مفردات التنافسي للدكتوراه

Physical Chemistry:

Thermodynamic:

1. The perfect gas, the kinetic model of gas, Real gases, the van der waals equation, the principle of
corresponding states, the basic concepts (work, heat and energy).

2. The first law of thermodynamic, the second law of thermodynamic, Hess's law, the Helmholtz and Gibbs
energies, standard molar, Gibbs energies, the relation between heat capacities and adiabatic changes.

Kinetic Chemistry:

1. Zero, first, second, third-order reactions, Arrhenius equation, Activation energy and complex reactions.

2. Collision theory, transition state theory and effect of Brønsted salt on the rate reaction.

Electrochemistry:

1. Galvanic cell, electrolytic cell, half reaction and electrodes and standard potential.

2. Nernst equation, Faraday's first law, writing the electrochemical cell.

3. The electrical double layer, the activation Gibbs energy, the Butler-Volmer equation, fuel cells and
secondary cells.

4. Relationship between E.M.F of a cell and ΔG, ΔH and ΔS.

Quantum Chemistry:

1. Wavefunction, Black-body radiation, the Planck distribution and the Schrödinger equation.

2. The Born interpretation of the wavefunction, normalization, the probability density and the uncertainty
principle.

3. Translation motion, solving Schrödinger equation for particle in a box, harmonic oscillator, angular
momentum.

4. The Born-Oppenheimer approximation, valence-bond theory, molecular orbital theory and the Hückel
approximation.

Molecular Spectroscopy:

1. X-ray diffraction (XRD): types of x-rays, production of x-rays, Bragg's law, why do we use x-rays?,
instrumentation, constructive and destructive interference of waves, lattice and unit cell and applications.

2. Mass spectroscopy (MS): production of mass, classification of composition depending on the separation
of charged particles, determination of a molecular formula, fragmentation and applications.

3. Infrared spectroscopy (IR): theoretical overlap of vibrational and rotational motions of molecules.

4. Nuclear magnetic resonance spectroscopy (NMR): $_{1}$H-NMR (chemical shift, coupling constant, coupling
of proton with other nuclei), $_{13}$C-NMR spectroscopy (chemical shift, $_{13}$C-$_{1}$H couplings), DEPT, NOE,
COSY and NOESY.

References:

1. P.W. Atkins, *Physical Chemistry*, sixth edition, Oxford University (2001).
2. R.M. Silverstein F.X. Webster, *Spectrometric Identification of Organic Compounds*, sixth edition,
New York University (2003).

Inorganic chemistry

1- Classification of organometallic compounds

2- Nomenclature of organometallic compounds

3- Bonding in organometallic compounds

4- 18-electron rule

5- Alkyl and aryl organometallic compounds

6- Metallocenes

7- Coordination chemistry

8- VBT , CFT , MOT of complexes and Nomenclature

9- Types of isomers

10- Stability of complexes and magnetic properties

11- Electronic transitions of complexes

References

1- Organometallic chemistry تاليف طلال العلاف
2- الكيمياء اللاعضوية التناسقية تاليف احسان عبد الغني
3- الكيمياء التناسقية تاليف مهدي ناجي الزكوم

Organic chemistry PhD,

Heterocycles

1. Nomenclature of Heterocyclic Compounds
2. Aromaticity and Basicity of Heterocyclic Compounds
3. mono heteroatom for five and six member ring
   Preparation and reactions
4. dihetro atoms and trihetro atoms for five member ring

   Preparation and reactions

Intermediate and mechanizes

1. Carbocation , stability and their reaction
2. Carbanions , stability and their reaction
3. S_N1 , E1 , S_N2, E2

References

A Guide book of organic reaction mechanism , peter Sykes
http://repository.um-palembang.ac.id/id/eprint/9155/1/A%20Guidebook%20of%20Organic%20Reaction%20Mechanism%20by%20Peter%20Sykes.pdf

