

**COMPLEMENTARY ELECTIVE
COURSES**

General Regulations for Complementary Elective Courses (Zoology, Biological Techniques and Physiology)

The Complementary courses run in the first four semesters with one theory course in each semester and one practical course spread over the four semesters. However the practical exam will be conducted only at the end of the fourth semester. Each theory course carries 2 credits and 40 marks and the practical course 4 credits, i.e. a total of 12 credits with a total of 200 marks.

Attendance–

75% attendance is compulsory for theory as well as practical courses, failing which a student is not eligible to appear for university examinations.

Evaluation -

The evaluation of each paper shall contain two parts:

- (i) Internal Assessment
- (ii) External Assessment

The internal to external assessment ratio is 1:4.

Theory Papers

External Evaluation

The external theory examination of all semesters shall be conducted by the University at the end of each semester.

Scheme of Question Paper

Time; 3 Hours

Max. Marks: 32

- V. Essay (Answer 2 out of 4)- $2 \times 6 = 12$ marks
- VI. Short essay (2 out of 3)- $2 \times 3 = 6$ marks
- VII. Short notes (6 out of 8)- $6 \times 2 = 12$ marks
- VIII. Objective Type (Multiple Choice) Questions - answer all questions - $4 \times 0.5 = 2$ marks

Internal Assessment

Internal evaluation is to be done by continuous assessment

- 1 Test papers (minimum 2) 5 Marks
- 2 Assignment /Seminar/Viva 3 Marks

Practical

Practical examination will be conducted at the end of fourth semester. There will be two external examiners and a skilled assistant (internal)

Scheme of Practical Examinations

Practical I

Time: 3 Hours

Max. Marks: 32

Major Question 12 marks

Minor Question 6 marks

Spot items (5 items) 5 x 2 = 10 Marks

Record 4 marks

Record – A practical record is compulsory for the course. Without a certified practical record, the student will not be allowed to appear for the practical examination. The practical record is to be valued externally.

Internal Assessment (8 marks)

Regularity/ Punctuality : 1 mark

Laboratory skill : 3 marks

Examination/ Viva : 2 marks

Record : 2 marks

Complementary Zoology

SCHEME

Sl. No	Sem	Course Code	NameoftheCourse	Credit	Hours/Week	Exam Hrs.	Max.Marks		
							Int	Ext	Total
1	I	1C01ZLG	Diversityoflife-I Protistans and Non Chordates	2	2	3	8	32	40
2	I	4C05ZLG-P	Practical	*	2	-	-	-	-
3	II	2C02ZLG	Diversityoflife-II Chordate Form and Function	2	2	3	8	32	40
4	II	4C05ZLG-P	Practical	*	2	-	-	-	-
5	III	3C03ZLG	Animal Physiology	2	3	3	8	32	40
6	III	4C05ZLG - P	Practical	*	2	-	-	-	-
7	IV	4C04ZLG	MedicalZoology	2	3	3	8	32	40
8	IV	4C05ZLG - P	Practical	4	2	3	8	32	40

**SCHEMecomPLEMENTARY
(BIOLOGICAL TECHNIQUES)**

Sl. No	Sem	Course Code	NameoftheCourse	Credit	Hours/Week	Exam Hrs.	Max.Marks		
							Int	Ext	Total
1	I	1C01BGT	GeneralLaboratoryTechniqu	2	2	3	8	32	40
2	I	4C05BGTP	Practical	*	2	-	-	-	
3	II	2C02BGT	LaboratoryEquipments and Techniques	2	2	3	8	32	40
4	II	4C05BGTP	Practical	*	2	-	-	-	-
5	III	3C03BGT	PreparationofBiological Specimens	2	3	3	8	32	40
6	III	4C05BGTP	Practical	*	2	-	-	-	-
7	IV	4C04BGT	AdvancedBiologicalTechniqu	2	3	3	8	32	40
8	IV	4C05BGTP	Practical	4	2	3	8	32	40

**SCHEMecomPLEMENTARY
(PHYSIOLOGY)**

Sl. No	Sem	Course Code	NameoftheCourse	Credit	Hours/Week	Exam Hrs.	Max.Marks		
							Int	Ext	Total
1	I	1C01PLY	BiologicalChemistry	2	2	3	8	32	40
2	I	4C05PLYP	Practical	*	2	-	-	-	
3	II	2C02PLY	CellBiology	2	2	3	8	32	40
4	II	4C05PLYP	Practical	*	2	-	-	-	-
5	III	3C03PLY	HumanPhysiology-I	2	3	3	8	32	40
6	III	4C05PLYP	Practical	*	2	-	-	-	-
7	IV	4C04PLY	HumanPhysiology-II	2	3	3	8	32	40
8	IV	4C05PLY	Practical	4	2	3	8	32	40

