

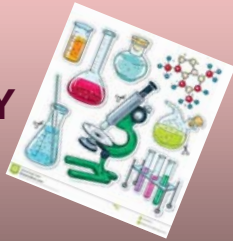
DİŞ HEKİMLİĞİ
1.SINIF
BIOCHEMISTRY
SLAYTLARI
2020-2021

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2020-2021 BIOCHEMISTRY



INTRODUCTION



In the way of becoming a dentist,
I wish you all a very happy and successful New
Academic Year.



DEPARTMENT OF BASIC MEDICAL SCIENCES

BIOCHEMISTRY
PHYSIOLOGY
MICROBIOLOGY
HISTOLOGY AND EMBRIOLOGY
MEDICAL BIOLOGY AND GENETICS

DEPARTMENT OF BASIC MEDICAL SCIENCES

BIOCHEMISTRY

Educational staffs :



Prof.Dr.Ayşen Yarat



Prof.Dr.Tuğba Tunalı Akbay



Prof.Dr.Ebru Işık Alturfan



Associate Professor
Şehkar Uslu Oktay

Our Short Curriculum Vitae (CV's)

PROF. DR. AYŞEN YARAT

Birth Place : Giresun
Birth Date : June 17th, 1957

Education:

Primary School : Fatih İlkokulu, 1968
Secondary and High School : Atatürk Kız Lisesi, 1974
Graduate : I.U. Chemistry Faculty, 1978
MSc : I.U. Chemistry Faculty, 1979
PhD : Biochemistry (Institute of Health Sciences, M.U. 1988)

Academic Degrees:

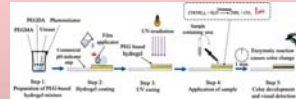
Lecturer : M.U. Faculty of Dentistry, 1989
Assistant Professor : M.U. Faculty of Dentistry, 1991
Associate Professor : Biochemistry (M.U. Faculty of Dentistry, 1993)
Professor : Biochemistry (M.U. Faculty of Dentistry, 1998)

Many Academic and Administrative Experiences

Many Experiences in Scientific Journals

7

Biosensors Urea Test Strips



Boron Studies



Deuterium Depleted Water



8

PROF.DR.TUĞBA TUNALI AKBAY

Birth Place : Istanbul
Birth Date : November 12nd, 1972

Education:

Primary School : Melahat Şefzade İlkokulu, 1983
Secondary and High School : Özel Kadıköy Kız Lisesi, 1989
Graduate : M.U. Art and Science Faculty, 1993
MSc : M.U. Health Sciences Institute, Biochemistry, 1996
PhD : M.U. Health Sciences Institute, Biochemistry, 2002
Post doctoral : Virginia Polytechnic Institute and State University, Biology Dept., Molecular Biology and Genetic Department Project Assistant (2002-2003)

Academic Degrees:

1993- 2006 : Research Assistant in M.U. Faculty of Dentistry, Biochemistry Department
2006- : Associate Professor in M.U. Faculty of Dentistry, Biochemistry Department
2013- : Professor in M.U. Faculty of Dentistry, Biochemistry Department

Many Academic and Administrative Experience

Many Experiences in Scientific Journals

9

Prof.Dr.Tuğba Akbay

https://instagram.com/eyvah_bulus_yaptim?utm_source=ig_profile_share&igshid=kf0x637yj39x

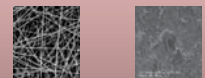


Tuğba Akbay is a professor in Biochemistry department. She works on breast milk filter. She finished one TUBITAK Project on that topic. Nowadays, she has a new TUBITAK Project that detects some impurities in breast milk with test strips. She has PhD and master science students. She also works on diabetes, skin burns and coagulation system in experimental rat models.

