Name_____ **Student #**_____

University of Toronto – Scarborough **Instructor: Prof. Carl Mitchell**

"Introduction to Environmental Science" (EESA01 L01)
Mid-Term Examination: Friday, November 2, 2012, 7-9 pm.

Time Allotted: 2 hours.

This mid-term examination has 60 questions and is worth 25% of your final grade.

INSTRUCTIONS: Answer ALL questions on the the SCANTRON sheet provided. Choose the answer which is *most* correct. Make only one mark per answer. Use either pencil (preferred) or black ball-point pen. Do not use felt-tipped pens or anything that writes in red. If you make a mistake, erase VERY completely. If you have a problem erasing, call over an invigilator and they can give you a new Scantron sheet to transcribe your answers.

ANSWER *ALL* THE FOLLOWING QUESTIONS:

1) Which scientists classify species using an organism's physical appearance and genetic makeup?
A) taxonomists
B) environmentalists
C) geneticists
D) ecologists
E) agronomists

2) Which of the following can change global species diversity?
A) speciation and immigration
B) immigration and extirpation
C) emigration and extinction
D) speciation and extinction
E) extirpation and extinction

3) Ecotones are the _____.
A) sounds that animal communities make in ecosystems
B) interactive behaviours leading to communication
C) areas between territories of organisms
D) studies of specific biomes by ecologists
E) transitional zones between ecosystems

4) Canada's age-structure diagram _____.
A) looks like a pyramid
B) reflects unequal distribution of males and females at all age groups
C) reflects an aging population
D) reflects a population with a high growth rate
E) reflects a "baby boom" in the early 1980s

5) The Cornucopian view held by many economists suggests that resource depletion due to greater numbers of people _____.
A) is not a problem if new resources can be found to replace depleted ones
B) is not a problem because disease will limit population size
C) is not a problem because humans are too intelligent to allow it to be
D) will cause a population crash
E) will lead to natural selection of the most fit individuals

6) The country of Belize depends on lobster for a major portion of its income, along with fishing and tourism. Over the past 30 years the average size of an individual lobster has dropped, even as increasing numbers of Belizeans buy boats, build lobster traps, and enter the industry. This is an example of _____.
A) the effects of pollution
B) the problems with monoculture
C) overharvesting
D) the results of an invasive species
E) habitat alteration

7) The greatest diversity (numbers of different species) of organisms can be found in _____.
A) insects
B) fish
C) birds
D) flowering plants
E) mammals

8) Rock that has undergone heat or pressure that causes it to change form is called _____.
A) sedimentary
B) conglomerate
C) deformative
D) metamorphic
E) igneous

9) The relative humidity is the _____.
A) ratio of water vapour to oxygen in the atmosphere
B) amount of water vapour in the atmosphere
C) difference in available water vapour at midnight and at noon
D) amount of oxygen in a given volume of water vapour relative to the maximum concentration
E) amount of water vapour relative to the maximum amount this volume of air could hold

10) A small section of prairie grasses, over a year, produces enough biomass to feed insects, mice, rabbits, birds, deer, antelope, and a host of decomposers. The amount of food potentially available to the herbivores is the _____.
A) secondary production
B) productivity
C) net primary production
D) gross primary production
E) food chain

11) Cattle on an open range, in some areas, may compact fragile soils while grazing. This can damage plant roots, leading to fewer, smaller plants, which may in turn cause cattle to graze more and work harder to obtain food. This is an example of a _____.
A) homeostatic system
B) dynamic equilibrium
C) positive feedback loop
D) food web
E) negative feedback loop

12) Plants conduct photosynthesis, making glucose and other carbohydrates. To do this they need _____.
A) water from the soil and carbon dioxide from the atmosphere
B) water from the soil
C) carbon dioxide from the atmosphere
D) water from the soil and carbon dioxide from the soil
E) water from the humid atmosphere and carbon dioxide from the soil

13) The human population is approximately _____.
A) 1.5 billion
B) 1.5 million
C) 6.5 million
D) 6.7 billion
E) 10 billion

14) The origin of all phosphorus in biological tissues is _____.
A) atmospheric phosphorus gas
B) phosphorus dissolved in the ocean and taken up by shellfish
C) phosphorus in animal bones
D) volcanic activities
E) phosphorus weathered from rock

15) The most accurate terms describing the trend over the past 50 years in resource use for human energy and agricultural systems are _____.
A) rapidly increasing, moving from unsustainable to sustainable
B) increasing and unsustainable
C) from unsustainable to sustainable
D) decreasing and sustainable
E) steady state - no change

