

Use of microorganisms:

1. Recovery of Metals.
2. Recovery of Petroleum.
3. Production of Fuels.
4. Production of microbial biomass.
5. Microbial control of pests.

M.Sc. ZOOLOGY IV SEMESTER

ELECTIVE GROUP D (SPECIAL PAPER)

ZOL 4DD3: ENVIRONMENTAL BIOLOGY

ENVIRONMENTAL EDUCATION, MANGEMENT AND REGULATIONS

Max. Marks: 100

Total Hours: 60

UNIT-I

Environmental education:

1. Knowledge about the environment, knowledge about humanity- environment relationship.
2. Knowledge about Environment and population growth, knowledge about the solution and prevention of environmental problems, rational use of resources.
3. Environmental education- goals, objectives, guided principles.
4. Strategies for environmental education- Authorisation, Curriculum renewal, teacher's training renewal, teaching methods, evaluation.
5. Models for future environmental education system.

UNIT-II

Environmental institutions and international cooperation:

1. Environmental Institutions, International Union for Conservation of Nature and Natural Resources (IUCN), World Wildlife Fund (WWF), US Environmental Protection Agency (EPA).
2. Global Environmental Agreements, Institutions of climate change, Indian Environmental Institutions, Central Pollution Control Board (CPCB).
3. Environmental Policies in India, Environmental Laws/Acts, National Environmental Tribunal Bill, 1992.
4. Environmental movements in India- The Chipko movement, Silent Valley movement, Appiko movement, Narmada Bachao Andolan, Teri Dam Conflict.

UNIT-III

Environmental laws:

1. Environmental Legislation status in India.
2. The Water (Prevention and Control of Pollution) Act, 1974.
3. The Air (Prevention and Control of Pollution) Act, 1981.
4. The Environment (Protection) Act, 1986.
5. The Biological Diversity Act, 2002.
6. The Wildlife (Protection) Act, 1972.

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7. Bio-Medical Waste (Management and Handling) Rules, 1998.

UNIT-IV

National and international regulatory organizations:

1. MoEF (Ministry of Environment And Forests), ZSI (Zoology Survey of India) WII (Wild life Institute of India), Bombay Natural History Society (BNHS).
2. Zoo Authority of India (ZAI), Salim Ali Centre for Ornithology & Natural History (SACONH), Indira Gandhi Conversation and Monitoring Centre (IGCMC), National Biodiversity Authority (NBA), Animal Welfare Board of India (AWBI), Centre for Environment Education (CEE).
3. WWF (World Wildlife Fund), UNEP (United Nations Environment Programme), CITES (Convention on International Trade of Endangered Species).
4. World Heritage and Biodiversity Convention, UNESCO (United Nations Educational, Scientific and Cultural Organization).
5. Ramsar (Wetland) sites in India and Ramsar convention.

PRACTICALS:

1. Measurement of particulate air pollutants, dust fall and suspended particulate matter from different sites.
2. Measurement of Noise pollution of different areas.
3. Water Quality Analysis: Determination pH, Electrical conductivity, Alkalinity, Salinity, Hardness, Nitrate, Phosphate, Silica and fluoride.
4. Determination of total suspended and dissolved solids/salts (TSS &TDS).
5. Toxicity Analysis of Water: For Chlorine, H₂S, Ammonia, Copper and Chromium.
6. Estimation of BOD and COD of polluted water.
7. Determination of LC₅₀ for fish (pesticide) using Probit analysis (use of appropriate software is suggested).
8. Study of Histo-pathological changes in any two of the tissues (Liver/ Kidney/ Gonad) using pesticide/heavy metal/nanoparticle.
9. Isolation and Enumeration of microorganisms in soil, water and air.
10. Bacteriological quality testing of water and wastewater: (a). Presumptive coliform test (MPN Index), (b). Confirmatory coliform test, Completed test.
11. Boric acid test for turmeric in chilly and coriander powder.
12. Detection of Lead chromate in chilly, and turmeric powder.
13. Detection of Colophony resin in Asafoetida.
14. Detection of cane sugar in milk.
15. Detection of starch and cellulose in milk.
16. Detection of added Glucose in milk and milk powder.
17. Foreign vegetable fats in milk.
18. Standard Plate Count in milk.
19. Study of water borne diseases.
20. Case studies on oil pollution and nuclear reactor disasters (At least one each).
21. Project work: To locate and describe water harvesting system like tanka/bavri in and around Jaipur and physicochemical and microbiological analysis of their water. (This can be done as part of the three / four day field study compulsory for this elective).
22. Visit to Institutions engaged in environmental management/Toxicology research and an industrial /polluted area. Report the study conducted and submit a write up/ print out

