Chapter 1

Introduction

VIVA VOCE

Q. 1 Define growth, differentiation, undifferentiated cells, phases of prenatal and postnatal periods, Naegele's formula, organizer, and induction.

- *Growth* is a mere increase in the number and size of cells.
- *Differentiation* is a process of cell transformation to acquire specific character and function.
- Zygote divides to form many undifferentiated cells as follows:
  1. Totipotent cells: Cells of zygote or morula can form all differentiated cell types of an organism. These are called totipotent cells.
  2. Pluripotent cells: For example, inner cell mass of blastocyst can form all types of differentiated cells of an organism except placenta.
  3. Multipotent cells: For example, adult stem cells can form more than one cell type.
- *Prenatal period* is divided into:
  1. *Germinal/ovular period*: First 2 weeks of development after fertilization.
  2. *Embryonic period*: From third to eighth week of development.
  3. *Fetal period*: From third month till the termination of pregnancy.
- *Postnatal period* is divided into the following phases:
  1. *Neonatal period*: First 28 days after birth.
  2. *Infancy*: From 1 month till 1 year of age.
  3. *Childhood*: From 1 to 12 years of age.
- *Naegele's formula*

  Expected date of delivery (EDD) = First day of LMP + 9 months + 7 days = First day of LMP + 280 days
- *Organizer* is a cluster of cells in developing embryo that can determine differentiation of other regions. Primary organizer is a dorsal lip of blastopore that is self-differentiating and its removal results in total failure of embryonic development. Influence of an organizer on another area of development is called *induction*. Inductors are substances that exert the same effects as that of organizer.

Some Interesting Facts

- Humans are eutherian or placental mammals.
- Development of a human from a single-cell stage of life involves growth and differentiation.
- Gestational age is measured from the beginning of woman's last menstrual period (LMP).
- Fertilization or conceptional age is measured from the time of fertilization. Fertilization age is 2 weeks lesser than the gestational age.
- Expected date of delivery can be determined by counting 280 days after the first day of last menstrual period (LMP) or 266 days after conception.

Q. 2 What is mitosis and its significance?

- *Mitosis*: Mitosis is a cell division that maintains constant number of chromosomes in parent and offspring cells.
- *Significance of mitosis*
  1. It helps in development and growth of an organism.
  2. It helps in replacing the damaged body cells.
  3. It contributes to replace old body cells.
  4. It produces two daughter cells that are genetically identical to the parent cells.

Q. 3 What is meiosis and its significance?

- *Meiosis*: Meiosis is the cell division that helps in the formation of gametes with haploid number of

chromosomes. Meiosis consists of two cell divisions as first meiotic and second meiotic divisions.

- *Significance of meiosis*
  1. Formation of gametes is the prime aim of meiosis.
  2. Meiosis helps to maintain constant chromosome number during sexual reproduction.
  3. Exchange of maternal and paternal genes that are carried by homologous chromosomes takes place.
  4. Meiosis (crossing over) helps to maintain genetic diversity and mixing of characters.

Multiple Choice Questions

Q. 1 The cells that can form all differentiated cell types of an organism are called:

A. Totipotent cells
B. Pluripotent cells
C. Multipotent cells
D. Oligopotent cells

Q. 2 Germinal or ovular period lasts for _____ of development after fertilization.

A. First 2 weeks
B. First 4 weeks
C. First 8 weeks
D. First 12 weeks

Q. 3 Fetal period extends:

A. For first 4 weeks after fertilization
B. From 4th week to the first three months of pregnancy
C. From third month till the termination of pregnancy
D. For last three months of the pregnancy

Q. 4 Neonatal period extends for first _____ days after birth.

A. 7
B. 14
C. 28
D. 30

Q. 5 Fertilization age is _____ weeks lesser than the gestational age.

A. 1
B. 2
C. 3
D. 4

Q. 6 Naegele's formula states expected date of delivery = First day of LMP + _____ days.

A. 220
B. 240
C. 260
D. 280

Q. 7 Y chromosome is _____.

A. Metacentric
B. Submetacentric
C. Acrocentric
D. Telocentric

Q. 8 Significance of mitosis is all *EXCEPT*:

A. Mitosis is a cell division that maintains a constant number of chromosomes in parent and offspring cells.
B. It helps in the development and growth of an organism.
C. It produces 8 daughter cells that are genetically identical to the parent cells.
D. It helps in replacing the damaged body cells.

Q. 9 Formation of mitotic spindle is the feature of _____.

A. Prophase
B. Metaphase
C. Anaphase
D. Telophase

Q. 10 All of the following are true about mitosis *EXCEPT*:

A. It is an equational division.
B. Two daughter cells are formed.
C. No crossover of genetic material takes place.
D. Chiasmata formation takes place in metaphase.

Q. 11 All of the following are true about meiosis *EXCEPT*:

A. It is a reductional division.
B. Crossover of genetic material takes place.
C. Chiasmata formation takes place in metaphase.
D. Two daughter cells are formed.

Q. 12 Tetrad chromosomes are seen in:

A. Leptotene
B. Zygotene
C. Pachytene
D. Diplotene

Q. 13 Crossing over takes place during:

A. Leptotene
B. Zygotene
C. Pachytene
D. Diplotene

Q. 14 Diplotene and zygotene stages are seen in:

A. Prophase
B. Metaphase
C. Anaphase
D. Telophase

Q. 15 What is the significance of meiosis?

A. Formation of gametes is the prime aim of meiosis.

B. Meiosis helps to maintain constant chromosome number during sexual reproduction.

C. Meiosis (crossing over) helps to maintain genetic diversity and mixing of characters.

D. All of the above

Q. 16 Which of the following is primary organizer?

A. Neutral tube B. Notochord

C. Primitive streak D. None of the above

Q. 17 In cell cycle, S phase is followed by:

A. G0 phase B. G1 phase

C. G2 phase D. M phase

Q. 18 Which of the following is an example of non-disjunction?

A. Down syndrome

B. Klinefelter syndrome

C. Turner syndrome

D. All of the above

Answers

Reference: *Textbook of Human Embryology*, 2/e, Yogesh Sontakke.

1. A. Totipotent cells (*Ref*: Page 2)
2. A. First 2 weeks (*Ref*: Page 2)
3. C. From third month till the termination of pregnancy (*Ref*: Page 2)
4. C. 28 (*Ref*: Page 2)
5. B. 2 (*Ref*: Page 3)
6. D. 280 (*Ref*: Page 3)
7. C. Acrocentric (*Ref*: Page 3)
8. C. It produces 8 daughter cells that are genetically identical to the parent cells (*Ref*: Page 4)
9. B. Metaphase (*Ref*: Page 5)
10. D. Chiasmata formation takes place in metaphase (*Ref*: Page 5)
11. D. Two daughter cells are formed (*Ref*: Page 5)
12. B. Zygotene (*Ref*: Page 5)
13. C. Pachytene (*Ref*: Page 5)
14. A. Prophase (*Ref*: Page 5)
15. D. All of the above (*Ref*: Page 6)
16. C. Primitive streak (*Ref*: Page 6)
17. C. G2 phase (*Ref*: Page 6)
18. D. All of the above (*Ref*: Page 6)