Unit 1 · Cell Biology

WORKSHEET

Full marks 46

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 46

1 Key words [4]

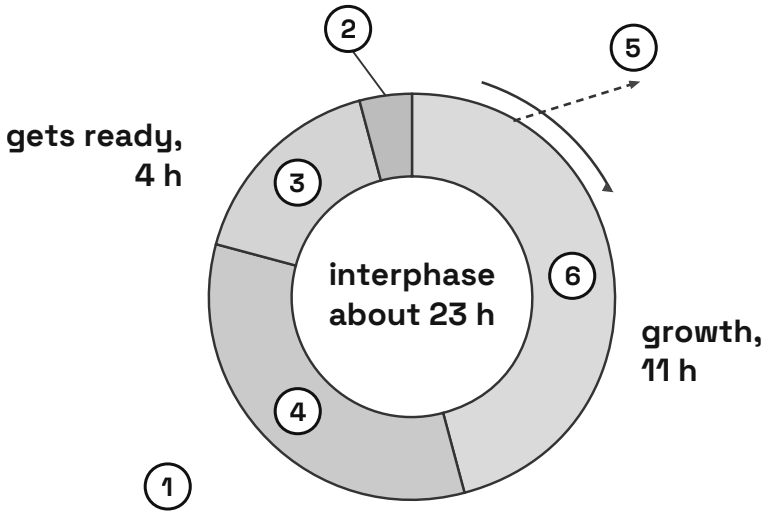
Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

binary fission	**bivalent**	**chiasma**	**clone**	**cytokinesis**	**karyokinesis**	**kinetochores**
S phase	**synapsis**	**telomere**				

The division of the nucleus is called _____, and the division of the cytoplasm is called _____. DNA is copied in the _____ of interphase. Spindle fibers attach to the _____ on the centromere. The pairing of homologous chromosomes in zygotene is called _____, and a paired couple of homologs is a _____. The point where two non-sister chromatids are seen to cross in diplotene is a _____. A group of organisms with the same genes, descended from one parent by asexual reproduction, is a _____.

2 Label the diagram [3]

The diagram shows the cell cycle of a typical human cell in a laboratory dish. Name the phases and write what happens at the places numbered 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. A cell is in G_2 phase. Compared with the same cell in G_1, it has: [1]

a. twice as many chromosomes and twice as much DNA
b. the same number of chromosomes and twice as much DNA
c. half as many chromosomes and the same DNA
d. the same number of chromosomes and the same DNA

ii. Synapsis, the pairing of homologous chromosomes, takes place in: [1]

a. leptotene **b.** zygotene
c. pachytene **d.** diakinesis

iii. Sister chromatids separate during: [1]

a. metaphase of mitosis and anaphase I **b.** anaphase I only
c. anaphase of mitosis and anaphase II **d.** telophase of mitosis and telophase II

iv. A cell with 2n = 24 completes meiosis I. Each daughter cell has: [1]

a. 24 chromosomes of one chromatid each **b.** 12 chromosomes of two chromatids each
c. 12 chromosomes of one chromatid each **d.** 48 chromosomes

v. The fruit fly has 2n = 8. Ignoring crossing over, how many kinds of gamete can one fly make? [1]

a. 8 **b.** 16
c. 64 **d.** 256

4 Very short answers [4]

Write very short answers to the following questions.

a. In which sub-stage of prophase I does crossing over take place? [1]

b. What is the short pause between meiosis I and meiosis II called? [1]

c. Why is a chromosome with two sister chromatids still counted as one chromosome? [1]

d. Name the stage of mitosis at which a human cell has 92 chromosomes. [1]

5 Short answers [10]

Write short answers to the following questions.

a. Interphase is not really a resting stage. [2]

b. Meiosis II is similar to mitosis. [2]

c. Write any two differences between meiosis I and meiosis II. [2]

d. Write any two differences between cytokinesis in an animal cell and in a plant cell. [2]

e. The tip of an onion root is used to study mitosis. [2]

6 Long answers [8]

Write long answers to the following questions.

a. Describe the sub-stages of prophase I of meiosis. [4]

b. How does sexual reproduction produce genetic variation? Explain the three sources. [4]

7 Numerical problems [9]

Solve the following problems. Show your working.

a. A cell in G_1 contains 12 pg of DNA. How much DNA is there in: a. the same cell in G_2, b. each cell after mitosis, c. each cell after meiosis I, d. a gamete? [2]

Answer:

b. A cell of a plant has $2n = 20$ chromosomes (maize). Write the number of chromosomes and chromatids in one cell at: a. G_1, b. metaphase of mitosis, c. anaphase of mitosis, d. metaphase I, e. each cell after meiosis I, f. each cell after meiosis II. [3]

Answer:

c. In a squash of an onion root tip, Sabina counted 400 cells: 352 in interphase, 28 in prophase, 6 in metaphase, 4 in anaphase and 10 in telophase. Find the mitotic index. If the whole cell cycle takes 20 hours, how long do interphase and prophase last? **[4]**

Answer: _____

8 Think **[3]**

A disease is spreading through the potato fields of a district where almost every farmer grows the same variety, planted from tubers. Explain the danger, and suggest what farmers and plant breeders could do.

9 Activity: The stages in an onion root tip (Practical 1) (not marked)

Look at a permanent slide of an onion root tip (or the slide you made) with the 40× objective. Count the cells at each stage in one field of view, and fill in the table.

Stage	What the chromosomes look like	Cells counted
Interphase		
Prophase		
Metaphase		
Anaphase		
Telophase		

Total cells: ___ Mitotic index = cells dividing ÷ total × 100% = ___