BIOACTIVE NANOFIBER PRODUCTION



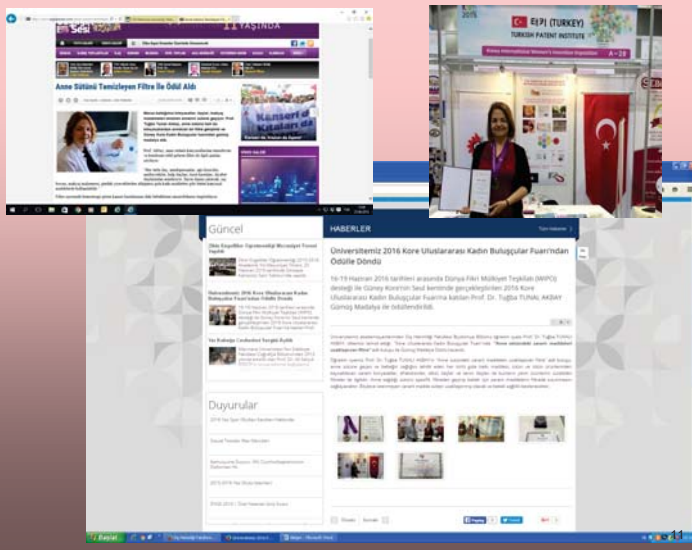
Breastmilk filter



Breastmilk test strips



10



PROF.DR. EBRU İŞİK ALTURFAN

Place of Birth : Istanbul
Date of Birth : July 15th, 1977

Education:

Primary School : İlhami Ahmet Örnekal İlkokulu, 1987
High School : Eyuboglu Koleji, 1995
Graduate : Veterinary Faculty, Istanbul University, 2000
PhD : Biochemistry (Institute of Health Sciences M.U.), 2006

Academic Experience:

2001-2002 : Researcher as an expert staff in M.U. Institute of Gastroenterology
2002-2010 : Research Assistant in Dental Faculty, Marmara University
2010- : Associate Professor in M.U. Dental Faculty, Department of Biochemistry
2016- : Professor in M.U. Dental Faculty, Department of Biochemistry
2010- : Lecturer in Istanbul Medipol University (Commission)
2010- : M.U. Health Science Institute Education Staff

Many Administrative Experience

Many Experiences in Scientific Journals

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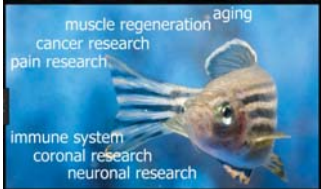





She is the founder of the zebrafish laboratory

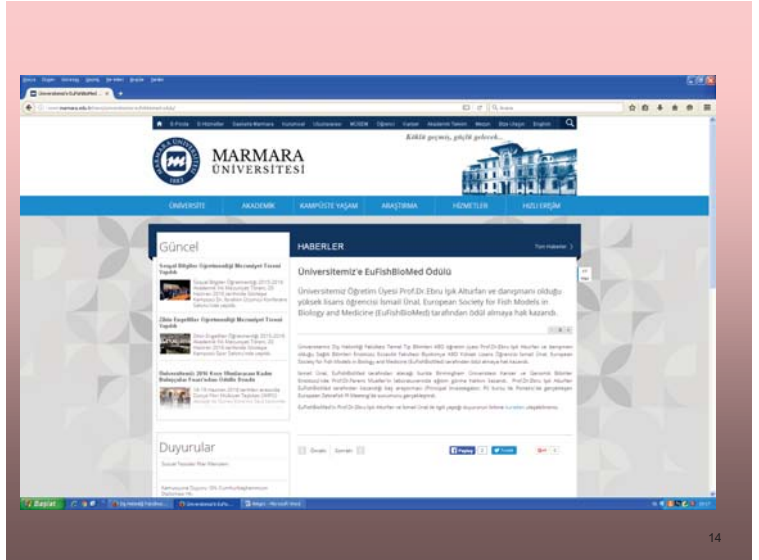
MARMARA ZEBRAFISH RESEARCH LABORATORY
MARMARA UNIVERSITY

Our first year student Babek Altayib conducted a study in Zebrafish Research Lab and won the first prize in International Congress of Dentistry Students in 2018.