* Examination at the end of IV Semester

PHYSIOLOGY

I SEMESTER

1C01 PLY BIOLOGICAL CHEMISTRY

Lecture hours: 2hours/week Total Hours 36 credit 2

Course outcomes

CO 1 : Get a comprehensive idea about the basic concepts of biochemistry

Unit I - Introduction

The Chemical elements of living matter-biological molecules, Protoplasm-Colloidal nature covalent bonds, Polar and non-polar molecules, Non-covalent bonds, ionic bonds, hydrogenbonds. (3 hours)

Unit II - Water

Biological properties of water and its significance , dipolar nature,dissociation of water, concept of pH, Buffers, Henderson- Hassel Balch equation (3 hours)

Unit III -Proteins, Peptides and amino acids

Classification of amino acids, Primary, secondary and tertiary structures of proteins, Biological functions of Protein. (6 hours)

Unit IV – Carbohydrates

Monosaccharides, disaccharides and polysaccharides, trioses, tetroses, pentoses, hexoses aldoses and ketoses, heteropolysaccharides-biological functions of carbohydrates. (6 hours)

Unit V- Fats & Fatty acids

Classification of fatty acids, Simple fats, saturated and unsaturated fats, classification of Lipids, Biological functions of lipids (4 hours)

Unit VI- Bioenergetics

The laws of thermodynamics and concept of entropy, free energy (2 hours)

Unit VII –Enzymes

Introduction to enzymes, properties, apoenzyme, holoenzyme, prosthetic group, active site, isoenzymes, zymogen, co enzymes, enzyme nomenclature and classification, Lock and Key model, Induced fit model, factors affecting the velocity of enzyme action- enzyme concentration, substrate concentration, pH, temperature. Enzyme inhibition- reversible, irreversible, competitive, non competitive, uncompetitive and end product inhibition. Michaelis- Menten equation and Michaelis constant (6 hours)

Unit VIII - Basal metabolism

BMR and factors affecting BMR, Interrelationship between carbohydrates, proteins and lipid metabolism, role of liver in metabolism. (6 hours)

REFERENCES

AwaparaJ : Introduction to Biological chemistry; Prentice-Hall, India.

Nelson :Leninger’s Principles of Biochemistry; Ane Books.

Rastogi : Biochemistry; Tata McGraw Hill.

Srivastava H S : Elements of Biochemistry; Rastogi Publications.

VeerakumariL : Biochemistry; MJP Pub

II SEMESTER

2CO2PLY CELL BIOLOGY

Lecture hrs: 2 hrs /week

Course outcomes

CO 1 : Getan over view of the basic concepts and techniques involved in the study of cells and an insight in to the complexity of the cellular machinery

Unit –I

Introduction to the study of cell biology- The discovery of cells, Basic properties of cells, Celltheory and its modern concept, Two fundamentally different classes of cells- characteristicsthat distinguish prokaryotic and eukaryotic cells (2 hrs)

Unit- II

Structure and chemical composition and functions of plasma membrane, plasma membrane models- fluid -Mosaic model, sandwich model and unit membrane concept, passive and active transport mechanisms of substances across the cell membrane- osmosis, simple and facilitated diffusion, ultrafiltration, phagocytosis, pinocytosis(6hrs)

Unit -III

Mitochondria- structure, chemical composition and functions-Oxidative phosphorylation ETS and ATP formation. (3 hrs)

Unit -IV

Structure, chemical composition and functions of cytoplasmic organelles--The Endoplasmic reticulum, The golgicomplex, Lysosome, Peroxisome and Glyoxysomes, Plant cell vacuoles and chloroplast types of transport vesicles-COP I, COP II and clathrin coated vesicle
(7 hrs)

Unit -V

Structure and functions of cell nucleus, chromosome- morphology, chromosomal DNA packing- nucleosome model, Giant chromosomes-polytene and lampbrush chromosomes, DNA replication-semiconservative method, Nucleolus structure and functions, Control of gene expressions in Eukaryotes, Ribosomes- structure, chemical composition, types and biological functions- protein synthesis(brief account -transcription and translation) (8 hrs)

Unit -VI

The cytoskeleton and cell motility-structure and function of microtubule, microfilament and intermediate filaments, Centriole, cilia and flagella . (5 hrs)

Unit -VII

Cellular reproduction, Cell cycle –M-phase, mitosis and Cytokinesis, Meiosis. (5 hrs)

REFERENCES

De Robertis : Cell and Molecular Biology; Holt-Saunders.

