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Biology EOC Review Guide – Sanderson HS Fall 2019

**Unit 1 Objectives (8-10 questions on EOC will be on these topics):**

* Understand the historical development of the classification system and what has promoted changes in the system over time.
* Understand how organisms have reproductive adaptations that allow them to experience reproductive success.
* Be able to work through a dichotomous key
* Recognize the similarities and differences between prokaryotic and eukaryotic cells AND be able to define cellular terminology (sexual/asexual reproduction, prokaryote vs eukaryote, autotroph/heterotroph, multicelled/unicelled)

**Videos to review:**

<https://www.youtube.com/watch?v=tYL_8gv7RiE>

<https://www.youtube.com/watch?v=F38BmgPcZ_I>

<https://www.youtube.com/watch?v=cQPVXrV0GNA>

<https://www.youtube.com/watch?v=wpKulkADzBk>

**Questions essential to mastering the objectives:**

1. What two kingdoms were the first two kingdoms in the classification system?
2. What advancements triggered changes in the classification to now become 6 kingdoms?
3. What are the 8 taxonomic ranks? (Which rank is the most broad? Most specific?)
4. Which two names make up binominal nomenclature (scientific name)?
5. Fill in the chart below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Animal** | **Plant** | **Protist** | **Fungi** | **Bacteria** | **Archaea** |
| Cell type (pro/eu) |  |  |  |  |  |  |
| Energy Method (auto/hetero) |  |  |  |  |  |  |
| # of cells (multi/uni) |  |  |  |  |  |  |
| Reproductive method |  |  |  |  |  |  |
| Unique aspects |  |  |  |  |  |  |

1. Identify the purpose for a dichotomous key AND explain in detail how to use one. Note: it would be HIGHLY beneficial to practice using one again…watch the amoeba sisters video linked above to practice.

**Unit 2 Objectives (15-17 questions on EOC will be on these topics):**

* Be able to analyze success of an organism in terms of behavioral, structural, and reproductive adaptations (i.e. their “fitness”). Behavioral adaptations such as suckling, taxis (photo/chemo/thermos), migration, estivation, hibernation, habituation, imprinting, classical conditioning, trial and error learning. Structural adaptations such as nutrition, respiration, transport, and excretion mechanisms, camouflage, and movements. Reproductive adaptations such as sexual vs asexual, eggs, seeds, spores, placental, and types of fertilization (internal vs external)
* Understand how there is biochemical, fossil, and anatomical evidence to support the theory of evolution
* Explain how natural selection influences the changes in species over time
* Understand how disease agents (bacteria, viruses) can influence natural selection
* Be able to determine evolutionary history from a phylogenetic tree, create your own phylogenetic tree, and determine relatedness from a phylogenetic tree.
* Explain how organisms can interact with each other (predation, competition, parasitism, mutualism, commensalism) and with their environments

**Videos to review:**

<https://www.youtube.com/watch?v=aTftyFboC_M>

<https://www.youtube.com/watch?v=cC8k2Sb1oQ8>

<https://www.youtube.com/watch?v=yJLRl2G41nQ&t=556s>

<https://www.youtube.com/watch?v=SWY3FKbtEz8>

<https://www.youtube.com/watch?v=EyyDq19Mi3A>

<https://www.youtube.com/watch?v=vZNeRWchqRc>

<https://www.youtube.com/watch?v=udZUaNKXbJA&t=17s>

<https://www.youtube.com/watch?v=ouZ9zEkxGWg&t=20s>

**Questions essential to mastering the objectives:**

1. Describe the following behaviors:
   1. Suckling
   2. Migration
   3. Hibernation
   4. Estivation
   5. Habituation
   6. Imprinting
   7. Classical Conditioning
   8. Trial and Error Learning
   9. Camouflage
   10. Mimicry
   11. Territorial Defense
   12. Courtship rituals
   13. Pheromones
2. What is the difference between innate, learned, and social behaviors?
3. What were the characteristics of the early earth? How did these characteristics influence the first life forms on the planet?
4. What evidence exists to support the theory of evolution? Explain how they support the theory.
5. Summarize the theory of natural selection proposed by Charles Darwin.
6. Describe the peppered moth example and relate it to the tenants of natural selection.
7. What is antibiotic resistance and how does this relate to natural selection?
8. Explain why a new flu vaccine is needed each year and how this relates to natural selection.
9. Explain how to use a phylogenetic tree/cladogram to determine relatedness.
10. Explain how to determine relative geologic history of organisms or traits using a phylogenetic tree/cladogram.

