

Essay about mitosis replication of eukaryotic cells

[Science](#), [Biology](#)



**ASSIGN
BUSTER**

Exercise 13

MITOSIS: REPLICATION OF EUKARYOTIC CELLS ANSWERS TO QUESTIONS

1.

- a. Mitosis and cytokinesis are often referred to collectively as "cellular division." Why are they more accurately called cellular replication?

The result of mitosis is production of two cells (replicates) identical to the parent cell. The genetic material is replicated rather than divided.

- b. Does the cell cycle have a beginning and an end? The organization of our study of cellular events indicates a beginning and end, but the events continue to repeat.

2.

- a. If a nucleus has eight chromosomes during interphase, how many chromosomes does it have during metaphase? During metaphase there are 8 double-stranded chromosomes.
- b. How many does it have after mitosis is complete? After mitosis (and separation of chromatids) there are 16 chromosomes distributed between two nuclei.

3.

- a. Why would we choose an embryonic mass of cells for procedure 13.3 in which to study the stages of mitosis? embryonic cells are replicating and growing rapidly
- b. Which stage of mitosis most often is associated with the beginning of cytokinesis? usually late anaphase

4.

- a. What region of a root has the most mitotic activity? meristem, just above cap
- b. Why is pinching of the cytoplasm inadequate for cytokinesis in plant cells? Pinching of cytoplasm is not appropriate for rigid cell walls.
- c. Locate a plant cell in late telophase. What is the volume of the new cells relative to a mature cell? Each cell is smaller (approximately 1/2) than the parent cell.

5.

- a. Why are the combined data from all the class members more meaningful than your results alone? Combined results reduce random error.
- b. How accurate were your predictions for length of each stage of mitosis? probably not close
- c. What sources of error can you list for this technique to determine the time elapsed during each stage of mitosis? variation in onion roots; student's ability to distinguish stages; microscopic cross sections of roots may or may not pass through the nuclear material

Exercise 14

MEIOSIS: REDUCTION DIVISION AND GAMETOGENESIS ANSWERS TO QUESTIONS

1.

- a. Why would shuffling genetic material and producing new combinations of characteristics be advantageous to a species? New genetic combinations allow adaptation to changing environments.
- b. When would it be deleterious? New combinations always produce a percentage of disadvantageous characteristics; the risk of bad gene combinations may be inappropriate in a stable, beneficial environment.

2.

- a. Synapsis occurs after chromosomal DNA has replicated. How many chromatids are involved in crossing-over of a homologous pair of chromosomes?
- b. Suppose synapsis occurred between two homologous chromosomes, and one had alleles for blue eyes and brown hair and the other had alleles for green eyes and blonde hair. How many different combinations of these alleles would be possible? 4 Remember that crossing-over does not necessarily occur between the loci, so the original combinations may remain intact.

3.

- a. If a nucleus has eight chromosomes when it begins meiosis, how many chromosomes does it have after telophase I? Telophase II? with two chromatids each; 4 with one chromatid each
- b. What are the major differences between the events of meiosis and mitosis? (see table 14. 2)

- c. What are some minor differences, and why do you consider them minor? minor differences would be those unrelated to chromosomal events

4.

- a. During gametogenesis a sperm cell undergoes considerable structural change. What are the basics of sperm structure and how does it relate to function? The basics include small head with nucleus; an acrosomal process with enzymes to digest the outer membranes of the egg; a head and neck rich in mitochondria; and tail used to propel the cell to the egg.
- b. What is the advantage of producing sperm in a system of tubes rather than in solid tissue? because sperm cells can be expelled easily from the body through a system of tubes
- c. What is each strand of a double-stranded chromosome called? chromatid

5. How would retaining extra cytoplasm enhance survival of a developing oocyte? More cytoplasm contains more nutrients to ensure survival.

6.

- a. What are the relative sizes of oocytes in a dormant follicle, a growing follicle, and a Graafian follicle? dormant oocyte 1X, growing oocyte 5X, mature oocyte 25X
- b. Are polar bodies visible in your prepared slide of a cat ovary? Why or why not? probably not, because cells in the ovary usually have not

finished meiosis I, and polar bodies disintegrate rapidly DNA
FINGERPRINTING LAB

Restriction Digestion of DNA Samples Observation Questions

1. Describe the samples of DNA (physical properties). The DNA samples are clear, colorless liquid samples.
2. Is there any observable difference between the samples of DNA? No. All samples appear similar.
3. Describe the appearance of the restriction endonuclease mix. The restriction enzymes appear to be clear, colorless liquids.