Gupta : Cell and Molecular Biology; Rastogi Pub.

Karp : Cell Biology; McGraw Hill.

Powar : Cell Biology; Himalaya Publishing House

Verma & Agarwal: Cytology; S. Chand.

III SEMESTER

3C 03 PLY HUMAN PHYSIOLOGY I

Lecture hrs: 3hrs/week

Course outcomes

CO 1 : Develop a comprehensive idea of the physiological features of the human body.

CO 2 : a clear idea about the functioning of the various systems in the human body

Unit I- Nutrition

The constituents of food, Dietary requirement of carbohydrate, proteins, fats, vitamins and minerals, balanced diet, Malnutrition, common deficiency diseases, Digestion and absorption of carbohydrates, proteins and fat, general structure of digestive glands, Gastro- Intestinal hormones, Gastric movements. Nervous and hormonal control of digestion. (10 hrs)

Unit II- Respiration

Definition, Mechanism of respiration, Pulmonary air volumes, physiology of gaseous exchange in lungs & tissues. Transport of oxygen and carbon dioxide. oxyhaemoglobin

curve, Effect of temperature & pH on oxyhaemoglobin curve, Neuro-physiological control of respiration- respiratory disturbances- apnoea, dyspnoea, hypoxia, hypo & hypercapnea, asphyxia, carbon monoxide poisoning. Acclimatisation-adaptation to high altitude. Oxygen toxicity. (10 hrs)

Unit III- Body fluids & circulation

Blood-composition & function. Importance of analysis of blood ESR, anaemia, leucopenia, polycythemia. Blood groups, blood clotting mechanism. Lymph & lymphatic system. Spleen-structure & function. Heart- structure & functions. Conducting system of heart, cardiac cycle and its control. Cardiovascular problems- atherosclerosis, ischaemia, angina pectoris, atherosclerosis, ASD, VSD, myocardial infarction, coronary thrombosis, ventricular fibrillation, blood pressure. (10 hrs)

Unit IV- Excretion

Histology of human nephron, physiology of urine formation. Counter current mechanism. Kidney diseases, stones in kidney and urinary tracts. Renal hypertension, nephrosis, nephritis, renal failure. Brief note on dialysis. (9 hrs)

Unit V- Nervous coordination

Types of neurons. Giant nerve fibers, transmission of nerve impulse, neurotransmitters, Sympathetic & parasympathetic system. Motor and sensory areas of brain. Physiology of vision, hearing & balancing. Cutaneous sense receptors. (10 hrs)

Unit VI- Human immune system

Specific and non specific defences. The lymphocytes and immunity. Humoral & cell mediated immunity. (3 hrs)

Unit VII- Homeostasis

Homeostasis, temperature regulation & pyrexia. (2 hrs)

REFERENCE BOOKS: ANIMAL PHYSIOLOGY

1. Guyton, A.C. (2015). Text Book of Medical Physiology, W.B. Saunders co.
2. Hoar, W.S. (1983). General and Comparative Physiology, Prentice Hall.
3. Prosser, C.L. (1978). Comparative Animal Physiology. W.B. Saunders co.
4. Schmidt Nielsen, K. (1994). Animal Physiology: Adaptation and Environment. Cambridge University Press

IV SEMESTER

4 CO 4 PLY HUMAN PHYSIOLOGY II

Lecture hours -3 hours /week

Course outcomes

CO 1 : Develop basic ideas on first aid

CO 2 :Develop interest in public health care

Unit I - Locomotion

Skeletal joints, bones of limbs

Muscle –structure, sarcofibrillar system, contractile proteins.

Electrochemical changes responsible for contraction & relaxation of muscle.

Muscle twitch, tetanus, isometric & isotonic contraction.

Action potential curve. All or none law. Fatigue, rigor mortis. (12 hrs)

Unit II- Reproduction

Reproduction & development. Structure of ovary and testis

Structure of ovum and sperm. Oogenesis and spermiogenesis, human menstrual cycle and hormonal control. fertilization, cleavage, blastocyst formation, implantation, placenta, hormonal control of pregnancy, gestation, parturition and lactation. (12 hrs)

Unit III- Endocrine glands

Endocrine glands, structure, hormones and their function. (10 hrs)

Unit IV-First aid

Artificial respiration. First aid for burns, snake bite, drowning & accidents. (5 hrs)

Unit V- Ageing

Physiological basis of ageing. (5 hrs)

Unit VI- Public health and awareness

Smoking and its effects

Alcoholism and its effects

Drug addiction and its effects

Cancer and carcinogens

Sexually transmitted diseases - Hepatitis, HIV, communicative diseases- water borne and air borne diseases. (10 hrs)

REFERENCES

Chatterjee CC : Human Physiology vol -I & II; Medical Allied Agency

Hoar W S : General and Comparative Physiology; Prentice Hall.

