Unit 4: Biodiversity - Study Guide (Key)

Presentation #1: The Importance of Biodiversity

Vocabulary:

1. Abundance - **the total number of organisms in an area (the species does not matter)**

2. Relative abundance **- the percent composition of a species in relation to the total number of organisms (what percentage of the total population is a particular species)**

3. Species richness - **the number of different species in an area**

Questions:

4. What are the factors that maintain all life on earth? **(review)**

Solar energy, biodiversity, and cycling (of nutrients)

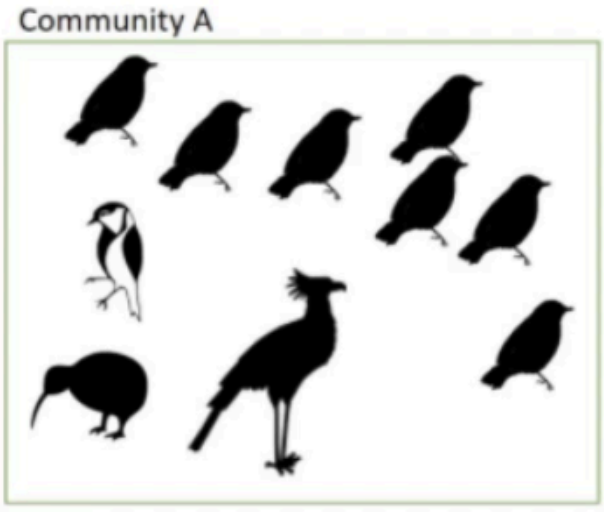
5. Identify and describe the three levels of biodiversity: genetic, species, and ecosystem diversity.

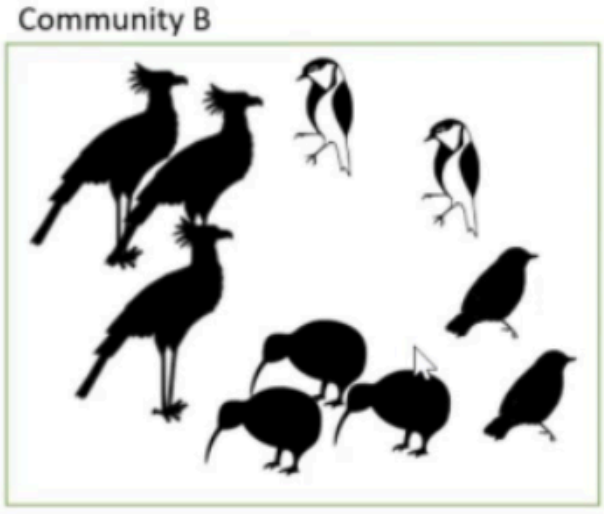
Genetic diversity - the differences in genes and alleles within a single species.

Species diversity - the differences in species within an ecosystem (species richness + relative abundance of each species)

Ecosystem diversity - the variety of ecosystems present in an area

6. What is the species abundance and species richness of each of the following communities? Which one is more diverse?





	Community A	Community B
Abundance	**10**	**10**
Species richness	**4**	**4**
More or Less Diverse	**Less (mostly small birds)**	**More (same species richness, but relative abundance is more even)**

a. What is the relative abundance of the large bird in community A?
10% (1 large bird / 10 total birds x 100%)

Presentation #2: Natural Selection

Vocabulary:

7. Species - **a population whose members can breed and produce fertile offspring**
8. Population - **a group of individuals of the same species that live in the same area**
9. Evolution - **change in the genetics of a population over generations**
10. Adaptation (adaptive trait) - **a trait that promotes survival and reproductive success**
11. Natural selection - **process by which nature (environmental pressures) selects for a change in species over time as only the fittest survive to pass on their traits to the next generation**

Questions:

12. Please classify each of the following adaptations into the correct category: structural, physiological, behavioral, warning coloration, and mimicry.

Adaptation Description	Picture	Type of Adaptation
Poison dart frogs are brightly colored to warn predators that they are poisonous		**Warning coloration (if you eat me, you will die)**
The wings of a moth look like the face of an owl		**Mimicry (I am not dangerous, but I'm going to scare you to think I am, so you do eat me)**
The quills of a porcupine make it harder for predators to hunt		**Structural = physical characteristics (my physical spikes will get in your nose, so don't eat me)**
Skunks spray a foul odor in order to scare off predators		**Physiological = chemicals produced (I make a stinky chemical that I can spray at you to ruin your day, so don't eat me)**
Meerkats will cry out in alarm to warn other meerkats of a predator		**Behavioral = organism actions (I warn my friends about you so you can't eat us)**

13. What are the sources of genetic diversity in a population?

Mutations (source of new genes and alleles) and sexual reproduction (mechanism that switches up what is passed down)