Restriction Digestion of DNA Samples Review Questions

1. Before you incubated your samples, describe any visible signs of change in the contents of the tubes containing the DNA combined with the restriction enzymes. DNA + EcoRI/PstI enzyme mix: No visible change apparent in the tubes.
2. Can you see any evidence to indicate that your samples of DNA were fragmented or altered in any way by the addition of EcoRI/PstI? Explain. No. No visible change apparent in the tubes.
3. In the absence of visible evidence of change, is it still possible that the DNA samples were fragmented? Explain your reasoning. Yes. They may be chemically changed but the changes may not be visible. Enzymes may have cut the DNA.
4. After a 24 hour incubation period, are there any visible clues that the restriction enzymes may have in some way changed the DNA in any of the tubes? Explain your reasoning. No. No visible change apparent in

the tubes but the enzymes may have cut the DNA. The reactions are at the molecular level and too small to be seen.

Electrophoresis of Your DNA Samples Review Questions

1. The electrophoresis apparatus creates an electrical field [positive and negative ends of the gel]. DNA molecules are negatively charged. To which pole of the electrophoresis field would you expect DNA to migrate (+ or -)? Explain. Positive.
2. What color represents the negative pole? Black.
3. After DNA samples are loaded in wells, they are "forced" to move through the gel matrix. Which size fragment (large vs small) would you expect to move toward the opposite end of the gel most quickly? Explain. Smaller. There is less resistance to their movement through the gel matrix.
4. Which fragments are expected to travel the shortest distance [remain closest to the well]? Explain. Larger. There is more resistance to their movement through the gel matrix.

Lesson 4 Thought Questions

1. What can you assume is contained within each band? DNA fragments.
2. If this were a fingerprinting gel, then how many kinds (samples) of DNA can you assume were placed in each separate well? One.
3. What would be a logical explanation as to why there is more than one band of DNA for each of the samples? The DNA must have been cut into fragments by restriction enzymes.

4. What probably caused the DNA to become fragmented? The chemical action of the restriction enzymes cutting at specific base sequences.
5. Which of the DNA samples have the same number of restriction sites for the restriction endonuclease used? Write the lane numbers. Lanes 2, 3, and 4 (CS, S1, and S2).
6. Which sample has the smallest DNA fragment? The sample in lane 5 (S3).
7. How many restriction sites were there in lane three? Two sites that cut the sample into two fragments.
8. Which DNA samples appear to have been “ cut” into the same number and size of fragments? Lanes 2 and 4 (CS and S2).
9. Based on your analysis of the photograph, what is your conclusion about the DNA samples in the photograph? Do any of the samples seem to be from the same source. If so which ones? Describe the evidence that supports your conclusion.

The DNA samples in lanes 2 and 4 (CS and S2) are from the same individual because they have identical restrictions sites that yield identical fragments.

DNA Fingerprinting: Overview

1. What are we trying to determine? Restate the central question. We are trying to determine if samples of DNA that we were provided with are from the same individual or from different individuals.
2. Which of your DNA samples were fragmented? What would your gel look like if the DNA were not fragmented? The number of fragmented samples will vary. They will have one band on the gel if the DNA was not cut.

3. What caused the DNA to become fragmented? The addition of restriction enzymes.
4. What determines where a restriction endonuclease will “cut” a DNA molecule? A special sequence of bases on the DNA called restriction sites.
5. A restriction endonuclease “cuts” two DNA molecules at the same location. What can you assume is identical about the molecules at that location? The restriction sites are identical.
6. Do any of your suspect samples appear to have EcoRI or PstI recognition sites at the same location as the DNA from the crime scene? The samples in lanes 2 and 5 match (CS and S3).
7. Based on the above analysis, do any of the suspect samples of DNA seem to be from the same individual as the DNA from the crime scene? Describe the scientific evidence that supports your conclusion. The CS and S3 samples appear to be identical. They both produce similar banding patterns on the gel.

Exercise 23

SURVEY OF BACTERIA: KINGDOMS ARCHAEABACTERIA AND BACTERIA ANSWERS TO QUESTIONS

1.

- a. Why is it important that bacteria release nutrients? Nutrients must be released and recycled for use by other living organisms. If nutrients were not released by decomposers, the nutrients would all eventually be locked up in dead, non-decaying tissue.

- b. What term would best describe heterotrophic bacteria that feed on living tissue? parasitism

2. What is the shape and size of each bacterial colony? E. coli—medium rod;

B. megaterium—large rod; R. rubrum—small and thin spirillum³.

- a. Which type of bacteria is most prevalent in the sample from your teeth? How do you know? probably gram positive because most of the cells are purple
- b. Is Bacillus megaterium gram positive or gram negative? gram positive

4.

