NATIONAL Science Bee

V/JV 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. The Earth's free atmospheric oxygen (O2) was originally formed by
    A. Breakdown of stratospheric ozone by ultraviolet light
    B. Chemosynthesis by primitive bacteria
    C. Oxygen produced from photosynthetic marine algae
    D. Photosynthesis by cyanobacteria (blue-green algae)

2. Competition among members of a squirrel population in a given area would be increased by
    A. An epidemic of rabies within the squirrel population
    B. An increase of squirrels in the area
    C. An increase in the number of hawks in the area
    D. An increase in the food supply

3. Nitrogen fixing bacteria
    A. Facilitate release of nitrogen back to the atmosphere
    B. Help assimilate nitrogen uptake by plants
    C. Convert atmospheric nitrogen to plant usable forms like ammonia
    D. Convert ammonia to other compounds like nitrate

4. Shrimp are most often fished for using
    A. Bottom trawling
    B. Cast netting
    C. Drift gill-netting
    D. Longline fishing

5. Which of the following atmospheric conditions would contain the most amount of water vapor in a given volume of air?
    A. 10oF at 10% relativity
    B. 10oF at 80% humidity
    C. 50oF at 80% relative humidity
    D. 80oF at 10% relativity

6. Which of the following statements about the role of carbon dioxide (CO2) in the carbon cycle are true?
    A. Carbon dioxide concentration in the atmosphere decreases when trees are cut down and trees decay
    B. The primary source of carbon dioxide entering Earth's atmosphere NOT caused by humans is outgassing from Earth's interior
    C. Carbon dioxide is produced during photosynthesis
    D. The ocean is a source of carbon dioxide rather than a sink

7. A biodiversity "hotspot" is
    A. A region with high biodiversity that is under threat from humans
    B. A region with high biodiversity that is not under threat from humans
    C. An area that is pinpointed as being the origin of a contagious disease
    D. An area that is experiencing a rapid birth rate

8. Which of the following choices is NOT a benefit with integrated pest management IPM?
    A. A reliable and effective and less environmentally damaging method of pest control
    B. The total eradication of pest species
    C. Reducing the use of the most harmful types of pesticides

D. Ending the pesticide treadmill of pests developing resistance to pesticides

9. Different biomes are distributed around the world. The type of biomes is determined by long-term seasonal weather patterns. These patterns are determined by
    A. Distance from Earth to the sun at certain times of the year
    B. Ocean currents
    C. The angle of solar radiation striking the Earth
    D. Amount of solar radiation that is released at certain times of the year

10. Which of the following pollutants contributes to the formation of both acid rain and photochemical smog?
    A. Sulfur oxides
    B. Ozone
    C. Particulates
    D. Sulfur oxides

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. Which of the following is least likely to have a density-dependent effect on growth of natural populations?
    A. Energy resource needs
    B. Increased rainfall
    C. Diseases
    D. Predator-prey imbalances

13. Which agricultural practices have the least impact on controlling soil erosion
    A. Drip Irrigation
    B. Terracing
    C. Contour plowing
    D. Surface irrigation

14. In which stage of the nitrogen cycle do bacteria in soil convert ammonia to nitrate ions?
    A. Nitrification
    B. Assimilation
    C. Ammonification
    D. Nitrogen Fixation

15. In North America, honeybees (Apis mellifera) should be considered
    A. A native species
    B. An exotic species
    C. An invasive species
    D. An endemic species

16. The idea that all people regardless of ethnic or socioeconomic status deserve equal environmental conditions is a central principle of
    A. The triple bottom line
    B. The National Environmental Policy Act
    C. The United Nations Environment Programme
    D. Environmental justice

17. Overharvesting a species for sport, medicinal, or industrial purposes may alter what associated with that species?
    A. The ecological interactions
    B. The intrinsic value
    C. The instrumental value
    D. The intrinsic value and the ecological interactions

18. Which entities are significant sources of methane (CH4)?
    A. Factories
    B. Burning fossil fuels and Deforestation
    C. Livestock and landfills
    D. Agriculture

19. All of the following are examples of negative externalities except
    A. A pulp mill that pollutes surrounding water and air
    B. Increased pollination rates of crops from local beekeeping
    C. Runoff of pesticides and fertilizers from farms to nearby river
    D. Acid deposition in the Adirondacks as a result of coal-burning plants in the Midwest

D. A process to remove CO2 from the atmosphere

20. Which is a United Nations organization concerned with the environment?
    A. World Resources Institute (WRI)
    B. Department of Energy (DOE)
    C. Environmental Protection Agency (EPA)
    D. World Health Organization (WHO)

21. Which US law helps sustainability by governing tracking and disposal of solid and hazardous waste?
    A. Resource Conservation and Recovery Act (RCRA)
    B. National Environmental Policy Act (NEPA)
    C. Clean Water Act (CWA)
    D. Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