الحلقية الغير متجانسة
http://www.chtf.stuba.sk/~szolcsanyi/education/files/Chemia%20heterocyklickych%20zlucenin/Heterocyclic%20Reviews%20and%20Summaries/Heterocycles_Palleros.pdf

http://www.uobabylon.edu.iq/eprints/paper_4_18767_191.pdf

https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/heterocy.htm

https://www.patnauniversity.ac.in/e-content/science/chemistry/MScChem42.pdf

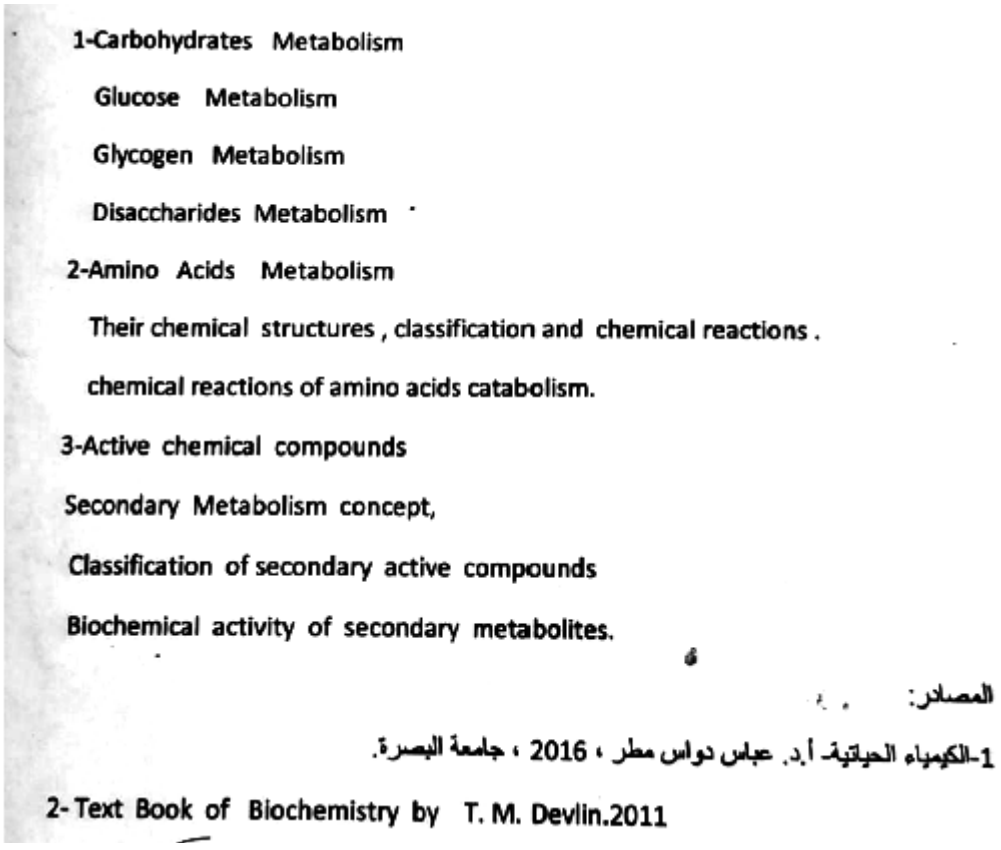
Heterocyclic Chemistry , by; **John A. Joule** and **Keith Mills** (كتاب)

Industrial chemistry

1- Introduction of polymers: Chapter 1; p(1-36)
2- Step polymerization : Chapter 2; p: (39-185)
3- Radical chain polymerization : Chapter 3; p (198-295)
4- Ionic chain polymerization : Chapter 5 ; p (372-420)
5- Chain copolymerization : Chapter 6 ; p (464-485)

References: Principles of polymerization
By: George Odian

Biochemistry



1-Carbohydrates Metabolism

Glucose Metabolism

Glycogen Metabolism

Disaccharides Metabolism

2-Amino Acids Metabolism

Their chemical structures , classification and chemical reactions .

chemical reactions of amino acids catabolism.

3-Active chemical compounds

Secondary Metabolism concept,

Classification of secondary active compounds

Biochemical activity of secondary metabolites.

المصادر:

1-الكيمياء الحياتية- أ.د. عباس دواس مطر ، 2016 ، جامعة البصرة.

2- Text Book of Biochemistry by T. M. Devlin.2011

Analytical Chemistry

Chapter 16
Spectrochemical Methods 457

References

ANALYTICAL CHEMISTRY

Sixth Edition

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