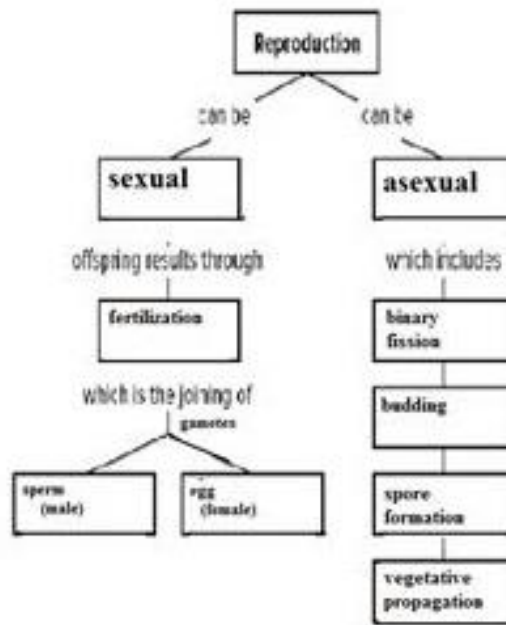
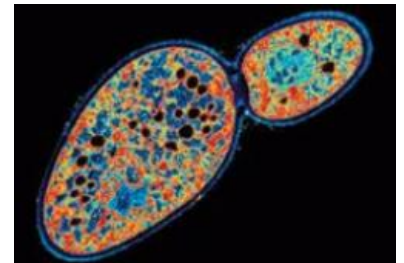


Unit 1 Review: Reproduction



1. Describe how the photo below represents reproduction. In your description include:
 - a. The type of reproduction with reasons to support



The photo represents reproduction because one cell, the large cell at the bottom left, is producing a new cell, the smaller cell at the top right. This appears to be similar to the asexual reproduction of yeast cells by budding, since one cell is becoming two, but the new cell produced by budding is much smaller. The larger cell would be the parent cell. This indicates it is asexual reproduction, as only one parent is involved.

- b. What you know about the offspring based on this type of reproduction

The offspring, or new cell produced by asexual reproduction would be genetically identical to the parent cell, or a clone, as mitosis is the process involved in the diagram.

2. Make a sketch of a plant cell that shows where the cell's genetic material would be found.

Answers should show a generalized plant cell having a boxy cell shape, a cell membrane plus an external cell wall, with a large central vacuole. Chloroplast may be shown as well. The next largest organelle should be the nucleus, and the diagram should indicate that the nucleus is the location of the cell's genetic information. Other organelles may be included as well, such as ribosomes, endoplasmic reticulum, and Golgi apparatus.

3. In what ways would your sketch be different if you were making a sketch of a animal cell? In what ways would it be similar?

Answers should indicate animal cells being more spherical, rounded or flexible in shape, not having a cell wall, large vacuole, or chloroplasts as found in plants. The similarities between animal and plant cells should include both having the nucleus as the location of the cell's genetic information. An animal cell nucleus would typically be the largest cell organelle, but it would be smaller than the vacuole region in a plant cell. Additionally, both animal and plant cells would have a cell membrane, as well as ribosomes, endoplasmic reticulum, and Golgi apparatus.

4. Explain how the following terms are related: DNA, Chromosome, genetic material.

An organism's genetic material exists in the form of DNA. When a cell prepares to divide, the very large DNA molecule condenses into separate structures called chromosomes.

5. What is the name of the molecule that stores genetic information?

DNA is the molecule that stores genetic information.

- a. Why is it important that this molecule be duplicated during interphase of the cell cycle?

DNA must be duplicated during the interphase portion of the cell cycle so that a double, complete set of the cell's genetic information is available for mitosis to take place. Only then can the chromosomes be evenly divided during mitosis so each daughter cell receives a full copy of the genetic material from the parent cell.

