Unit 3 · Cell Division

WORKSHEET

Full marks 39

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 39

1 Key words [4]

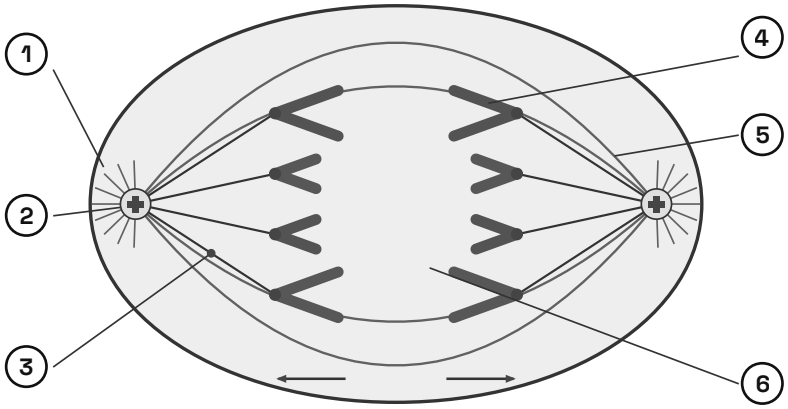
Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

chiasmata	**congression**	**diakinesis**	**G_0**	**interkinesis**	**karyokinesis**	**kinetochores**
pachytene	**synapsis**	**synaptonemal complex**				

The division of the nucleus is _____. A cell that stops dividing leaves the cycle from G_1 into _____. Spindle fibers attach to a chromosome at two small protein discs, the _____. In zygotene the homologous chromosomes pair up by _____, held by the _____. Crossing over happens at _____, and at diplotene the homologs stay joined at X-shaped _____. The short pause between meiosis I and meiosis II, with no copying of DNA, is _____.

2 Label the diagram [3]

The diagram shows an animal cell in anaphase of mitosis, with its kinds of spindle fibers. Write the names of the parts 1 to 6. Each carries 0.5 mark.



1. _____ **2.** _____

3. _____ **4.** _____

5. _____ **6.** _____

3 Multiple choice [5]

Choose the correct option for each of the following questions.

i. In which phase of the cell cycle does each chromosome come to have two sister chromatids? [1]

a. G_1 **b.** S
c. G_2 **d.** G_0

ii. Crossing over takes place between: [1]

a. sister chromatids of the same chromosome
b. non-sister chromatids of homologous chromosomes
c. two chromosomes that are not homologous
d. the two daughter cells of meiosis I

iii. During anaphase, an acrocentric chromosome looks like the letter: [1]

a. V **b.** L
c. J **d.** I

iv. A human cell ($2n = 46$) is at metaphase of mitosis. How many chromosomes and chromatids does it have? [1]

a. 23 chromosomes, 46 chromatids **b.** 46 chromosomes, 92 chromatids
c. 92 chromosomes, 92 chromatids **d.** 46 chromosomes, 46 chromatids

v. Vincristine, a drug from the Madagascar periwinkle, sticks to tubulin and stops the spindle forming. At which point would a dividing cell treated with it be stuck? [1]

a. in G_1, before copying its DNA
b. in S phase
c. before anaphase, unable to separate its chromatids
d. in telophase, unable to form nuclear envelopes

4 Very short answers [3]

Write very short answers to the following questions.

a. Name the three ways in which cells divide. [1]

b. In which direction does the cell plate grow, and what does it become? [1]

c. Why is meiosis II called an equational division? [1]

5 Short answers [9]

Write short answers to the following questions.

a. Interphase is often called the resting stage. Is the name right? Give a reason. [2]

b. How does cytokinesis in an animal cell differ from that in a plant cell? [2]

c. A student says amitosis is a good way to divide every cell, because it is quick and simple. Why is it used by only a few kinds of cell? [2]

d. Write three differences between anaphase I of meiosis and anaphase of mitosis. [3]

6 Numerical problems [4]

Solve the following problem. Show your working.

In a squash of an onion root tip, 800 cells were counted: 680 in interphase, 64 in prophase, 24 in metaphase, 12 in anaphase and 20 in telophase. The cell cycle lasts 20 hours. i. Find the mitotic index. ii. Find how long prophase and anaphase last, in minutes. iii. How long does interphase last? iv. Which stage of mitosis would be hardest to find on the slide, and why?

Answer:

7 Long answers [8]

Write long answers to the following questions.

a. Describe the five sub-phases of prophase I of meiosis. **[4]**

b. Explain why meiosis matters to a species, giving four points. **[4]**

8 Think [3]

In meiosis, the DNA is copied once but the cell divides twice. Use this to explain how the DNA content (C) of a cell changes from G_1 of a meiocyte to the four cells it makes, if the meiocyte in G_1 has 2C. What would go wrong over generations if the DNA were copied again before meiosis II?

9 Activity: Explore mitosis in an onion root tip

(not marked)

Grow roots from an onion resting on a glass of water for 5 days. With your teacher (the acid burns: wear goggles), soften the last 2–3 mm of a root tip in stain and 1 M hydrochloric acid, squash it under a cover slip, and look with the 10× and then the 40× objective. Count the cells in one field.

Stage	Number of cells	What the chromosomes look like
interphase		
prophase		
metaphase		
anaphase		
telophase		
total		

Mitotic index of your field: