### First semester Syllabus

<table>
<thead>
<tr>
<th>عدد الوحدات</th>
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<tbody>
<tr>
<td>3</td>
<td>General Introduction and outline + Classical Mechanics includes: Conservative System, Hamilton and Lagrange functions. + Quantum Theory includes: Photoelectric effect, Bohr atom, Sommerfield Quantization</td>
<td>3</td>
<td>Quantum chemistry</td>
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<td>Classical Mechanics + Schrodinger Equation</td>
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<td>Postulates of Quantum Mechanics</td>
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<td>Normalization and Orthogonality, Application of Schrodinger Equation to some systems, Particle in a box, Microwave spectroscopy</td>
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<td>Applications of Schrodinger Equation to some systems, IR spectroscopy, Hydrogen</td>
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### second semester Syllabus

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<td>3</td>
<td>Introduction-</td>
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<td>Vibration-</td>
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<td>Vibration of one particle -</td>
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<td>Vibration of di atomic molecules -</td>
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<td>Harmonics oscillation-</td>
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<td>Dissociation and Dissociation energy-</td>
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### Spectroscopy

1- Optical Methods:

a- Introduction of Optical Methods:

Nature of energy, Reaction with material, Molecular spectra Fluorescence, Phosphorescence, Raman spectra, Polarisation, Continuous and linear sources of radiation, Filters, Monochromators

b- Ultraviolet and Infrared Absorption: Absorption ability, Beers’ law deviation, Spectrophotometers, Qualitative and quantitative analysis, Application

### INSTRUMENTAL

MICROWAVE SPECTROSCOPY

. Introduction in molecular rotation-

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<td>3</td>
<td>. Applications in energy and bond length calculi-</td>
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<td>. Isotopic substitution effect-</td>
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### ANALYSIS
c- Molecular Chemiluminescence
(Fluorescence, Phosphorescence)

Measurements and calculations, Fluorescence spectra, Excitation spectra, Measurements of fluorescence, Spectrophotometer and fluorometer, Chemical quenching, Phosphoroscope.
d- Infrared absorption:

IR-spectra, Qualitative analysis, quantitative analysis by baseline method, Liquids and gases analysis, IR-absorption spectrophotometers, Calibration of IR-absorption spectrophotometer.
e- Measurement by Polarization light:
measurement, Nephelometry measurement, Scattering spectrophotometer, Light, Turbidimetric titration, Raman scattering or nephelometry, Application of
f- Atomic Absorption Analysis:
atomization, Fuel and oxidents, Burners- Nebulizer system, Flame and flameless atomization, Cold atomization, Calibration, Matrix effects, Chemical interference, Detection limit, Application.
g- Atomic Emission Spectrophotometer:
Principle, Methods of atomic excitation, ICP- atomic emission spectroscopy, Quantitative analysis, Interferences, Application.
h- Thermal Analysis:
Classification, Thermogravimetry (TGA), Differential thermal analysis (DTA).

IV- Protein and amino acids metabolism

V- Nucleotides metabolism

VI- Replication and transcription of DNA.

I- Introduction of metabolism
II- Carbohydrate metabolism

-Glycolysis pathway
-Krebs cycle
<table>
<thead>
<tr>
<th>VII- Protein synthesis</th>
<th>VIII- The blood</th>
<th>IX- The Urine</th>
<th>X- Human Nutrition, digestion and absorption.</th>
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<tr>
<th>Glyoxylate cycle</th>
<th>Phosphogluconate pathway</th>
<th>Lipid catabolism and anabolism pathway</th>
<th>Triglyceride catabolism</th>
<th>Cholesterol catabolism and bile acid synthesis</th>
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<th>II- Carbohydrate metabolism</th>
<th>III- Lipid metabolism</th>
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<td>I- Introduction of metabolism</td>
<td>Biochemistry</td>
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### Polymer chemistry

1. Condensation polymerization, addition and substitution polycondensation, mechanisms of polycondensation, kinetics of polycondensation, gel points, molecular weight determination.

2. Industrial applications: polyesters, polyamides, polycarbonates, polyureas, polyurethanes.

- Reactions and transformations of polymers:
  - degradation, branching, crosslinking, isomerisation, side group reactions, complex formation, ion-exchangers, polymeric reagents.

Molecular forces in polymers: primary and secondary forces, cohesive energy density (CED), methods of CED determination, solubility parameter, effect of molecular forces on polymer chain.

- Molecular weight of polymers: polymer fractionation, polydispersity.

### Molecular forces in polymers

- Relationship between petrol petrochemistry and polymers.

2. Chemical structure of polymers, primary, secondary, and supermolecular structures, polymer classification and nomenclature.
Methods of M.wt determination: viscometry, membrane

osmometry, light-scattering, ultracentrifugation, diffusion

diffusion, end-group analysis, M.wt distribution curves

IV- Protein and amino acids metabolism
V- Nucleotides metabolism
VI- Replication and transcription of DNA.
VII- Protein synthesis:
VIII- The blood
IX- The Urine
X- Human Nutrition, digestion and absorption.

Addition polymerization, basic concepts, monomer structures and initiation ability.

Free radical polymerization, methods of initiation, mechanism and kinetics of F.R.

Copolymerisation, kinetics of copolymerization, monomer – reactivity ratios.

Ionic polymerization: cationic and anionic polymerization.

Coordination polymerization, Zeigler - Natta catalysts, mechanism and kinetics of polymerization.

Spectroscopy

Ultraviolet spectroscopy
Infrared spectroscopy
Nuclear Magnetic resonance

Identification of
dentification of
organic
compound

3.5

spectroscopy

petroleum

Raw materials used in chemical industry

Petrochemicals
كيمياء النفط

1. أصل النفط

2. البتروكيميائيات الأساسية المشتقة من عمليات الغاز المصدر

3. عملية إنتاج الألكينات والألكانات ومشتقاتها البتروكيميائية الأساسية

4. عمليات الأكسدة البتروكيميائية ومشتقاتها الأساسية

5. عمليات إنتاج المواد الأروماتية ومشتقاتها البتروكيميائية الأساسية

6. كيمياء عمليات التكرير والمشتقات النفطية الأساسية

Origin

Occurrence and production methods

Classification of petroleum

Oxidation process in petrochemical industry

Production of basic alkenes and alkynes

Basic petrochemicals from synthesis gas

Processing of basic alkenes and alkynes

Classification of petroleum

Evaluation methods

Chemical composition of petroleum

Basic refining processes