- a. Where are the bacteria? Are they between cells or inside cells? inside the cells
- b. Why is this relationship between a plant and bacterium called mutualism? Both partners benefit from the association.
- c. How does Rhizobium benefit from this association? nutrients from the host
- d. How does the host plant benefit from the association? nitrogen supply from the bacterium

5. Based on their appearance, which drugs or chemicals retard the growth of bacteria? depends on the drugs that you use

6. Do all cells of a trichome of Oscillatoria appear similar? yes

7.

- a. Do adjacent cells share a common sheath? usually

- b. What do you suppose is the function of the sheath? protection
- c. Do clusters of *Gloeocapsa* represent multicellular organisms? Why or why not?

No, the cells are not obligate dependents—they can operate independently; the protoplasts of the cells are not connected; the aggregation of cells can be broken into individual cells without killing the cells.

8.

- a. How is the shape of *Merismopedia* different from other cyanobacteria you studied in this exercise? *Merismopedia* is a flat, square colony one cell thick.
- b. How would a colony attain this shape? equal divisions in two planes

Exercise 24

Survey of Kingdom Protista: The Algae ANSWERS TO QUESTIONS

1.

- a. Is the movement of *Chlamydomonas* smooth or does it appear jerky? relatively smooth
- b. Can you see both flagella? You may need to reduce the light intensity to see flagella. probably not, depends on student's microscope
- c. How does methylcellulose affect movement of *Chlamydomonas*? slows it down
- d. How does the stigma help *Chlamydomonas* survive? detects light

2.

- a. Under what environmental conditions would a zygote not undergo meiosis immediately? unfavorable conditions
- b. Are spores of *Chlamydomonas* haploid or diploid? haploid
- c. Which portions of the life cycle of *Chlamydomonas* are haploid? all portions from meiosis to syngamy
- d. Which are diploid? all portions from syngamy to meiosis

3.

- a. Are the filaments of *Spirogyra* branched? no
- b. What is the shape of the chloroplasts of *Spirogyra*? spiral
- c. Can you see any conjugation tubes? If you can't, examine the prepared slides that demonstrate these structures. probably not seen on live material, but easily seen on prepared material
- d. How do you think that *Spirogyra* reproduces asexually? mitosis and fragmentation

4.

- a. How is *Cladophora* morphologically similar to *Spirogyra*. How is it different? They are both filaments, but *Cladophora* is branched and *Spirogyra* is unbranched.
- b. What is the shape of its chloroplasts? broad and dispersed

5.

- a. What is oogamy? one gamete (sperm) is small and motile, the other gamete (egg) is larger and nonmotile
- b. What are the tiny spheres inside the larger sphere of *Volvox*? daughter colonies

- c. How do you suppose they get out? Parent colonies turn inside out or rupture.
- d. How do you think the number of cells in a young Volvox colony compares to the number in a mature colony? less than or equal to the number in the mature colony

6.

- a. How is Fucus' structure different from green algae that you have examined earlier in this exercise? Fucus is larger, more parenchymatous, and flattened.
- b. Are all portions of the thallus photosynthetic?
- How can you tell? probably not, due to different concentrations of pigments
- c. Considering where Fucus lives, what do you think is the function of its gelatinous sheath? Since Fucus lives in intertidal regions, the gelatinous sheath probably prevents desiccation.
- d. Are the swollen structures solid masses or are they empty? essentially empty

7.

- a. Are the gametes of Fucus isogamous or oogamous? oogamous
- b. How does the structure of tissue surrounding the reproductive structures compare with that of green algae? Tissues in brown algae are more complex.

8.

- a. Can you see any pores in the walls of diatoms? probably yes

- b. Are any of the diatoms moving? possibly
- c. If diatoms lack flagella, how do you explain their motility? gliding on a gelatinous secretion
- d. How would diatomaceous earth compare to sand as a swimming pool filter material? Which would be better and why? Diatomaceous earth would be better because it is finer. How do the shapes of dinoflagellates compare with other unicellular algae that you have observed in this exercise? bizarre and varied What is the function of the eyespot of Euglena? detect light

Exercise 25

SURVEY OF KINGDOM PROTISTA: PROTOZOA AND SLIME MOLDS ANSWERS TO QUESTIONS

1.

- a. Can you detect moving cytoplasm in the extending pseudopods of Amoeba? probably yes
- b. What do you suppose the Amoeba is moving toward or away from? light or food
- c. How does the Amoeba respond to nutrient broth? usually increased movement
- d. Approximately how long would it take an Amoeba to move across the field of view on low power? a few minutes
- e. Why is a contractile vacuole of a protozoan often more difficult to see than a food vacuole? A contractile vacuole contains clear excretory fluid, while food vacuoles contain particulate matter.

