

# DEVELOPMENTAL BIOLOGY

## Paper 14

### THEORY

(48 Periods)

#### Unit 1: Introduction

(5)

History and basic concepts: Epigenesis, preformation, Mosaic and regulative development; Discovery of induction, Cell-Cell interaction, Pattern formation, Differentiation and growth, Differential gene expression, Cytoplasmic determinants and asymmetric cell division, Reliability of development: Redundancy and negative feed-back.

#### Unit 2: Early Embryonic Development

(20)

Gametogenesis, Spermatogenesis, Oogenesis; Types of eggs, Egg membranes; Fertilization: Changes in gametes, monospermy and polyspermy; Planes and patterns of cleavage; Early development of frog and chick up to gastrulation; Fate maps; Embryonic induction and organizers

#### Unit 3: Late Embryonic Development

(8)

Fate of Germ Layers; Extra-embryonic membranes in birds; Implantation of embryo in humans, Placenta (Structure, types and functions of placenta)

#### Unit 4: Post Embryonic Development

(8)

Metamorphosis: Changes, hormonal regulations in amphibians; Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each); Ageing: Concepts and models

#### Unit 5: Implications of Developmental Biology

(7)

Teratogenesis: Teratogenic agents and their effects on embryonic development; *In vitro* fertilization, Stem cell culture, Amniocentesis.

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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-bud stage, tadpole (external and internal gill stages)
2. Study of whole mounts of developmental stages of chick through permanent slides: Primitive streak (13 and 18 hours), 21, 24, 28, 33, 36, 48, 72, and 96 hours of incubation (Hamilton and Hamburger stages)
3. Study of developmental stages (above mentioned) by raising chick embryo in the laboratory.
4. Study of the developmental stages and life cycle of *Drosophila* from stock culture
5. Study of different types of placenta
6. Project report on *Drosophila* culture/chick embryo development

### 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 Publishers.

### SUGGESTED READING

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