

Topic :- Cell Cycle and Cell Division

- 1 **(b)**
Duration of the cell cycle, *i.e.*, period between two successive cell divisions is called generation time. It depends on the type of cell and external factors such as temperature food and oxygen supplies. Mammalian (*e.g.*, human) cell divides once in approximate every 24 hrs
- 2 **(b)**
There are two main ways of cell division *i.e.*, mitosis and meiosis. In each case, division of the nucleus, called karyokinesis, occurs before the division of the cytoplasm, termed as cytokinesis
- 3 **(d)**
All the statements are correct
- 4 **(c)**
During the G_0 -phase, cells are metabolically active but no longer proliferate in normal condition
- 5 **(c)**
In **pachytene** substage of meiosis-I, the paired homologous chromosomes divide into sister chromatids. Thus, each bivalent is composed of four chromatids and known as tetrad.
- 6 **(a)**
The pairing of homologous chromosomes during **zygotene** is called synapsis, *i.e.*, the homologous chromosomes, which come from mother and father paired in zygotene.
- 7 **(a)**
Mitosis usually results in the production of diploid daughter cells with identical genetic complement. The growth of multicellular organisms is due to mitosis. Cell growth results in disturbing the ratio between the nucleus and the cytoplasm. It therefore, becomes essential for the cell to divide to restore the nucleo-cytoplasmic ratio. A very significant contribution of mitosis is cell repair
The cells of the upper layer of the epidermis, cells of the lining of the gut and blood cells are being constantly replaced. Mitotic divisions in the meristematic tissues – the apical and the lateral cambium, result in a continuous growth of plants throughout their life

- 8 **(b)**
Mitosis divides the parent cell into two identical daughter cells, each with a nucleus having the same amount of DNA, the same number and kind of chromosomes and the same heredity instructions as the parent cell, that's why it is called as the equational division
- 9 **(b)**
The complete disintegration of the nuclear envelope marks the start of the second phase of mitosis, *i.e.*, metaphase. Hence the chromosomes are spread through the cytoplasm of the cell. By this stage, condensation of chromosomes is completed and they can be observed clearly under the microscope. This then, is the stage of which morphology of chromosomes is most easily studied. At this stage, metaphase chromosomes are made up of two sister chromatids, which are held together by the centromere
- 10 **(b)**
In plant cells, during metaphase chromosomes line up around the equator of the spindle and attached by their centromere to the spindle fibres (microtubules). In animal cells, during metaphase, smaller chromosomes are usually central in position with larger ones peripheral in position.
- 11 **(c)**
Mitosis lasts on an average from 30 min to 3 hrs
- 12 **(a)**
In the S and G₂-phases of interphase, the new DNA molecules formed are not distinct but intertwined. Prophase, which is the first stage of mitosis follows the S and G₂-phases of interphase
- 13 **(a)**
A-Cyclins; B-CdK; C-Check points; D-Mitotic cyclin
- 14 **(b)**
Synapsis is the pairing of homologous chromosomes during the zygotene stage of meiosis. Each pair is called bivalent. One chromosome of the pair comes from the male parent and other from the female parent. Each member of the pair is of the same length, their centromeres are in the same position and they usually have the same number of genes arranged in the same order. After zygotene stage, cell entered in **pachytene** stage in which the bivalents become spiralled, shortened and thickened.
- 15 **(d)**
Prophase is generally identified by the initiation of condensation of chromosomal material. The chromosomal material condenses to form chromosomes. The nuclear envelope breaks down and spindles start to assemble at opposite ends of the cell

16 **(b)**

Cdk₂/cyclin B.

The cell cycle is controlled by enzymes like cyclin dependent kinases (CdKs). CdKs phosphorylate amino acids like serine and threonine which initiates or blocks the activities related to cell cycle. *The other check points involved in cell cycle are*

1. G₁check point (Enter S or synthesis) is controlled by Cdk₄/Cyclin D, Cdk₆/Cyclin D
2. G₂ check point (Enter M or maturation promoting factor) by is controlled Cdk₂/cyclin B

Metaphase check point is controlled by cyclin B degradation

17 **(c)**

Mitosis is divided into four stages

A-Prophase, B-Metaphase, C-Anaphase, D-Telophase

18 **(d)**

Telophase is the reverse stage of prophase. During this phase, the cytoplasmic viscosity decreases and the two chromosome groups reorganize themselves into nuclei. A nucleae envelope appears outside the nucleoplasm collected in the area of chromatin. Spindle fibres disappear around the poles and Golgi complex and endoplasmic reticulum are reformed

19 **(c)**

I. Spindle microtubules that extends from the two poles of a dividing cell are called polar fibres

II. A centromere that connects two identical copies of single chromosome. These two copies are called sister chromatids

III. In 'X' phase, the paired chromosomes separate and begin moving to opposite ends of the cell. This 'X' phase is called anaphase

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	b	b	d	c	c	a	a	b	b	b
Q.	11	12	13	14	15	16	17	18	19	20
A.	c	a	a	b	d	b	c	d	c	c

PE