- f. Why would excess water tend to accumulate in Amoeba? because solute concentration in the amoeba is higher than the concentration in the environment and water diffuses into the cell

2. How could fossilized forams in different geological layers of rock or sediment indicate the probability of finding oil? Different species are present in different environmental conditions; therefore, a list of species may include those associated with environmental conditions appropriate for oil formation.

3.

- a. How large is a trypanosome relative to an Amoeba? much smaller
- b. What alga does a trypanosome superficially resemble? Euglena

4.

- a. Are cilia visible on living or prepared Paramecium? probably not
- b. Does Paramecium rotate as it moves? yes
- c. How does movement of Paramecium compare with that of Amoeba? With a flagellated alga? Paramecium moves much faster than Amoeba, but not as fast as many flagellated species.

5.

- a. Why is the division of Paramecium cells called "transverse" fission? The plane of separation is transverse to the longitudinal axis.
- b. Why is transverse fission not a sexual process? it doesn't recombine genes
- c. What are the advantages and disadvantages of conjugation in Paramecium? disadvantages: conjugation requires more than one

organism and is energy consuming advantage: creation of new genetic combinations

6.

- a. What is the value or function of the rapid contraction stalk of Vorticella? avoid predation
- b. What is the probable function of the moving cilia of Vorticella? create water currents bringing food particles to the organism

7.

- a. Is cytoplasmic movement of Physarum apparent? probably yes
- b. Is the movement in a particular direction? probably not, but on moist medium they may apparently move toward food
- c. What is a possible function of cytoplasmic movement in Physarum? avoid light, find food

Exercise 26

SURVEY OF KINGDOM FUNGI: MOLDS, SAC FUNGI, MUSHROOMS, AND LICHENS ANSWERS TO QUESTIONS

1.

- a. Are hyphae present? o
- b. Are the cells motile? yes

2.

- a. How many species of mold are on the bread? 2, 3, or 4

- b. Do any of the molds on the bread have hyphae modified as sporangiophores and sporangia? probably yes
- c. Is pigment distributed uniformly in each mycelium? If not, where is the pigment concentrated in each mold? No, pigment is usually concentrated in sporangia.
- d. What is the adaptive significance of spores forming on ends of upright filaments rather than closer to the protective substrate? to enhance distribution of released spores

3.

- a. In what structure is the dark pigment of *Rhizopus* concentrated? sporangia
- b. Is *Rhizopus* reproducing sexually as well as asexually in the same petri dish? How can you tell? Yes (if students are provided with cultures with two strains); because sporangia as well as zygospores are visible.

4. What is the relative size of *Penicillium* hyphae compared to *Rhizopus* hyphae? *Penicillium* hyphae are much smaller than *Rhizopus* hyphae.

5.

- a. Do you see chains of yeast cells produced by budding? probably yes
- b. How is the structure of yeast hyphae different from that of molds? Yeast hyphae are greatly reduced to a chain of one or two cells, while molds are very long and multicellular.

6. What is the difference between dikaryotic and diploid cells? Dikaryotic cells have two distinct nuclei, each with a haploid (single) set of

chromosomes; a diploid cell has one nucleus with a diploid (double set of chromosomes).

7. How many spores would you estimate are present on the gills of a single cap of *Coprinus*? Remember that a prepared slide shows only a cross section.
many, many thousands

8.

- a. What is the value of photosynthetic algae to the growth of a fungus in a lichen? Algae conduct photosynthesis and produce an energy rich carbon source, (i. e. , glucose).
- b. Would you expect lichens to grow best in rural or urban environments? Why? best in rural environments because they are so sensitive to air pollution

Exercise 27

**SURVEY OF THE PLANT KINGDOM: LIVERWORTS, MOSSES, AND HORNWORTS
OF PHyla HEPATICOPHYTA, BRYOPHYTA, AND ANTHOCEROPHYTA
ANSWERS TO QUESTIONS**

1. What are the functions of rhizoids? anchorage, possibly absorption

2. What is the function of these pores? gas exchange

3. How do the positions of the archegonium and antheridium relate to their reproductive function? Antheridia need to disperse sperm and are upright with pores on top of the antheridial disk; archegonia are protected under the surface of the archegonial disk.

4.

- a. What is the function of the foot? nutrient transport from gametophyte to sporophyte
- b. Are spores haploid or diploid? haploid
- c. What is the functional significance of the response of elaters to moisture? dispersal of spores

5.