**Unit 3 Objectives (10-12 questions on EOC will be on these topics):**

* Be able to describe the carbon cycle as it relates to photosynthesis, respiration, decomposition, and burning of fossil fuels. Be able to describe the nitrogen cycle, specifically how bacteria are involved in supporting the synthesis of proteins in living organisms.
* Explain factors that influence climate and climate change
* Identify how the transfer of energy occurs in food webs
* Be able to interpret various population graphs such as predator/prey, exponential (J-curve), logistic (S-curve), and age structure graphs
* Explain what factors contribute to population growth and whether they are density independent or density dependent
* Identify factors in the world and in NC that disrupt ecosystem balance such as Dutch Elm disease, Pfiesteria, Invasive species, acid rain, beach erosion, urban development/deforestation, and waste lagoons on hog farms.

**Videos to review:**

<https://www.youtube.com/watch?v=NHqEthRCqQ4>

<https://www.youtube.com/watch?v=lnAKICtJIA4>

<https://www.youtube.com/watch?v=RBOsqmBQBQk>

<https://www.youtube.com/watch?v=-oVavgmveyY>

**Questions essential to mastering the objectives:**

1. How does carbon enter the atmosphere? How does it leave the atmosphere and become fixed into living organisms?
2. Draw the carbon cycle and label what process (photosynthesis, respiration, burning of fossil fuels, etc) occurs at each stage.
3. In what state of matter is nitrogen found in the atmosphere?
4. How is nitrogen fixed into a usable source? (Note: what organism allows this?)
5. What are abiotic factors in an ecosystem? Biotic factors?
6. What is the greenhouse effect?
7. What factors contribute to the greenhouse effect?
8. What are the consequences of the greenhouse effect?
9. In a food chain, how much energy is transferred from one trophic level to the next?
10. In a food chain, where does all energy originate from?
11. Grass 🡪 Rabbit 🡪 Fox 🡪 Eagle
    1. Identify each organism as trophic level 1, 2, 3, etc.
    2. Identify each organism as a producer or consumer
    3. Identify each consumer as herbivore, omnivore, or carnivore
12. Sketch a predator/prey graph and explain why the trends occur.
13. Sketch an exponential growth graph and explain why the trends occur. What assumptions are made for populations that show exponential growth?
14. Sketch a logistic growth graph and explain why the trends occur.
15. What is carrying capacity?
16. Define density independent factors and give three examples.
17. Define density dependent factors and give three examples.
18. Explain how you would determine high birth or low birth rates from an age structure graph. You may sketch a picture of an age structure graph if needed.
19. Explain how you would determine a rapidly growing population from an age structure graph. Would this indicate a developing or developed country?
20. Explain how you would determine a slowly growing population from an age structure graph. Would this indicate a developing or developed country?
21. Briefly describe the problem below and explain how it can disrupt ecosystem balance (whether it alters the food chain or nutrient cycles) and how humans can help fix the problem.
    1. Dutch Elm disease
    2. Pfiesteria
    3. Invasive species
    4. Acid rain
    5. Beach Erosion
    6. Urban development/Deforestation
    7. Waste lagoons on hog farms

**Unit 4 Objectives (6-7 questions on EOC will be on these topics):**

* Identify which two organelles accomplish photosynthesis and aerobic cellular respiration and how their shape allows them to complete that function.
* Compare the structures and functions of the major biological molecules (carbohydrates, lipids, proteins, and nucleic acids) as related to the survival of living organisms and their need for a constant supply of energy.
* Understand the overall reactions for photosynthesis, aerobic respiration, and anaerobic respiration.
* Understand why ATP is considered the energy containing molecule for cells.