Park & J E Park : Social and Preventive Medicine.

Rastogi S C : Essentials of Animal Physiology; New Age Int'l Pub.

Subramaniam.S, Madhavankutty K, Singh S D. : Textbook of Human Physiology; S Chand.

PRACTICAL PHYSIOLOGY 4C O5 PLY(P)

Microtechniques

Study of compound microscope

Stage and ocular micrometers

Cytology

- Squash preparation of onion root tip to study mitotic stages(minor)
- Preparation of salivary gland chromosomes of *D. melanogaster*(Demo)
- Smear preparation of buccal epithelium(minor)
- Preparation of blood smear and differential count of WBC(major)
- Total count of WBC by hemocytometer. (Demo)
- Total count of RBC by hemocytometer. (Demo)

Biochemistry

- Glucose estimation by calorimeter. (Demo)
- Protein estimation by calorimeter. (Demo)
- Paper chromatographic separation of amino acids. (Demo)
- Qualitative test for carbohydrates. (Major)
- Qualitative test for protein. (Major)
- Qualitative test for fat. (Major)

Physiology

- Effect of temperature/ pH on salivary amylase activity. (Demo)
- Estimation of oxygen consumption by cockroach (Demo)
- Detection of abnormal constituents of urine- glucose, albumin and bile. (Major)
- Detection of blood groups. (Minor)
- Determination of coagulation time. (Minor)
- Determination of blood pressure using sphygmomanometer. (Demo)
- Cardiac efficiency test. (Minor)

Histology

- Study of permanent slides (Any five items) – Epithelial tissue, Muscle, Cartilage, Bone, Nervous tissue, etc.

REFERENCE BOOKS: ANIMAL PHYSIOLOGY

1. Guyton, A.C. (2015).Text Book of Medical Physiology, W.B. Saunders co.
2. Hoar, W.S.(1983). General and Comparative Physiology, Prentice Hall.
3. Prosser,C.L.(1978). Comparative Animal Physiology. W.B. Saundersco.
4. Schmidt Nielsen, K. (1994). Animal Physiology: Adaptation and Environment. Cambridge University Press

First Semester B Sc Degree Examination
Complementary Course in Physiology
1C01 PLY Biological Chemistry

Time: 3 Hrs

Max. Marks- 32

I. Essay Questions. Answer any TWO.

2X6= 12

1. Describe the primary, secondary and tertiary structure of proteins.
2. Describe the factors affecting enzyme activity.
3. Classify carbohydrates giving examples.
4. Describe the role of liver in metabolism.

II. Short Essay Questions. Answer any two

2x3= 6

5. Describe different models of enzyme activity.
6. Write a note on Henderson- Hasselbalch equation.
7. Explain Michaelis Menten equation.

III. Short Answer Questions. Answer any SIX.

6X2= 12

8. What are zymogens?
9. What is BMR? What are the factors that affect BMR?
10. What is meant by competitive inhibition of enzyme action? Give an example.
11. Distinguish between saturated and unsaturated fats. Give example.
12. Distinguish between aldose sugars and ketose sugars. Give an example to each of them.
13. What are the biological properties of water?
14. Explain entropy in connection with living system.
15. What is BMR? What are the factors affecting it?

IV. Multiple Choice Questions. Answer all

4 x 0.5= 2

16. Which of the following is an example of monosaccharide?
(a. Galactose b. Sucrose c. Lactose d. maltose)
17. Hydrolysis reactions are catalyzed by enzymes called

(a. Oxidoreductase b. Ligase c. Hydrolase d. Lyase)

18. A process by which a protein structure assumes its functional shape or conformation

a) Denaturing b. Folding c. Synthesis d. polymerisation)

19. Which of the following is a heteropolysaccharide?

a) starch b) cellulose c) chitin d) Fructose

Second Semester B Sc Degree Examination
Complementary Course in Physiology
2CO2 PLY Cell Biology

