

Learning Objectives Part 3

1. What is a tissue?

Different tissue express different genes, but contains the same genes. Muscle tissue vs. neuron

2. How does the lac operon work and why is it important to the bacteria that have it and to humans?

RNA polymerase attaches and initiates transcription between the promoter and the enzyme genes, a DNA control sequence called an operator acts as a switch. The operator determines whether RNA polymerase can attach to the promoter and start transcribing the genes. Transcription is turned off because a protein called repressor binds to the operator and physically blocks the attachment of RNA polymerase to the promoter.

3. What is fermentation and why is it important?

Fermentation is NADH was produced during glycolysis and then converted back to NAD⁺. When glucose turns into 2 pyruvates by glycolysis. The 2 pyruvate produce lactate by NADH to NAD⁺. It is anaerobic exercise in the muscle. Fermentation is way of harvesting chemical energy that doesn't require oxygen.

- Lactic acid fermentation; muscle cells and bacteria can regenerate NAD⁺ Muscle cells switch lactic acid when the need for ATP outpaces delivery of O₂ via the blood stream. Lactate builds up in muscle during exercise. Used to make cheese and yogurt.
- Alcohol Fermentation; yeasts are single- celled fungi normally use aerobic respiration to process their food recycle NADH to NAD⁺ Pyruvate- CO₂ and ethanol CO₂ = bubbles

4. How is gene expression regulated?

It is related by nutrients. Growth factors, and neighboring cells. Also changed outside the organism, due to different transcription factors. In a muscle protein in the nuclei make up the arrangement of muscle. In neurons the proteins change making synapses. Yogurt as it turns acidic, gets rid of lactose.

5. what are examples of DNA- binding proteins and what does each one to bind to? What is a general rule about where DNA- Binding proteins bind to DNA?

6. What are the major differences between prokaryotes and eukaryotes?

Prokaryotes are small and simpler, they have flagella, Reproduce by binary fission.

Both have plasma membrane, cytosol, chromosomes, ribosomes.

Eukaryotes have membrane enclosed nucleus, membrane bound organelles, and many chromosomes.

7. Why do cells need to divide?

Cells undergo reproduction—Cell Division—so two daughter cells that are genetically identical to each other chromosomes- parents cell splits into 2 (Duplicate chromosomes) asexual reproduction is reproduce by dividing in half= replicas Sexual reproduction fertilization of an egg by sperm.

8. What needs to happen during the cell cycle in prokaryotes or eukaryotes?

Prokaryotes reproduce by binary fission "Dividing in half"

Chromosomes is duplicating copies more towards opposite end, cell elongates, doubles in size, plasma membrane grows inward more cells wall is made and it divides. (Bacteria)

Eukaryotes reproduce by mitosis. Mitosis is to get exactly one copy of each chromosomes into each new daughter cell during the cell cycle. Interphase, Prophase, Pro-metaphase, Metaphase, Anaphase, Telophase & Cytokinesis.

9. What makes one cell different from another in a multicellular organism?

10. How would you predict the amount of mRNA if you know the amount of proteins, and how would you predict the amount of protein given the amount of mRNA? How would the amount of protein and mRNA relate?

11. What are the types of tumors and cancers?

Tumor is a mass of abnormally growing cell cycle control system. A benign tumor is abnormal cells remain at their original site. The benign tumors can cause problems if they grow in and disrupt certain organs, such as the brain, but often they can be completely removed by surgery or even left alone. A malignant tumor can spread into neighboring tissue and invade other parts of the body, displacing normal tissue and interrupting organ function as it grows. An individual with a malignant tumor is said to have cancer. The spread of cancer cells beyond their original site is called metastasis.

12. What are sister chromatids and when do they form?

Each chromosome now consists of two copies called sister chromatids, joined copies of the original chromosome. The two sister chromatids are attached together along their lengths by proteins and are cinched especially tightly at a region called the centromere. When the cell divides the sister chromatids of a duplicated chromosome spate from each other.

13. What are the stages of the cell cycle including the checkpoints?

Interphase which is divided into three sub phases g1 phase s phase, and g2 phase. During all 3 phases, the cell grows. The chromosomes are duplicated during the s phase: at the beginning of the s phase, each chromosome is single. At the end of the sub phase after DNA replication the chromosomes are doubled each consisting of two sister chromatids joined along their lengths.

During the G₂ phase, the cell grows more as it completes preparations for cell division. The M phase is the interval of the cell cycle when the cell physically divides, accounts for only 10% of the total time required for the cell cycle. The mitotic phase is divided into two overlapping stages, called mitosis and cytokinesis. In mitosis the nucleus and its contents- most important the duplicated chromosomes- divide and evenly distributed, forming two daughter nuclei. During cytokinesis, which usually begins before mitosis ends, the cytoplasm is divided in two. The combination of mitosis and cytokinesis produces two genetically identical daughter cells, each with a single nucleus, surrounding cytoplasm stocked with organelles and a plasma membrane. Each newly produced daughter cell may then proceed through G₁ and repeat the cell.

14. What affects whether a cell goes through the G₁ checkpoint?

15. What would happen if you add growth factors to cells in a petri dish? Why would you compare what happened over time with the growth factors to without the growth factors? Influence the rate of cell growth.

16. What would happen if a growth factor receptor (or another component of the signal transduction pathway) is mutated so that it is stuck in the ON state (has a shape that is like having the growth factor bound, even when there is no growth factor)?

17. Compare oncogenes to tumor-suppressors

Oncogene is such a gene which can cause cancer when present in a single copy in the cell. Tumor Suppressors proteins they encode help prevent uncontrolled cell growth.

18. What are the lifestyle choices that can reduce the risk of cancer?

19. What are the types of cytoskeleton components, what are some specific examples and what are their relative sizes?

20. What are the stages of mitosis? What is happening to the chromosomes cytoskeleton and membranes at each stage of mitosis and interphase? For this material you may want to make and study a table in addition to writing a paragraph and drawing, labeling and explaining mitosis and interphase

21. Compare cytokinesis in plant versus animal eukaryotic cells

22. what is the human life cycle?

23. What is asexual reproduction, including examples?

24. what is sexual reproduction? Including categories and examples?

25. What are the advantages and disadvantages of sexual versus asexual reproduction?

26. What are homologous chromosomes?

27. what is the purpose of meiosis?

28. What are the phases and events of mitosis?