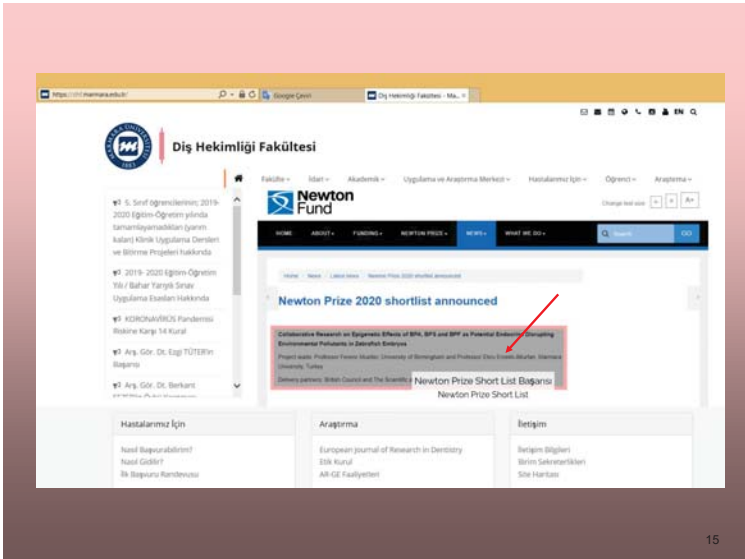
muscle regeneration
aging
cancer research
pain research
immune system
coronal research
neuronal research

Prof.Ebru Işık Alturfan uses zebrafish as a model organism to study the biochemical pathways in different disease models& toxicological research.



MARMARA ÜNİVERSİTESİ

Üniversitemiz Öğretim Üyesi Prof.Dr.Ebru Işık Alturfan ve danışmanı olduğu yüksek lisans öğrencisi İsmail Ünal, European Society for Fish Models in Biology and Medicine (EufishBioMed) tarafından 2018 yılında ilk dereceyi kazanarak...



Newton Prize 2020 shortlist announced

Collaborative Research on Epigenetic Effects of BPA, BPS and BPF on Prenatal Endocrine Disrupting Developmental Pathways in Zebrafish Embryos

Project leads: Professor Feriye Mutlu, University of Birmingham and Professor Öksüz Ebru Işık Alturfan, Marmara University, Turkey

Co-supervisors: Dr. Ebru Işık Alturfan and Dr. Feriye Mutlu

ASSOCIATE PROFESSOR (DOÇ. DR.) NİHAL ŞEHKÂR OKTAY

Birth Place : Istanbul
Birth Date : August 11th 1982

Education :

Primary School : Hırka-i Serif İlkokulu, Istanbul, 1988
High School : F.K.G. Anadolu Lisesi, Istanbul, 2000
Undergraduate education : I. U. Faculty of Science, Department of Biology, 2005
English Language Training : M.L.S. International A General English Language and IELTS Examination Preparation Course, Bournemouth, England. (March- July 2006)
PhD candidate : Marmara University, Institute of Health Science, Department of Biochemistry, 2006 – 2011
Post Doctorate Researcher : Department of Periodontics, College of Dentistry, University of Florida, USA (June 2013-September 2014)
Department of Pharmacology and Therapeutics, College of Medicine, University of Florida, USA (December 2013-September 2014)

Academic Degree :

2007 -2014 : Research Assistant, Marmara University, Faculty of Dentistry, Department of Basic Science, Biochemistry
2014-2020 : Assistant Professor in M.U. Faculty of Dentistry, Biochemistry.
2020 - : Associate Professor in M.U. Dental Faculty, Biochemistry

You can access our publications on the Internet.

