

G8 Biology Guidebook

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Contents

1	Overview	5
2	Chapter I: From A Cell To An Organism	7
2.1	Lecture 1: Cell Cycle	9
2.2	Lecture 2: Cell Division	9
2.3	Lecture 3: Levels of Organization	9
2.4	Experiment 1: Observing Mitosis In Plant Cells	9
2.5	Experiment 2: Cell Differentiation	9
2.6	Project 1: Mitosis & The Cell Cycle	9
2.7	Project 2: Biological Organization	9
3	Chapter II: Reproduction Of Organisms	11
3.1	Lecture 4: Sexual Reproduction	12
3.2	Lecture 5: Meiosis-1	15
3.3	Lecture 6: Meiosis-2	16
3.4	Lecture 7: Meiosis-3	19
3.5	Lecture 8: Asexual Reproduction	20

Chapter 1

Overview



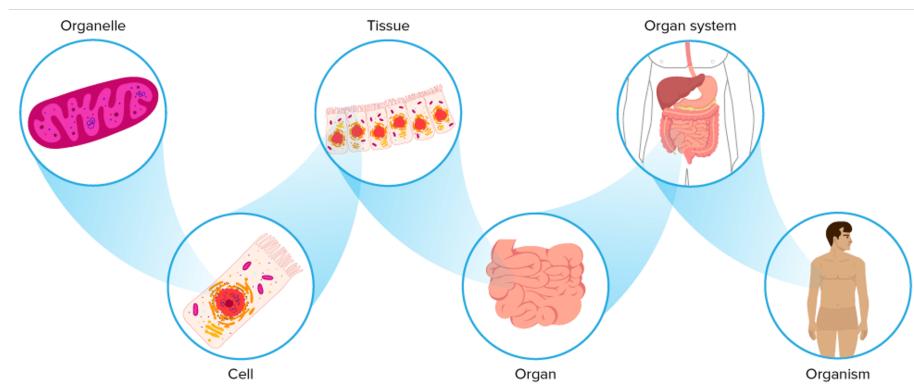
G8 Biology

2024 Fall

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Mr. Page
A304

Chapter 2

Chapter I: From A Cell To An Organism



2.1 Lecture 1: Cell Cycle

2.2 Lecture 2: Cell Division

2.3 Lecture 3: Levels of Organization

2.4 Experiment 1: Observing Mitosis In Plant Cells

2.5 Experiment 2: Cell Differentiation

2.6 Project 1: Mitosis & The Cell Cycle

2.7 Project 2: Biological Organization

Thaumoctopus Mimicus

Kingdom: Animalia
Phylum: Mollusca
Class: Cephalopoda
Order: Octopoda
Family: Octopodidae
Species: Thaumoctopus Mimicus
Scientific Name: Thaumoctopus Mimicus

Living Range: Indo-Pacific Region

Typical Animal Cell

Diagram of a typical animal cell showing various organelles: Vacuole, Lysosome, Mitochondria, Smooth Endoplasmic Reticulum, Rough Endoplasmic Reticulum, Nucleus, Nucleolus, Cytoplasm, and Cell Membrane.

Protection & Disguise

Like other mimics, the Octopus can change its color itself. In order to do this, some changing cells, called chromatophores, will change colors. Some of them have a light reflecting layer underneath them which allows them to change color by either expanding or contracting. Cells, home to the light reflecting layer, are called iridophores.

Octopus Tissues

Muscle

Muscle tissues are found in your skeletal muscles, heart, and smooth muscle. They allow the octopus to move.

Connective

Connective tissues are found in between other tissue types and organs. They allow flexibility for Octopus. Large connective tissues can be a major part of connective tissues, such as the case of Octopus.

Organs of a Octopus

Organ are collections of tissues with a similar function.

Fun Facts

Octopuses have 3 hearts. Two pumping blood to the gills, pumping blood to the rest of the body. Moreover, they have 9 brains, each of the arms having a separate brain, with one main brain in main control.

