AC – 20/05/2025
Item No. – 6.6 (N) (1ab) Sem. III & IV

As Per NEP 2020

University of Mumbai

Syllabus for Minor Vertical 2 (Scheme – I)		
Faculty of Science		
Board of Studies in Zoology		
Second Year Programme in Minor (Zoology)		
Semester	**III & IV**	
Title of Paper	**Sem.**	**Total Credits 4**
I) Physiology and Endocrinology	**III**	2
II) Laboratory Exercises on Physiology and Endocrinology		2
Title of Paper		**Credits**
I) Haematology	**IV**	2
II) Laboratory Exercises on Haematology		2
From the Academic Year		**2025-26**

Semester – III

Syllabus
B.Sc. (Zoology)
(Semester – III)

Title of Paper: Physiology and Endocrinology

Sr. No.	Heading	Particulars
1	**Description of the course: Including but not limited to:**	The physiology and endocrinology course explore body functions, including digestion, respiration, and hormonal control. Physiology examines adaptations in feeding, excretion, circulation, reproduction, and thermoregulation across organisms. Endocrinology focuses on hormone regulation, feedback mechanisms, and endocrine glands like the hypothalamus, pituitary, thyroid, and pancreas. Both fields are vital for understanding metabolism, reproduction, stress responses, and circadian rhythms. They contribute to medical advancements in diabetes management, hormone therapies, and neuroendocrine research. With growing interest in metabolic diseases and biotechnology, career opportunities span healthcare, research, and pharmaceuticals, offering strong prospects in clinical and academic fields.
2	**Vertical:**	Minor
3	**Type:**	Theory
4	**Credit**:	2 credits for theory (1 credit = 15 Hours for Theory in a semester)
5	**Hours Allotted:**	30 Hours (Theory)
6	**Marks Allotted**:	50 Marks (Theory)
7	**Course Objectives:** • To develop an understanding of physiological processes and adaptations in different animal species. • To analyse disruptions in physiological systems and explore various management approaches to tackle such disruption.	
8	**Course Outcomes:** Upon completion of the course, learners should be able to: • Explain the physiological mechanisms behind processes like digestion, respiration, circulation, and reproduction etc. • Compare physiological processes across species and recognize challenges in these systems.	

9	**Module 1: Physiology**	
	1.1 Physiology of Digestion and Excretion 1.1.1 Adaptations supporting feeding and digestion: 1.1.1.1. Herbivores: Stomach adaptation in Camel 1.1.1.2. Carnivores: Scroll valve in Sharks 1.1.1.3. Omnivores: Diverse range of digestive enzymes in humans 1.1.1.4. Sanguivores: Modified saliva with anticoagulants in leeches 1.1.1.5. Symbiotic feeders: Role of gut microbiota in termites 1.1.2 Physiology of Excretion in humans: Urine formation in humans, Importance of juxta-glomerular complex	04hrs
	1.2 Physiology of Respiration and Circulation 1.2.1 Structure of lungs in humans 1.2.2 Transport of gases and role of haemoglobin in humans 1.2.3 Respiratory volumes and capacities: Tidal Volume (TV), Inspiratory Reserve Volume (IRV), Expiratory Reserve Volume (ERV), Vital Capacity (VC) 1.2.4 Physiology of circulation: 1.2.4.1 Single and Double circulation 1.2.4.2 Open and Closed circulation 1.2.4.3 Neurogenic and Myogenic hearts 1.2.4.4 Pacemaker and working of heart	04hrs
	1.3 Physiology of reproduction 1.3.1. Oestrous and Menstrual Cycles 1.3.2. Gamete Development: Oogenesis, Spermatogenesis	04hrs
	1.4 Thermoregulation and Biological clocks 1.4.1 Acclimation and acclimatization 1.4.2 Thermoregulation: Heat production – shivering and non-shivering thermogenesis; brown fat, heat loss 1.4.3 Daily torpor, hibernation, aestivation 1.4.4 Circadian & Diurnal rhythm	03hrs
	Module 2: Endocrinology	
	2. 1 Introduction to Endocrinology 2.1.1 Definition and scope of endocrinology 2.1.2 Vertebrate endocrinology: Classification of hormones (peptides, steroids, amines), Concept of feedback regulation in the endocrine system	03hrs
	2.2 Major endocrine glands: Histology, Hormones and their function 2.2.1 Hypothalamus 2.2.2 Pituitary gland 2.2.3 Thyroid Gland 2.2.4 Parathyroid Gland 2.2.5 Pancreas 2.2.6 Adrenal gland	08hrs
	2.3 Neuroendocrinology 2.3.1 Role of neurotransmitters and neuropeptides: Dopamine, Gamma-Aminobutyric Acid (GABA), Oxytocin, Neuropeptide Y (NPY), Endorphins 2.3.2 Pineal gland 2.3.3 Hormones related to behaviour, mood and stress	03hrs
	2.4 Role of hormones in hunger and satiety: Ghrelin, Leptin, and Cholecystokinin	01hrs

