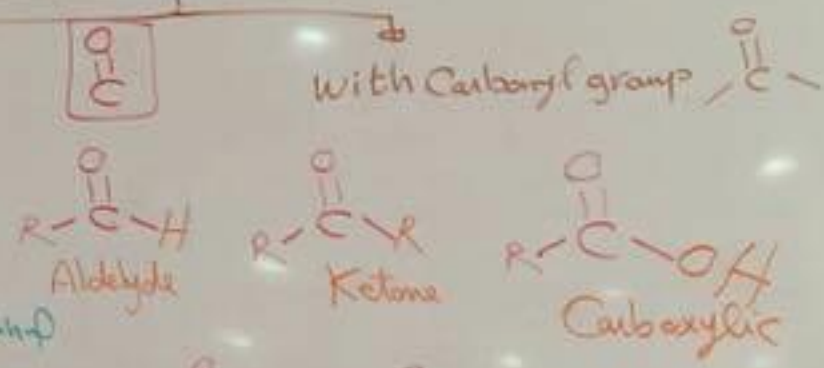
Chapter-7

Organic Chemistry

Functional group's

(a) alcohol
(b) Carboxylic
(c) Ketone
(d) Aldehyde
(e) Amine

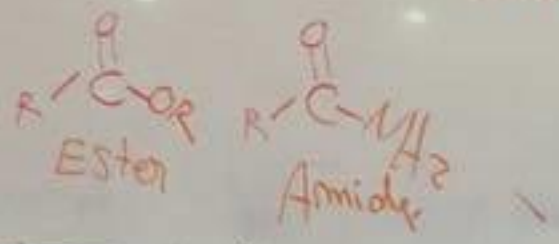




R-OH alcohol

R-NH2 Amine

R-OR ether

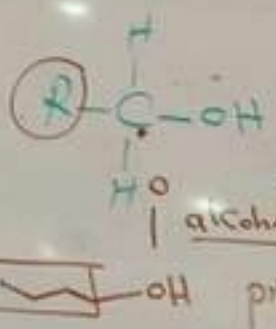


③

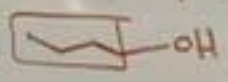
Chapter-7 (13)

Chapter-7
Organic Chemistry

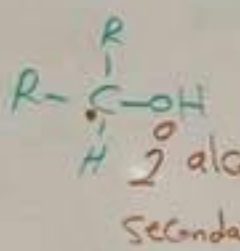
Alcohol —OH



1° alcohol

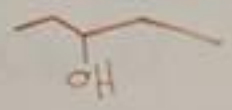


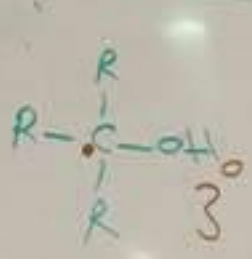
primary



2° alcohol

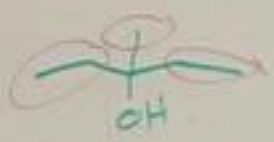
secondary



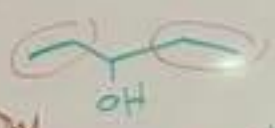


3°

tertiary



3°



2°

1°

(3)

Chapter-7 (11)

Chapter-7
Organic Chemistry

- Hydrocarbons
  - Saturated HC
    - Alkane
      - C_nH_{2n+2}
      - methane
    - Cycloalkanes
      - C_nH_2
      - Cyclopropane
  - Unsaturated HC
    - Alkenes
      - C_nH_{2n}
      - Ethylene
    - Alkynes
      - C_nH_{2n-2}
      - Acetylene
    - Aromatic
      - C_nH_{2n-6}
      - benzene

Chapter-7 (12)

Chapter-7

Organic Chemistry

Functional group's

- without Carbonyl group
  - ① CH_4 — CH_3-OH alcohol ($R-OH$)
  - phenol
  - ② Amine or Amine: $CH_4 \rightarrow CH_3NH_2$
  - ③ CH_3-O-CH_3 Ether ($R-O-R$)
- Carbonyl group
- with Carbonyl group
  - Aldelyde ($R-C(=O)-H$)
  - Ketone ($R-C(=O)-R$)
  - Carboxylic ($R-C(=O)-OH$)
  - Esta ($R-C(=O)-OR$)
  - Amide ($R-C(=O)-NH_2$)