The Organ Systems of an Octopus

Digestive System

poison gland, Crop, Stomach, Digestive Cœcum, Anus, Ink Sac, Beak

Respiratory System

Branchial Vein, Systematic heart, Branchial Heart

Reproductive System

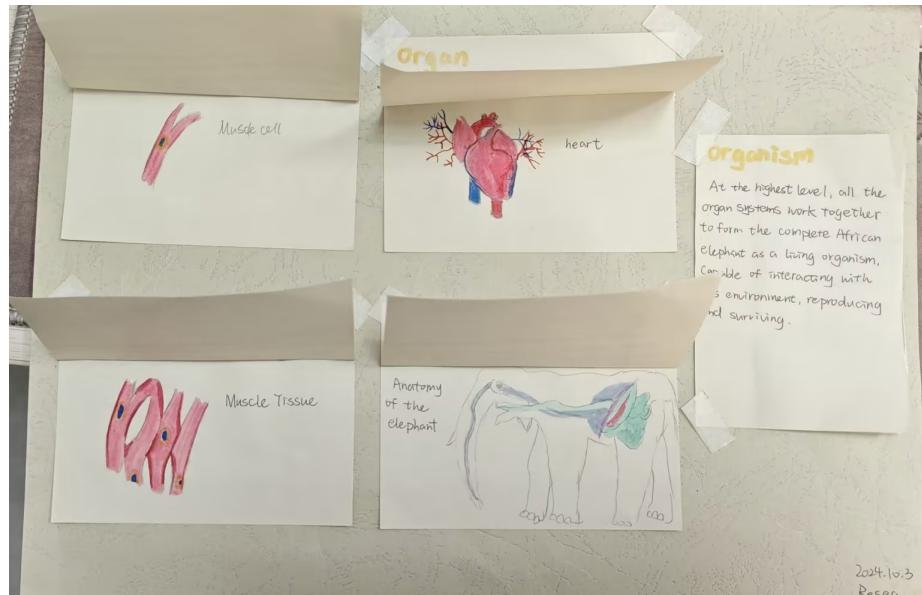
Testes, Ovaries, Funnel

HE O Mimic Octopus

Organism (n.) system consisting parts that depend each other

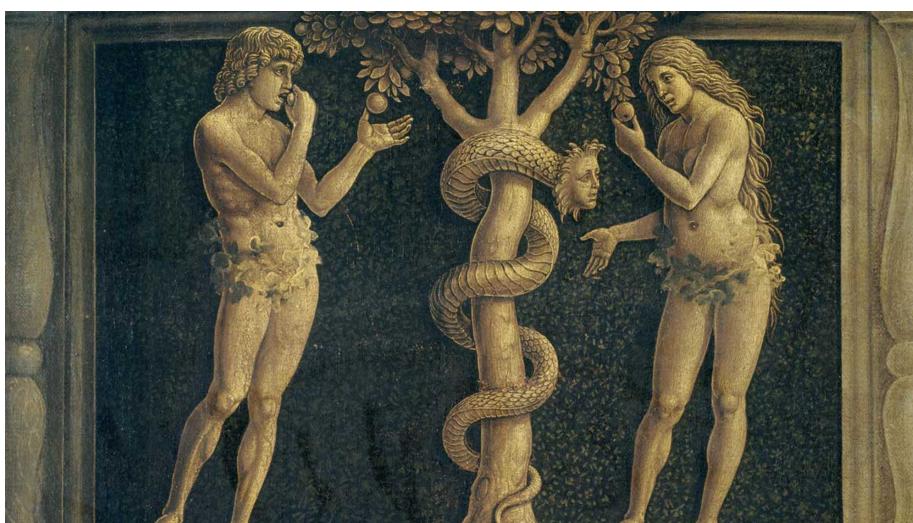
Unlike other octopuses, the mimic is noteworthy for being able impersonate a wide variety other marine animals in order to elude predators. As an octopus can distort its self to look like a snake.

10 CHAPTER 2. CHAPTER I: FROM A CELL TO AN ORGANISM



Chapter 3

Chapter II: Reproduction Of Organisms



3.1 Lecture 4: Sexual Reproduction



3.1.1 Keywords

Sexual Reproduction
Meiosis
Sperm
Egg
Fertilization
Zygote
Haploid
Diploid
Homologous chromosomes

3.1.2 Lesson outline

A. What is sexual reproduction?

1. Sexual reproduction produces an offspring when genetic materials from two different sex cells combine.
 - a. The female sex cell, a(n) egg, forms in an ovary.
 - b. The male sex cell, a(n) sperm, forms in a testis.
2. During a process called fertilization, an egg cell and a sperm cell join together. The new cell that forms is called a(n) zygote.