giving the dates, methodology, results and references. Include photographs of the activity.

SUGGESTED BOOKS:

1. Environmental Microbiology: Maier, R.M, Pepper, I. L., Gerba, C. P.
2. The Basic Science of poisons. Casarett & Doull's Toxicology: Curtis Klassen.
3. Biotechnology: Applying the Genetic Revolution, Clark, D. P. & Tazdemik, N. J..
4. Principle of Environmental Science, Cunningham, W.P. & Cunningham, M...
5. Microbiology Fundamentals and Application, Purohit, S. S.
6. Microbial Biopesticides, Koul, O & Dhaliwal, G. S.
7. Bioremediation Technology, Fulekar, M. H.
8. Biotransformation: Bioremediation Technology for Health & Environmental Protection, Stapleton Jr., R. D. & Singh, V. P. Elsevier.
9. Methods of analysis for Adulterants and Contaminants in foods. Toteja, G.S., Mukherjee, A., Mittal, R., Saxena, B. N. Indian Council of Medical Research, New Delhi.
10. Environmental pollution-Health and Toxicology. Rana, S. V. S. Narosa Publishing House, New Delhi.
11. Fundamentals of Toxicology. Pandey, K., Shukla, J. P., Trivedi, S. P. New Central Book-Agency (P) Ltd. Kolkata.
12. APHA-AWWA-WPCF, 1989. Standard Methods for the Examination of water and Waste water. (17th edn.). Publishers.
13. Principles of Ecotoxicology. Butter, G.C. 1988. John Wiley and Sons.
14. Basic Environmental Toxicology. Cockerham, G.L. and Shane, B.S. 1994. (Eds.). CRC Press.
15. Environmental Radioactivity. Eisenbude, M. 1998. Academic Press, NY.
16. Chemistry of Pollution. Fellenberg, G. 1999. John Wiley and Sons, New Delhi.
17. Principles and Methods of Toxicology. Hayes, W.A. 2001. CRC Press, NY.
18. Methods of Air sampling and Analysis (3rd Edn.). James, P. Lodge, J.R., JSc Lewis Pub., INC.
19. Essentials of Toxicology. Klaassen, C.D and J.B. Walkins. 2003. Mc Graw -Hill Professional New Delhi.
20. Toxicology- Principles and Applications. Niesink, R.J.M., De Vries, J. and Hollinger, M.A. 1996. (Eds.). CRC Press.
21. Toxicity of Heavy Metals in Environment. Oehme, W.F. 1989. Marcel DAKKAR Inc., New York.
22. Waste Water Engineering Including Air Pollution. Purnima, B.B., A.K. Janin and Arun K. Jain. 2011. Laxmi Publications (P) Ltd. New Delhi.
23. Biological aspects of Water Pollution. Wilber, C.G. 1989. Charles C. Thomas Publishers, Illinois, USA.
24. EIA for Developing Countries. Asit K. Biswas et al., 1987, United Nations University, Tokyo.
25. Environmental Impact Assessment. Carter, L. 1996. McGraw Hill, New Delhi.
26. Microbial Ecology: Fundamentals and Applications. Ronald M. Atlas, Richard Bartha. Benjamin/Cummings.

ZOL 412D: PRACTICAL-VIII

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Scheme for Practical Examination
(Based on ZOL 4D01, ZOL 4D02 and ZOL 4D03)

Max Marks: 100

Time: 4 hrs

1. Major Exercise	26
2 (a) Minor Exercise	10
(b) Minor Exercise	10
3. Spotting (8 × 3)	24
4. Seminar	10
5. Viva Voce	10
6. Record	10

Notes:

1. It should be ensured that animals used in the practical exercises are not covered under the Wildlife act 1972 and amendments made subsequently.