<https://www.ncbi.nlm.nih.gov/>

PUBMED

- 2018
- Melatonin improves hyperglycemia induced damages in rat brain, Gürel-Gökmen B, İpekci H, Oktay S, Alev B, Ustundağ UV, Ak E, Akakın D, Sener G, Emekli-Alturfan E, Yarat A, Tunali-Akhay T. Diabetes Metab Res Rev. 2018 Aug 11;e3060. doi: 10.1002/dmrr.3060. [Epub ahead of print]
- Boron Content of Some Foods Consumed in Istanbul, Turkey, Kuru R, Yilmaz S, Tasli PN, Yarat A, Sahin F. Biol Trace Elem Res. 2018 Apr 14; doi: 10.1007/s12011-018-1319-9. [Epub ahead of print]
- Protective effect of platelet-rich plasma on urethral injury model of male rats, Tavukcu IH, Aytaç Ö, Anıl F, Alev B, Çevik Ö, Bulbul N, Yarat A, Çetinel Ş, Sener G, Kulaksızoglu H. Neurosurg Urology. 2018 Apr;37(4):1286-1293. doi: 10.1002/num.23460. Epub 2017 Dec 11.
- The effect of vitamin U on the lung tissue of pentylentetrazole-induced seizures in rats, Oktay S, Bayrak G, Alev B, İpekci H, Ustundağ UV, Türkyılmaz IB, Pisciçiler R, Emekli-Alturfan E, Tunali-Akhay T, Yanardag R, Yarat A. Naunyn-Schmiedeberg Arch Pharmacol. 2018 Feb;391(2):177-184. doi: 10.1007/s00210-017-1447-3. Epub 2017 Dec 7.
- Methylxanthine induces malformations and alterations on apoptosis, oxidant-antioxidant status, c-myc and mvcx expressions in zebrafish embryos, Ateş PS, Ünal I, Ustundağ UV, Alturfan AA, Yiğitbaşı T, Emekli-Alturfan E. J Biochem Mol Toxicol. 2018 Mar;32(3):e22036. doi: 10.1002/jbt.22036. Epub 2018 Jan 23.
- Evaluation of the interaction between proliferation, oxidant-antioxidant status, Wnt pathway, and apoptosis in zebrafish embryos exposed to silver nanoparticles used in textile industry, Eryılmaz O, Ateş PS, Ünal I, Ustundağ UV, Bay S, Alturfan AA, Yiğitbaşı T, Emekli-Alturfan E, Akalın M. J Biochem Mol Toxicol. 2018 Jan;32(1). doi: 10.1002/jbt.22015. Epub 2017 Dec 28.
- Masticatory parameters of children with and without clinically diagnosed caries in permanent dentition, Kaya MS, Akşur S, Güçlü B, Dincoglu D, Yarat A. Eur J Paediatr Dent. 2017 Jun;18(2):116-120. doi: 10.23804/ejpd.2017.18.02.06.
- Tooth replantation with adipose tissue stem cells and fibrin sealant: microscopic analysis of rat's teeth, Demirel S, Yalvac ME, Tapsin S, Akşur S, Ak E, Çetinel S, Yarat A, Sahin F. Springerplus. 2016 May 17;5(1):656. doi: 10.1186/s40064-016-2263-9. eCollection 2016.
- Effects of hyaluronic acid on bleeding following third molar extraction, Gocmen G, Aktop S, Türüner B, Goker B, Yarat A. J Appl Oral Sci. 2017 Mar-Apr;29(2):211-216. doi: 10.1590/1678-77572015-0187.
- The investigation of Helicobacter pylori in the dental biofilm and saliva samples of children with dyspeptic complaints, Akşit Break D, Akşur S, Kıratlı B, Usta M, Urgancı N, Alev B, Yarat A, Sahin F. BMC Oral Health. 2017 Mar 21;17(1):67. doi: 10.1186/s12903-017-0361-x.

2019

1. **Protective effect of Myrtle (*Myrtus communis*) on burn induced skin injury.**
Ozcan O, Ipekci H, Alev B, Ustundag UV, Ak E, Sen A, Alturfan EE, Sener G, **Yarat A**, Cetinet S, Akbay TT.
Burns. 2019 Aug 2; pii: S0305-4179(19)30297-9. doi: 10.1016/j.burns.2019.07.015. [Epub ahead of print]
PMID: 31383607
[Similar articles](#)
2. **Boron-rich diet may regulate blood lipid profile and prevent obesity: A non-drug and self-controlled clinical trial.**
Kuru R, Yilmaz S, Balan G, Tuzuner BA, Tasi PN, Akyuz S, Yener Ozturk F, Altuntas Y, **Yarat A**, Sahin F.
J Trace Elem Med Biol. 2019 Jul;54:191-198. doi: 10.1016/j.jtmb.2019.04.021. Epub 2019 May 1.
PMID: 31109611
[Similar articles](#)
3. **Antibacterial and photodynamic effects of some plant extracts for cavity disinfection.**
Akyuz S, Chousein Ntemir OM, Sacan O, Yanardag R, Kalayci S, **Yarat A**, Sahin F.
Photodiagnosis Photodyn Ther. 2019 Jun;26:48-52. doi: 10.1016/j.pdt.2019.02.025. Epub 2019 Feb 26.
PMID: 30822566
[Similar articles](#)