6. How does the DNA sequence of a parent bacterial cell compare to the DNA sequence of a daughter cell?

Before bacteria reproduce using binary fission, the DNA sequence is replicated or copied, producing two DNA strands with the same exact sequence. Then the cell divides into two, each one with their own copy of the DNA. thus, one parent cell produces two individual, identical daughter cells, each containing the same DNA as the parent cell.

7. How is genetic variation important to the survival of a species?

Genetic variation is very important to the survival of a species, as it produces some individual differences between individuals. If conditions vary, genetically identical organisms could all die, as they are all equally vulnerable to changes. But variation in the genetic information between members of a species would allow for differential survival. Even slight genetic differences could mean that some individuals within a population can survive in the changed conditions, and are able to reproduce and the population can continue.

8. In a little less than a month your body replaces all the cells of your skin. Is this an example of mitosis or meiosis? Explain.

It is an example of mitosis. Replacement of any cells in a multicellular organism is accomplished by the process of mitosis, as this copies the individual's DNA exactly to produce more identical cells. For

example, skin cells are constantly dividing and producing new skin cells, as the outer, dead skin cells are constantly worn off.

9. Both Mitosis and Meiosis are required for humans to reproduce and develop

a. What role does meiosis play? Explain

Meiosis is necessary for reproduction of individuals in a population. It produces gametes, the eggs in females, and sperm in males. These are haploid cells, having only 23 chromosomes in humans, instead of the usual diploid number of 46 chromosomes in all other cells. Then, when the egg and sperm join during fertilization, the zygote will have the correct total number of chromosomes, or 46. If eggs and sperm were produced by mitosis, they would still be diploid and each have 46 chromosomes. Combining an egg and a sperm would then result in a zygote with double the human number, at 92 chromosomes, making the zygote inviable.

b. What role does mitosis play? Explain

All other aspects of human development require the process of mitosis. This includes the single celled zygote dividing by mitosis a vast number of times in order to produce a human, with our trillions of cells. All of the pre-natal developmental stages, including embryonic and fetal development, occur by mitosis, as well as the growth of a human after birth, all the way to his or her adult size. Ongoing repair and replacement of cells throughout the human's lifetime is also done by mitosis. Mitosis is the necessary process for all of these steps, since not only can it be a very rapid cell division process, but more importantly, it is the only process that ensures every daughter cell has identical DNA or genetic information to the parent cell, and thus, codes for all the necessities of that particular human life. If meiosis was used for any of these steps, the cells produced would be haploid, with only half the correct chromosome number, not capable of independent existence, and not able to be useful as the cells for any part of the individual.

10. Why is sexual reproduction an advantage for an organism? Describe two disadvantages that are also a part of sexual reproduction.

Sexual reproduction is an advantage for an organism as it produces great genetic diversity of gametes, and also genetic diversity of the subsequent offspring, with two different parents. This increases the ability of a population to survive and thrive in varying conditions. Disadvantages of sexual reproduction include the great deal of energy and time expended finding a mate, fewer offspring are produced than by asexual reproduction, there is a longer amount of time before an organism is sexually mature and can reproduce, and there may be a great deal of time and energy spent by parents raising offspring.

11. Plants can reproduce both sexually and asexually

a. Describe one way that a plant reproduces asexually

Answers can include one of a variety of vegetative propagation methods discussed (cutting, air layering, grafting etc). For example, strawberry plants producing new plants at the end of horizontal stems called runners, 'piggyback' plants producing new plants

on the leaves of the parent plants, or spider plants producing new plantlets along aerial stolons.

- i. Why is it considered asexual reproduction? What does it tell you about the genetic material of the new plant?

Each example used for plant asexual reproduction would involve only one parent, and the new plants would be produced by mitosis. This would mean that the offspring are all genetically identical to the parent plant, and to each other.

- ii. How do farmers and gardeners use a plants ability to asexually reproduce? Use an example you have learned about.

Examples include farmers and gardeners making use of relatively simple, quick and affordable plant asexual reproduction methods such as potato tubers cut and planted, daffodil and tulip bulbs separated, leaf cuttings of African violets, stem cuttings of geraniums and ivy, peony and lily roots divided, grafting new twigs on fruit trees, layering of climbing roses or willows, air layering of tropical plants, or tissue culture of trees.