Chapter-7 (8)

Chapter-7

Organic Chemistry

$CH_3-CH_2-CH_2-CH_3$ butane C_4H_{10}

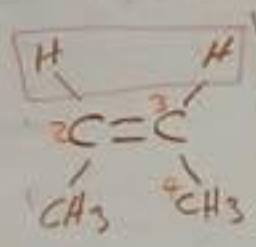
Isomers

$CH_3-CH(CH_3)-CH_3$ 2-methylpropane C_4H_{10}

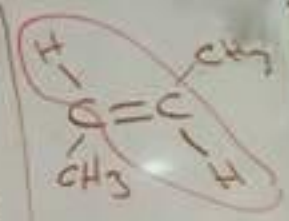
$CH_3-CH_2-CH_2-CH_2-CH_3$

$CH_3-CH(CH_3)-CH_2-CH_3$

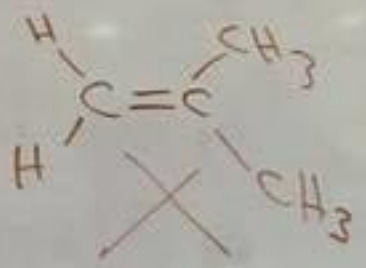
$CH_3-C(CH_3)_2-CH_3$



Cis–



Trans–



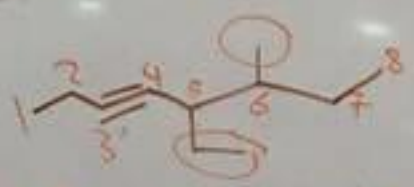
Chapter-7 (1)

Chapter-7
Organic Chemistry

Alkynes
- yne
C_nH_{2n-2}

unsaturated Hydrocarb

5-methyl-1-hexyne



5-ethyl, 6-methyl, 3-octyne

$HC \equiv CH$
Acetylene

Chapter-7 (1)

Chapter-7

Organic Chemistry

benzene

-OH CH_3 NH_2

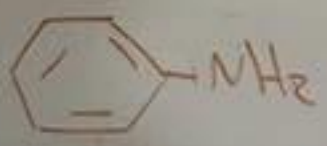
phenol Toluene Aniline

Aromatic

Arene C_nH_{2n-6}

benzene

C_6H_6



Chapter-7 ≈ (1)

Chapter-7

Organic Chemistry

C_nH_{2n}

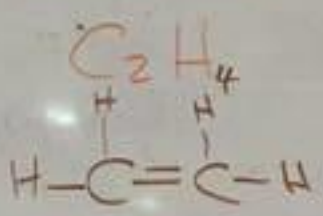
Alkenes

$H_2C=CH_2$

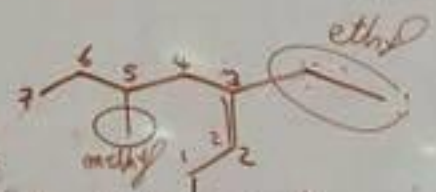
Ethene

(ethylene)

Unsaturated hydrocarbons



5-methyl-1-hexene



3-ethyl, 5-methyl-2-heptene

-hept-2-en

Chapter-7 (6)

Chapter-7

Organic Chemistry

C_3H_6 cyclopropane

C_4H_8 cyclobutane

C_5H_{10} cyclopentane

C_6H_{12} cyclohexane

Cycloalkanes

C_nH_{2n}

$C_3H_8 \rightarrow C_3H_6$

1-ethyl, 3-methyl cyclohexane

methyl cyclopropane

1-ethyl, 2-methyl, cyclopropane

cyclopropylethane

3)

Chapter-7 (5)