10	**References:** **Physiology:** • Arumugam, N., & Mariakuttikan, A. (2019). Animal physiology. Saras Publication. ISBN: 978-9386519575. • Biswas, P. K. (2012). Handbook of animal physiology. Agrotech Press. ISBN: 978-9383101284. • Choudhary, K., & Saran, R. P. (2024). Animal physiology: Textbook for CSIR NET, DBT, ICMR, GATE, SET. IFAS Publications. ISBN: 978-8196967574. • Guyton, A. C., & Hall, J. E. (2011). Textbook of medical physiology (12th ed.). Harcourt Asia Pvt. Ltd./W.B. Saunders. ISBN: 978-1416031107. • Kay, I. (1998). Introduction to animal physiology. Garland Science. ISBN: 978-1859960465. • Mandave, S., and Jadhav, S, (2017). Human Anatomy and Physiology. Career Publications. ISBN: 978-9382322260. • Nagabhushanam, R. (2008). Textbook of animal physiology. Oxford & IBH. ISBN: 978-8174414405. • Prosser, C. Ladd., Bishop and David W. (1950). Comparative animal physiology. Saunders, Philadelphia. ISBN: 978-0721673813. • Rastogi, S. C. (2019). Essentials of animal physiology (4th ed.). New Age International. ISBN: 978-8122420140. • Saxena, S. (2012). Animal physiology. Oxford University Press. ISBN: 978-9350301079. • Schmidt-Nielsen, K. (1990). Animal Physiology. Cambridge University Press, Cambridge. ISBN: 978-0511801822. • Singh, H. R., & Kumar, N. (2017). Animal physiology and biochemistry. Vishal Publishing Co. ISBN: 978-9381745246. • Tortora, G. J., & Derrickson, B. H. (2009). Principles of anatomy and physiology (16th ed.). John Wiley & Sons, Inc. ISBN: 978-1-119-66268-6 • Verma, P. S., Tyagi, B. S., & Agarwal, V. K. (2000). Animal physiology. S Chand Publication. ISBN: 978-8121903510. • Withers, P., & Withers, P. C.: (Ed.) (1992). Comparative Animal Physiology. Saunders College Publishing. ISBN: 978-0030128479. **Endocrinology:** • Amrit Lal (2021). Textbook of Endocrinology, Publication Jaypee Brothers Medical Publishers. ISBN- 9789354651649. • Atul Samiran (2021). Concept of Endocrinology, Shashwat Publications ISBN-9789390761098. • Chandra S. Negi (2010). Introduction to Endocrinology, PHI Learning Publication. ISBN-9788120338500. • David G. Gardner and Dolores Shoback (2017). Greenspan's Basic & Clinical Endocrinology (10th Edition). ISBN-13: 9781259589287. • David O. Norris, James A. Carr (2013). Vertebrate Endocrinology. ISBN-:9780123964656, 0123964652. • Elizabeth H. Holt and Susan P. Porterfield (2022). Goodman's Basic Medical Endocrinology (5th Edition). ISBN-13: 9780123739750. • Fredric E. Wondisford (2020). Essentials of Endocrinology and Metabolism 1st ed. ISBN-13: 9783030542853. • G. Tripathi (2008). Endocrinology and Reproductive Biology, S. Chand Publishing, ISBN- 9788121928502. • John Wass, Robert Semple, Wiebke Arlt (2022). Oxford Textbook of Endocrinology and Diabetes (3rd Edition) OUP Oxford Publication. ISBN-13: 9780198870193.

