

FACULTY OF LIFE SCIENCES

Syllabus

For

M. Sc. (HONS.) ZOOLOGY
(FIVE YEARS INTEGRATED COURSE)
(Credit Based Evaluation & Grading System)
(FOR OLD STUDENTS)
(SEMESTER III-IV)

Examinations: 2019–20



Guru Nanak Dev University
Amritsar

- Note: (i) Copy rights are reserved.
Nobody is allowed to print it in any form.
Defaulters will be prosecuted.
- (ii) Subject to change in the syllabi at any time.
Please visit the University website time to time.

1
MSC (HONS) ZOOLOGY (FYIC) (CBEGS)
(FOR OLD STUDENTS)

M.Sc (Hons) Zoology (Five Years integrated course)
(Semester III to IV)

Semester III

Course No.	Course Title	L	T	P	Total
ZOL 204	Animal Physiology	3	1	0	4
BSL 201	Morphology and Anatomy	3	1	0	4
ZOL 205	Genetics	3	1	0	4
	ID	4	0	0	4
*ESL 220	Environmental Studies	3	0	0	3
ZOP 224	Zoology Lab III	0	0	3	3
BSP 221	Botany Lab III	0	0	1.5	1.5
	Total Credits	16	3	4.5	23.5

*Note: Credits will not be included in SGPA

Note:- BSL201, BSP221 Same as B.Sc(Hons) Botany and *ESL220 same as B.Sc(Hons) Human Genetics

Semester IV

Course No.	Course Title	L	T	P	Total
ZOL 256	Embryology	2	1	0	3
ZOL 257	Bio molecules	2	1	0	3
BSL 252	Plant Ecology and Phytogeography	3	1	0	4
CYL 291	Physical Chemistry	3	1	0	4
	ID	4	0	0	4
BSP 271	Botany Lab IV	0	0	1.5	1.5
ZOP 271	Zoology Lab IV	0	0	3	3
CYP 292	Chemistry Lab	0	0	3	3
	Total Credits	14	4	7.5	25.5

Note:- BSL252, BSP271 Same as B.Sc(Hons) Botany and CYL291 same as B.Sc(Hons) Human Genetics and CYL292 to be provided by Department of Chemistry

2
MSC (HONS) ZOOLOGY (FYIC) (CBEGS)
(FOR OLD STUDENTS)

SEMESTER-III

ZOL 102: Biology of Non Chordates

Credit 3-1-0

Max. Time: 3hrs

Max. Marks: 100

Mid Semester Exam:20%Weightage

End Semester Exam:80%Weightage

Instructions to the paper setters:

The question paper shall consist of 8 questions of equal marks. Two questions shall be set from each section (A-D). A question may have sub sections(not exceeding 4) with appropriate allocation of marks. The candidates shall be asked to attempt five questions by selecting at least one question from each section. The fifth question may be attempted from any section.

Section-A

The Invertebrates: An Introduction

Protozoa

General Characters

Detailed study of *Amoeba* and *Paramecium*

Porifera

General Characters

Detailed study of *Sycon* / *Scypha*

Skeleton in Sponges

Canal System in Sponges

Section-B

Coelenterata

General Characters

Detailed study of *Obelia*

Polymorphism

Coral Reefs

Platyhelminthes

General Characters

Detailed study of *Fasciola hepatica*

Aschelminthes

General Characters

Detailed study of *Ascaris*

3
MSC (HONS) ZOOLOGY (FYIC) (CBEGS)
(FOR OLD STUDENTS)

SEMESTER-III

Section-C

Annelida

General Characters

Detailed study of *Pheretima*

Arthropoda

General Characters

Detailed study of *Periplaneta*

Metamorphosis in Insects

Section-D

Mollusca

General Characters

Detailed study of *Pila*

Molluscan Larvae

Shell in Mollusca , Torsion in mollusca shell

Echinodermata

General Characters

Detailed study of Starfish

Echinoderm Larvae

MSC (HONS) ZOOLOGY (FYIC) (CBEGS)
(FOR OLD STUDENTS)

SEMESTER-III

Suggested Reading Material:

- Barnes, R. D. (1980). The Invertebrate Zoology, Holt-Saunders, Philadelphia, 4th ed.
- Barth, R. H. and Brosherars, R. E. (1982). The Invertebrate World. Holt-Saunders, Tokyo, Japan. Engemann, J. G. And Hegner, R. W. (1981). The invertebrate Zoology 3rd edition . Macmillan, New York.
- Hyman, L. H. The invertebrates (Vol. I-VI)
- Vol. I Protozoa through Ctenophora (1940)
- Vol. II Platyhelminthes and Rhynchocoela (1951).
- Vol. III Acanthocephala, Aschelminthes and Entoprocta (1951). McGraw Hill, New York.
- Meglitch, P. (1972). Invertebrate Zoology. Oxford Uni. Press, New York.
- Parker, T. J. And Haswell, W.A. (1972). A text book of Zoology Vol. I (revised by Marshall) ELBS and the Macmillan Co. London.
- Russel- Hunter, W. D. (1968). A Biology of Lower Invertebrates. McMillan Co. New York.
- Russel-Hunter, W. D. (1968). A Biology of Higher Invertebrates. MacMillan Co. New York.
- Sherman, I. W. and Sherman, V. G. (1970). The Invertebrates, Function and form , MacMillan Co. New York.

Books of Indian Authors:

- Dhami, P. S. And Dhami, J. K. (2015). Invertebrates Zoology, R.,Chand& Company, New Delhi.
- Kotpal, R. L., Aggarwal, S. K. &Khetarpal, R. P. (2015). Modern Text Book of Zoology Invertebrates, Rastogi Publications, Meerut.
- Kotpal, R. L. Zoology, Phylum Books, Rastogi Publications, Meerut

MSC (HONS) ZOOLOGY (FYIC) (CBEGS)
(FOR OLD STUDENTS)

SEMESTER-III

ZOL 204: Animal Physiology

Credit 3-1-0

Max. Time: 3hrs

Max. Marks: 100

Mid Semester Exam:20%Weightage

End Semester Exam:80%Weightage

Instructions to the paper setters:

The question paper shall consist of 8 questions of equal marks. Two questions shall be set from each section (A-D). A question may have sub sections(not exceeding 4) with appropriate allocation of marks. The candidates shall be asked to attempt five questions by selecting at least one question from each section. The fifth question may be attempted from any section

Section A

Digestion

Types of Nutrition

Ingestion

Digestion

Absorption

Assimilation

Respiration

Exchange of gases in lungs and blood

Oxygen dissociation curve of Hb

Bohr effect , Chloride shift

Section B

Circulation

Types of circulatory system

Circulation of Blood

Lymphatic System

Cardiac cycle

Origin and regulation of Heart beat

Muscle Tissue

Muscle contraction and fatigue

**MSC (HONS) ZOOLOGY (FYIC) (CBEGS)
(FOR OLD STUDENTS)**

SEMESTER-III

Section C

Neural Integration

Propagation of Nerve impulse

Synaptic transmission

Endocrine Glands

Different endocrine glands and their functions

Section D

Excretion

Types of excretion and waste products

Formation of urea and urine

Reproduction

Male Reproductive System

Female Reproductive System

Suggested Reading Material.

- Barrington, E. U. W. (1967), Invertebrates Structure and Functions. Houghton Mifflin Co. Boston.
- Barth, R. H. and Broshears, R. E (1982), The Invertebrate world. Holt Saunder, Japan.
- Bekleimishev, W. M. (1969), Principles of Comparative Anatomy of Invertebrates, Vol. I – Morphology, Vol. II – Organology. Chicago University Press, Chicago.
- Brusca, R. C. and Brusca, G. J. (2003), Invertebrates (2nd Ed). Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts.
- Cooper, G. M. (2004), The Cell: A Molecular Approach (3rd ed), ASM Press, Washington, D.C.
- Engemann, J. G. and Hegner, R. W. (1981), Invertebrate Zoology (3rd ed.) Macmillan, New York.
- Gardiner, M. S. (1972), The Biology of Invertebrates, McGraw Hill, New York.
- Goodrich, E. S. (1958), Structure and Development of Vertebrates, Vol. I and II. D. E. Publication, New York.
- Hildebrand, M. and Goslow. Jr. G.E. (2001), Analysis of Vertebrates Structure John Wiley , N. Y.
- Hill, R. W., Wyse, G. K. and Anderson, N. (2004), Animal physiology. Sinauer Associate, INC. Pub. Saunderland, Massachusettes, USA.
- Hoar, W. S. (1984), General and Comparative Physiology. Prentice Hall of India Pvt. Limited, New Delhi, India.
- Hyman, L. H. The Invertebrates. Vol I– Protozoa through Ctenophora (1940), Vol. II – Platyhelminthes and Rhynchocoela (1951), Vol. III- Acanthocephala, Aschelminthes and Entoprocta (1951), Mc Graw Hill, New York.