14. A population of mostly white rabbits but some black rabbits lives in an area where there is snow year round, but over time climate change warms the area so that there is no snow anymore, but black rocky mountains. Using the main points of natural selection, describe how this species would be expected to adapt over time and why?
    a. **Variation: Within the population exist variation: white rabbits and black rabbits**
    b. **Competition: There are not enough hiding spots in the forest, and so they compete to hide from predators**
    c. **Adaptation/Fitness: As the snow disappears, the white rabbits are more easily seen and hunted, whereas the black rabbits are able to blend in with the black rock (favorable adaptation)**
    d. **Reproduction: Because black rabbits survive, they pass on their genes and the population changes to be mostly black with some white.**

15. Describe how a species of bird might diverge into multiple species over time through natural selection (speciation)?
    Answers can vary.
    Example:
    - **A bird species ranges in color from dark green to brown.**
    - **This species lives in the canopy of the tree (where it is green)**
    - **The green birds are better able to blend in and eat the grubs in the canopy, outcompeting the brown birds**
    - **Instead of just dying, the brown birds start living on the trunk where they can blend in and eat.**
    - **Over time, the different birds no longer mate and have offspring and are thus different species**
    - **This process happens over and over again resulting in different species.**

Presentation #3: Human Influence on Evolution

Vocabulary:

16. Artificial selection - **the process of selection conducted under human direction**

17. Extinction - **the disappearance of a species from Earth**

18. Background extinction rate - **a constant, slow rate of extinction that occurs as a part of evolution**

19. Mass extinction events - **episodes that killed off massive numbers of species at once**

20. Endemic species - **a species that only exists in a certain, specialized area**

Questions:

21. Describe two examples of artificial selection.
    Variety of dog breeds (everything started from the wolf)
    Variety of food crops (we have selected for various traits and totally changed plants over time)

22. Explain how extinction and speciation affect Earth's biodiversity.

Number of species in existence (biodiversity) = speciation (formation of new species) - extinction (removal of species)

23. Is extinction inherently bad? If not, what is?

Extinction is a normal part of a changing Earth, and is not inherently bad. What is bad is the current rate of extinction which is way faster than ever.

24. Identify the factors that cause extinction, as well as species vulnerable to extinction.

Extinction can occur when environments change rapidly so that natural selection can't keep up.

- **Severe weather**
- **Climate change**
- **Changing sea levels**
- **Invasive species**
- **Natural disasters**

25. Describe how human activity is affecting extinction rates.

- **Resource depletion**
- **Population growth / development leads to destruction of natural habitats**
- **Hunting and harvesting of species**
- **Bringing invasive species to an area that take over and choke out the native (endemic) species**

Presentation #4: Species Interactions

Vocabulary:

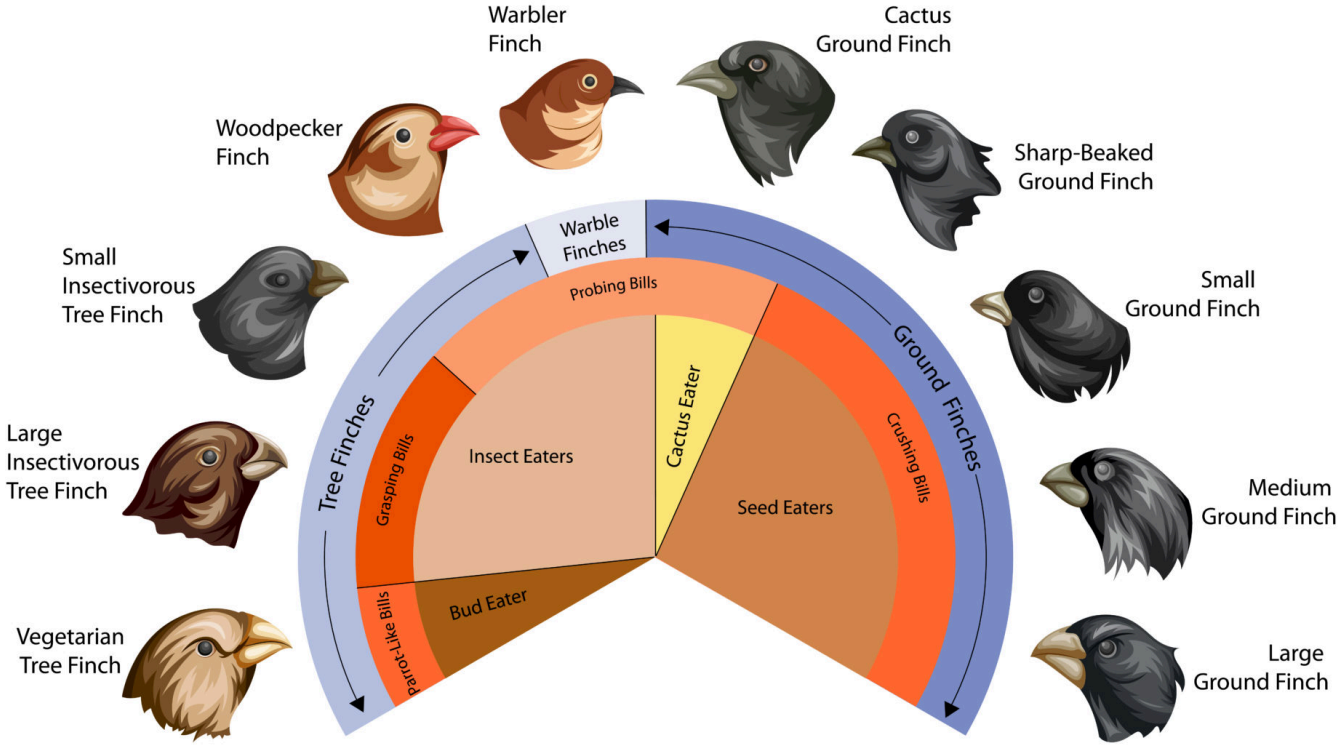
26. Coevolution - **the influence of closely interacting species on each other in their evolution (they evolve in response to each other)**
27. Commensalism - **one species benefits, while the other is not affected**
28. Mutualism - **both species benefit from the interaction**
29. Parasitism - **the parasite benefits from its host, which is harmed**
30. Predation - **one species, the predator, kills and eats the other, the prey**
31. Competition - **two or more species compete for a resource that is in short supply**

