Al-Qasim Green University

College of Biotechnology/ Department of Genetic Engineering

YEAR: FIRST
SUBJECT: General Chemistry (Analytical)
THEORITICAL HOURS: 2
PRACTICAL HOURS: 2
UNITS: 3

General Chemistry (analytical)…… Theoretical Syllabus… First Semester

Course module description:

- To reinforce chemical principles central to analytical chemistry.
- To introduce instrumental techniques for chemical measurement.
- To develop critical thinking for interpreting analytical data.
- To select instrumentation appropriate to the measurement need

Course/module academic calendar

Week	Basic material to be covered	Hours
1-2	Atoms & Electrical Structure/Periodic Table	4
3-4	Chemical Bonding	4
5-6	Formula Masses / The Molecular Formula	4
7-8-9	Acid Base Theory/Ionization constant/Auto-ionization water/ Measurement of PH	6
10-11-12-13	Chemical Quantitative Analysis /Standard Solution/ Titration of Acid Base Indication.	8
14-15	Buffers/Bio-Chemical Buffers	4

General Chemistry (analytical)…… Practical Syllabus… First Semester

Course/module academic calendar

Week	Basic material to be covered	Hours
1-2	General Introduction (Chemicals, Instruments)	4
3-4	Introduction of Analytical Analysis	4
5-6-7	Qualitative Analysis of Cations & Aions	6
8-9	Preparation of Solutions	4
10-11	Titration Analysis	4

12-13	Acid – Base Titrations	4
14-15	Precipitation Titrations	4

Text books:

- Analytical Chemistry,Gray D. Christain ,Wiley,6thedition,2004

References:

- Modern Analytical Chemistry ,david Hervey, Ist edition,2000

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YEAR: Second
SUBJECT: Biochemistry-1
THEORITICAL HOURS: 2
PRACTICAL HOURS: 2
UNITS: 3

Biochemistry-1……. Theoretical Syllabus…… First Semester

Course module description:

- Define "biochemistry."
- Identify the five classes of polymeric biomolecules and their monomeric building blocks.
- Explain the specificity of enzymes (biochemical catalysts), and the chemistry involved in enzyme action.
- Explain how the metabolism of glucose leads ultimately to the generation of large quantities of ATP.
- Describe how fats and amino acids are metabolized, and explain how they can be used for fuel.
- describe the structure of DNA, and explain how it carries genetic information in its base sequence

Course/module academic calendar

week	Basic material to be covered	Hours
1	Water, electrolytes, acid base balance and buffers	2
2	Amino acids and peptides	2
3	Enzymes: catalysis, types, function and inhibition	2
4	Lipids: definition, chemical nature, function	2
5	Nucleic acids: nucleotides, DNA, RNA	2
6	Carbohydrates -1: monosaccharides, disaccharides,	2
7	Carbohydrates -2: polysaccharidesand glycoproteins	2
8	Glycolysis -1: reactions and energy produced Storage,	2
9	Glycolysis -2: mechanisms and control	2
10	Glycolysis-3: glycogen, gluconeogenesis, penose pathway	2
11	Citric acid cycle	2
12	Electron transport and oxidative phosphorylation	2
13	Metabolism of amino acids: synthesis and degradation, essential and nonessential amino acids	2
14	Purines and Pyrimidines: synthesis and degradation	2
15	Integration of metabolism	2

Biochemistry - 1 ……..(Practical syllabus)…….. First Semester

Course module description:

Principle and application of Chromatography (Paper, thin-layer, column and GLC), Centrifugation (RPM and G, Ultra centrifugation), Spectroscopic techniques (UV, visible spectroscopy, X-ray crystallography, NMR, IR, fluorescence & atomic absorption), Isotopes and their importance (GM counters & Scintillation counting).

Course/module academic calendar

Week	Basic material to be covered	Hours
1	pH: Operation of pH meter to measure the pH of Haemolymph and body fluids. Preparation of buffers: Phosphate buffer and citrate buffer.	2
2	Chromatographic techniques:a. Paper chromatographic techniques to separate amino acids.	2
3	Chromatographic techniques: b. Thin layer chromatographic technique to separate lipids.	2
4	Chromatographic techniques: c. Column chromatographic techniques to separate urinary pigments.	2 2
5	Chromatographic techniques: d. HPLC – Demonstration.	
6	Colorimetric/Spectrophotometric estimation of the following biomolecules.	2
7	Total free amino acids (Ninhydrin reagent method)	2
8	Colorimetric/Spectrophotometric estimation of the following biomolecules. b. Protein (Biuret and Lowry *et al*., 1951 method)	2 2
9	Colorimetric/Spectrophotometric estimation of the following biomolecules. c. Total soluble carbohydrates (Anthrone reagent method)	2
10	Colorimetric/Spectrophotometric estimation of the following biomolecules. c. Total soluble carbohydrates (Anthrone reagent method)	2
11	Proteins : Properties , Structures , Synthesis types, reactions	2
12	Protein extraction from animal tissues and separation – 1	2
13	Protein extraction from animal tissues and separation – 2	2
14	Protein extraction from animal tissues and separation – 3	2
15	Protein extraction from plant tissues and separation – 4	2

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YEAR: Second
SUBJECT: Microbiology (1)
THEORITICAL HOURS: 2
PRACTICAL HOURS: 2
UNITS: 3

Microbiology (1) ……**(Theoretical Syllabus) …..… First semester**

Course module description:

Microbiology course introduction to the microbial world diversity of prokaryotes, their development, structure and function of Prokaryotic metabolism, nutrition and growth. Microbial genetics and control. Fundamental principles of the interrelationship of microorganisms and their role in the environment.