B. Diploid Cells

1. Organisms that reproduce sexually make two kinds of cells—body cells and sex cells.
2. Body cells are diploid; they have pairs of chromosomes.
3. If a zygote has too many or too few chromosomes, it will not develop properly.
4. Different organisms have different numbers of chromosomes.
5. Homologous chromosomes are pairs of chromosomes that have genes for the same traits arranged in the same order.

C. Haploid Cells

1. Sex cells are haploid; they have only one chromosome from each pair of chromosomes.
2. In meiosis, one diploid cell divides and makes four haploid cells.

3.1.3 Homework**Matching**

1. G
2. B
3. H
4. C
5. I
6. A
7. D
8. F
9. E

Multiple Choice Questions

10. A
11. B

Short Answer Questions

12. Sexual reproduction is the production of an offspring that results when the genetic material from two different cells combine.

(Hint: Check “how to write a definition” in extension)

s

13. A zygote is a new cell that forms when an egg cell and a sperm cell join during fertilization.

(Hint: Check “how to write a definition” in extension)

s

14. A diploid cell has pairs of chromosomes and is located in body cells. A haploid cell has only one set of chromosomes and is located in sex cells.

(Hint: a pair of chromosomes/two sets of chromosomes vs. one chromosome from each pair/one set of chromosomes)

3.1.4 Extension

How to write a definition?

A formal definition is based upon a concise, logical pattern that includes as much information as it can within a minimum amount of space. The primary reason to include definitions in your writing is to avoid misunderstanding with your audience. A formal definition consists of three parts:

1. The **term** (word or phrase) to be defined
2. The **class** of object or concept to which the term belongs
3. The **differentiating characteristics** that distinguish it from all others of its class

For example:

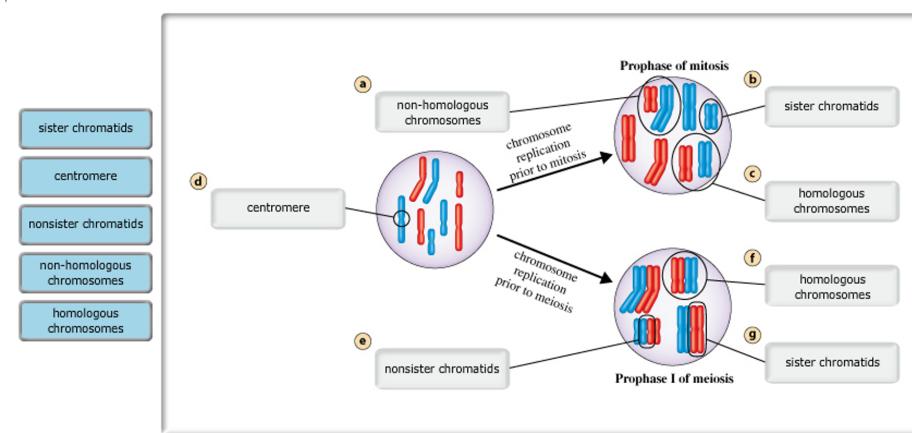
- Water (term) is a liquid (class) made up of molecules of hydrogen and oxygen in the ratio of 2 to 1 (differentiating characteristics).
- Comic books (term) are sequential and narrative publications (class) consisting of illustrations, captions, dialogue balloons, and often focus on super-powered heroes (differentiating characteristics).
- Astronomy (term) is a branch of scientific study (class) primarily concerned with celestial objects inside and outside of the earth's atmosphere (differentiating characteristics).

Sources:

1. https://owl.purdue.edu/owl/general_writing/common_writing_assignments/definitions.html
2. <https://www.sjsu.edu/aanapisi/docs/DefinitonLessonPlanbyEdSams.pdf>

3.2 Lecture 5: Meiosis-1

3.2.1 Lesson outline



D. The Phases of Meiosis

1. Meiosis involves two divisions of the nucleus and the cytoplasm. These divisions, known as meiosis I and meiosis II, result in four haploid cells.
2. During interphase, the reproductive cell grows and duplicates its chromosomes.
3. During meiosis I, each pair of duplicated homologous chromosomes separates.
4. After meiosis I, the two cells formed during this stage go through a second division of the nucleus and cytoplasm called meiosis II. During meiosis II, sister chromatids separate to produce four haploid cells.

E. Why is meiosis important?

1. Meiosis forms sex cells with the correct haploid number of chromosomes. This maintains the correct diploid number of chromosomes in organisms when sex cells join. Meiosis creates genetic variation by producing haploid cells.