Chapter-7
Organic Chemistry

C_3H_6 cyclopropane

C_4H_8 cyclobutane

C_5H_{10} cyclopentane

C_6H_{12} cyclohexane

Cycloalkanes

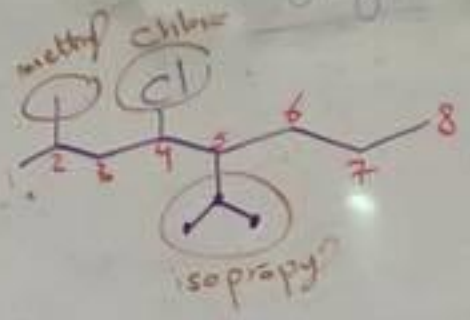
C-C-C

C_nH_{2n}

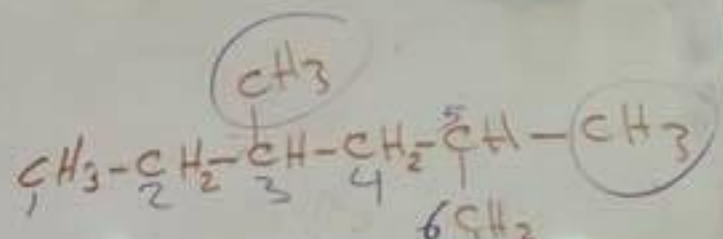
$C_3H_8 \rightarrow C_3H_6$

Chapter-7 (5)

Chapter-7
Organic Chemistry



4-chloro, 5-isopropyl, 2-methyl octane

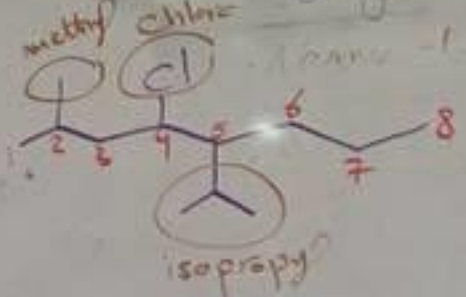


3,5-dimethyl heptane

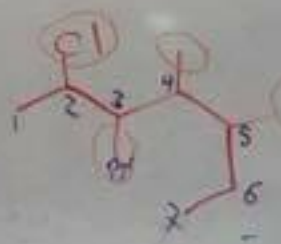
Chapter-7 (4)

Chapter-7

Organic Chemistry



4-chloro, 5-isopropyl, 2-methyl octane

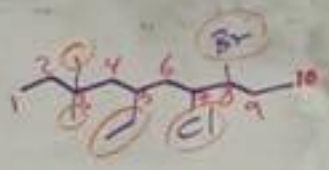


Isopropyl

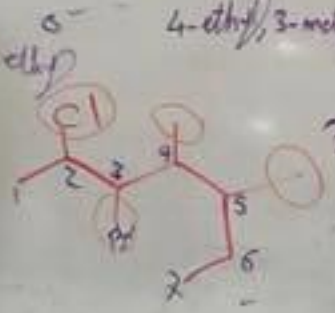
C_6H_{12}

Chapter- 7

Organic Chemisty



Ans 8-bromo, 7-chloro, 5-ethyl, 3,3-di-ethyl decane



4-ethyl, 3-methyl heptane

3,bromo,2-Chloro, 4,5-di methyl heptane

Chapter-7 (3)

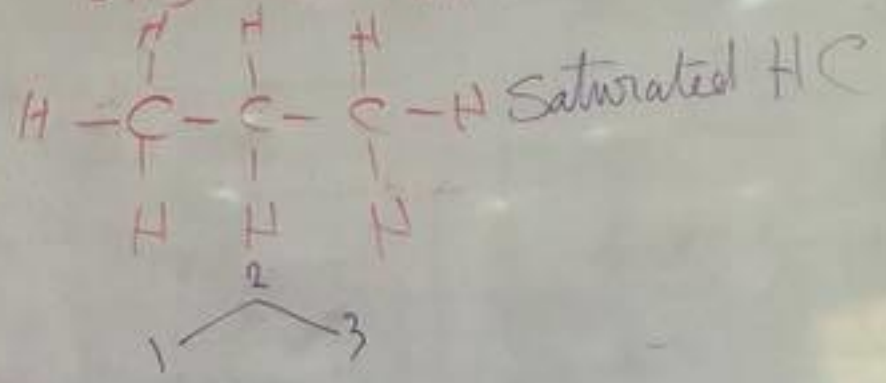
Chapter-7

Organic Chemistry

- C-C Single bond **Alkanes** C_nH_{2n+2}

- CH_4 methane
  C_2H_6 ethane
  C_3H_8 propane
  C_4H_{10} butane
  C_5H_{12} pentane
  C_6H_{14} hexane
  C_7H_{16} heptane
  C_8H_{18} octane
  C_9H_{20} nonane
  $C_{10}H_{22}$ decane