**Videos to review:**

<https://www.youtube.com/watch?v=0IJMRsTcwcg>

<https://www.youtube.com/watch?v=00jbG_cfGuQ&t=257s>

<https://www.youtube.com/watch?v=H8WJ2KENlK0&t=19s>

**Questions essential to mastering the objectives:**

1. What do organic compounds contain that inorganic compounds do not? Give examples of organic molecules. Give examples of inorganic molecules.
2. Fill in the chart for organic molecules below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Carbohydrates | Lipids | Proteins | Nucleic Acids |
| Monomer and Polymer |  | Polymer not needed |  |  |
| Elements Present |  |  |  |  |
| Function |  |  |  |  |
| Non-food examples |  |  |  |  |
| Drawing |  |  |  |  |

1. Fill in the chart for photosynthesis and respiration below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Photosynthesis | Aerobic Cell Respiration | Anaerobic: Lactic Acid Fermentation | Anaerobic: Alcoholic Fermentation |
| Write the equation |  |  |  |  |
| What is needed for this reaction to occur (reactants) |  |  |  |  |
| What is the goal of this process |  |  |  |  |
| What is/are the waste product(s) |  |  |  |  |
| What organisms undergo this reaction? |  |  |  |  |
| Organelle where this reaction takes place |  |  |  |  |

1. What factors can affect the rate of photosynthesis? Why?
2. What is ATP?
3. Where is ATP made?
4. How is energy stored within an ATP molecule?
5. How is energy used from an ATP molecule? (in other words…what happens to ATP when energy is released?)
6. Identify a process where ATP is required.
7. How does an organism obtain oxygen for aerobic respiration?
8. How does a plant obtain carbon dioxide for photosynthesis?
9. How does an organism obtain glucose for respiration?
10. How does a plant release oxygen after photosynthesis has occurred?
11. How does a plant obtain water for photosynthesis?
12. How is water transported throughout a plant?
13. How are sugars transported throughout a plant?
14. What type of organic molecule is cellulose? What is its function?
15. What type of organic molecule is glycogen? What is its function?
16. What type of organic molecule is a wax? What is its function?
17. What type of organic molecule is a steroid? What is its function?

**Unit 5 Objectives (7-8 questions on EOC will be on these topics):**

* Compare prokaryotic and eukaryotic cells in terms of their general structures and degree of complexity.
* Compare structure and function of organelles in eukaryotic cells (differences in animal and plant cells).
* Explain how unicelled organisms have adaptations that help them survive in particular environments.
* Explain the makeup of the cell (plasma) membrane, in detail.
* Understand how cellular transport works (both passive and active transport).
* Compare and contrast the different types of passive transport (diffusion, osmosis, facilitated diffusion)

**Videos to review:**

<https://www.youtube.com/watch?v=cj8dDTHGJBY>

<https://www.youtube.com/watch?v=Pxujitlv8wc>

<https://www.youtube.com/watch?v=y31DlJ6uGgE&t=262s>

<https://www.youtube.com/watch?v=RPAZvs4hvGA&t=55s>

**Questions essential to mastering the objectives:**

1. What makes a prokaryotic cell different from a eukaryotic cell?
2. Where is DNA located in a prokaryotic cell? What is prokaryotic DNA called and/or what does it look like?
3. Draw and label a bacterium.
4. Where is DNA located in a eukaryotic cell? What is eukaryotic DNA called and/or what does it look like?
5. Draw and label a basic animal cell.
6. What cell parts exist in both a prokaryotic and eukaryotic cell?
7. Fill in the chart about cell organelles below:

|  |  |  |
| --- | --- | --- |
| Organelle | Function | Found in (bacteria, plant, animal) |
| Plasma membrane |  |  |
| Cell wall |  |  |
| Nucleus |  |  |
| Cytoplasm |  |  |
| Ribosome |  |  |
| Mitochondria |  |  |
| Vacuole |  |  |
| Chloroplast |  |  |

1. Draw and label the plasma membrane.
2. Compare and contrast diffusion, osmosis, and facilitated diffusion.
3. Fill in the chart about cellular transport below:

|  |  |  |
| --- | --- | --- |
|  | Passive Transport | Active Transport |
| Which directions to particles move? |  |  |
| Is energy required? |  |  |
| Is equilibrium reached? |  |  |
| Example(s): |  |  |

**Unit 6 Objectives (12-14 questions on EOC will be on these topics):**

* Explain how DNA and RNA code for proteins and determine traits (protein synthesis)
* Understand the structure of DNA and RNA
* Explain the steps of DNA replication and the end result of DNA replication
* Identify some of the purposes of specific proteins such as enzymes, insulin, and hemoglobin.
* Explain how enzymes act as catalysts for various reactions (enzyme mechanics)
* Explain how mutations in DNA can result to changes in the protein that is produced and then lead to changes in phenotype
* Interpret how DNA is used for identification of criminals, paternity cases, or relatedness of organisms

