

## FOUNDATIONS OF DEVELOPMENTAL BIOLOGY

### THEORY

(48 Periods)

#### **Unit 1: Historical Background of Developmental Biology**

(4)

Chief events in animal development, Epigenesis, Preformation, Experimental embryology, Induction, Differentiation, Growth and differential gene expression

#### **Unit 2: Early Growth and Development of the Embryo**

(20)

Formation of gametes: Spermatogenesis, Oogenesis

Egg types, Egg envelopes, Fertilization: Sperm egg interaction, egg activation, prevention of polyspermy, fusion of male and female pronuclei, post-fertilization metabolic changes

Cleavage: Different planes and patterns; morula and blastula; Development of frog and chick up to gastrulation; Fate maps; Embryonic induction

#### **Unit 3: Post Gastrulation Development**

(9)

Fate of germ layers, Embryonic adaptations: Extra-embryonic membranes in birds, placenta in mammals (Structure, types and functions of placenta)

#### **Unit 4: Later Part of Ontogenesis**

(9)

Amphibian metamorphosis: Metamorphic changes and hormonal regulation; Regeneration: Types of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each)

#### **Unit 5: Medical Implications of Development**

(6)

Teratogenesis: Effect of teratogens on development of embryo, stem cells and potential therapies

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## PRACTICAL

1. Study of whole mounts and sections of developmental stages of frog through permanent slides: Cleavage stages, blastula, gastrula, neurula, tail buds stage, tadpole (external and internal gill stages)
2. Study of whole mounts of developmental stages of chick through permanent slides: Primitive streak (18 h), 24, 33, 48, 72 and 96 hours of incubation (Hamilton and Hamburger stage).
3. Study the developmental stages and the life cycle of *Drosophila* from the stock culture.
4. Study of different types of placenta

**\* Project Report on *Drosophila* culture**

## ESSENTIAL READINGS

- Gilbert, S. F. (2010). *Developmental Biology*, IX Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
- Balinsky B. I. and Fabian B. C. (1981). *An Introduction to Embryology*, V Edition International Thompson Computer Press.
- Kalthoff, (2008). *Analysis of Biological Development*, II Edition, McGraw-Hill Professional.

## SUGGESTED READINGS

- Wolpert L. (2002). *Principles of Development*. II Edition, Oxford University Press.