Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_

**Unit 10 Ecology Review Packet**

**Topic #1: Population Ecology and Community**



1. For the graph given to the right, explain how the birth rate compares to the death rate at points a, b, and d.

*A – birth rate is higher than death rate (but only marginally)*

*B – Birth rate is much higher than death rate (highest growth, almost exponential)*

*C- birth rate continues to be higher than death rate*

*D – birth rate and death are equal*

*\*note: could also include immigration with births and emigration with deaths*

2. Two populations of protists, *P. caudatum and P. aurelia*, were grown separately and then in mixed culture. What can you conclude about the effect of each species on the population size of the other species?

*There is interspecies competition between the two species. P Aurelia seems to have a limiting effect on P. caudatum.*



3. In the population growth equations, what does “K” stand for? Why is this value significant? (In other words, what does it mean?)

*K stands for the carrying capacity. It is significant because it allows for a more realistic growth and shows us how limiting factors can affect a population*

4. For the following survivorship curves on the graph to the right—Type I and Type III—answer the following questions.

A. What type of population is this… r-selected or k-selected?

B. Do organisms with this survivorship pattern typically die young or live to an old age?

C. Do organisms with this survivorship pattern typically reproduce once with many offspring or reproduce several times with a small number of offspring each time?

|  |  |  |
| --- | --- | --- |
|  | ***Type I*** | ***Type III*** |
| *A* | *K-selected* | *r-selected* |
| *B* | *Most Live to Old age* | *Most Die young* |
| *C* | *Several times, small #s* | *Once with many* |

5. Estimate the carrying capacity of the deer population on Walla Walla Island in the graph to the right. Why does the population size initially go over the carrying capacity?

*Approximately 80 deer – this is the overshoot and then limiting factors come into play and begin to downshoot the population*



6. For the food web shown to the right, how would a decrease in the number of owls affect the number of snakes and caterpillars?

*It would cause an increase in the number of snakes and thus a decrease in caterpillar because their predator is increasing.*

7. If there are 2300 KJ of energy at the producer level, how much of that energy can be transferred up to the secondary consumer level? Explain your answer.

*Primary Consumer = 230*

*Secondary Consumer = 23*

*10% rule*

8. In a forest ecosystem with no other herbivores, rabbits normally eat grass and leaves. In a forest ecosystem with other herbivores, rabbits eat leaves only.

For the forest ecosystem with other herbivores, identify the rabbits’ fundamental niche and realized niche. Make sure to explain the difference between a fundamental and realized niche.

*Fundamental niche is eating grass and leaves whereas the realized niche is leaf eating only. Fundamental niche is all things that the rabbit could possibly eat or take part in, whereas the realized niche is what actually exists when other organisms are present in an ecosystem.*

9. What is resource partitioning and how does it minimize competition? Why would minimizing competition be a good thing for the two species involved in the competitive relationship?

*At times two species that compete for resources will evolve differently from each other so they do not compete for the same resources anymore and they can coexist in the same community*.

10. Which of the organism on the list below is a primary consumer? How do you know?

|  |  |
| --- | --- |
| **Type of Organism** | **Number of Organisms** |
| Cougar | 4 |
| Grass | 4000 |
| Fox | 40 |
| Rabbit | 400 |

*Grass – highest number of organism (order = grass, rabbit, fox then cougar)*

11. Within a community, mice have the highest relative abundance of any primary consumer. Voles, another primary consumer, do not have the highest relative abundance, but they eat a producer that could spread and result in the extinction of all the other producers in the ecosystem. Which of the two primary consumers—mice or voles—is a keystone species, and which is a dominant species? How do you know?

