

National  
**Ecology &**  
Environmental Science

Exam

EMS Ecology & Environmental Science National  
Championship Exam

Name \_\_\_\_\_

School  
\_\_\_\_\_

Grade \_\_\_\_\_

Email address \_\_\_\_\_

**Instructions – Circle the correct answer or leave it blank. Correct answers are worth 2 points. Incorrect answers are worth –1 point. Questions left blank are worth 0 points.**

1. A particular location on Earth with interacting biotic and abiotic components is called a(n)
  - A. Feedback loop
  - B. Ecosystem
  - C. Speciation
  - D. Biophilia
2. Which of the following is an abiotic component?
  - A. An eagle
  - B. A tree
  - C. A rock
  - D. A human
3. Amphibians are often used to gauge the health of an ecosystem. This makes them a(n)
  - A. Environmental indicators
  - B. Indicator species
  - C. Ecosystem service
  - D. Alarm species
4. Shrimp are most often fished for using
  - A. Bottom trawling
  - B. Cast netting
  - C. Drift gill-netting
  - D. Longline fishing
5. Living on Earth in a way that allows humans to use its resources without depriving future generations of those resources is
  - A. Consumption
  - B. Development
  - C. Sustainability
  - D. Carbon Footprint
6. A prediction that there is no difference between groups or conditions, or a statement that can be proved wrong is called
  - A. Disseminating findings
  - B. A Hypothesis
  - C. The scientific method
  - D. A Null hypothesis
7. A physical law that states energy can neither be created nor destroyed but can change from one form to another is
  - A. Law of Conservation of Matter
  - B. The First Law of Thermodynamics
  - C. The Third Law of Thermodynamics
  - D. Law of Energy Transformations
8. Entropy is
  - A. The amount of heat in a system
  - B. The ease at which an energy source can be used for work
  - C. The lowest level of energy quality
  - D. The randomness of a system
9. Pure water has a pH of 7 because
  - A. Its H<sup>+</sup> ion concentration is equal to its OH<sup>-</sup> ion concentration
  - B. Its ability to dissolve carbon dioxide adjusts its natural pH
  - C. Its surface tension equally attracts acids and bases
  - D. Its polarity results in a molecule with a positive and a negative end
10. Which of the following is NOT a consequence of human population growth?
  - A. Emission of greenhouse gasses
  - B. Rise in sea level
  - C. Background extinction
  - D. Depletion of natural resources

- C. 10%  
D. 50%
11. Which greenhouse gasses contribute most to climate change?  
A. Carbon dioxide and water vapor  
B. Carbon dioxide and methane  
C. Carbon dioxide and nitrous oxide  
D. Carbon dioxide and sulfur hexafluoride
12. An organism that uses the energy of the Sun to produce usable forms of energy is?  
A. Primary producer  
B. Primary consumer  
C. Secondary consumer  
D. Tertiary consumer
13. The region of our planet where life resides is the  
A. Atmosphere  
B. Geosphere  
C. Biosphere  
D. Cryosphere
14. The sequence of consumption from producers through tertiary consumers is a(n)  
A. Energy chain  
B. Trophic pyramid  
C. Trophic levels  
D. Food chain
15. An organism that consumes dead animals is called a(n)  
A. Scavenger  
B. Virus  
C. An invasive species  
D. An endemic species
16. The total amount of solar energy that producers in an ecosystem capture via photosynthesis over a given amount of time is called  
A. Net primary productivity  
B. Gross primary productivity  
C. Cellular respiration  
D. Solar capture
17. The average efficiency of energy transfer between trophic levels is  
A. 1%  
B. 4 %
18. A zebra is an example of a(n)?  
A. Primary producer  
B. Primary consumer  
C. Secondary consumer  
D. Scavenger
19. The release of water from leaves during photosynthesis is called?  
A. Evapotranspiration  
B. Cellular respiration  
C. Transpiration  
D. Evaporation
20. A process by which some organisms can convert nitrogen gas directly into ammonia?  
A. Assimilation  
B. Mineralization  
C. Ammonification  
D. Fixation
21. The transportation of dissolved molecules through the soil via groundwater is called  
A. Sedimentation  
B. Leaching  
C. Uplift  
D. Weathering
22. The largest carbon pool is found in  
A. Oceans  
B. The atmosphere  
C. Fossil fuels  
D. Sedimentary rock
23. The rate at which an ecosystem returns to its natural state after a disturbance is  
A. Resilience  
B. Resistance  
C. Bounceback  
D. Restoration
24. The waste product in photosynthesis is  
A. Carbon dioxide  
B. Energy  
C. Glucose  
D. Oxygen
25. Which layer of atmosphere is closest to Earth?  
A. Troposphere