MSC (HONS) ZOOLOGY (FYIC) (CBEGS)
(FOR OLD STUDENTS)

SEMESTER-III

- Jollie, M. (1968), Chordate Morphology, Reinhold, New York.
- Kardong, K. V. (1995), Vertebrates – Comparative Anatomy, Function, Evolution. W.B.C. Pub. , Oxford.
- Karp, G.(2005), Cell and Molecular Biology; concepts and experiments (4th ed.),Hoboken, John Willy and Sons, New York.
- Kent, G. C. and Carr, R. K. (2001), Comparative Anatomy of the Vertebrates (9th ed), McGraw Hill Higher Education, New York.
- Linzey, D. (2001), Vertebrate Biology. McGraw Hill Publishing Company, New York.
- McGowan, C. (1999), A Practical Guide to Vertebrates Mechanics, Cambridge University Press, UK.
- Meglitsch, P. A. and Schran, F. R. (1991), Invertebrate Zoology (3rd Ed). Oxford University Press, New York.
- Pechenik, A. Jan. (2000), Biology of the invertebrates, (4th Ed), McGraw HillBook Co. Singapore.
- Prosser, C.L. (1984), Comparative Animal Physiology. Satish Book Enterprise Books seller & Publishers, Agra.
- Pough, F. H., Heiser, J. B. and McFarland, W. N. (1990), Vertebrate Life 3rded., Macmillan Pub. Co., New York.
- Purves, W. K., Oriane, G. H., Space, H. C. and Sadava, D. (2001), Life – The Science of Biology (6th ed), Sinauer Assoc. Inc., USA.
- Randall, D., Burggren, K.L. and French, K. (2002), Eckert Animal Physiology: Mechanisms and Adaptations. W.H. Freeman and Company, New York.
- Ruppert, E. E. and Barnes, R. D. (2004), Invertebrate Zoology (7th ed). Saunders Publ., Philadelphia.
- Saxena, A. (2005). Text book of Mollusca. Discovery Publishing House, New Delhi.
- Willmer, P. Stone, G. and Johnston, I (2000). Environmental Physiology of Animals, Blackwell Science.
- Withers, P.C. (1992), Comparative Animal Physiology Saunder College Publishing, New York.
- Young, J. Z. (1982), The Life of Vertebrates, New York.

8
MSC (HONS) ZOOLOGY (FYIC) (CBEGS)
(FOR OLD STUDENTS)

SEMESTER-III

ZOL 205: Genetics

Credit 3-1-0

Max. Time: 3hrs

Max. Marks: 100

Mid Semester Exam:20%Weightage

End Semester Exam:80%Weightage

Instructions to the paper setters:

The question paper shall consist of 8 questions of equal marks. Two questions shall be set from each section (A-D). A question may have sub sections(not exceeding 4) with appropriate allocation of marks. The candidates shall be asked to attempt five questions by selecting at least one question from each section. The fifth question may be attempted from any section

Section A

General Introduction and Mendelian Genetics

Mendel's experiments

Principle of segregation

Principle of Independent assortment

Interactions of genes

Section B

Linkage, Crossing over and Chromosome mapping:

Linkage and linkage groups

Complete and incomplete linkage

Cytological basis of crossing over

Section C

Sex determination :

Chromosome theory of sex determination

Genetic Balance Theory

Cytoplasmic sex determination

Sex linked inheritance:

Sex linked inheritance in *Drosophila* and man

Sex limited and sex influenced genes

**MSC (HONS) ZOOLOGY (FYIC) (CBECS)
(FOR OLD STUDENTS)**

SEMESTER-III

Section D

Extrachromosomal inheritance:

Criteria for cytoplasmic Inheritance

Examples of cytoplasmic Inheritance

Mutations

Chromosomal mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy

Gene Mutations: Induced versus spontaneous mutations, Back versus Suppressor mutations