Time: 3 Hrs

Max. Marks- 32

I. Essay Questions Answer any two.

2X6= 12

1. Illustrate and explain the fluid mosaic model of plasma membrane.

2. Describe ETS and ATP formation in the mitochondria.

3. Describe semiconservative method of DNA replication.

4. Describe the process of meiosis.

II. Short Essay Questions. Answer any two

2 x 3= 6

5. Describe the structure and function of microtubules.

6. Write a note on nucleolus.

7. Distinguish between prokaryotic and eukaryotic cells.

III. Short Answer Questions. Answer any six.

6 X 2= 12

8. What is facilitated diffusion?

9. What are lampbrush chromosomes? What is their significance?

10. What are the functions of Golgi complex?

11. What is meant by oxidative phosphorylation?

12. Explain phagocytosis.

13. What is translation?

14. Describe the structure of flagella.

15. What is cytokinesis?

IV. Multiple Choice Questions. Answer all.

4x0.5= 2

16. Carbohydrates attached to lipid and protein are usually _____.

a) polysaccharides, b) oligosaccharides, c) monosaccharides d) Pentoses

17. Cytoskeleton is made up of .

a) Cellulosic microfibrils, b) Proteinaceous filaments, c) CaCO₃ granules d) Nucleotides

18. The statement that 'all biological catalysts are proteins' is no more valid because of the discovery of

a) Ribozyme b) Lysozyme c) Enzymes d) Holoenzyme

19. DNA replication occurs in

a) S phase, b) M phase, c) G₁ phase d) G₀ Phase

Third Semester B Sc Degree Examination

Complementary Course in Physiology

3C03 PLY: Human Physiology-I

Time:3hrs

Max.marks:32

I. Essay Questions. Answer any TWO

2x6=12

1. Describe the process of protein digestion in man

2. Write an essay on neuro physiological control on respiration

3. Describe the structure of heart and cardiac cycle

4. Describe the process of urine formation with special reference to counter current mechanism.

II. Short Essay Questions. Answer any TWO

2x3=6

5. Briefly illustrate the effect of pH on oxyhaemoglobin curve

6. Describe the structure of a typical neuron

7. Describe the mechanism of cell mediated immunity

III. Short Answer Questions. Answer any SIX

6x2=12

8. What is ASD

9. Write a brief note on dialysis
10. What are neurotransmitters
11. What is cell mediated immunity
12. What is homeostasis
13. What is leucopenia
14. What is balanced diet
15. What is pyrexia

IV. Multiple Choice Question Answer all

4x0.5=2

16. Secretion of bile is regulated by
a) Gastrin b) Enterogastrin c) Duocrinin d) Cholecystokinin
17. The inability to breathe is
a) Eupnoea b) Dyspnoea c) Apnoea d) Pneumonia
18. Which of the following is an anti-coagulant
a) Thrombin b) Fibrinogen c) Prothrombin d) Heparin
19. Hot spot of hearing is
a) Cochlea b) Retina c) Cornea d) Organ of Corti

Fourth Semester B Sc Degree Examination

Complementary Course in Zoology

4 CO 4 PLY: Human Physiology-II

Time :3 Hours

Maximum Marks : 32

(Give illustrations and figures wherever necessary)

I. Essay Questions. Answer any TWO.

2x6=12

1. Write an essay on the electrochemical changes responsible for contraction & relaxation of muscle.
2. Write an essay on major endocrine glands, their hormones and functions.
3. Explain human menstrual cycle.

4. Explain the EM structure of a striated muscle fiber.

II. Short Essay Questions. Answer any TWO.

2x3=6

Write short notes on:

5. Artificial respiration.

6. Physiological basis of ageing.

7. Drug addiction and its effects

III. Short Answer Questions. Answer any SIX. 6 x 2 = 12

8. What are synovial joints?

9. Name any four bones of lower limb.

10. What is Rigor mortis ?

11. Suggest any four first aid for snake bite?

12. What are communicative diseases ?

13. Write any four ill effects of smoking ?

14. What is TSH?

15. What are carcinogens?

IV. Multiple Choice Questions. Answer all.

4x0.5=2

16. The all-or-none response means that

- a) all of the muscles in a region contract together
- b) all of the muscle fibres within a muscle contract together
- c) when a muscle fibre contracts, it contracts completely
- d) when a muscle fibre contracts, all of its ATP is changed to ADP

17. Concentration of the urine is controlled by _____

- a) MSH b) ADH c) Oxytocin d) ACTH

18. What are 2 examples of NON Communicable Diseases

- a) Flu, Mono b) Crohn's disease, Strep throat c) Cancer, High blood pressure
- d) Asthma, measles

19. ACTH stimulates the adrenal cortex to release a group of hormones called

- a) Mineralocorticoid b) Glucocorticoid c) Endorphin d) Glucagon