Unit 10 · Mutation and Polyploidy

WORKSHEET

Full marks 32

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 32

1 Key words [4]

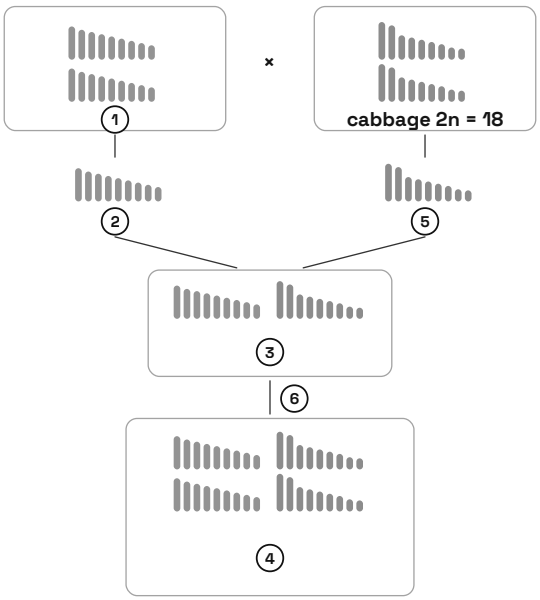
Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

aneuploidy	**crossing over**	**euploidy**	**frameshift**	**inversion**	**linkage**	**mutagens**
non-disjunction	**nonsense**	**transition**				

Agents such as X-rays and some chemicals that cause mutations are _____. A substitution of one purine for the other, such as A for G, is a _____. An insertion or deletion of one base changes every codon after it, which is a _____ mutation. A substitution that turns a codon into a stop codon is a _____ mutation. A piece of a chromosome rejoined the other way round is an _____. The failure of homologous chromosomes or sister chromatids to separate is _____. The loss or addition of single chromosomes is _____, and of complete sets of chromosomes _____.

2 Label the diagram [3]

The diagram shows how *Raphanobrassica* was made. Write the missing words or numbers for 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. Which mutation can be passed to a person's children? [1]

a. one in a skin cell, caused by sunlight
b. one in a lung cell, caused by smoking
c. one in a cell of the testes or ovaries that goes on to make gametes
d. any mutation, in any cell

ii. In a gene, the codon TTA (leucine) changes to TTG, which also means leucine. What is this mutation? [1]

a. a frameshift
b. a nonsense mutation
c. a silent substitution, a transition
d. a missense substitution, a transversion

iii. A person has 47 chromosomes: three copies of chromosome 18 and two of every other. What is this? [1]

a. triploidy, a euploidy
b. trisomy, an aneuploidy
c. monosomy, an aneuploidy
d. a translocation, a structural change

iv. Which change would most likely do the most harm to a protein? [1]

a. a substitution in the last codon before the stop
b. the deletion of one base near the start of the gene
c. the deletion of three bases in the middle of the gene
d. a silent substitution in the first codon after ATG

v. A plant hybrid between two species is sterile. Why can doubling its chromosomes make it fertile? [1]

a. doubling makes its cells larger
b. after doubling, every chromosome has an identical partner to pair with in meiosis
c. doubling turns it back into one of its parent species
d. doubling removes the chromosomes of one parent

4 Short answers [9]

Write short answers to the following questions.

a. Differentiate between autopolyploidy and allopolyploidy, with one example of each. [2]

b. Sickle-cell anemia is caused by a change of GAG to GTG in a gene. What kind of mutation is it, and what does it do to the protein? [2]

c. The coding strand of a short gene reads ATG CAT GTA TGA (Met–His–Val–Stop). Write it after an extra A is inserted after ATG, and say what happens to the protein. **[2]**

d. Describe the four kinds of structural change in chromosomes. **[3]**

5 Numerical problem **[4]**

Show your working.

A diploid plant species has 2n = 14. How many chromosomes would a monosomic, a trisomic, a nullisomic, a triploid and a tetraploid plant of it have? If it is crossed with another species with 2n = 18, how many chromosomes would the hybrid and the allotetraploid made from it have?

Answer:

6 Long answer **[4]**

Write a long answer to the following question.

What is aneuploidy? Describe its kinds, with one human example of each where there is one.

7 Think [3]

Bananas and seedless watermelons both have three sets of chromosomes. Explain why they have no seeds, and how farmers keep growing them.

8 Activity: A sentence read in threes (not marked)

Write THE BIG RED DOG ATE THE HOT BUN in words of three letters (each word a codon). Make each change below, then split the letters into threes again from the start.

Change	The sentence now	Words still right
RED becomes RID		
an extra X after BIG		
one letter left out after BIG		
three letters left out after BIG		

Which change does the most damage, and why?