$CH_3-CH_2-CH_3$ propane C_3H_8 ✓



Saturated HC

Chapter-7 (2)

(a) C_6H_{14} Alkane
(b) C_5H_{10} Alkyne
(c) C_6H_{12} Alkene
(d) C_6H_6 Aromatic

Chapter-7

Organic Chemistry

Hydrocarbons

Hydrogen + Carbon

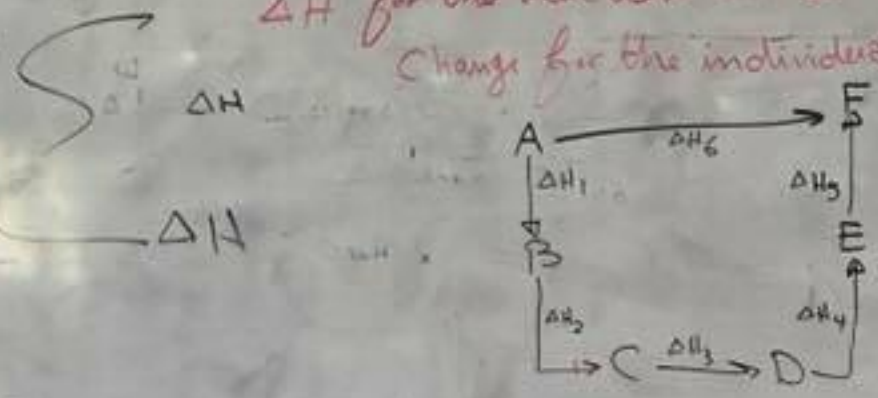
	Alkanes	Alkenes	Alkynes	Aromatic
	-C-C single	C=C double	C≡C	- ring
suffix	-ane	-ene	-yne	
General formula	C_nH_{2n+2}	C_nH_{2n}	C_nH_{2n-2}	C_nH_{2n-6}
first member	methane CH_4 Ethane C_2H_6	C_2H_4 Ethene (Ethylene)	C_2H_2 $HC\equiv CH$ Ethyne (Acetylene)	C_6H_6 benzene

Chapter-6

Chapter-6

Hesss Law

If a reaction is carried out in a series (multiple) steps
ΔH for the reaction will be equal to the sum of the enthalpy
Change for the individual steps



$$\Delta H_6 = \Delta H_1 + \Delta H_2 + \Delta H_3 + \Delta H_4 - \Delta H_5$$

Chapter-6 / (13)

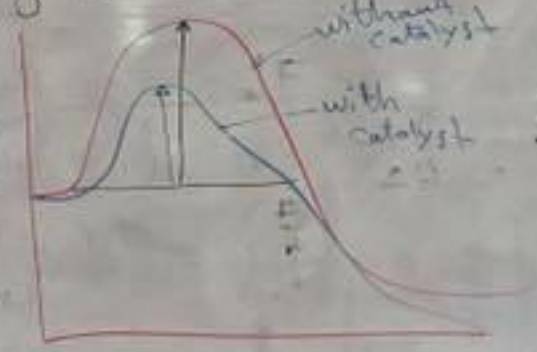
Chapter-6

Catalysts

It is a substance that increases (accelerates) the rate of a chemical reaction without itself Consumed Change

decrease it

Lower the activation Energy



Catalysts

Homogenous

Reactant + Catalyst in the same phase State

Heterogenous

Reactant + Catalyst in different State's

Chapter-6 (16)

Chapter-6

Enthalpy (H)

It is the amount of heat content absorb used or released in a system at constant pressure.