M.Sc. ZOOLOGY IV SEMESTER

ELECTIVE GROUP E (SPECIAL PAPER)

ZOL 4E01: REPRODUCTIVE BIOLOGY

PHYSIOLOGY OF REPRODUCTION

Max. Marks: 100

Total Hours: 60

UNIT-I

Fertilization:

1. Prefertilization events,
2. Biochemistry of fertilization
3. Post-fertilization events
4. Capacitation.

UNIT-II

Implantation:

1. Implantation, decidual changes
2. Hormonal regulation,
3. Delayed implantation

Placenta as endocrine tissue: foeto-placental unit.

UNIT-III

Gestation:

1. Physiological changes
2. Pregnancy tests
3. Hormonal regulation.


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Parturition:

1. Onset of parturition
2. Hormonal control of parturition.

Lactation:

1. The mammary gland
2. Hormonal control of lactation.

UNIT-IV

Miscellaneous factors affecting reproduction:

1. Nutrition and reproduction
2. Effect of light, temperature
3. Environmental disruptors
4. Change of lifestyle.

M.Sc. ZOOLOGY IV SEMESTER

ELECTIVE GROUP E (SPECIAL PAPER)

ZOL 4 E02: REPRODUCTIVE BIOLOGY

CONTRACEPTION AND REPRODUCTIVE HEALTH

Max. Marks: 100

Total Hours: 60

UNIT-I

Fundamental aspects of control of fertility in males:

1. Mechanical
2. Surgical
3. Chemical
4. Immunological methods.

UNIT-II

Fundamental aspects of control of fertility in females:

1. Natural.
2. Mechanical.
3. Surgical.
4. Chemical.
5. Immunological.
6. Emergency contraception.

UNIT-III

Sexually transmitted diseases: Pathophysiology, diagnosis, mprevention, treatment of

1. Bacterial diseases(Syphilis. Gonorrhoea)
2. Viral (AIDS)

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3. Fungal (Candidiasis)
4. Protozoan (Trichomoniasis)

Hormones and cancer:

1. Definition of cancer
2. Benign and malignant tumor
3. Types of cancer: Prostate, cervical, breast, testicular and ovarian cancers
4. Cancer problem in India
5. Hormones and cancer

UNIT-IV

Teratological effects of Xenobiotics.

Demography:

1. Population growth rate
2. National population policy
3. Pearl Index
4. Family welfare programmes

M.Sc. ZOOLOGY IV SEMESTER

ELECTIVE GROUP E (SPECIAL PAPER)

ZOL 4 E03: REPRODUCTIVE BIOLOGY

REPRODUCTIVE TECHNOLOGIES

Max. Marks: 100

Total Hours: 60

UNIT-I

Reproductive dysfunctions in males and females:

1. Endocrinological
2. Physiological
3. Anatomical
4. Congenital
5. Idiopathic factors

Diagnosis of male infertility:

1. Semen analysis: Physical examinations, microscopic examinations, biochemical analysis, Immunological tests.
2. Sperm functional tests: Zona binding assays, hamster-oocyte penetration test, Hypo-osmotic swelling test, acrosome reaction, Acrosome intactness test, Nuclear chromatin decondensation test, Sperm mitochondrial activity index test.
3. Endocrinological diagnosis.

UNIT-II

Diagnosis of female infertility:

1. Monitoring of ovarian and reproductive cycles.
2. Endometrial biopsy.
3. Ductal blockage.
4. Endocrine diagnosis

Assisted reproductive technology (ART):

1. Artificial insemination
2. Super ovulation, oocyte collection.
3. Collection and preparation of sperm for assisted fertilization.
4. In vitro fertilization and related techniques (IVF, GIFT, ZIFT, TET, ICSI etc.).
5. Ethical issues and regulatory guidelines

Cryopreservation:

1. Semen,
2. Oocytes
3. Embryos

UNIT-III

1. Animal cloning.
2. Sperm and embryo sexing.

Animal husbandry:

1. Improvement of breeds of farm animals
2. Artificial insemination and embryo transfer technique
3. Transgenic animals.
4. Induction of early puberty in cattle

UNIT-IV

Pre-natal diagnosis of genetic diseases.