*Voles are the keystone species because they hold the key to keeping the entire community in check compared to the mice which are the dominant species because they have the highest relative abundance.*

**Topic #2: Ecosystems**

12. Provide two reasons why invasive species populations grow rapidly in the ecosystems to which they are introduced?

*No natural predators, resistance to kill methods, r-selected species, unlimited resources, prey have no adaptation to fight, ideal weather, etc.*

13. Describe the difference between primary and secondary succession.



14. Give an example of a biotic and abiotic factor that would affect the survival of a tomato plant.

*Biotic – deer population*

*Abiotic – growing temperature*

**Topic #3: Biogeochemical Cycles**

15. In the carbon cycle pictured to the right, what will immediately happen when a large number of trees are planted?

*Decrease in atmospheric carbon due to increased photosynthesis.*

16. How do plants typically take in “nutrients” like nitrogen and phosphorus? How do they take in carbon?

*Nutrients are usually taken in by the roots that are in the soil (sometimes with the aide of bacteria or fungus). Carbon is taken in through the stomata in the leaves during photosynthesis.*

17. In the nitrogen cycle pictured to the right, how will the nitrogen content of the soil be affected if an infectious disease kills off all the detritivores in the ecosystem?

*It will decrease because there isn’t anything allowing the nitrogen that is in the decaying plants and animals to enter the soil.*

18. In the phosphorus cycle pictured above, how will the phosphorus content of plants be affected if there is very little weathering / erosion of rocks during a particular year?

*Little weathering leads to a decrease in phosphate in the water which would decrease the phosphorus content in plants*

19. Where is most of the phosphorus in the non-living environment stored? What about nitrogen and carbon?

*Phosphorus = rocks*

*Nitrogen = soil, atmosphere*

*Carbon = fossil fuels*

**Topic #4: Timing and Coordination**

20. Provide an example of how multiple organ systems coordinated actions to provide a higher-level function to the organism.

*1. Respiratory and Circulatory Systems – respiratory brings in oxygen and the blood delivers it to all cells – the cells also release the CO2 into the blood, which the blood carries back to the lungs so they can release it into the air.*

*2. Muscle and Nervous System – nervous system send signals to muscles to get them to contract*

*3. Plant Root, Vascular and Leaves – Roots take up water, send it through the vascular system to supply H2O to the leaves where photosynthesis happens. Photosynthesis makes sugar which then goes through the vascular system to be stored in the roots.*

21.Explain how both phototropism and photoperiodism function in plant coordination and response to their environment.

*1. Phototropism allows plants to grow based on light*

*2. Photoperiodism allows plants to coordinated germination with day length*

22. Provide an example of a learned behavior and an innate behavior – explain why you classified each example as the type of behavior you did.

*Learned = teaching tricks, behaviors, having to see the behavior in order to reproduce it (imprinting)*

*Innate = genes that control behavior, do not need to see others doing it (stickle back fish)*

 *FAP is when it is a series of events that happens through with no stopping*

**Calculations Review**

***Directions:*** *For the following questions, show all your work and circle your final answer.*

**Population Growth Equations:**



1. A population of mockingbirds has an annual per capita birth rate of 0.08 and an annual per capita death rate of 0.03. Calculate an estimate of the population change for a population of 2,000 birds in one year. Give your answer to the nearest whole number.

*B = .08*

*D = .03*

*N = 2000*

*Find: population change*

*dN/dt = B-D*

*= .08 - .03*

*=.05*

*.05 (2000) = 100 birds*

2. A population of goldfish has a carrying capacity of 120 individuals. Calculate the growth rate of a population over a year in which the original population size is 700 individuals and the maximum per capita growth rate is 0.4. Give your answer to the nearest whole number.

*K = 120*

*N = 700*

*Rmax = .4*

*Find: dN/dt*

*dN/dt = rmaxN (K-N/K)*

*= .4 (700) (-580/120)*

*= - 1353*

3. Let’s say there are 3.7 kcal of energy per gram of caterpillar biomass. How much energy is stored in the tissues of 9 caterpillars if their biomass is equal to 15.3 grams? Give your answer to the nearest tenth.

*3.7 kcal per 1 gram*

*15.3 x 3.7 = 56.6 kcals of energy in their total biomass*

4. If caterpillars are consumers of Brussels sprouts, calculate the secondary productivity (per caterpillar) given the following data.

Brussel sprout energy taken into each caterpillar = 2.2 kcal

Energy lost as solid waste from each caterpillar = 0.8 kcal

Energy lost to caterpillar cell respiration = 0.7 kcal

*SP = NPP – Waste – Respiration*

 *= 2.2 - .8 - .7*

*= .7 kcal*