

Student Worksheet for Activity 3.7.1

Comparing Mitosis and Meiosis

In this investigation, you will model and compare the events of mitosis and meiosis.

Materials

blue modelling clay
red modelling clay
green modelling clay

plastic knife
sheets of paper
pencil

Procedure

For each step, make a coloured sketch of your model with appropriate labels. Include brief descriptions of your steps and make sure to use the same step numbers as given.

Part 1: Mitosis

1. Take some red clay and roll it between your hands to create a piece 10 cm long and about as thick as your finger. Make another piece about 5 cm long.
2. Repeat step 1 with the blue clay.
3. Make an identical copy of each piece of clay. Then attach the identical pieces with a green ball of clay (Figure 3).
4. Draw a line down the length of a sheet of paper. Line up the four chromosomes along the line (Figure 4).

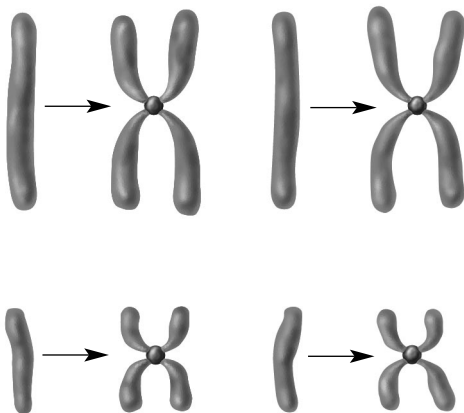


Figure 3

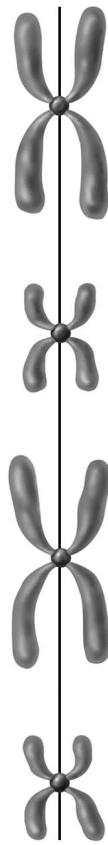


Figure 4

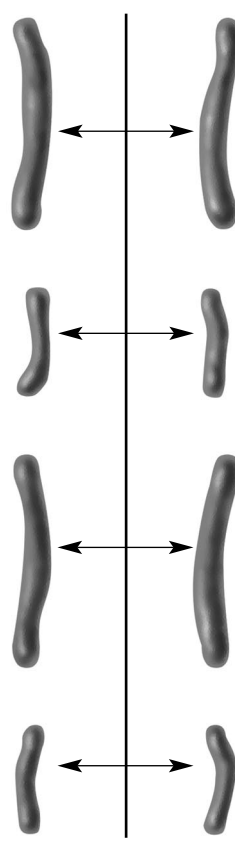


Figure 5

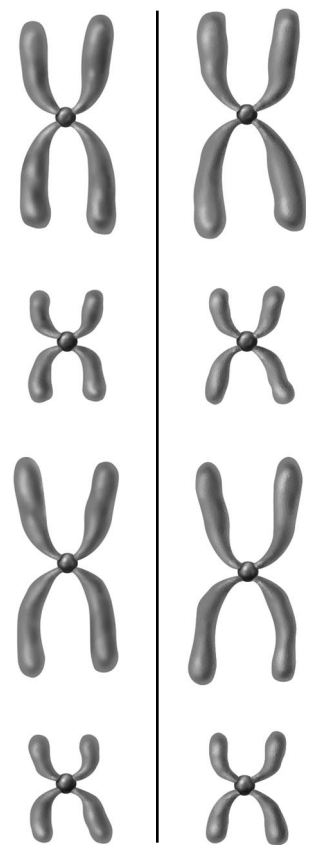


Figure 6

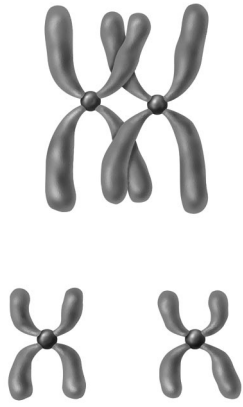


Figure 7

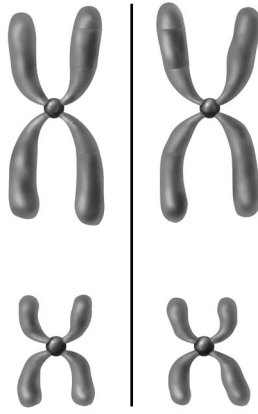


Figure 8

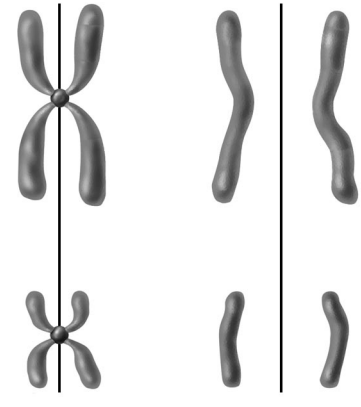


Figure 9

5. Remove the green balls and move each of the single pieces of clay to opposite ends of the paper (Figure 5).
6. If the cell is going to divide again, each single chromosome must synthesize a duplicate during interphase. Make an identical copy of each piece of clay as before (Figure 6).

Part 2: Meiosis

7. Follow steps 1 to 3 from part 1.
8. Demonstrate crossing-over. Break off a piece of clay from one chromosome and attach it to the other chromosome (Figure 7). Repeat a few times if you like.
9. To simulate metaphase I, place the chromosomes on either side of the equatorial plate, represented by a line drawn on a piece of paper (Figure 8).
10. Choose one of the haploid daughter cells and line the chromosomes up along the equatorial plate. Remove the centromere and move chromosomes to opposite poles (Figure 9).

Analysis

Part 1: Mitosis

- (a) In step 3, what process did you model?
- (b) What do the red and blue pieces of clay represent? What do the green balls of clay represent?
- (c) In step 4, what is the diploid chromosome number of the cell?
- (d) What phase of mitosis does the model represent?
- (e) In step 5, what structure do the single pieces of clay represent after separation?

- (f) What phase of mitosis does the model represent?
- (g) In step 6, how many chromosomes are in each of the daughter cells?
- (h) Compare the daughter cells with the parent cell.

Part 2: Meiosis

- (i) In steps 1 to 3, on what basis are chromosomes considered to be homologous?
- (j) What is the diploid chromosome number?
- (k) In step 8, what must happen before the homologous chromosomes can cross over?
- (l) In which phase does crossing over occur?
- (m) What happens during crossing over?
- (n) In step 9, how does metaphase I of meiosis differ from metaphase of mitosis?
- (o) What is the haploid chromosome number?
- (p) In step 10, compare the resulting daughter cells of mitosis and meiosis.