22. The use of cell phones in the developing world is an example of ?
    A. The Kuznets curve
    B. A positive externality
    C. Leapfrogging
    D. A negative externality

23. Which of the following activities causes a cooling of Earth?
    A. Volcanic eruptions
    B. Evaporation of water vapor
    C. Deforestation
    D. Emissions of greenhouse gasses by man

24. Which of the following is NOT a greenhouse gas?
    A. Methane
    B. Nitrogen
    C. Nitrous oxide
    D. Water vapor

25. Carbon sequestration is
    A. A method for preventing carbon emissions from landfill
    B. A method for emissions reduction focusing on efficiency
    C. The release of carbon from soils due to warming

26. Which predicted consequence of global warming has not yet occured?
    A. Melting ice caps
    B. Melting permafrost
    C. Shutting down the thermohaline ocean circulation
    D. Altered breeding and flowering times of plants and animals

27. How might the range of pests be increased due to climate change?
    A. Decreased duration of cold spells
    B. Higher intensity weather events
    C. Increasing number of heat waves
    D. Disruption of oceanic currents

28. Which of the following species is historically overharvested?
    A. Brown-headed cowbird
    B. Sharks
    C. Honeybee
    D. Zebra mussel

29. The most significant cause of species decline and extinction throughout the world is
    A. Overharvesting
    B. Pollution
    C. Climate change
    D. Habitat loss

30. The Lacey Act
    A. Provides protected habitats for threatened species
    B. Forbids interstate shipping of illegally harvested plants and animals
    C. Prevents spread of invasive species to the US
    D. Gives penalties for polluting ecosystems

31. Organisms that live outside of their historical range are called
    A. Native species
    B. Endemic species
    C. Exotic species
    D. Natural species

32. In a major extinction event, what is the minimum percentage of species that goes extinct?
    A. 75
    B. 50
    C. 40
    D. 25

33. Which group of organisms has had the greatest number of extinctions since 1500?
    A. Amphibians
    B. Reptiles
    C. Mammals
    D. Birds

34. Atrazine and DDT are examples of
    A. Neurotoxins
    B. Endocrine disruptors
    C. Teratogens
    D. Carcinogens

35. Which is NOT a cause of high concentrations of DDT in fish-eating birds?
    A. Bioaccumulation
    B. Biomagnification
    C. Synergistic interactions
    D. Persistence

36. Which legislation imposes a tax on the chemical and petroleum industries to pay for hazardous substance cleanup?
    A. CERCLA
    B. RCRA
    C. HSWA
    D. Cradle to Grave Act

37. The soil horizon commonly known as subsoil is the
    A. A horizon
    B. O horizon
    C. E horizon
    D. B horizon

38. Which of the following added to soil would lower base saturation?
    A. Calcium
    B. Aluminum
    C. Sodium
    D. Potassium

39. What percentage of solar energy reaching the Earth is converted to chemical energy through photosynthesis?
    A. 1%
    B. 5%
    C. 25%
    D. 90%

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. The efficiency of energy that transfers between trophic levels on average is
    A. 1%
    B. 5%
    C. 10%
    D. 40%

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. Paving ground surfaces and construction of buildings affects which biochemical cycle the most?
    A. Hydrologic cycle
    B. Phosphorus cycle
    C. Carbon cycle
    D. Sulfur cycle

44. Which nutrient is a limiting nutrient in most aquatic systems?
    A. Nitrogen
    B. Sulfur
    C. Calcium
    D. Phosphorus

45. The largest carbon pool is found in
    A. Living organisms
    B. Fossil fuels
    C. Sedimentary rocks
    D. Oceans

46. When an ecosystem can return rapidly to its original state after a disturbance it is
    A. Resistant
    B. Resilient
    C. Stable
    D. Adaptable

47. The intermediate disturbance hypothesis says that intermediate disturbances will
    A. Increase species diversity
    B. Increase runoff
    C. Increase nutrient cycling
    D. Decrease primary productivity

48. At which trophic level are dragonflies that consume mosquitoes that feed on cattle?
    A. Producers
    B. Primary consumer
    C. Secondary consumer
    D. Tertiary consumer

49. Which of the following macronutrients is required by humans in the greatest amount?
    A. Calcium
    B. Magnesium
    C. Nitrogen
    D. Potassium

50. If a severe drought occured and it took years for productivity to return to normal, the ecosystem has
    A. High resistance
    B. Low resilience
    C. High resilience
    D. Low resistance

51. Which biogeochemical cycle has no gaseous component
    A. Phosphorus
    B. Sulfur
    C. Potassium
    D. Sulfur and Calcium

