Unit 3 · Genetics

WORKSHEET

Full marks 40

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 40

1 Key words [4]

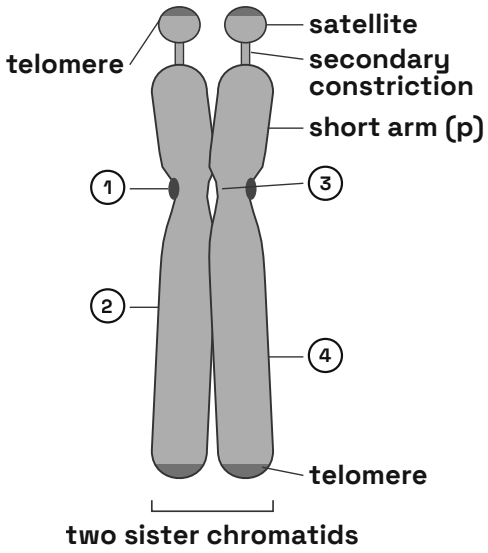
Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

allele	**centromere**	**chromatid**	**genotype**	**histone**	**karyotype**	**kinetochores**	**locus**
satellite	**telomeres**						

Each half of a chromosome at metaphase is a _____. The two halves are joined at the _____, also called the primary constriction. The spindle fibers attach to protein discs on it, the _____. The ends of a chromosome are its _____. A chromosome with a knob beyond a secondary constriction is a SAT chromosome, and the knob is a _____. A gene's fixed place on a chromosome is its _____. One of the different forms of a gene is an _____. The set of alleles an individual has is its _____.

2 Label the diagram [2]

The diagram shows a chromosome at metaphase. Name the parts numbered 1 to 4. Each carries 0.5 mark.



1. _____ 2. _____

3. _____ 4. _____

3 Multiple choice [5]

Choose the correct option for each of the following questions.

i. The part of a chromosome that holds the two sister chromatids together is the: [1]

a. telomere **b.** centromere
c. satellite **d.** chromonema

ii. Which type of chromosome is not found in a normal human cell? [1]

a. metacentric **b.** submetacentric
c. acrocentric **d.** telocentric

iii. The term "genetics" was coined by: [1]

a. Gregor Mendel **b.** William Bateson
c. Thomas Hunt Morgan **d.** Wilhelm Johannsen

iv. The fixed place of a gene on a chromosome is called its: [1]

a. allele **b.** locus
c. kinetochore **d.** centromere

v. The chromosome theory of inheritance was put forward by: [1]

a. Mendel and Bateson **b.** Sutton and Boveri
c. Watson and Crick **d.** Tjio and Levan

4 Match the columns [3]

Match each type of chromosome with what is true of it. One description in Column B is not needed. Each carries 0.5 mark.

Column A		Column B
1. metacentric	☐	**a.** arm ratio 1.7 to 3, L-shaped
2. submetacentric	☐	**b.** decides the sex of the individual
3. acrocentric	☐	**c.** arm ratio 1 to 1.7, V-shaped
4. telocentric	☐	**d.** arm ratio over 3, J-shaped
5. autosome	☐	**e.** arm ratio 0 to 1, Y-shaped
6. sex chromosome	☐	**f.** carries genes for the body's characters
		g. no short arm, I-shaped

5 Very short answers [3]

Write very short answers to the following questions.

a. Who is called the father of genetics? [1]

b. How many autosomes are there in a human sperm? [1]

c. Write what is in a woman's body cell and what is in a man's, in the form "44 + ...". **[1]**

6 Short answers **[8]**

Write short answers to the following questions.

a. Give a reason: chromosomes are studied at the metaphase of cell division. **[2]**

b. Give a reason: chromosomes are found in pairs in a body cell. **[2]**

c. Write any two differences between a gene and a chromosome. **[2]**

d. Bijay's two parents are tall, but he grew up short because he was badly fed as a small child. What kind of variation is this? Will his children inherit it? Give a reason. **[2]**

7 Long answer **[4]**

Write a long answer to the following question.

Explain the relation between gene and chromosome.

8 Working it out [8]

Solve the following problems. Show your working.

a. A chromosome 7 μm long has an arm ratio of 2.5. Find the length of each arm and name the type of chromosome. [3]

Answer: _____

b. In a chromosome 12 μm long, the centromere is 5.5 μm from one end. Find the arm ratio and the type. [2]

Answer: _____

c. A dog's body cell has 78 chromosomes, and dogs decide sex by X and Y as humans do. How many autosomes are there in a dog's body cell, and how many chromosomes, and which, in its sperm? [3]

Answer: _____

9 Think [3]

A human cell is at metaphase of mitosis. How many chromosomes, chromatids and centromeres does it have?

10 Activity: Hang a clay chromosome (not marked)

Roll four pairs of clay strands, all 12 cm long. Join each pair with a button at the place given in the table, hold it up by the button, and fill in the table.

Button	Short arm (cm)	Long arm (cm)	Arm ratio	Type	Shape when hung
at the middle, 6 cm					
4 cm from one end					
2 cm from one end					
at one end					

Why does using the same length of clay for all four make this a fair comparison?