- a. How many cells thick is the leaflet? one or two
- b. Is there a midrib? Vein? yes
- c. Are stomata or pores visible on the leaf surface? probably not
- d. How does the symmetry of a moss gametophyte compare with that of a liverwort gametophyte? Mosses are radially symmetrical and liverworts are bilaterally symmetrical.

6.

- a. How many times its own weight did the moss absorb? or more times
- b. How does this compare with the paper towel? much greater
- c. Why is Sphagnum often used in shipping items that must be kept moist? because it holds water so well

7. Where is the egg located in the archegonium? egg is enlarged cell at base of neck

8. Are sperm haploid or diploid? haploid

9. Is the sporophyte more prominent in mosses or liverworts? mosses

10. What is the adaptive significance of the seta of the sporophyte growing well above the mat of the gametophyte? better dispersal

11.

- a. What process produces spores? meiosis
- b. Is the capsule haploid or diploid? diploid

12. Can you think of any evolutionary implications of the similarity between a moss protonema and a filamentous green alga? both have similar form and live in similar habitat, which suggests that selective pressures for developing these structures may have been similar

Exercise 28

**SURVEY OF THE PLANT KINGDOM: SEEDLESS VASCULAR PLANTS OF PHyla
PTEROPHYTA, LYCOPHYTA, PSILOPHYTA, AND SPHENOPHYTA ANSWERS TO
QUESTIONS**

1.

- a. Which parts of the life cycle are haploid? gametophyte
- b. Which are diploid? sporophyte

2.

- a. How many veins are present in each frond? usually 1 large vein
- b. What tissues compose a vein? xylem and phloem
- c. What is the function of the stalk? The blade? The pinnae? stalk—support; blade and pinnae—photosynthesis

3.

- a. What is the function of an annulus? breaking point for opening sporangium

- b. Are any spores in the sporangium? probably so

4.

- a. Did the application of acetone cause the spores of the fern to disperse? probably yes
- b. How is the mechanism for spore dispersal in ferns similar to that of bryophytes? Moisture causes changes in cell (elater or annulus) shape to release spores.

5.

- a. Is the prothallium haploid or diploid? haploid
- b. Is the prothallium sporophyte or gametophyte? gametophyte

6.

- a. What is the adaptive significance of having these structures on the lower surface of the prothallium rather than on the upper surface? protection from desiccation
- b. What is the adaptive significance of having sperm and egg produced at different times? discourages inbreeding

7. How do *Salvinia* and *Azolla* differ from other ferns you've examined earlier? smaller, aquatic

8.

- a. What type of branching characterizes *Psilotum*? dichotomous
- b. Are any roots present? no
- c. Are any leaves present? no
- d. Where are the sporangia? at end of short lateral branches

- e. Where does photosynthesis occur in Psilotum? stem

9.

- a. Where are the leaves? n rings along stem
- b. What part of the plant is photosynthetic? stem
- c. Which part of the life cycle of Equisetum is dominant, the sporophyte or gametophyte? sporophyte

10.

- a. How does strobili formation in Equisetum compare with Lycopodium and Selaginella? sporangia of Lycopodium and Selaginella are on microphylls
- b. How do elaters aid in the dispersal of spores? moves spores

11.

- a. How could a rhizome be involved in asexual reproduction? produces new growth, which could be separated from parent plant (e. g. , via fragmentation), thereby resulting in a new individual
- b. How is a rhizome different from a rhizoid? rhizome is underground stem; rhizoid is small, rootlike structure
- c. Does the rhizome have leaves? depends on specimen, but probably yes
- d. What is the shape and size of the leaves? thin, elongate, arranged in spirals
- e. What is the significance of this form of the leaves? intercept light for photosynthesis

- f. Is a midvein visible? yes g. What does the word " evergreen" mean? does not lose all of its leaves seasonally
- h. Is " evergreenness" a good characteristic for classifying plants? Why or why not? No, unrelated plants are evergreen.

12.

- a. How many sporangia occur on each sporophyll of Lycopodium? one
- b. Can you see why spores of Lycopodium are sometimes called " vegetable sulfur"? yes
- c. Why are the spores a good, dry lubricant? powdery; certain species produce some oil
- d. Which is the dominant part of the Lycopodium life cycle, the sporophyte or gametophyte? sporophyte

13.

- a. Are spores of Selaginella similar in size? no
- b. What is this condition called? heterosporous
- c. What is the functional significance of the difference in the appearance of dehydrated and rehydrated Selaginella? water conservation and survival during drought
- d. Can you see why these plants are sometimes referred to as " resurrection plants"? yes