	• K. Vijayakumar (2016). Comparative Endocrinology, Anmol Publications. ISBN-9788126161743. • N.K. Narayan (2019). Essentials of Endocrinology, Cambridge Scholars Publishing. ISBN- 9781527547125. • P. C. Dutta (2004). Textbook of Endocrinology, Publication Oxford & IBH ISBN-9788120418492. • R.L. Kotpal (2017). Animal Physiology and Endocrinology, Rastogi Publications. ISBN- 9788171339613. • Richard I. G. Holt and Neil A. Hanley (2021). Essential Endocrinology and Diabetes (7th Edition). ISBN-13: 9781118763964. • S. R. Joshi (2014). Essentials of Endocrinology, BI Publications ISBN-9789350909071. • Shlomo Melmed and P. Michael Conn. (2005). Endocrinology: Basic and Clinical Principles. Softcover reprint of hardcover 2nd ed. 2005 Edition. ISBN-13: 978-1617375620. • Shlomo Melmed, Richard J. Auchus, Allison B. Goldfine, Clifford J. Rosen, Peter A. Kopp, (2024). Williams Textbook of Endocrinology (15th Edition) Hardback ISBN: 9780323932301 eBook ISBN: 9780323933476.	
11	**Internal Continuous Assessment: 40%**	**External, Semester End Examination 60% Individual Passing in Internal and External Examination**
12	**Continuous Evaluation through:** Quizzes, Class Tests, Presentation, Project, Role play, Creative writing, Assignment etc. (at least 3)	

Syllabus
B.Sc. (Zoology)
(Semester – III)
Title of the paper: Laboratory Exercises on Physiology and Endocrinology

Sr. No.	Heading	Particulars
1	**Description of the course: Including but not limited to:**	This course provides practical experience in assessing human physiology and endocrine function. Students will measure blood glucose using the GOD-POD method, evaluate lung function through the balloon method and peak flow meter, interpret electrocardiograms, examine histological samples of endocrine glands, perform urinary hCG pregnancy tests, and study various endocrine disorders. Additionally, students will research and report on endocrine therapies, gaining essential laboratory skills and a comprehensive understanding of physiological and endocrine assessments.
2	**Vertical:**	Minor
3	**Type:**	Practical
4	**Credit**:	2 credits for practical (1 credit = 30 Hours for Practical in a semester)
5	**Hours Allotted:**	60 Hours (Practical)
6	**Marks Allotted**:	50 Marks (Practical)
7	**Course Objectives:** • To analyze physiological parameters by measuring blood glucose levels, lung capacity, and cardiac function using biochemical and physiological techniques. • To interpret endocrine structures, hormonal functions, and related disorders through histological examination, diagnostic methods, and clinical case studies.	
8	**Course Outcomes:** Upon completion of this course, learner will be able to: • Demonstrate proficiency in biochemical assays for glucose estimation, respiratory function tests, and ECG interpretation to assess metabolic and cardiovascular health. • Evaluate endocrine disorders and therapeutic interventions by studying gland histology, pregnancy detection, and endocrine therapies, including IVF.	
9	1. Determination of blood glucose levels using a GOD-POD method. 2. Estimation of lung capacity (tidal volume and vital capacity) using the balloon method. 3. Peak flow meter – Working and assessment of lung function. 4. Interpretation of an electrocardiogram (ECG) and assess the electrical activity of the heart. 5. Study of histology of pituitary gland, thyroid gland, parathyroid, pancreas, adrenal gland, ovary and testis.	