3.2.2 Homework

Fill in the Blanks

1. diploid; haploid
2. haploid; diploid
3. diploid
4. homologous chromosomes
5. homologous chromosomes
6. N/A
7. meiosis
8. sister chromatids
9. sister chromatids

10. meiosis; meiosis

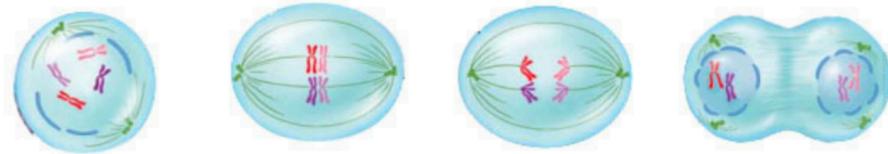
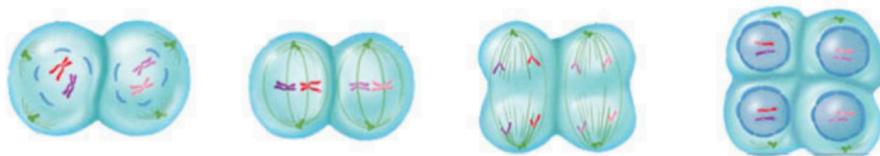
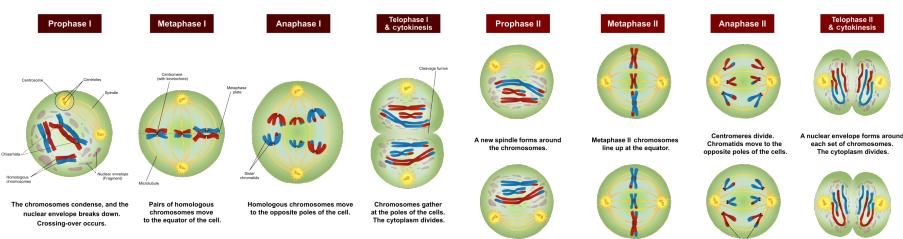
11. meiosis

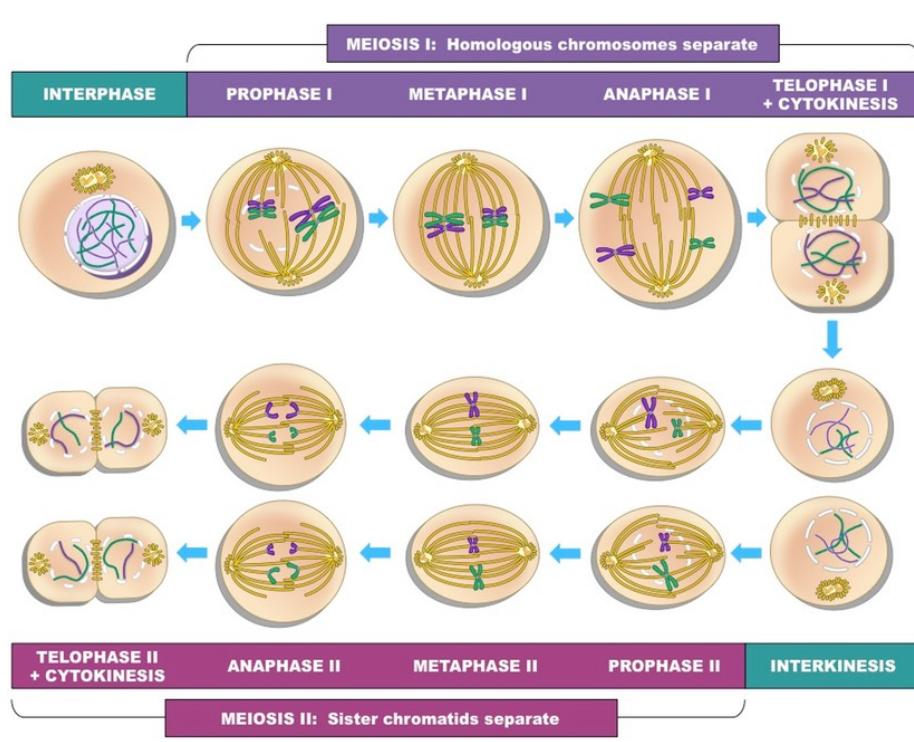
Short Answer Questions

12. Sex cells are haploid cells.

3.3 Lecture 6: Meiosis-2

3.3.1 Lesson outline

Meiosis I**Meiosis II***meiosis illustration 1**meiosis illustration 2*



meiosis illustration 3

1. interphase
2. Homologous chromosomes
3. breaks
4. middle
5. Spindle
6. homologous
7. Sister chromatids
8. two
9. Sister chromatids
10. Chromosomes; Nuclear membrane