**Videos to review:**

<https://www.youtube.com/watch?v=5qSrmeiWsuc>

<https://www.youtube.com/watch?v=ok9esggzN18>

<https://www.youtube.com/watch?v=itsb2SqR-R0>

<https://www.youtube.com/watch?v=eDbK0cxKKsk>

**Questions essential to mastering the objectives:**

1. Summarize the steps of DNA replication
2. What are the three parts of a nucleotide?
3. What are the base pairing rules in DNA? In RNA?
4. Fill in the chart below to compare and contrast DNA and RNA

|  |  |  |
| --- | --- | --- |
|  | DNA | RNA |
| Names of nitrogenous bases and which ones pair up |  |  |
| Type of sugar |  |  |
| Number of strands |  |  |

1. What is insulin? Describe a situation in which insulin is crucial for survival.
2. What is hemoglobin? Describe a disorder in which a mutation has occurred in the hemoglobin protein.
3. What is the goal of protein synthesis?
4. What are the two main steps of protein synthesis?
5. Where does transcription take place?
6. Summarize what happens during transcription.
7. Where does translation take place?
8. Summarize what happens during translation.
9. Differentiate between a codon and an anticodon. Which one determines the amino acid type?
10. Use a codon chart: What amino acid sequence would be the correct sequence for a reading frame that reads: AUG – CUA – UUC – GUC – UGA
11. What causes mutations? (What type of environmental triggers can cause them)
12. Describe each of the following mutation types:
    1. Substitution
    2. Insertion
    3. Deletion
13. What is gel electrophoresis used for?
14. Summarize the steps of gel electrophoresis.
15. How would you identify a criminal from crime scene DNA using a DNA fingerprint?
16. How would you identify the father of a child if you were given DNA fingerprints from both mother, father, and baby?
17. What are restriction enzymes? What are they used for?
18. What is the role of an enzyme in a chemical reaction?
19. What does an enzyme do to activation energy for a chemical reaction?
20. Draw a picture of an enzyme binding to a substrate, forming the enzyme-substrate complex, and creating products. Label all parts, including active site.
21. What factors can cause an enzyme to no longer function? What word describes this process?

**Unit 7 Objectives (7-8 questions on EOC will be on these topics):**

* Interpret how changes in the cell cycle (specifically at checkpoints) could contribute to cancer
* Understand the difference between asexual and sexual reproduction
* Recognize how cell specialization/cell differentiation occurs (general idea)
* Know the phases of mitosis and what is occurring in each phase
* Know the phases of meiosis and what is occurring in each phase
* Explain applications of transgenics/GMOs, bacterial transformation, cloning (therapeutic and reproductive), stem cells, and gene therapy
* Evaluate some of the ethical issues surrounding biotechnology
* Explain the role of meiosis in sexual reproduction and specifically genetic variation

**Videos to review:**

<https://www.youtube.com/watch?v=ZDZUAleWX78>

<https://www.youtube.com/watch?v=t3g26p9Mh_k&t=192s>

<https://www.youtube.com/watch?v=wNe6RuK0FfA>

<https://www.youtube.com/watch?v=2aVnN4RePyI&t=396s>

<https://www.youtube.com/watch?v=mXVoTj06zwg>

<https://www.youtube.com/watch?v=zglQ2Ildw4I>

<https://www.youtube.com/watch?v=16enC385R0w>

**Questions essential to mastering the objectives:**

1. Describe what happens in each stage of the cell cycle:
   1. G1
   2. S
   3. G2
   4. Mitosis
   5. G0
2. Summarize each phase of mitosis:
   1. Interphase
   2. Prophase
   3. Metaphase
   4. Anaphase
   5. Telophase/Cytokinesis
3. Fill in the chart regarding asexual and sexual reproduction:

|  |  |  |
| --- | --- | --- |
|  | Asexual Reproduction | Sexual Reproduction |
| How many parents are involved? |  |  |
| Do the offspring express variation? |  |  |
| Is the fusion of gametes involved? |  |  |
| Which form of cell division is associated with this process (mitosis or meiosis)? |  |  |