Course/module academic calendar

week	Basic material to be covered	Hours
1	The scope & Early History of Microbiology	2
2	Principle of Classification & Survey of the Microbial World	2
3	Techniques used in the observation of Microorganisms	2
4	Introduction of Biochemistry of Microorganism	2
5	Prokaryotes (structure, Organization)	2
6	A survey of Prokaryotes	2
7	Fungi	2
8	Protozoa	2
9	Algae	2
10	Viruses(Structure, Organization, Cultivation, and Viral Pathogenesis	2
11	Bacterial Growth & Cultivation techniques	2
12	Microbial Metabolism & Cellular Regulation	2
13	Microbial Genetics,	2
14	Control of Microorganisms	2

15	Antimicrobial Chemotherapy	2

Microbiology -1 ….. (Practical Syllabus) ……. First Semester

Course/module academic calendar

Week	Basic material to be covered	Hours
1	Introduction & General Instructions	2
2	Microscope & Microscopy	2
3	Microscopic Slide Techniques	2
4	Sterilization Methods	2
5	Culture Media	2
6	Differentiation of Gr^{-ev} Bacteria Groups by Staining Reactions	2
7	Differentiation of Gr^{+ev} Bacteria Groups by Staining Reactions	2
8	Counting of Bacteria	2
9	Isolation of Pure Bacteria colonies	2
10	Technique for Isolation of Anaerobic Bacteria	2
11	Bacterial Anatomy	2
12	Biochemical Activities of Microorganisms	2
13	Antibiotics Sensitivity	2
14	Isolation of Microbes from Clinical samples (urine,sputum etc..)	2
15	Final Exam	2

Text books:

- Microbiology, Ananthanarayan & paniker's, 8th edition, universities press (India). 2009

References:

- Foundationsin Microbiology, Fourth Edition,The McGraw−Hill , (2002).
- Jawetz, Melnick, &Adelberg's Medical Microbiology, Twenty-Fifth Edition,,USA, McGraw-Hill Companies (2010).
- Harvey, Richard A.; Champe, Pamela C.; Fisher, Bruce D.

Lippincott's Illustrated Reviews: Microbiology, 2nd Edition, Lippincott Williams & Wilkins.(2007).

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YEAR: Second
SUBJECT: Molecular Biology
THEORITICAL HOURS: 2
PRACTICAL HOURS: 2
UNITS: 3

Molecular Biology …….. (Theoretical Syllabus)

Course module description:

The student will learn the structure and function of biological macromolecules, in Particular nucleic acids (DNA and RNA) and proteins and how these molecules act to copy, express and accurately transmit genetic information. The course focuses on mechanisms of: DNA replication, transcription, translation (protein synthesis) in prokaryotes and eukaryotes .DNA damage and repairing.

Course/module academic calendar

week	Basic material to be covered	Hours
1	Nucleic Acids: Nucleic acid as the genetic material. The nature of genetic material. The chemical nature of polynucleotides	2
2	The DNA structure (double helix and A,B, Z-forms). DNAs of various sizes and shapes. RNA secondary and tertiary structures	2
3	Physical chemistry of nucleic acids. Organell DNA (assignment). Storage of nucleic acid	2
4	Denaturation and renaturation of DNA. C-value paradox, Cot value and curve, chemical complexity	2
5	**Enzymology of DNA replication:** DNA polymerases, Helicase, DNA ligase, Primase, Telomerases and Topoisomerase	2
6	**DNA replication machinery:** General features of DNA replication. Replication in prokaryotes. Replication in eukaryotes	2
7	DNA damage and DNA repair. Nucleotide excision repair. Base excision repair. Mismatch repair. Double strand breakage repair	2
8	**Transcription:** RNA polymerase structure in prokaryotes and eukaryotes.	2
9	**Transcription:** Transcription initiation by RNA polymerase I, II, III and organell-specific RNA polymerases. Regulatory sequences in prokaryotes and eukaryotes	2
10	Activators, repressors and general transcription factors. Molecular mechanisms of transcription activation andrepression	2
11	Stages of transcription in prokaryotes and eukaryotes: Initiation, Elongation and Termination	2
12	**Nuclear mechanisms of post-transcriptional control:** Pre-mRNA processing: Splicing, Capping and Cleavage/Polyadenylation. Pre-rRNA processing: Splicing, Cleavage, Exonucleolytic digestion and Base modification. Pre-tRNA processing: Splicing	2
13	**Cytoplasmic mechanisms of post-transcriptional** **Control**: Mechanisms of mRNA degradation in the Cytoplasm, Surveillance mechanisms	2

	prevent translation of improperly processed mRNAs. Localization of mRNAs. permits production of proteins at specific regions within the cytoplasm Micro RNAs (miRNAs), RNA interference (RNAi	
14	**Translation**: The genetic code **(**revision). The structure of: t-RNA (revision). Prokaryotic and eukaryotic ribosomes. Aminoacylation of tRNA (revision). Stages of translation in prokaryote2s and eukaryotes (initiation, elongation and termination). Post-translational modifications.	2
15	Final exam.	2