	6. Diagnosis of pregnancy through the presence or absence of human chorionic gonadotropin (hCG) in urine using a kit method. 7. Study of endocrine disorders such as dwarfism, gigantism, acromegaly, goiter, Grave's disease, cretinism, Addison's disease, Cushing Syndrome, diabetes mellitus, polycystic ovarian syndrome (PCOS). 8. Preparation and submission of report on Endocrine therapies / IVF.	
10	**References:** **Physiology:** • Allen, C., & Harper, V. (2022). Laboratory Manual for Anatomy and Physiology, 5th Edition. John Wiley & Sons, Inc. ISBN: 978-1-118-80656-2. • Geetha, N. (2024). Practical physiology. Jaypee Brothers Medical Publishers Pvt. Ltd. ISBN: 978-9350251413. • Ghai, C. L. (2022). A textbook of practical physiology (10th ed.). Jaypee Brothers Medical Publishers (P) Ltd. ISBN: 978-93-5025-932-0. **Endocrinology:** • B. N. Pandey (2012). Biochemistry, Physiology and Endocrinology (Vol. 3), McGraw Hill Education. ISBN-9781259050350. • Dr. Simon Rajaratnam and Dr. Anulekha Mary John (2019). Handbook of Endocrine Protocols (2nd Edition) ISBN-13: 9789352706983. • Harsh Vardhan Bhaskar (2009). Manual of Practical Physiology and Endocrinology, Campus Books International. ISBN 8180300536. • Norman Lavin (2018). Manual of Endocrinology and Metabolism (5th Edition) Lippincott Manual Series ISBN-13: 9781496322647.	
11	**Internal Continuous Assessment: 40%**	**External, Semester End Examination 60% Individual Passing in Internal and External Examination**
12	**Continuous Evaluation through:** Quizzes, Class Tests, Presentation, Project, Role play, Creative writing, Assignment etc. (at least 3)	

Semester – IV

Syllabus
B.Sc. (Zoology)
(Semester – IV)

Title of Paper: Haematology

Sr. No.	Heading	Particulars
1	**Description of the course: Including but not limited to:**	Haematology is the study of blood, blood-forming organs, and related diseases. It covers blood composition, haematopoiesis, disorders, diagnostic techniques, and treatments. This field is essential in diagnosing and managing conditions like anaemia, leukaemia, and clotting disorders, playing a vital role in laboratory medicine, transfusion science, and oncology. Haematology is linked to pathology, immunology, genetics, and pharmacology, contributing to advancements in cancer treatment, stem cell therapy, and regenerative medicine. Professionals in this field are in high demand in hospitals, diagnostic labs, blood banks, and pharmaceutical companies. Career options include haematologists, lab technologists, transfusion specialists, and clinical researchers. With increasing blood disorders and medical advancements, haematology offers strong career prospects in both clinical and research sectors
2	**Vertical:**	Minor
3	**Type:**	Theory
4	**Credit:**	2 credits for theory (1 credit = 15 Hours for Theory in a semester)
5	**Hours Allotted:**	30 Hours (Theory)
6	**Marks Allotted**:	50 Marks (Theory)
7	**Course Objectives:** • To familiarize learners with the composition of blood and the physiological processes involved in blood clotting, and various clinical aspects of haematology. • To introduce foundational concepts in applied haematology, providing knowledge of essential diagnostic techniques used in pathology.	
8	**Course Outcomes:** Upon completion of the course, the learners should be able to: • Relate the core concepts of haematology. • Explain the common terminologies and relate to the diagnostic tests used in pathology labs, preparing them for advanced studies in pathology.	