- B. Stratosphere  
C. Mesosphere  
D. Thermosphere
26. The maximum amount of water vapor in the air at a given temperature is the  
A. Adiabatic cooling  
B. Latent moisture  
C. Saturation point  
D. Humidity
27. A convection current in the atmosphere when air rises at 60 degrees North and South and sinking at 90 degrees North and South is ?  
A. A Ferrell cell  
B. A polar cell  
C. Intertropical convergence zone  
D. Hadley cells
28. The upward movement of ocean water due to convection currents is called  
A. Upwelling  
B. Depression  
C. Thermohaline Circulation  
D. A gyre
29. A warm, wet biome found between 20 degrees N and S of equator is a(n)  
A. Woodlands  
B. Temperate Grassland  
C. Boreal Forest  
D. Tropical Rainforest
30. Permafrost is an important factor in which of the following biomes?  
A. Tundra  
B. Boreal Forest  
C. Cold Desert  
D. Temperate Rainforest
31. A lake with high level of productivity is called  
A. Mesotrophic  
B. Eutrophic  
C. Oligotrophic  
D. Limnetic
32. A phenomenon in which algae in coral dies causing the corals to turn white is ?  
A. Thermal Accumulation  
B. Calcium Deposition  
C. Coral Bleaching  
D. CO2 poisoning
33. Most of the photosynthesis in lakes occurs in the  
A. Profundal zone  
B. Aphotic zone  
C. Benthic zone  
D. Littoral zone
34. Which biome contains the aphotic zone?  
A. Open ocean  
B. Mangrove swamps  
C. Coral reefs  
D. Freshwater wetlands
35. The number of species in a given area is  
A. Species phylogeny  
B. Species declination  
C. Species richness  
D. Species evenness
36. Which of the following occurs during an El Nino event?  
A. Upwelling along the South American coast  
B. A buildup of warm water along the South American coast  
C. Stronger trade winds  
D. Movement of warm water from east to west
37. The number of individuals per unit area at a given time is  
A. Population density  
B. Population distribution  
C. Population sex ratio  
D. Population size
38. A species with a high growth rate leading to overshoots and die-offs  
A. K-selected species  
B. r-selected species  
C. Type I species  
D. Type II species
39. An interaction in which one organism lives in or on another organism called the host is  
A. Commensalism  
B. Mutualism

- C. Parasitism
  - D. Predation
40. Which aquatic ecosystems have the highest net primary productivity?
- A. Open ocean
  - B. Lakes and streams
  - C. Coral Reefs
  - D. Swamps and marshes
41. Pathogens are a type of
- A. Mutualist
  - B. Parasites
  - C. Herbivore
  - D. Predator
42. The total energy captured by photosynthesis minus energy used for respiration is
- A. Gross primary productivity
  - B. Net primary productivity
  - C. Biomass productivity
  - D. Carbon sequestration
43. Which is an example of a secondary energy source?
- A. Solar
  - B. Coal
  - C. Electricity
  - D. Nuclear
44. Cogeneration is
- A. The use of 2 or more energy sources to produce electricity
  - B. The use of 2 separate turbines to generate electricity
  - C. A method of electricity generation that includes renewable energy
  - D. The use of a fuel to generate heat and electricity
45. The major source of energy in the United States is
- A. Natural gas
  - B. Oil
  - C. Coal
  - D. Nuclear
46. What type of coal has the highest energy density?
- A. Anthracite
  - B. Lignite
  - C. Bituminous
  - D. Peat
47. Natural gas is primarily
- A. Ethane
  - B. Propane
  - C. Butane
  - D. Methane
48. The unit that measures the rate at which a sample of radioactive material decay of 1 atom or nucleus per second is
- A. A Curie
  - B. A Becquerel
  - C. A Rutherford
  - D. A Bundle
49. What is one reason for the renewed interest in nuclear power?
- A. The desire for low energy costs
  - B. Due to decreased energy independence
  - C. The need for low carbon dioxide emissions
  - D. Because of the lack of significant accidents
50. Which of the following is the most fuel-efficient mode of transportation in joules per passenger-kilometer?
- A. Train
  - B. Bus
  - C. Airplane
  - D. Car with three passengers
51. Which of the following is NOT a nonrenewable energy source?
- A. Oil
  - B. Coal
  - C. Nuclear fuels
  - D. Wind
52. Air pollutants for which acceptable levels of exposure can be determined and an ambient standard has been set are called
- A. Primary air pollutant
  - B. Ambient air pollutant
  - C. Criteria air pollutant
  - D. Incomplete air pollutant