Molecular biology …….. (Practical Syllabus)

Course/module academic calendar

week	Basic material to be covered	Hours
1	Isolation of genomic DNA from prokaryotic cells	2
2	Isolation of genomic DNA from eukaryotic cells	2
3	Isolation of RNA from animal tissues and reverse transcription – 1	2
4	Isolation of RNA from plant tissues and reverse transcription – 2	2
5	Amplification of specific gene sequences by polymerase chain reaction (PCR) – 1	2
6	Estimation of DNA -1: Spectrophotometry & Fluorimetry	2
7	Estimation of DNA -2: , Restriction Enzyme Digestion Agarose Gel Electrophoresis	2
8	Restriction enzyme digestion of DNA and agarose gel electrophoresis – 1	2
9	Restriction enzyme digestion of DNA and agarose gel electrophoresis – 2	2
10	Isolation of plasmid DNA and cutting with restriction enzymes	2
11	Isolation of plasmid DNA and cutting with restriction enzymes	2
12	. Setting up a ligation reaction	2
13	Transformation; preparation of competent cells and transforming them with suitable plasmid	2
14	Transformation; preparation of competent cells and transforming them with suitable plasmid	2
15	RNA Extraction & Quant (RT-PCR)	2

Text Books

- Molecular Biology of gene, James D.et,al…,Fifth edition, Dorling Kindersley9india),2009

References:

- Human Molecular Genetics, Tom Strachan and Andrew P Read, New York: Wiley-Liss; 1999.

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YEAR: Second
SUBJECT: Plant Anatomy
THEORITICAL HOURS: 2
PRACTICAL HOURS: 2
UNITS: 3

Plant Anatomy …….. (Theoretical Syllabus)

Course module description:

This course is gives an introduction to the basic internal structure of plants, including their cells, tissues, and organs. It will consider the appearance and description of plant parts, but also emphasize developmental and functional aspects. In other words, it will relate structures with how they arose and their possible functions. The lab will consist of experience with the use of microscopes, the sectioning and staining of plant materials, and the observation of plant structures.

Course/module academic calendar

week	Basic material to be covered	Hours
1	Introduction to Plant Anatomy, Introduction to the Plant Kingdom	2
2	Basic plant morphology and review of the cell components.	2
3	Plant Structure: The protoplast &Cell walls	2
4	Tissues types : parenchyma, collenchymas & sclerenchyma	2
5	Tissues – epidermis ,xylem and phloem	2
6	Apical meristems: Primary root , shoot growth and division theories	2
7	Roots anatomy in monocot & dicot	2
8	Stems anatomy in monocot & dicot	2
9	Secondary growth – vascular cambium components	2
10	Secondary growth – xylem and phloem	2
11	Secondary growth – periderm	2
12	Leaves anatomy	2
13	Reproduction, Flowers	2
14	Fruits, seeds anatomy	2
15	Functional anatomy case study	2

Plant Anatomy: ……(Practical Syllabus)

Course/module academic calendar

week	Basic material to be covered	Hours
1	Cell Wall stages formation, Primary cell wall, Secondary cell wall, intercellular space	2
2	Plant Cell, living components (plastids) , Non living Components	2
3	Cell wall structure, Types of Pits	2
4	Meristematic Tissues, Root growing Points, Growth and Division Theories in Root & Steem	2
5	Lateral Meristems, Vascular Cambium, and its Components, Cork cambium, Periderm	2
6	permanent tissues , Parenchyma Tissues ,Types of Parenchyma Tissues, Cell shape in Parenchyma Tissues	2
7	Collenchyma tissues, Types of Collenchyma tissues	2
8	Sclerenchyma Tissues, Cell Types in Sclerenchyma Tissues	2
9	Sclereids and types of Sclereids , Fibers and types of fibers.	2
10	Xylem Tissue in Gymnosperms And Angiospermae ,xylem in vertical & horizontal sections	2
11	(*A*nnual rings, Types of Xylem (Diffuse – and ring porous Ring porous wood,)	2
12	Phylum in Gymnosperms And Angiospermae,Primary and Secondary Phylum	2
13	Internal structure of Stems and root in Monocot and Dicot	2
14	Types Central cylinder	2
15	Anatomy of seeds & fruits	2

Text Books

- Esau plant anatomy Meristems cell and tissue of the plant body ,Ray F .Evert ,2006P
- Plant Anatomy: An Applied Approach, David F. Cutler, Ted Botha, Dennis Wm. Stevenson, Willy, 2008.

References:

- Plant anatomy, Manisha Majumdar,book Rix: Edition,2004