1. **White LED Light Exposure Inhibits the Development and Xanthophore Pigmentation of Zebrafish Embryos.**
Ustundag UV, Çalıskan-Ak E, Aleş PS, Ünal İ, Eğilmez G, Yiğitbaşı T, Ata Alturfan A, **Emekli-Alturfan E**.
Sci Rep. 2019 Jul 25;9(1):10810. doi: 10.1038/s41598-019-47163-y.
PMID: 31346212 Free PMC Article
[Similar articles](#)
2. **Fishing for Carbonic's Disease: A review of the literature.**
Ünal İ, **Emekli-Alturfan E**.
J Clin Neurosci. 2019 Apr;62:1-6. doi: 10.1016/j.jocn.2019.01.015. Epub 2019 Jan 16. Review.
PMID: 30665479
[Similar articles](#)
3. **Assessment of dental caries and salivary nitric oxide levels in children with dyspepsia.**
Akut-Bıcak D, **Emekli-Alturfan E**, Ustundag UV, Akyuz S.
BMC Oral Health. 2019 Jan 11;19(1):11. doi: 10.1186/s12903-019-0707-z.
PMID: 30634964 Free PMC Article
[Similar articles](#)
4. **Bofenone impairs oxidant/antioxidant balance both in brain and intestines in zebrafish.**
Ünal İ, Ustundag UV, Aleş PS, Eğilmez G, Alturfan AA, Yiğitbaşı T, **Emekli-Alturfan E**.
Int J Neurosci. 2019 Apr;129(4):363-368. doi: 10.1080/00207179.2018.1538141. Epub 2018 Dec 10.
PMID: 30334840
[Similar articles](#)

19

2020

1. **Neuroprotective effects of mitoxantrone and oleantrin on Parkinson's disease model in zebrafish.**
Ünal İ, Çalıskan-Ak E, Ustundag UV, Aleş PS, Alturfan AA, Alturfan MA, Emekli-Alturfan E.
Int J Neurosci. 2020 Jun;130(6):519-530. doi: 10.1080/00207179.2019.1608047. Epub 2019 Dec 4.
PMID: 31771386
[Similar articles](#)

-Kuru R, Balan G, Yilmaz S, Tasi PN, Akyuz S, Yarat A, Sahin F. The level of two trace elements in carious, non-carious, primary, and permanent teeth. Eur Oral Res 2020; 54(2): 77-80.

-Ruya Kuru, Sahin Yilmaz, Ozlem Sacan, Refiye Yanardag, Aysen Yarat, Fikretin Sahin. Boron concentrations in tap water in many cities of Turkey. Toxicological & Environmental Chemistry. 102(5-6):240-249,2020. Doi:10.1080/02772248.2020.1778701

-Oktay S, Bal OÖ, Kuru L, Yarat A, Noyan U. Is sialic acid a promising marker for periodontal diseases? Niger J Clin Pract 2020;23:603-9.

-Akay T., Ipekci H., Yarat A. Validated Immunosorbent Surface-Based Determination of Theophylline in Milk. Journal of Analytical Chemistry, 2020, 75(5):640-644. Doi:10.1134/s1066194820050020

-Ruya Kuru, Sahin Yilmaz, Ozlem Sacan, Refiye Yanardag, Aysen Yarat, Fikretin Sahin. Boron levels in bottled waters in Turkey. 3rd International Eurasian Conference on Biological and Chemical Sciences (EurasianBioChem 2020), March 19-20, 2020 Ankara, Turkey www.EurasianBioChem.org. Proceeding Book: 763-767. (oral presentation)

-Busra Selmi Cepis, Serap Akyuz, Aysen Yarat. Evaluation of the effect of coffee and carbonated beverages on calcium phosphate precipitation, in the point of formation of calculus. 3rd International Eurasian Conference on Biological and Chemical Sciences (EurasianBioChem 2020), March 19-20, 2020 Ankara, Turkey www.EurasianBioChem.org. Proceeding Book: 548-554. (oral presentation).