- b. Describe one way that a plant reproduces sexually

Pollination of a flower. Pollen from the male part of the plant is brought (via pollinators-bees, birds etc) to the female part of the plant

- i. Why is it considered sexual reproduction? What does it tell you about the genetic material of the new plant?

Information from two parents are involved, offspring with be genetically different from parents.

12. Complete the following table

Question	Mitosis	Meiosis
How many cells are produced for every cell that begins?	2	4
How do parent and daughter cells compare to each other?	Genetically identical	Parent cells are diploid Gametes produced are haploid (half the number of chromosomes)
How do daughter cells compare to each other?	Genetically identical	Genetically diverse, all different
Number of divisions of the nucleus?	1	2

Question	Mitosis	Meiosis
Function	Regular cell division, for asexual reproduction, as well as growth and replacement of cells	Sexual reproduction to produce haploid gametes

13. In three or four sentences, describe the major events that happen in the cell cycle

The cell cycle is a series of events during the lifetime of a cell, and consists of two main stages. The longest stage is interphase. During interphase, the cell grows and develops, and prepares for cell division by making an exact copy of all of its DNA, and copying its organelles as well. If interphase has proceeded completely and correctly, then the cell may enter the cell division stage. At this time, the cell divides by mitosis, which evenly sends a complete copy of the DNA to each of two daughter cells. Finally, the cells divide by cytokinesis, and now are complete and separate daughter cells. After this time, the new cells will enter interphase, and the cell cycle begins again.

a. Does every type of cell go through the cell cycle? Support your answer with examples

Every eukaryote cell goes through the cell cycle; the cell cycle represents the life cycle of a cell. Cells that produce gametes have a division stage of the cell cycle that includes meiosis). Cells that make exact copies of other cells, for example in growth and repair, have a division stage that involves mitosis.

b. Is the cell cycle exactly the same for every cell in a person's body? Give examples

The overall steps in the cell cycle follow the same sequence of events for every cell in a person's body (except those producing gametes). But the length of time taken for the complete cycle, and amount of time the cell may spend in interphase can vary, depending on the age of the person and the part of the body. For example, the cell cycle and mitosis occurs very rapidly in embryos and fetal development, and in infancy too.

14. The cells that make up the body of duck contain 80 chromosomes. How many chromosomes are in each of the following cells? Explain your answer for each. Use the terms haploid and diploid in your answers

- Egg cell
- Sperm cell
- Zygote

a) Duck egg cells would be haploid, and have 40 chromosomes.

b) Duck sperm cells would also be haploid, and consist of 40 chromosomes.

c) A duck zygote would be a diploid cell with 80 chromosomes, formed by the fertilization of the egg by the sperm cell.

15. How are haploid cells different from diploid cells? What processes produce these cells?

Diploid cells comprise almost all of the cells of an organism, and have the full number of chromosomes for the individual, with paired homologous chromosomes, one set from the individual's mother and one set from the father. For humans, diploid cells have 46 chromosomes, or 23 pairs. Haploid cells are only the gametes, eggs or sperm, and have half the number of chromosomes as in their parent, diploid cells. Only one of each chromosome is found in a haploid cell. Human eggs or sperm have 23 chromosomes, and none are paired. Diploid cells are produced by mitosis, while haploid cells are produced by meiosis.

16. You are working as a counsellor in a summer camp. Some of the buildings are old and the roofs leak. You notice a dark fuzzy looking material you think is mould growing in one of the buildings. Develop an explanation for where the dark fuzzy growth might have come from, how it is growing and how it could cause health problems?

