Question-1

What do you mean by cell reproduction?

Solution:

A new cell arises by the division of pre-existing cells. The growth and development of a living being is dependent on the division of cells. The single-celled zygote, by means of cell division, develops into an adult having a large number of cells. This is otherwise called cell reproduction.

Question-2

What do you understand by mitosis?

Solution:

Mitosis is a type of cell division, characterized by some complicated changes that force nuclear division. It is a continuous and regular process consisting of prophase, metaphase, anaphase and telophase. The number of chromosomes in the two daughter cells remains the same.

Question-3

What are mitogens?

Solution:

Mitogens are chemicals which stimulate mitosis cell division.

Question-4

How does growth occur in an organism?

Solution:

Growth can be defined as an irreversible phenomenon in which increase in the size of dry weight occurs in the organism during the course of its development. Growth involves important processes like cell division and assimilation. The basis of growth is cell division in all multicellular organisms. As a result of cell division, the number of cells increases in the body. But growth can occur only when the new cells formed as a result of cell division are in a position to absorb and assimilate food or are able to synthesize new protoplasm from materials surrounding them. When this happens, the cells expand and increase in size and volume. When these cells reach their optimum size, they again divide to produce new cells. In this way growth occurs in organisms.

Question-5

Write one point of difference between chromatin and chromatid.

Solution:

Chromatin	Chromatid
Chromatin is a minute thread-like staining heredity material found in the nucleus of a cell.	Chromatid is defined as a longitudinal half of each chromosome found during prophase.

Question-6

What happens to homologous chromosomes during meiosis?

Solution:

In the leptotene stage of meiosis, the chromosomes are thread-like and coiled. During zygotene, the homologous chromosomes start pairing up. In the pachytene stage, the chromosomes begin to thicken and shorten. Diplotene is marked by the attraction force between two homologous chromosomes. Uncoiling of homologous chromosomes is seen during diplotene stage. The uncoiling of homologous chromosomes tends to separate from each other but remains attached at the chiasmata. During diakinesis, the separation of homologous chromosomes is complete. Exchange of parts between chromatids of homologous chromosomes may take place.

Question-7

Give an account of the different types of meiosis based on the site of occurrence and period.

Solution:

There are three kinds of meiosis

(i) Gametic meiosis, (ii) Sporogenic meiosis and (iii) Zygotic meiosis. These three types have been described in relation to their time and place of occurrence.

(i) Gametic meiosis

It occurs in some lower plants and all animals during the formation of gametes or gametogenesis. The male and female haploid gametes fuse to form a diploid zygote. The zygote divides by mitosis and gives rise to a diploid adult.

(ii) Sporogenic meiosis

The diploid spore mother cells form haploid spores through meiosis. It is referred to as intermediate meiosis and occurs in some lower and higher plants. A gametophyte is produced by the germination of spores. The haploid gametophyte gives rise to a haploid gamete by mitosis. These gametes unite to form a diploid zygote and a diploid sporophyte is developed from the zygote.

(iii) Zygotic meiosis

The examples of this type of meiosis are some protozoa and lower plants like fungi. The haploid adult produces haploid gametes by mitosis. By fertilization of these gametes, a diploid zygote is produced. The diploid zygote through meiosis and mitosis produces a haploid adult.

Question-8

At which stage of meiosis does crossing over of genetic material take place?

Solution:

In meiosis, crossing over of genetic material takes place during the diplotene sub-stage of prophase I.

Question-9

What are interzonal fibres?

Solution:

In metaphase I, the protein fibres are formed in between the centromeres of the homologous chromosomes. These are called interzonal fibres.

Question-10

Name the chemical that arrests cell division in the cell.

Solution:

Colchicine is the chemical that arrests cell division in the cell.

Question-11

Name three events, which are responsible for genetic consequence during meiosis.

Solution:

The three events, which are responsible for genetic consequence during meiosis, are

(i) The pairing of homologous chromosomes.

(ii) The process of crossing over and recombination.

(iii) Segregation of homologous chromosomes.

Question-12

How does gametic meiosis differ from zygotic meiosis?

Solution:

Gametic meiosis	Zygotic meiosis
It is called terminal meiosis.	It is called initial meiosis.
The diploid adult forms gametes, which are haploid by meiosis.	The diploid zygote divides by meiosis known as zygotic meiosis.
Example for gametic meiosis is lower plants and animals.	Example for zygotic meiosis is algae and protozoa.