16) A migratory bat species pollinates agave plants in northern Mexico on its way to the southwestern United States, where it spends the summer eating insects and reproducing. Farmers spraying pesticides affect these bats, which eat the insects and also feed them to the baby bats. This could be the start of a story about _____.
A) insect biodiversity
B) a top predator
C) an umbrella species
D) an extirpation
E) a keystone species

17) Why was human population growth initially regarded as a good thing?
A) to spread religion around the world
B) to spread democracy through all countries
C) greater pool of workers and helpers
D) larger armies for conquering new lands
E) fewer children to support folks in old age

18) The extinction of a particular population from a given area (but not the entire species globally) is called _____.
A) adaptation
B) extinction
C) extirpation
D) emigration
E) evolution

19) The eutrophication that has taken place in the Gulf of St. Lawrence and other locations appears to be due to _____.
A) weather alone, because it is only obvious in the summer
B) pesticide use along the waterways
C) excess nutrients from fertilizers
D) global warming from human use of fossil fuels
E) heavy metals dumped in the sewage

20) A country with _____ is *not* expected to grow quickly in the near future.
A) high female literacy
B) a pyramid-shaped age-structure diagram
C) a female to male ratio of 1.2 to 1
D) many developing regions
E) growing industrialization

21) Any network of relationships among a group of components, which interact with and influence one another through exchange of matter and/or information, is referred to as _____.
A) hierarchy
B) an environmental collaboration
C) an interchange
D) an ecosystem
E) a system

22) Replacement fertility _____.
A) is below 2 in Latin America and the Caribbean
B) is below 2 in Africa
C) restores population size after a catastrophic event
D) is equal to 2.1 in stable populations
E) is a contraceptive technique

23) The process of subduction _____.
A) causes the formation of deep ocean trenches
B) occurs when denser ocean crusts slide beneath lighter continental crusts
C) occurs when plates pull apart
D) is caused by volcanoes
E) is responsible for hurricanes

24) Seasons are a result of _____.
A) Earth rotating near the Sun and then farther away from the Sun
B) the phases of the Moon
C) changes in day length
D) alterations in Hadley cells
E) differences in the amount and intensity of sunlight brought about by the tilt of the axis

25) The annual global growth rate of the human population peaked in the _____ and has been declining ever since.
A) 1960s
B) 1950s
C) early 1900s
D) year 2000
E) 1990s

26) A species of lizard has gone extinct. This could be due to any of the following reasons *except* _____.
A) introduction of a species that competed for food resources
B) inbreeding
C) habitat destruction by humans
D) climate change
E) increased genetic diversity within the species

27) The world population growth rate is currently close to _____%.
A) 10 **B) 1.2** C) 20 D) 5 E) 2.5

28) The physical, abiotic components of our planet can be divided into the _____.
A) lithosphere, hydrosphere, biosphere, and atmosphere
B) centrosphere, geosphere, biosphere, and abiosphere
C) lithosphere, biosphere, and atmosphere
D) lithosphere, hydrosphere, and atmosphere
E) geosphere and atmosphere

29) European rabbits were introduced into Australia and quickly spread, reproduced, and became a terrible pest. They eat up to $600 million worth of food and pasture crops annually, and have damaged the populations of many native plants and the populations of animals that eat the plants. Twice in the past 50 years, rabbit diseases have been introduced to try to control the population, with some success. This is a case where _____.
A) an invasive species has reduced the genetic diversity of indigenous species
B) habitat alteration resulted in decreased biodiversity
C) climate change has decreased the genetic diversity of indigenous species
D) an extirpation has occurred
E) an invasive species has caused overharvesting

30) In a controlled experiment, _____.
A) you need only a single experimental organism; replicates are not needed
B) the researcher has several hypotheses, one of which will be proven correct
C) the researcher knows the outcome before she or he begins
D) the researcher controls for the effects of all variables except one
E) the experimental organisms have all been used before and given good results

31) Which of the following can change local species diversity but *not* global diversity?
A) speciation and extinction
B) extirpation and extinction
C) speciation and immigration
D) immigration and extirpation
E) emigration and extinction

32) According to the IPAT model, technology that enhances our acquisition of minerals, fossil fuels, timber, and ocean fish _____.
A) increases population
B) increases environmental impact
C) increases sensitivity
D) decreases environmental impact
E) decreases sensitivity