11. align
12. pulled apart; opposite ends of the cells
13. chromosomes
14. four
15. half

3.3.2 Homework

Multiple Choice Questions

1. A
2. C
3. D
4. D

Short Answer Questions

(6 points maximum) One point for each of the following:

- Correct description of meiosis (simply rephrasing the question earns no point)
- DNA replicates in interphase
- Homologous chromosomes pair in prophase I
- Spindles move chromosomes pairs to poles in anaphase I
- Two cycles/rounds of division in meiosis
- No additional replication before meiosis II
- Sister chromatids separate to poles in anaphase II
- 1 germ cell yields 4 gametes

Fill in the Blanks

1. Anaphase II
2. N/A
3. Metaphase I
4. Telophase II (not quite obvious)
5. Telophase I (not quite obvious)

- 6. N/A
- 7. Metaphase II
- 8. Prophase I
- 9. Prophase II
- 10. Anaphase I

3.4 Lecture 7: Meiosis-3

3.4.1 Lesson outline

F. How do mitosis and meiosis differ?

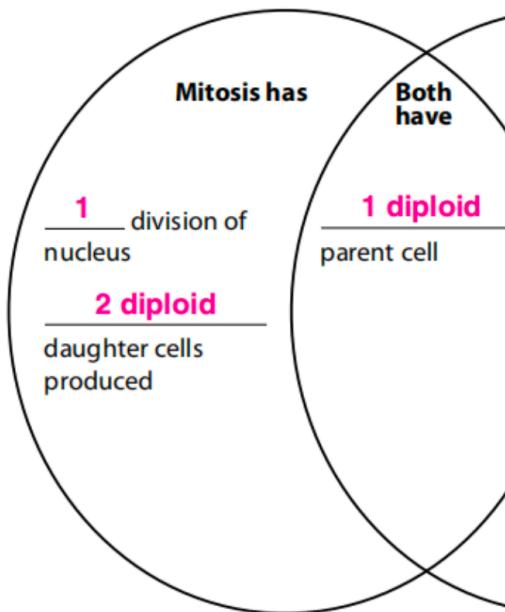
- 1. During mitosis and cell division, a body cell and its nucleus divide once and produce two identical cells.
- 2. During meiosis, a reproductive cell and its nucleus divide twice and produce four cells—two pairs of identical haploid cells.

G. Advantages of Sexual Reproduction

- 1. Sexual reproduction produces offspring that have a new combination of DNA. This results in genetic variation among individuals.
- 2. Genetic variation gives individuals within a population slight differences that might be an advantage if the environment changes.
- 3. Selective breeding has been used to develop desirable traits in plants and animals.

H. Disadvantages of Sexual Reproduction

- 1. One disadvantage of sexual reproduction is that organisms have to grow and develop until they are mature enough to produce sex cells.
- 2. Another disadvantage is that searching for a mate takes time and energy and might expose individuals to predators, diseases, or harsh environmental conditions.



Compare and contrast meiosis and mitosis and cell division

Explain why genetic variation and selective breeding are advantages of sexual reproduction.

Genetic variation: Instead of being exact genetic copies of parents, members of the same species have different traits, which enable some of them to survive environmental changes.

Selective breeding: The process of choosing and breeding individuals with desirable traits allows breeders to create offspring with those traits.

Identify two main disadvantages of sexual reproduction.

1. takes time and takes energy
2. sexual reproduction is limited by certain factors (For example, fertilization cannot take place during pregnancy, which can last as long as two years in some mammals.)

Explain how the process of meiosis relates to the way in which a child resembles but is not an exact copy of his or her parents.

Observable characteristics in a child, such as **eye color, hair type and color, the shapes of facial features, and height**, resemble those of his or her parents, because the child **inherits portions of DNA from each parent**. A child is not an exact copy of his or her parents because the child **does not carry identical DNA to either parent**.

3.5 Lecture 8: Asexual Reproduction