Suggested Reading Material

- Alberts, B., Johanson, A., Lewis, J. Raff, M., Roberts, M. and Walter, P. (2000) Molecular Biology of the cell, 4th Edition, Garland Science, New York.
- Brown, T. A. (2006) Gene cloning and DNA analysis and introduction (5th Edition), Oxford, Blackwell Publishers.
- Christophger Howe (1995) Gene cloning and Manipulation, Cambridge University Press, New York.
- Clark, D.P.(2010), Molecular Biology, Academic Elsevier, USA.
- Cox, M.M. and Nelson, D.L.(2011), Lehninger Principles of Biochemistry (5th ed), W.H Freeman and Company, NewYork.
- Dale, J.W.Shantz MU (2002) From Genes to Genome: Cons, New York.
- DeRoberties, M. D. and DeRobertiees, M.D. (Jr) (1995) . Cell and Molecular Biology (8th ed.) B.I. Waverly, Pvt. Ltd., ND.
- Freifelder. D. (1993). Molecular Biology (2nd ed.) Narosa Publishing House, India
- Freifelder. D. and Malacinski, G. M. (1993). Essentials of Molecular Biology (2nd ed), John and Bartlett Publishing, U.K.
- Lewin B (2001) Genes VII, Oxford University Press, New York.
- Lodish, H., Berk, A., Matsudaira, P., Kiser, C. A., Kriger, M., Scott, M. P., Zipursky,S.L. and Darnell, J. (2004) Molecular Cell Biology, 5th Edition W.H. Freeman and Company, New York.
- Primrose, S.B. , Twyman R.M. and Old R.W. (2001) Principles of Gene manipulation, 6th Ed. Blackwell Scientific Publication, Oxford, U.K.
- Waston J.D., Tooze J. and Kurtz, D.T. (1991) Recombinant DNA. A short course 2nd Ed., W.H. Freeman and Company , New York
- Weaver, R.F. (2005) Molecular Biology,

10
MSC (HONS) ZOOLOGY (FYIC) (CBEGS)
(FOR OLD STUDENTS)

SEMESTER-III

ZOP 224: Zoology Lab-III

Credit:- 0-0-3

1. Karyotyping of a Human Cell.
2. To study the pedigree analysis of a family
3. Numericals on mendel's laws of heredity and linkage, crossing over.
4. Demonstration of Barr body in the oral epithelium of human beings.
5. To study blood group in man
6. To perform dermatoglyphics
7. To study some inherited human characters.
8. To determine clotting time and bleeding time.
9. To estimate the heart beat using sphigmomanometer before and after exercise.
10. To determine Hb. content in the blood sample.

11
MSC (HONS) ZOOLOGY (FYIC) (CBEGS)
(FOR OLD STUDENTS)

SEMESTER-IV

ZOL 256: Embryology

Credit 2-1-0

Max. Time: 3hrs

Max. Marks: 100

Mid Semester Exam: 20% Weightage

End Semester Exam: 80% Weightage

Instructions to the paper setters:

The question paper shall consist of 8 questions of equal marks. Two questions shall be set from each section (A-D). A question may have sub sections(not exceeding 4) with appropriate allocation of marks. The candidates shall be asked to attempt five questions by selecting at least one question from each section. The fifth question may be attempted from any section

Section A

Introduction: Historical perspective and basic concepts of embryology

Gametogenesis: Spermatogenesis and oogenesis, Types of eggs, egg membranes, polarity of egg

Section B

Fertilization (External and internal), Changes in gametes, Blocks to Polyspermy, Parthenogenesis, Planes and Patterns of cleavage, Types of Blastula, Fate maps

Section C

Gastrulation: Major events during gastrulation in Amphibia, birds and mammals.

Morphogenetic moments, Germinal layers and their fate

Section D

Foetal membranes, their formation and role

Embryonic nutrition: Modes of embryonic nutrition

Developmental constraints: Physical, Morphogenetic, Phylatic, Environmentally induced Phenotypes

Suggested Reading Material

- Balinsky, B. I. (1981), An introduction of Embryology, Saunders, Philadelphia.
- Bellairs, R. (1971), Development Processes in Higher Vertebrates, University of Miami Press , Miami.
- Berril, N. J. (1971), Development Biology. McGraw Hill, New Delhi.
- Dawnpart, Development Biology.
- Ebert, J. D. & Sussex , I. M. (1970), Interacting Systems in Development, Holt, Rinehart and Winston, New York.
-

MSC (HONS) ZOOLOGY (FYIC) (CBEGS)
(FOR OLD STUDENTS)