Question-13

Write three opportunities for large-scale recombination of genetic information.

Solution:

In sexual reproduction there are three opportunities for large-scale recombination of genetic information. They are,

(i) Fertilization when genetic information from two different parents is combined in a new individual.

(ii) Crossover when genetic information on maternal and paternal chromosomes can be exchanged.

(iii) Independent assortment when the maternal and paternal chromosomes in the cell are mixed in a variety of new combinations.

Question-14

Which structure of animal cell forms the asters of spindle fibre?

Solution:

The centrosome is the structure of animal cell that forms the asters of spindle fibre.

Question-15

What is a kinetochore?

Solution:

A part of the chromosome for the attachment of chromosomal fibres is called kinetochore.

Question-16

Name the method by which cytokinesis takes place in plant cell.

Solution:

Cytokinesis takes place in plant cell by the formation of cell plate.

Question-17

Does cell multiplication include developmental processes associated with growth?

Solution:

Cell multiplication is a simple process of increasing the number of cells by cell division. Hence, it does not include developmental processes associated with growth.

Question-18

Write the three processes which takes place in the interphase.

Solution:

The three processes in interphase are

(i) The replication of DNA with the synthesis of histones and nuclear protein.

(ii) Division of centriole is seen which is to form new centriole that lies at right angle to each other.

(iii) Cells synthesis energy rich compounds to provide energy for the cell divisions.

Question-19

Write a note on pre-mitotic gap period.

Solution:

It is the stage when rate and amount of protein synthesis are maximum. It is the post DNA synthetic phase during which all the metabolic activities are concern with the growth of the organelle. The macromolecules are formed in this phase only. Highly extended chromosome-coiling starts in this phase.

Question-20

Mention the phases of meiosis in which: The chromosome number is reduced to half. DNA amount is reduced to haploid state.

Solution:

(i) Anaphase

(ii) Anaphase II.

Question-21

What are the five phases of mitotic cycle?

Solution:

1. Prophase,

2. Prometaphase,

3. Metaphase,

4. Anaphase,

5. Telophase.

Question-22

At which stage of meiosis crossing over of genetic material takes place?

Solution:

Diplotene substage of prophase I.

Question-23

What are interzonal fibres?

Solution:

In metaphase I stage, the proteins fibres are formed in between the centromeres of homologous chromosomes. They are called interzonal fibres.

Question-24

Name the forces, which help in chromosomal movement during cell division?

Solution:

The chromosome movement if brought about by shortening of spindle fibres attached to the centromere.

Question-25

What is reannealing?

Solution:

Separated chromosome segments get reunited soon by the help of enzyme and it is called re-annealing.

Question-26

What is the importance of chromosome replication during interphase?

Solution:

Interphase. It is "a stage between the two successive cell divisions." It is considered as the resting stage of the nucleus as it does not show any morphological changes. But physiologically it is very active stage in the life of a cell as the cell prepares itself for division and many biochemical changes occur during this stage.

Question-27

Why is meiosis called the reductional division, whereas mitosis is called equational division?

Solution:

In meiosis, the number of chromosomes is reduced to half, so it is called reductional division. The gametes (haploid) are formed in sexually reproducing organisms in germ cells. There are two main stages of meiosis –

(i) Meiosis I and
(ii) Meiosis II.

The stages of Meiosis II are similar to mitosis hence mitosis is called equational division.

Question-28

Supply a specific scientific term for each of the following:

(a) The period between two successive mitotic divisions.

(b) Process of cell division by which the chromosome number is halved.

(c) Point at which two sister chromatids are held together.

(d) Phase in the cell cycle when protein and RNA are synthesized.

(e) Nuclear division.

Solution:

(a) Interphase,
(b) Meiosis,
(c) Centromere,
(d) G1 Phase,
(e) Karyokinesis.

Question-29

What are different ways in which the pairing occurs during zygotene?

Solution:

The three different ways of pairing during zygotene are

Proterminal Pairing: Two homologous chromosomes begin pairing at the ends of terminals, which gradually proceed towards the centromere.

Procentric Pairing: The pairing begins at the centromere and progresses towards the end.

Random (Intermediate Pairing): The pairing may occur at several points towards the end of chromosomes.