1. Define the following types of asexual reproduction:
   1. Binary fission
   2. Regeneration
   3. Budding
2. Fill in the following chart to compare and contrast mitosis and meiosis:

|  |  |  |
| --- | --- | --- |
|  | Mitosis | Meiosis |
| Cells that undergo this process |  |  |
| Number of cell divisions |  |  |
| Number of cells produced in the end |  |  |
| Type of cell produced (haploid or diploid) |  |  |
| Drawing |  |  |

1. Define the following terms:
   1. Gametes
   2. Somatic cells
   3. Zygote
   4. Haploid
   5. Diploid
   6. Homologous chromosomes
2. Meiosis 1 is where genetic variation occurs that will allow haploid gametes to be created that are genetically different. What processes cause this genetic variation and in what stages do these processes occur?
3. What is a stem cell?
4. How does a stem cell become differentiated?
5. Why are embryonic stem cells controversial?
6. What is a clone?
7. What is the difference between reproductive and therapeutic cloning?
8. What are the steps to creating a reproductive clone?
9. What is a transgenic organism/GMO?
10. Why do we use transgenics/GMOs?
11. What was the goal of the Human Genome Project?
12. What are the steps to bacterial transformation?
13. What is one use of bacterial transformation in the medical field?

**Unit 8 Objectives (2-4 questions on EOC will be on these topics):**

* Predict offspring ratios or percentages based on inheritance patterns such as normal pattern (dominant/recessive), incomplete dominance, codominance, and sex-linked traits
* Be able to read a pedigree and determine genotypes of individuals in the pedigree
* Be able to read a karyotype and determine chromosomal abnormalities and gender
* Know the inheritance pattern of some well know genetic disorders (cystic fibrosis, sickle cell anemia, huntington’s disease, colorblindness, and hemophilia)

**Videos to review:**

<https://www.youtube.com/watch?v=pv3Kj0UjiLE&t=26s>

<https://www.youtube.com/watch?v=i-0rSv6oxSY&t=16s>

<https://www.youtube.com/watch?v=h2xufrHWG3E&t=23s>

<https://www.youtube.com/watch?v=YoEgUqHOcbc>

<https://www.youtube.com/watch?v=Gd09V2AkZv4&t=313s>

**Questions essential to mastering the objectives:**

1. Define the following terms:
   1. fertilization
   2. gene
   3. allele
   4. dominant
   5. recessive
   6. homozygous
   7. heterozygous
   8. genotype
   9. phenotype
2. Complete the following Punnett squares:
   1. In mice black fur is dominant to white fur. Cross a white mouse with a heterozygote. What is the chance they will produce mice with black fur? White fur?
   2. In chickens, black feathers and white feathers exhibit codominance. Cross two checkered chickens. What is the chance a black feathered chicken will be produced? White feathered chicken? Checkered chickens?
   3. In roses, when red and white alleles are both present in a flower they will produce pink petals. Cross a red rose and a white rose. What is the chance red roses will be produced? White roses? Pink roses?
   4. A woman with type AB blood marries a man who is type A blood, but has a mother with type O blood. What are the possible blood types of the children?
   5. In humans, hemophilia is a sex-linked trait. Cross a man with hemophilia with a woman with no family history of hemophilia. What are the chances they will have children with hemophilia? A boy with hemophilia? A girl with hemophilia?
3. Which parent determines the gender of the offspring? Why?
4. Why are males more likely to inherit a sex-linked trait?
5. Draw a pedigree of a family with the following characteristics
   1. A mother and a father with 2 children – a boy and a girl in that order
   2. Both children married and had 1 daughter each
   3. In your pedigree, free ear lobes are dominant to attached ear lobes – color in those with free ear lobes
   4. The father has free ear lobes along with both of his children and his grandchildren
   5. Determine the genotype of everyone in the family
6. For each of the genetic disorders below list whether the disorder is autosomal dominant, autosomal recessive, or sex-linked recessive
   1. Cystic Fibrosis
   2. Sickle Cell Anemia
   3. Huntington’s Disease
   4. Colorblindness
   5. Hemophilia
7. What are the first 22 pairs of chromosomes called on a karyotype?
8. What do the last pair of chromosomes on a karyotype tell us?
9. What is nondisjunction? How can nondisjunction be recognized in a karyotype as a chromosomal disorder?