SEMESTER-IV

- Elder, K. and Dale, B.(2001). In vitro fertilization 2nd edition. Cambridge University Press, Cambridge.
- Gilbert, S.F. (2015), Developmental Biology, Sinauer – associates, Inc. USA.
- Goel, S. C (1984), Principles and Animal Developmental Biology, Himalaya, Bombay.
- Grant, P. (1978). Biology of Developing System.
- Jangir, O.P. (2005). Developmental Biology. A manual. Agrobios (India)
- Karp, G. & Berrill, M. J. (1981), Development McGraw Hill, New Delhi.
- Loomis, W. F. (1986), Developmental Biology Macmillan, New York.
- Miller, W. A. (1986), Developmental Biology Springer Verlag, New York, Inc.
- Oppenheimer, J. M. and Willer , B. H. (1964), Foundation of Experimental Embryology, Prentice – Hall, New Delhi.
- Pritchard, D. J. (1986), Foundation of Development Genetics, Taylor and Francis, London.
- Saunder, J. W. (1982), Developmental Biology, Patterns, Principles, Problems, MacMillan, New York.
- Spratt, N. T. Jn. (1971), Developmental Biology. Macmillan, New York.
- Waddigton, C. H. (1966), Principles of Development and Differentiation. Macmillan, New York.

13
MSC (HONS) ZOOLOGY (FYIC) (CBEGS)
(FOR OLD STUDENTS)

SEMESTER-IV

ZOL 257: Bio Molecules

Credit 3-1-0

Max. Time: 3hrs

Max. Marks: 100
Mid Semester Exam:20%Weightage
End Semester Exam:80%Weightage

Instructions to the paper setters:

The question paper shall consist of 8 questions of equal marks. Two questions shall be set from each section (A-D). A question may have sub sections(not exceeding 4) with appropriate allocation of marks. The candidates shall be asked to attempt five questions by selecting at least one question from each section. The fifth question may be attempted from any section

Section A

Chemistry of Life

Water as an essential substance for life
Atoms and Molecules (Types of bonds and interaction)

Section B

Amino Acids- Classification of amino acids, Amphoteric amino acids, Acid base properties of amino acids, primary, secondary, tertiary

Peptides: Ionisation behavior of peptides

Proteins: Structural and functional proteins, levels of proteins structural and quaternary structure

Section C

Carbohydrates: Mono, di and poly saccharides

Lipids: Storage and structural lipids

Lipids as signals, cofactors and pigments

Section D

Nucleotides and Nucleic acids

Nucleic acids types

Chemistry of nucleic acids

Functions of nucleotides and nucleic acids

14
MSC (HONS) ZOOLOGY (FYIC) (CBEGS)
(FOR OLD STUDENTS)

SEMESTER-IV

Suggested Reading Material

- Abeles, R.H., Fray, P.A. and Jencks, W.P. (1992) Biochemistry, Jones and Bartlett Publishers, London.
- Berg, J. M., Tymoczko, J.L. and Stryer (2002) Biochemistry (5th Ed.) W.H. Freeman and Co., NY.
- Cohn, E.E., Stump.P.K., Bruening , G. and Doi, R.H. (1987) Outlines of Biochemistry (5th Ed)Johan Wiley & Sons, NY.
- Elliott, W.H. and Elliot, D.C. (2001) Biochemistry & Molecular Biology (Second Edition) Oxford University Press, New York.
- Horton , H.R., Moran, L.A., Ochs, R.S. Rawn, J.D. and Scrimgeour, K.G. (2002) Principles of Biochemistry (3rd Ed.) Prentice Hall Upper Saddle River N.J. 07458.
- Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W(2009) Harper's Illustrated Biochemistry (Twenty Sixth Edition) Mc Graw Hill.
- Nelson, David L. and Cox, Michael M. (2000). Lehninger Principles of Biochemistry (3rd Edition) Mc Millan Worth Publishers.
- Rawn, J.D. (1983) Biochemistry. Harper and Raw Publishers, New York.
- Vasudevan, D. M. and Sree Kumari, S. (2001) Text Book of Biochemistry (3rd Ed.) Jaypee Brothers Medical Publisher (P) Ltd. New Delhi.
- Voet, D. and Voet, J.G. (2015) Biochemistry (4th Ed.) John Wiley and Sons, NY.
- Zubay, G. (1998). Biochemistry (4th Edition) Wm.C. Brown Publishers, USA.

15
MSC (HONS) ZOOLOGY (FYIC) (CBEGS)
(FOR OLD STUDENTS)

SEMESTER-IV

ZOP 271: Zoology Lab-IV

Credit:- 0-0-3

1. To study permanent slides of T.S. Ovary and T.S. Testis.
2. To study the life cycles of different animals through models/charts/preserved specimens
3. To analyse carbohydrate content in a given sample.
4. To analyse lipid content in a given sample.
5. To study protein content of a given sample.