53. A situation in which a warm layer of air at mid-altitude covers a layer of cold dense air below is called a(n)
- Inversion layer
  - Thermal inversion
  - Photochemical smog
  - Ground level ozone
54. Recent increases in acid deposition in the western United States are due to
- Increased emission in the United States
  - Decreased precipitation due to climate change
  - Increased emissions in Europe
  - Increased emissions in China
55. Where is denitrification NOT likely to occur?
- Topsoil of freshly tilled croplands
  - Sediments of a deep lake
  - Recently flooded croplands
  - Well-fertilized cropland
56. In the United States, which organization is most likely to address issues related to sick building syndrome in the work environment?
- EPA
  - OSHA
  - WHO
  - DOE
57. Which of the following does NOT contribute to causing a rain shadow?
- A mountain range
  - Adiabatic cooling
  - Polar air
  - Humid ocean air
58. What is the name of the natural process where the sun's energy is absorbed and re-radiated which warms the atmosphere?
- Radiation
  - Albedo
  - Greenline Effect
  - Greenhouse Effect
59. Which list only contains organic material?
- Dead trees, decomposing leaves, earthworms
  - Water, ash, CO<sub>2</sub> gas
  - Cellulose, ethanol, calcium chloride
  - Proteins, lipids, salts
60. The process by which producers use solar energy to convert carbon dioxide and water into glucose is
- Cellular respiration
  - Aerobic respiration
  - Photosynthesis
  - Anaerobic respiration
61. Organisms that specialize in breaking down dead tissues and waste products into smaller particles are?
- Detritivores
  - Autotrophs
  - Decomposers
  - Herbivores
62. The amount of biomass present in an ecosystem at a particular time is called a(n)?
- Trophic pyramid
  - Standing crop
  - Yield
  - Hectare
63. Which statement about aquatic biomes is correct??
- Coral reefs have the lowest diversity of species
  - Can be categorized by temperature and precipitation
  - Freshwater wetlands have emergent plants in deepest areas, lakes do not
  - Lakes contain littoral and intertidal zones
64. Survival of the fittest refers to
- The largest, strongest animals always survive
  - Being able to survive and reproduce
  - The organisms that produce the most offspring
  - The organisms that care for their offspring the longest
65. Gene flow is
- When individuals move from one population to another
  - Trait that improves an individual's fitness
  - A drastic reduction in the size of a

- population
- D. Change in genetic composition due to random mating.
66. Which of the following evolutionary effects results in reduced genetic variation?
- The Founder Effect
  - Mutation
  - Gene flow
  - Natural selection
67. The limits to the abiotic conditions that a species can tolerate is
- Fundamental niche
  - Realized niche
  - Range of Tolerance
  - Distribution of species
68. The range of abiotic and biotic conditions under which a species actually lives is ?
- Fundamental niche
  - Realized niche
  - Range of Tolerance
  - Distribution of species
69. How many global mass extinctions have occurred (include the current one)?
- 6
  - 5
  - 3
  - 2
70. Which is NOT a measure of biodiversity?
- Species richness
  - Ecosystem diversity
  - Genetic diversity
  - Economic diversity
71. Which example describes artificial selection?
- Whales have evolved tails that propel them through water
  - Thoroughbred racehorses have been bred for speed
  - Ostriches have lost the ability to fly
  - Darwin's finches have beaks adapted to eating different foods
72. A species that lives in a very small area of the world and nowhere else?
- Invasive species
  - Indicator species
  - Endemic species
  - Fundamental species
73. Biogeographic regions that have great biodiversity threatened by human habitation is called a
- Biodiversity hotspot
  - Biodiversity territory
  - Deforested locality
  - Species richness belt
74. Interactions between remoras and sharks is an example of
- Mutualism
  - Herbivory
  - Parasitism
  - Commensalism
75. Who is the Swedish environmental activist that has challenged world leaders to take immediate action on climate change?
- Malena Ernman
  - Greta Thunberg
  - Annika Henroth-Rothstein
  - Joakim Fohlman
- Tie Breaker
- List the following biomes in order of increasing latitude
- Tundra, Tropical rainforest, Temperate Forest, Desert, Coniferous Forest, Temperate grassland
- Ecology & Environmental Science Answer Key: