# Unit 3: Matter and Energy - Study Guide

## Presentation #1: Matter and Energy

Vocabulary:

1. Matter -

2. Energy -

Questions:

3. What is the difference between an element and a compound?

4. Determine if the following describes a physical or chemical change.

| Description | Physical | Chemical |
|---|---|---|
| A piece of wood burns and turns to ash | | |
| Ice melts into liquid water | | |
| A rock is broken into smaller pieces using a sledgehammer | | |
| An iron pole rusts by the ocean | | |
| Leaf litter decomposes as bacteria break it down | | |

5. What are our planet's four major systems/spheres? And what services do they provide?

| | |
|---|---|
| | |
| | |
| | |

6. Describe how energy and matter move through Earth's spheres/systems.

## Presentation #2: Systems

Vocabulary:

7. Ecosystem -

8. Producers -

9. Consumers -

10. Decomposers -

Questions:

11. Make a food chain including a producer, an herbivore, and two carnivores. End with a decomposer.

12. Classify the following biotic factors as either producers/autotrophs, consumers/heterotrophs, or decomposers.

| Biotic Factor | Producer | Consumer | Decomposer |
|---|---|---|---|
| Bacteria | | | |
| Grass | | | |
| Vulture | | | |
| Tree | | | |
| Fungi | | | |
| Deer | | | |

13. What is the role of each biotic component in keeping the ecosystem balanced and making nutrients and energy available to the ecosystem?

    a. Producers:

    b. Consumers:

    c. Decomposers:

## Presentation #3: Feedback Loops

Vocabulary:

14. Detritivore -

15. Feedback loops -

Questions:

16. What is the difference between a positive and a negative feedback loop?

17. Determine if the following situations describe a positive or a negative feedback loop.

| Description | Positive | Negative |
|---|---|---|
| When a plant dies, its body decomposes and nourishes the soil allowing for even more plants to grow. | | |
| Predator prey relationships. When a predator eats prey, it reduces the population of its food source, ultimately leading to a reduction in the predator population. | | |
| Erosion removes organic matter and nutrients from the forest floor, leaving less plants to anchor the soil which leads to more erosion | | |
| Ice and snow reflect sunlight back into space, causing temperatures to drop and more ice and snow to form. | | |
| Trees absorb nutrients in the soil to grow, leaving fewer nutrients to support trees in the future. | | |

18. What is the role of detritivores and decomposers in an ecosystem?

**Nutrient Cycle Activities (No presentations)**

*Note: These concepts were covered through various Gizmos and other activities in class.*

Vocabulary:

19. Biomass -

20. Carbon reservoir -

21. Carbon sink -

22. Fossil fuel -

23. Greenhouse gas -

Questions:

24. Draw and describe the carbon cycle?

25. Why is carbon so important to ecosystems and the organisms with them?

26. How is carbon related to climate change? What human activities and natural processes add to the problem of climate change? What human activities and natural processes help in limiting climate change?

27. Draw and describe the water cycle?

28. Draw and describe the phosphorus cycle?

29. Draw and describe the nitrogen cycle?

30. What causes eutrophication and how does eutrophication impact ecosystems?

31. What human activities cause NO and $NO_2$ to be released into the atmosphere and how does that impact air quality?

## Presentation #4: Primary Productivity

Vocabulary:

32. Net primary productivity (NPP) -

33. Gross primary productivity (GPP) -

Questions:

34. What can the overall primary productivity of an ecosystem tell you about that ecosystem?

35. Identify the four factors that impact primary productivity in an ecosystem.

36. Identify the most productive terrestrial ecosystems and explain why they are so productive in regards to the 4 factors.

## Presentation #5: Productivity in Aquatic Ecosystems

Questions:

37. Identify the most important productive aquatic ecosystems and explain why they are productive in regards to the 4 factors.

38. Identify and describe the 3 layers of ocean ecosystems.

39. Describe the importance of phytoplankton in ocean ecosystems as well as our planet.

40. Describe the ways nutrients are cycled in the benthic zone.

41. Compare and contrast productivity in ocean ecosystems vs. terrestrial ecosystems.