Hormonal bioassay: Principles, Procedure and applications of hours

1. ELISA
2. Radio immunoassay (RIA)
3. Radioreceptor binding assay
4. Immuno-cytochemistry.

PRACTICALS

1. Surgical procedure in reproduction:
 - (i) Castration,
 - (ii) Ovariectomy,
 - (iii) Adrenalectomy
 - (iv) Vasectomy
2. Biochemical investigation of marker parameters.
3. Induction of superovulation and collection of oocytes.
4. Hormonal bioassays estrogens & androgen.
5. Pregnancy test.
6. Biochemical investigations of the reproductive glands with special reference to their markers. Fructose, glycogen, cholesterol, Acid & Alkaline phosphatase.

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7. Electrophoresis: Study of protein profile in epididymic fluid.
8. Demonstration of *in vitro* fertilization (GIFT, ZIFT, TET, ICSI, etc.).
9. Immunoassays: RIA, ELISA.
10. Visit to State and National laboratories /Institute

SUGGESTED BOOKS

1. Reproduction in Domestic animals. Cole, H. H. and Cupps P. T. Academic Press, New York.
2. Male Fertility and Infertility, Clover TD. and Barratt C.L.R. Cambridge University Press, Cambridge, 1999.
3. Biology of Human Reproduction. Pinon, Jr. R. University Science Books California, 2002.
4. The Reproductive Physiology of Mammals: From Farm To Field And Beyond, Keith K. Schillo Cengage Delmar Learning 2008.
5. Assisted Reproductive Technology: A Reference Book on A.R.T., Philippe Merveil Eska Publishing, 2010.
6. Reproductive Endocrinology & Infertility, Daftary & Patki BI Publications Pvt Ltd, 2009.
7. Reproductive Endocrinology and Infertility: Integrating Modern Clinical and Laboratory Practice, Douglas T. Carrell Springer, 2010.
8. Andrology: Male Reproductive Health and Dysfunction, Eberhard Nieschlag, Hermann M. Behre, Susan Nieschlag Springer, 2010.
9. Reproductive Endocrinology: A Molecular Approach, Pedro J. Chedresespringer, USA, 2009.
10. Hormonal Contraception: Birth Control, Endocrine System, Steroid Hormone, Frederic P. Miller, Agnes F. Vandome, John McBrewster Alphascript Publishing, 2010.
11. Hormonal contraception, Ronald T. Burkman, Steven G. Gabbe Wolter Kluwer ; Lippincott Williams & Wilkins, 2007.
12. Text Book on Sexually Transmitted Diseases and AIDS by IASSTD & AIDS, Vinod K Sharma, Rishi Bhargava and N. Usman VIVA BOOKS PVT. LTD, Jaipur
13. Sexually transmitted diseases: epidemiology, pathology, diagnosis, and treatment By Kenneth A. Borchardt, Michael A. Noble CRC Press, 1997.
14. Sexually transmitted diseases, Louise I. Gerdes Greenhaven Press, 2002.
15. Reproductive Biotechnology of Farm Animals, Dugwekar Vg Agrotech Publishing Academy, 2006.
16. Biotechnology of human reproduction, Alberto Revelli, Ilan Tur-Kaspa, Jan Gunnar Holte Parthenon Pub. Group, 2003.
17. Menopause: Biology and Pathobiology, Lobo, Rogerio A. Academic Press 2000.
18. Dynamics of human reproduction: biology, biometry, demography, James W. Wood Transaction publishers 1994.
19. Introduction To Endocrinology, Negi PHI Learning Pvt Limited, New Delhi, 2009.
20. The Reproductive System, Kara Rogers (Ed.) Britannica Educational Publishing, 2010.
21. WHO. Laboratory manual for the examination of human semen and sperm-cervical mucus interaction. Cambridge: Cambridge University Press; 1999 & 2010.


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