Answers can include descriptions about mould and the suitability of the camp conditions for its growth. It is very likely that the dark, fuzzy material growing in the old summer camp building is mould. The description fits the type of fuzzy spores on sporangia that produce mould. Mould spores are microscopic, airborne, and everywhere, so they could easily have blown into the building. The camp building has probably been damp inside for a long time, with its leaky roof, used in summer only, probably not heated, and never really dries out in the winters. Mould loves warm, damp and dark conditions, just as found in the old building. It grows and reproduces asexually by mitosis, and can just keep producing more and more mould spores quickly. Mould can grow in and on wood, walls, and fabric, extending their fine thread-like cells into everything. Since mould spores are sent into the air, they are easily breathed in. Some types of mould cause disease and lung problems, and can infect anyone in the building. As a summer counsellor, it is important to protect the campers and their health, so you really want the camp director to check on this problem right away.

17. Bacteria have both positive and negative influences in the food industry.

- a. What are some of these positive and negative influences?

Positive bacterial influences include on the food industry such as the production of cheese, yogurt, pickles, soy sauce and chocolate. Negative influences of bacteria on the food industry could include food spoilage or decomposition, and food poisoning

- b. Develop a hypothesis about the effect of temperature on the reproduction of bacteria?

An example of a hypothesis: If the temperature is decreased, then bacteria will reproduce less quickly.

- c. Describe how you could carry out an investigation to test your hypothesis.

Answers could include suggestions of growing bacteria at different temperatures and measuring the size of the population over time. Temperatures to use could include room temperature, in an incubator at school (optimum growth at 37 °C), in a refrigerator, and in the freezer. A thermometer should be used in each location, to note the temperature.

18. The offspring below has a male and female parent. Do all living things have two biological parents? Explain.



Not all organisms have two biological parents, only those who have been produced by sexual reproduction.

19. Explain why sexual reproduction is an advantage for species that live in a changing environment.

Sexual reproduction is an advantage for species that live in a changing environment due to the great genetic diversity of the offspring. All individuals produced by sexual reproduction are genetically varied, different and unique. This diversity means that there is a much greater chance that at least some of the offspring will have characteristics or adaptations suited to the new environment. If the environment continues to change, in each new generation, there is still a greater chance that some will survive.

20. Compare and Contrast Asexual and Sexual Reproduction (chart we did in class)

21. Comparing Sexual and Asexual Reproduction

	Sexual	Asexual
# of Parents	2	1
# of Offspring	few	many
Variety of Offspring	diverse	identical
Speed of reproduction	slow	quick

Timing (when offspring can reproduce)	Offspring take longer to reach maturity	Offspring mature quickly so can begin reproducing soon after being produced
Advantages	Genetic variation	Only one parent is needed, occurs quickly, many offspring produced, offspring can begin reproducing soon after being produced.
Disadvantages	Search for mate might expose individuals to predators, disease or harsh conditions. Fewer offspring so it takes longer for a population to grow Offspring cannot reproduce until they reach maturity which takes longer Lots of energy and time to raise offspring to be independent.	If environment changes (drought, flood, fire, etc) or disease invades then all organisms since they are identical will all respond in the same way (ie become diseased or die) Lack of diversity leaves organisms vulnerable to change
Example of an Organism	Humans, Salmon, Flowers	Bacteria, Yeast, Mould

22. Give examples of types of Asexual Reproduction

Binary fission, Budding, Spore Formation, Vegetative Propagation

23. Give examples of organisms that undergo asexual reproduction

Yeast, Bacteria, Mould, Plants

24. Give examples of organism that use sexual reproduction

Humans, Plants, Salmon, Bears,

25. Why is reproduction important to sustainability and continuity of a species?

Reproduction ensures that life exists beyond its present generation. Reproduction ensures that organisms have a source of nutrients and energy to sustain their life processes.

26. What are gametes?

Sex cells. Haploid. Male-sperm, Female-egg

27. What is a zygote?

Sperm cell and egg cell fuse during fertilization to form the single celled zygote.

28. What are homologous chromosomes? How do they compare?

Paired chromosomes, one come from the female and one from the male. They carry the same genes but may have differing alleles

29. Which gamete determines the sex of the zygote?

They sperm cell will determine the sex as the male has the potential to give an X or a Y