52. Due to their narrow range of tolerance in climate conditions for growth, global climate change is affecting
    A. Growing wheat
    B. Growing corn
    C. Growing rice
    D. Growing wine grapes

53. Earth's seasons are affected primarily by
    A. Rotation rate
    B. Proximity to the sun
    C. Tilt of Earth's axis
    D. Eccentricity of the elliptical orbit

54. In which layer of the atmosphere do airplanes fly
    A. Troposphere
    B. Stratosphere
    C. Mesosphere
    D. Thermosphere

55. Albedo is highest in which of these areas?
    A. Snow
    B. Water
    C. Tropical rainforest
    D. Asphalt pavement

56. The latitude that receives the most intense sunlight causing the ascension of the Hadley cells to converge is
    A. 30 degree latitude north and south
    B. The Ferrell cells zone
    C. Polar convergence zone
    D. The ITCZ (intertropical convergence zone)

57. Which of the following does NOT contribute to causing a rain shadow?
    A. A mountain range
    B. Adiabatic cooling
    C. Polar air
    D. Humid ocean air

58. What is the maximum amount of water vapor that air can hold at a given temperature?
    A. Saturation point
    B. Absolute humidity
    C. Dew point

D. Latent heat capacity

59. When cold nutrient rich water moves toward the surface, it is called?
    A. Thermohaline circulation
    B. Upwelling
    C. Gyres
    D. Coriolis effect

60. Which of the following is NOT a factor in ocean currents?
    A. Gravity
    B. Prevailing winds
    C. Temperature
    D. Precipitation

61. Gyres do all of the following except?
    A. Result from the Coriolis Effect
    B. Affect the temperatures of coastal areas
    C. Redistribute nutrients from the deep ocean
    D. Redistribute heat in the ocean

62. Plant growth in which of the biomes is constrained by precipitation?
    A. Temperate grassland
    B. Boreal Forest
    C. Tundra
    D. Tropical rainforest

63. Which biome contains the aphotic zone?
    A. Mangrove swamps
    B. Open ocean
    C. Coral reefs
    D. Freshwater wetlands

64. How many species are estimated to exist on Earth?
    A. 2 million
    B. 8 million
    C. 30 million
    D. 10 million

65. Phylogeny is
    A. The genetic biodiversity of a species
    B. The study of morphological traits
    C. The branching pattern of evolutionary relationships
    D. The number of evolutionarily related species in ecosystems

66. Which of the following evolutionary effects results in reduced genetic variation?
    A. The Founder Effect
    B. Mutation
    C. Gene flow
    D. Natural selection

67. Random mating in a population that causes a decline in genetic variation over time is
    A. Gene flow
    B. Genetic drift
    C. The bottleneck effect
    D. Phenotype adaptation

68. Which of the following would cause the most rapid evolution?
    A. Recombination
    B. Geographic isolation
    C. Environmental change
    D. Artificial selection

69. Which population is regulated by density-independent factors?
    A. Algae
    B. Trees
    C. Paramecium bacteria
    D. Birds

70. Of the following, which one does NOT have a significant effect on the number of offspring produced by a population?
    A. Population distribution
    B. Carrying capacity
    C. Age structure
    D. Ratio of sexes

71. When populations are not limited by resources, their growth produces a(n)
    A. S-shaped curve
    B. J-shaped curve
    C. Inverse growth curve
    D. Logistic growth curve

72. The r-selected species typically has
    A. Extensive parental care
    B. Populations near carrying capacity
    C. A type I survivorship curve

D. Fast population growth rates

73. Intrinsic growth rates of populations
    A. Occurs at carrying capacity
    B. Depends on limiting resources
    C. Occurs under ideal conditions
    D. Decreases as population size increases

74. Interactions between sunflowers and bees is an example of
    A. Mutualism
    B. Herbivory
    C. Parasitism
    D. Commensalism

75. The ground-breaking work, Silent Spring, that led to the ban on DDT was authored by?
    A. Oscar Wilde
    B. Rachel Carson
    C. Jane Goodall
    D. Roger Muir

Ecology & Environmental Science Answer Key:

1) D
2) B
3) C
4) A
5) C
6) B
7) A
8) B
9) C
10) D
11) A
12) B
13) D
14) A
15) B
16) D
17) A
18) C
19) B
20) D
21) A
22) C
23) A
24) B
25) D
26) C
27) A
28) B
29) D
30) B
31) C
32) A
33) D
34) B
35) C
36) A
37) D
38) B
39) A
40) D
41) C
42) B
43) A
44) D
45) C
46) B
47) A
48) D
49) C
50) B
51) A
52) D
53) C
54) B
55) A
56) D
57) C
58) A
59) B
60) D
61) C
62) A
63) B
64) D
65) C
66) A
67) B
68) D
69) C
70) A
71) B
72) D
73) C
74) A
75) B