9	**Module 1: Basic Haematology**	
	1.1 Introduction to Haematology: Definition, Scope and Importance	01hr
	1.2 Composition of blood 1.2.1 Cellular components 1.2.2 Plasma and serum 1.2.3 Inorganic constituents 1.2.4 Organic constituents 1.2.5 Respiratory gases	02hrs
	1.3 Blood volume 1.3.1 Total quantity and regulation 1.3.2 Haemorrhage	01hr
	1.4 Erythrocytes 1.4.1 Erythropoiesis 1.4.2 Variation in number 1.4.3 Abnormalities in form and structure of Erythrocytes	03hrs
	1.5 Haemoglobin 1.5.1 Haemoglobin – Structure, function and types 1.5.2 Synthesis and degradation 1.5.3 Anaemia types, causes, and diagnosis	03hrs
	1.6 Leucocytes 1.6.1 Types of leucocytes and their functions 1.6.2 Leucopoiesis 1.6.3 Leukaemia: Types, classification, and symptoms	02hrs
	1.7 Thrombocytes 1.7.1 Thrombopoiesis 1.7.2 Structure and Function	01hrs
	1.8 Blood Clotting 1.8.1 Mechanism of coagulation 1.8.2 Coagulation factors 1.8.3 Failure of clotting mechanism – haemophilia and purpura	02hrs
	Module 2: Applied Haematology	
	2.1 Introduction to Applied Haematology 2.1.1 Definition, scope 2.1.2 Brief introduction of basic branches: 2.1.2.1 Clinical 2.1.2.2 Microbiological 2.1.2.3 Oncological 2.1.2.4 Forensic Haematology	02hrs
	2.2 Haematological Techniques and Laboratory Practices 2.2.1 Blood collection methods (venepuncture, capillary blood sampling) 2.2.2 Blood smear preparation and staining	02hr
	2.3 Microscopic examinations of blood for: 2.3.1 Detection of blood cancers – Lymphoma, Myeloma 2.3.2 Infectious diseases – Malaria, Filariasis, Leishmaniasis 2.3.3 Abnormalities of haemoglobin – Sickle cell, Thalassemia	03hrs
	2.4 Biochemical examinations of blood 2.4.1 Liver function tests: Albumin, AST, ALT, ALP. 2.4.2 Kidney function tests: Serum creatinine, blood urea nitrogen 2.4.3 Carbohydrate metabolism tests: Blood sugar, Glucose tolerance test, Glycosylated haemoglobin test 2.4.4 Other biochemical tests: Blood hormones (Thyroid, FSH, LH), Cancer Antigen test (CA125)	04hrs

	2.5 Blood Bank 2.5.1 Basic Principles of Blood Bank 2.5.2 ABO & Rh blood group system 2.5.3 Blood collection and processing 2.5.4 Anticoagulants and preservative used in blood bank	03hrs
	2.6 Blood transfusion – Types	01hr

10 **References:**

- B.S. Shah, 2014, Short Textbook of Hematology, CBS Publishers & Distributors Pvt Ltd, India, ISBN 9788123924076
- C. C. Chatterjee (2017). Human Physiology 12Ed Vol 1, CBS Publishers & Distributors, ISBN 978-8123928722.
- Christian S. R. Hatton, Nevin C. Hughes–Jones, Deborah Hay and David M. Keeling (2013). Wiley–Blackwell Publishers, ISBN 978-0470673591.
- Drew Provan (2009). ABC of Clinical Haematology, BMJ Books, ISBN: 978-1-444-31268-3.
- Maheshwari Nanda (2017). Clinical Pathology Hematology and Blood Banking, Jaypee Brothers Medical Publishers, ISBN 978-9386261182.
- Marshall Lichtman, Ernest Beutler, Kenneth Kaushansky, Thomas Kipps, Uri Seligsohn and Josef Prchal (2005). Williams Hematology, ISBN 9780071435918.
- Ramadas Nayak and Sharada Rai (2017). Essentials in Hematology and Clinical Pathology, Jaypee Brothers Medical Publishers, ISBN 978-9351524236.
- Ramadas Nayak, 2014, Rapid Review of Hematology, Jaypee, ISBN 9789350909614
- Rusia U, 2014, Precise Haematology: For Undergraduate Medical Students, Wiley India, ISBN 9788126539437
- Shirish M. Kawthalkar (2013). Essentials of Haematology, Jaypee Brothers Medical Publishers, ISBN 978-9350901847.
- Tejinder Singh (2008). Textbook of Haematology, Arya Publications, ISBN 978-8178555249.
- U. Satyanarayana, U. Chakrapani; 2020, Biochemistry, Elsevier Australia, ISBN 9788131262542

11	**Internal Continuous Assessment: 40%**	**External, Semester End Examination 60% Individual Passing in Internal and External Examination**
12	**Continuous Evaluation through:** Quizzes, Class Tests, Presentation, Project, Role play, Creative writing, Assignment etc. (at least 3).	