-Özcan Özcan, Hazal Ipekci, Burcu Alev, Ünal Yeli Ustundag, Ali Ser, Elmi Emekli-Alturfan, Gökçel Sener, Aysen Yarat, Tuğba Tunali Akbay. The effect of Myrtus communis L. on the small intestine and lungs in experimental thermal burn injury. [Journal of Thermal Biology. 2020; 107:985](#)

-Çolak A, Yarat A, Yardımcı T. Effect of Deuterium Depletion on Erythrocytes in Experimental Diabetes. Experient 2020; 10(1): 30-7.

-Şirinoğlu-Çapan B, Akyüz S, Alev B, Tacal-Aslan B, Kadir T, Yarat A. In Vitro Fluoride-Release Recharge Pattern and Antimicrobial Effects of Current Restorative Materials Used in Pediatric Dentistry. Experient 2020; 10(1): 7-15.

-Harzineci H, Türkyılmaz İB, Ustundag UV, Emekli-Alturfan E, Tuzuner BA, Ipekci H, et al. White Cabbage Extract Reduces the Harmful Effects of Amiodarone on Heart Tissue in Rats. Experient 2020; 10(1): 1-6.

20

Our Books

21



22

BİYOKİMYADA TEMEL VE ÖZEL KONULAR (Basic and Special Subjects in Biochemistry)

Editörler:

Prof.Dr.Aysen Yarat
Prof.Dr.Tuğba Tunali Akbay
Prof.Dr.Ebru Işık Alturfan



23

SOME OTHER BOOKS FOR BIOCHEMISTRY

- Biochemistry - Lehninger
- Biochemistry - Stryer
- Biochemistry - Harper
- Biochemistry - Rawn
- Biochemistry - Moran
- Biochemistry - Campbell
- Biochemistry - Lippincott
- Medical Biochemistry- Bhagavan
- Medical Biochemistry – Bynes and Dominiczak
- Biyokimya - Edip Keha ve İrfan Küfrelioğlu
- Biyokimya - Engin Gözükar
- Biyokimya - T.Asi
- Biyokimya - Leyla Kalaycıoğlu, Behiç Serpek, Mehmet Nizamioğlu, Nuri Başpınar, Ali Muhtar Tiftik
- Temel Biyokimya - Taner Onat, Kaya Emerk
- Biyokimya – Figen Gürdol ve ark.



24

Theoric Courses

- Biochemistry - 3h/ week
(1st and 2nd terms)



25

2020-2021

TOPICS
Introduction to Biochemistry & Biologic Materials
Concentrations, Osmolarity, pH & Acid-Base Balance
Structure of Carbons, Chemical Bonds, Spectrophotometer
Classification of Organic Compounds, Isomerism
Functions of Proteins, Classification & Structure of AminoAcids
Three-Dimensional Structure of Proteins
Monosaccharides, Disaccharides, Oligo & Polysaccharides
Carbohydrate Digestion & Absorption
Functions of Lipids, Classification of Lipids, Explanation of Classification
Kinetics of Enzymes, Inhibition of Enzymes, Allosteric Enzymes
Digestion of Proteins
Digestion of Lipids
Regulation of Glycolysis, Glycolysis in Erythrocytes, The Importance of Citric Acid Cycle
The Importance of Pentose Phosphate Pathway, The Regulation of Gluconeogenesis
Glycogen, The Importance of Glycogen, Control & Degradation of Glycogen
Regulation of Blood Sugar, Introduction to Lipid Metabolism & Lipoproteins
Oxidation of Fatty Acids, Fatty Acids & Triglyceride Synthesis
Synthesis & Functions of Cholesterol, Bile Acid Synthesis & Ketogenesis
Electron Carriers & Features, Inhibition of Oxidative Phosphorylation
Deamination & Transamination of Amino Acids, Urea Cycle & Ammonia Detoxification
Some Important Amino Acids & Metabolism of These Amino Acids
Classification of Hormones & Mechanism of Action
Structure & Metabolism of Vitamins
Structure & Metabolism of Nucleic Acids
Porphyrias & Heme Metabolism
Xenobiotic Metabolism & Proteomics
Bioenergetics
Hemostatic Mechanism
Closing Marks

26



Practical Courses :

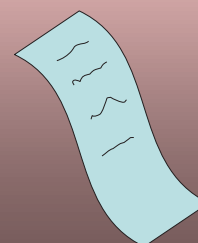
- Biochemistry practices -1h/week



27

EXAMS

- 2 midterms exams
- Final exam
- Make up exam



28

DEFINITION OF CHEMISTRY

Chemistry involves matter, energy and their interrelationship.