Questions:

32. Please classify each of the following species interactions into the correct category: mutualism, commensalism, parasitism, predation, and competition.

Interaction Description	Picture	Type of Interaction
Two kangaroos fight over who gets the right to mate with the female kangaroos		**Competition (females are a limited resource the males fight over)**
The pearlfish lives inside the sea cucumber's butt, where it gains protection and nutrients. Meanwhile, the sea cucumber just has a fish in its butt.		**Commensalism (pearlfish benefits, but the sea cucumber really isn't effected)**
A golden eagle drops a mountain goat off the side of the mountain so that it can feast on its flesh		**Predations (golden eagle kills and eats the mountain goat)**
A bee gains food from a flower, and the flower is able to reproduce via pollination		**Mutualism (the bee benefits by getting food, the flower benefits by getting to reproduce)**
The mosquito feasts on the blood of various organisms, sometimes spreading disease as it does so.		**Parasitism (the mosquito drinks the blood of a mammal which is harmed)**

33. Describe how the following image is an example of character displacement and resource partitioning.



Character displacement is when similar species develop distinct traits due to competition. This allows for resource partitioning, where similar species can coexist because the are using different resources in the same area.

For example, the large beak of the ground finches allows them to break open seeds, while the small beaks of the tree finches make it easier for them to find and eat insects. Their traits are different (character displacement) so that they can go after different resources (resource partitioning) which allows them to all live and thrive in the same area.

Presentation #5: Important Categories of Species

Vocabulary:

34. Keystone species - **a species on which other species in an ecosystem largely depend (remove the keystone species and the ecosystem drastically changes)**

35. Ecosystem engineer - **species that modify their environment in a significant manner (creating or modifying habitats)**

36. Endemic species - **native species that live in small areas**

37. Invasive species - **non-native species that once introduced, can out-compete native species**

38. Generalist - **species that can live in many different types of environments, and have varied diet**

39. Specialist - **species that have a limited diet and strict habitat requirements**

40. Indicator Species - **an organism whose presence, absence, or abundance reflects a specific environmental condition**

Questions:

41. Identify categories of species that have a greater impact on species diversity within an ecosystem.

Keystone species and ecosystem engineers have the greatest impact on species diversity within an ecosystem.

42. Identify categories of species that are more susceptible to extinction and explain why.

Endemic species - they have a narrow range where live so if it is destroyed, they go extinction
Specialists - they have a narrow diet and are limited in where they can live, so more likely to go extinct

43. Identify categories of species that are less susceptible to extinction and explain why.

Generalists - they have a wide range of areas where they can live and varied diets, so they are less likely to go extinct

44. What is the difference between an R-species and a K-species?

R-species - organisms that exhibit high reproductive rates followed by high mortality rates

K-species - organisms that exhibit low reproductive rates and lower mortality rates

45. Please classify each of the following species into the correct category: keystone species, ecosystem engineers, generalist, specialist, R-species, K-species, indicator species, endemic species, invasive species. *(Hint: the species in question is bolded)*

Species Description	Picture	Type of Species
The absence of **sea otters** has led to the overpopulation of urchins that have destroyed coastal kelp forests.		**Keystone Species**
A **raccoon** is able to live pretty much anywhere and eat anything..		**Generalist**
Rats were brought to the Hawaiian islands via ships.		**Invasive Species**
Monk seals have always been native to the Hawaiian islands.		**Endemic Species**
A **beaver** builds dams on streams and rivers leading to the formation of still pools.		**Ecosystem Engineer**
Elephants only have one baby at a time and raise that baby to maturity, taking good care of it.		**K-Species**
A **panda** is only able to live in very specific bamboo forests or it will die.		**Specialist**
Sea turtles lay hundreds of eggs in the sand, leaving them to hatch and survive on their own.		**R-Species**
The type of **lichen** present in an area can tell you how much air pollution (SO_2) there is in an area.		**Indicator Species**