Syllabus
B.Sc. (Zoology)
(Semester – IV)
Title of the Paper: Laboratory Exercises on Haematology

Sr. No.	Heading	Particulars
1	**Description of the course: Including but not limited to:**	The haematology practical provides hands-on experience with blood samples, haematology analysers, and techniques to analyse both normal and abnormal blood components. It covers the diagnosis of blood disorders and aims to enhance understanding of blood cell morphology and functions. With the growing demand in the healthcare sector, professionals in this field are highly sought after by hospitals, diagnostic labs, blood banks, and pharmaceutical companies.
2	**Vertical:**	Minor
3	**Type:**	Practical
4	**Credit:**	2 credits for practical (1 credit = 30 Hours for Practical in a semester)
5	**Hours Allotted:**	60 Hours (Practical)
6	**Marks Allotted**:	50 Marks (Practical)
7	**Course Objectives:** • Analyse haematological parameters by performing erythrocyte and leucocyte counts, haemoglobin estimation, and blood group determination. • Interpret pathological conditions and immune responses through diagnostic techniques such as erythrocyte sedimentation rate, clotting time, and latex agglutination tests.	
8	**Course Outcomes:** Upon completion of the course, the learners should be able to: • Demonstrate proficiency in haematological techniques, including blood cell enumeration, hemoglobin estimation, and identification of pathological conditions using slides or images. • Evaluate blood disorders and immune responses by determining ESR, bleeding and clotting times, and performing diagnostic tests for conditions like malaria and rheumatoid arthritis.	
9	1. Total count of erythrocytes. 2. Total count of leucocytes. 3. Differential count of leucocytes. 4. Determination of bleeding and clotting time. 5. Estimation of haemoglobin by Sahli's acid hematin method. 6. Estimation of serum / plasma proteins by Folin's method. 7. Determination of Erythrocyte Sedimentation Rate by Wintrobe / Westergren Method. 8. Determination of blood group. 9. Identification of pathological conditions (from slides or pictures): Malaria, Filariasis, Leishmaniasis, Sickle cell anaemia. 10. Latex agglutination test – Rheumatoid arthritis.	

10	**References:** • Dacie, J.V. and Lewis, S.M. (2006). Practical hematology, Churchill Livingstone, London, ISBN 9780443066603. • Dr. K.C. Ghose & Dr. B. Manna; 1999; Practical Zoology; Second Edition; New Central Book Agency Pvt. Ltd., Kolkata. • Praful B. Godkar and Darshan P. Godkar (2020). Textbook Of Medical Laboratory Technology Clinical Laboratory Science and Molecular Diagnosis 2 Vol Set 3Ed (Pb 2018) Bhalani Publishing House, ISBN 978-9381496190. • Ramnik Sood; 2009, Medical Laboratory Technology Methods and Interpretations, Jaypee Brothers Medical Pub, ISBN 9788184484496	
11	**Internal Continuous Assessment: 40%**	**External, Semester End Examination 60% Individual Passing in Internal and External Examination**
12	**Continuous Evaluation through:** Quizzes, Class Tests, Presentation, Project, Role play, Creative writing, Assignment etc. (at least 3).	

QUESTION PAPER PATTERN
(External and Internal)

S. Y. B. Sc. Zoology evaluation pattern and question paper pattern for semester end theory examination of minor courses

Internal Continuous Assessment: 40% (20 Marks)	Semester End Examination: 60% (30 Marks)	Duration for Semester End Examination
Continuous Evaluation through: Quizzes, Class Tests, Presentation, Project, Role play, Creative writing, Assignment, etc. (10 Marks), Viva (5 marks) Overall performance (5 Marks) Total (20 Marks)	**As per paper pattern**	**01.00 hour**

Format of Theory Question Paper: Semester End Examination

Time 1.0 Hr **Max. Marks 30**

Attempt any two out of four:

Q. 1. Answer the following: a. Module I b. Module I c. Module II	 05 05 05
Q. 2. Answer the following: a. Module II b. Module II c. Module I	 05 05 05
Q. 3. Answer the following: a. Module I b. Module II	 08 07
Q. 4. Answer the following: a. Module II b. Module I	 08 07

S. Y. B. Sc. Zoology Evaluation pattern and Question paper pattern for Semester End Practical Examination of Minor Course