- **Chemistry:** is the study of matter, its chemical and physical properties, the chemical and physical changes it undergoes, and the energy changes that accompany those processes.
- **Matter:** is anything that has mass and occupies space. The changes that matter undergoes always involve either gain or loss of energy.
- **Energy:** is nonmaterial and is the ability to do work to accomplish some change.

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Major Areas of Chemistry

Biochemistry is the study of life at the molecular level and the processes associated with life, such as reproduction, growth and respiration.

Organic Chemistry is the study of matter that is composed principally of carbon and hydrogen.

Inorganic Chemistry is the study of matter that consists of all of the elements other than carbon and hydrogen and their combinations

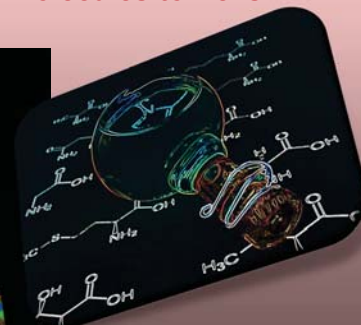
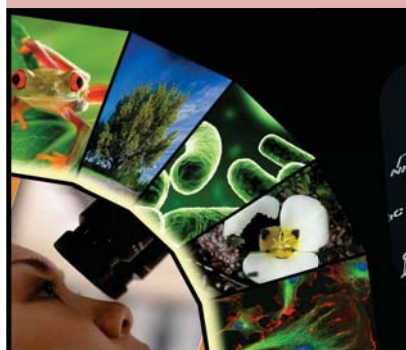
Analytic Chemistry involves the analysis of matter to determine its composition and the quantity of each kind of matter that is present.

Physical Chemistry is a discipline that attempts to explain the way in which matter behaves.

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BIOCHEMISTRY:

FROM Atoms to Molecules to Cells



PhD. Student Burcin ALEV

32

Biochemistry is the chemistry of life.

Biochemistry is the study of life at the molecular level and the processes associated with life, such as reproduction, growth and respiration.

Biochemistry is a branch of medical science that seeks to describe the structure, organization and functions of living matter in molecular terms.

33

...the study of life at the molecular level

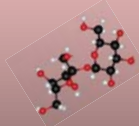
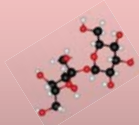
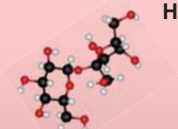
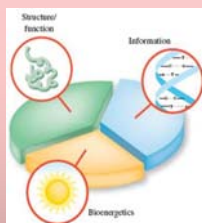


Important characteristics of life:

- ❖ Organisms are able to extract energy from molecules called nutrients.
- ❖ Organisms display the attributes of growth, differentiation, and reproduction.
- ❖ Organisms have the ability to respond to changes in their environments.

34

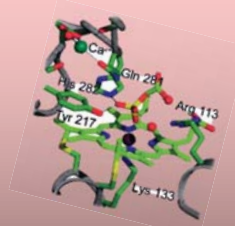
How Biochemistry Works To Describe Biological Processes?



Biochemistry is to describe life's processes **using the language of molecules**, that is, applying the principles and methods of chemistry to determine **molecular structure** from which it is often possible to explain **biological function**.

35

1. Structural and Functional Biochemistry



cytochrome c nitrite reductase from *Sulfurospirillum deleyianum*.

focuses initially on discovering the **chemical structures** and three-dimensional arrangements of biomolecules, those chemicals that are found in living matter.

To describe biological processes, one must have a knowledge of the molecular structures of biomolecules, which then often leads to an **understanding of the function or purpose of the cellular molecules**.

36