Change in Enthalpy ΔH

$$\Delta H = H_{final} - H_{inital} = q_p$$

$$= H_{product} - H_{reactant}$$

Chapter-6 (11)

Chapter-6

Energy ← Joule
calories
Calories = kilo calorie

cal = 4.16 J

Calorimetry

A Calorimeter is a device used to measure the quantity of heat transferred to or from an object

A bomb Calorimeter

- used at Constant Volume
- used high temperatures
- used in gases
- used solid

Coffee-Cup Calorimeter

- used at a Constant pressure
- low temperature
- not used in gases (escape)
- Solutions only

Chapter-6 (9)

Chapter-6

If 25.0 g of Al is cooled from 310.0°C to 37°C, what amount of energy (J) is lost by Al? The C_s of Al is 0.897 J/g.°C

$q = m \times C_s \times \Delta T$

$= 25 \times 0.897 \times (-273)$

$= -6120$ J

$= -6.12$ kJ

$\Delta T = T_f - T_i$

$= 37 - 310$

$\Delta T = -273$°C

35.8 g zinc heated 20°C → 28°C

$C_s = 0.388$ J

$q = m \times C_s \times \Delta T$

$= 35.8 \times 0.388 \times 8$

$= 111$ J

$q = m$

$= 2$

35.8 g

zinc
heated $20^\circ C \rightarrow 28^\circ C$

$=$

$C_s = 0.388\ J$

$q = m \times C_s \times \Delta T$

$= 35.8 \times 0.388 \times 8$

$= 111\ J$

Chapter-6 (7)

Chapter-6

Quantifying Heat and Work

Endothermic
absorb heat
ΔE = +ve

Endo = inner
= absorb

Exo = outer
= release

Exothermic (release heat)
ΔE = −ve value

$$q = C \times \Delta T$$

q = heat, C = Constant heat Capacity, ΔT = change of temperature

Heat capacity (C)

The quantity of heat required to change the temp. of the system by 1°C.

Heat cap. Unit = J/°C

Chapter-6

Quantifying Heat and Work

specific heat capacity (C_s)

The quantity of heat required to change the temp. of 1 gram of the substance by 1°C.

Unit C_s = J / g.°C

Heat capacity (C)

The quantity of heat required to change the temp. of the system by 1°C.

Heat cp. Unit = J / °C

$q = m \times C_s \times \Delta T$

Chapter-6 (6)

Chapter-6

Joule J
KJ = 1000 J

Internal Energy (E)

The sum of kinetic and potential energy

A certain gas expands in volume from 2.0 L to 6.0 L against constant pressure of 1.2 atm

Calculate the work

$$\Delta E = q + W$$

ΔE: Internal Energy — q: heat — W: work

0.480 KJ

480 J

$$W = -P\Delta V$$

W: work — P: pressure atm — ΔV: change of Volume

$\Delta V = V_f - V_i$

$= 6.0 - 2.0 = 4.0$ L

$= -1.2 \times 4 = -4.8$

$-4.8 \times 101.3 = -4.8 \times 10^2$ J

Unit W, q = joule

1 atm = 101.3 J

Chapter-6/②

Chapter-6

Law of Conservation of Energy:

Energy Cannot be Created or Destroed.

Energy in the Universe is a constant.

1st Law of thermodynamics

Chapter-6 (3)

Chapter-6

Forms of Energy

Energy is all around you!

- You can hear energy as sound
- You can see energy as light
- You can feel it as wind

Chapter-6 (4)

Chapter-6

Types of Energy

Kinetic Energy
associated with motion (movement)

- Heat
- Electrical
- optical (Radiant)
- Wind

potential Energy
Stored energy

- Chemical
- Gravitational
- Electrostatic
- Nuclear

Chapter-6 (5)

Chapter-6

Energy

$w < 0$ → Work

-ve negative

$w > 0$ ← Work

+ve positive

$q < 0$ heat →

-ve negative

$q > 0$ ← heat

+ve positive

Surrounding

System

$A + B \longrightarrow C + D + heat \quad \Delta H = -230\ KJ$

$A + B + heat \longrightarrow C + D \quad \Delta H = 500\ KJ$

Open system

matter
heat
system

Closed system

no matter
heat

no heat
no matter

Isolated system

Chapter-6

Thermodynamic : The study of the relationship between heat, work and energy.

ThermoChemistry: The thermodynamic of chemical reactions

Heat : The energy transferred from a hot object to a cold object.

Temperature: is a measure of the thermal energy

Energy: The capacity to do work

Power: The capacity to do something

Work : The energy required to move an object against a force.