Internal Continuous Assessment: 40% (20 Marks)	Semester End Examination: 60% (30 Marks)	Duration for Semester End Examination
Continuous Evaluation through: Assignment / Objective test (10 Marks), Viva (5 marks) Overall performance (5 Marks) = 20 Marks	**As per paper pattern**	**2 hrs**

Format of Practical Question Paper: Semester End Examination

Time 2 hrs **Max. Marks 30**

Q.1 Major experiment	08 / 09
Q.2 Minor experiment	06 / 07
Q.3 Identification / Minor Experiment	06 / 05
Q.4 Assignment / Identification	05 / 04
Q.5 Journal and Viva	05

University of Mumbai
S. Y. B. Sc. Zoology: Semester – III
Skeleton Question Paper pattern for Practical Examination
S1MN3: Laboratory Exercises on Physiology and Endocrinology

Duration: 2hrs **Total Marks: 30**

Major **(08)**

Q.1 To determine blood glucose levels using GOD-POD method.

OR

Q.1 Estimation of lung capacity (tidal volume and vital capacity) using balloon method.

Minor **(06)**

Q.2 To diagnose pregnancy through the presence or absence of hCG in urine using a kit method.

OR

Q.2 To assess the lung function using a peak flow meter.

Q.3 Identify and describe: **(06)**

a) Based on the interpretation of ECG: Normal ECG / Bradycardia / Tachycardia
b) Based on permanent slides of endocrine glands: Pituitary glands / Thyroid gland / Pancreas / Adrenal gland/ Ovary / Testis
c) Based on endocrine disorders: Gigantism / Acromegaly / Goitre / Osteoporosis / Polycystic ovarian Syndrome

Q.4 Submission of report and viva based on endocrine therapies / IVF. **(05)**

Q.5 Journal and viva **(05)**

University of Mumbai
S. Y. B. Sc. Zoology: Semester – IV
Skeleton Question Paper pattern for Practical Examination
S1MN4: Laboratory Exercises on Haematology

Duration: 2 hrs **Total Marks: 30**

Major **(09)**

Q.1 Determine the total erythrocyte count and comment on clinical condition.

OR

Q.1 Determine the total leucocytes count and comment on clinical condition.

OR

Q.1 Prepare a report on the differential count of leucocytes and interpret the findings in relation to clinical conditions.

Minor 1 **(07)**

Q.2 Estimate the total plasma proteins by Folin's method.

OR

Q.2 Record bleeding and clotting time and comment on clinical significance.

OR

Q.2 Determine Erythrocyte Sedimentation Rate by Wintrobe / Westergren Method.

Minor 2 **(05)**

Q.3 Estimate haemoglobin by Sahli's acid haematin method.

OR

Q.3 Perform Latex agglutination test – Rheumatoid Arthritis.

OR

Q.3 Determine the blood group of the given blood sample.

Q.4 Identify and describe the pathological condition **(04)**

a) Malaria / Filariasis
b) Leishmaniasis / Sickle cell anaemia

Q.5 Journal and viva **(05)**

Letter Grades and Grade Points:

Semester GPA/ Programme CGPA Semester/ Programme	% of Marks	Alpha-Sign/ Letter Grade Result	Grading Point
9.00 - 10.00	90.0 - 100	O (Outstanding)	10
8.00 - < 9.00	80.0 - < 90.0	A+ (Excellent)	9
7.00 - < 8.00	70.0 - < 80.0	A (Very Good)	8
6.00 - < 7.00	60.0 - < 70.0	B+ (Good)	7
5.50 - < 6.00	55.0 - < 60.0	B (Above Average)	6
5.00 - < 5.50	50.0 - < 55.0	C (Average)	5
4.00 - < 5.00	40.0 - < 50.0	P (Pass)	4
Below 4.00	Below 40.0	F (Fail)	0
Ab (Absent)	-	Ab (Absent)	0

Sd/-
Sign of the BOS Coordinator
Dr. Vaishali U. Somani
BOS in Zoology

Sd/-
Sign of the Offg. Associate Dean
Dr. Madhav R. Rajwade
Faculty of Science & Technology

Sd/-
Sign of the Offg. Dean
Prof. Shivram S. Garje
Faculty of Science & Technology