33) The origin of all nitrogen in biological tissues is _____.
A) atmospheric N_2 gas
B) volcanoes
C) nitrogen weathered from rock
D) lightning
E) earthquake activities

34) Human beings have dramatically altered the flux rate of nitrogen from _____.
A) from soils to the atmosphere
B) proteins to inorganic ions in soils
C) the atmosphere to various pools on the earth's surface
D) oceans to soils
E) producers to consumers through increased wildfires

35) An experiment _____.
A) is an activity designed to test the validity of a hypothesis
B) involves only collection of quantitative data
C) does not need to be repeated
D) often involves manipulating as many variables as possible
E) is designed to prove a scientific hypothesis

36) Sachiko and Fred are having a discussion about the scientific method. Sachiko makes the comment that every time she sees people carrying open umbrellas, she also sees several small car accidents. This is a(n) _____.
A) theory about car accidents
B) scientific study
C) theory about umbrellas
D) hypothesis
E) observation

37) Rocks, wind, water, temperature and solar radiation are all examples of _____.
A) abiotic environmental factors
B) biotic environmental factors
C) renewable resources
D) biodegradable materials
E) non-renewable resources

38) The largest pools of carbon in the carbon cycle are _____.
A) freshwater systems and oceans
B) sedimentary rock and fossil fuels
C) hydrosphere
D) atmosphere
E) plants and animals

39) Biodiversity enhances food security because it _____.
A) decreases the number of predators
B) means that there is genetic uniformity
C) can protect some crops through genetic resources against losses due to disease
D) reduces the number of pollinators
E) increases the number of available pathogens

40) The scientific process and knowledge is based on _____.
A) the fact that hypotheses can be proven
B) educated guesses
C) just quantitative data
D) observation
E) testing hypotheses that are built on observations

41) The patterns of convection currents between the equator and subtropical latitudes are called _____.
A) Hadley cells
B) Coriolis cells
C) high-pressure cells
D) El Niño events
E) Ferrel cells

42) If a population roughly doubles in the course of 50 years, its growth rate would be close to _____%.
A) 25 B) 20 **C) 1.5** D) 10 E) 5

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43) Declining death rates due to increased food production and improved medical care while birth rates remain high is characteristic of the _____ stage.
A) revolutionary
B) stabilization
C) post-industrial
D) transitional
E) pre-industrial

44) A population of birds is found on a remote island. Which of the following information is most important in deciding if the birds all belong to a single species?
A) They can breed with one another.
B) The males all sing very similar songs.
C) All the birds appear to eat the same range of food.
D) They share many physical characteristics.
E) The offspring of some matings are sterile.

45) Like the carbon cycle, the most substantially altered flux of the mercury cycle has been:
A) from lithosphere to atmosphere
B) from atmosphere to lithosphere
C) from atmosphere to hydrosphere
D) from lithosphere to hydrosphere
E) from atmosphere to cryosphere

46) The very bioaccumulative form of mercury is called:
A) mercury-2+
B) divalent inorganic mercury
C) elemental volatile mercury
D) methylmercury
E) dimethylmercury

47) The Gulf of Mexico "dead zone" is mostly due to:
A) too much phosphorus
B) too much nitrogen
C) too little calcium
D) too much carbon dioxide
E) too few shrimp

48) The process of _____ converts ammonium into a useable form for plants:
A) ammonification
B) denitrification
C) fertilization
D) nitrification
E) oxygenation

49) A 200 km^2 field takes up carbon dioxide from the atmosphere at a rate of 46.7 tonnes hr^{-1} and emits carbon back to the atmosphere at a rate of 23.111 tonnes hr^{-1}. The field is:
A) respiring madly compared to its rate of photosynthesis
B) a carbon dioxide sink
C) a carbon dioxide source
D) quite apparently unvegetated

50) At which of the following latitudes would there be the most precipitation?
A) 4°N B) 88°S C) 47°N D) 23°N E) 24°S

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51) _____ air holds less water vapour than _____ air:
A) warm; cool
B) cool; warm

52) Latent heat transfer is:
A) what makes you feel warm at the pool
B) what makes you feel cool in the desert
C) related to the break-up or formation of hydrogen bonds in water, ice, and water vapour
D) easily measured with a thermometer
E) all of the above

53) Less insolation is absorbed at the Arctic Circle than near the equator because:
A) there is more atmosphere through which insolation has to travel at high latitudes
B) insolation is spread out over a larger area at high latitudes
C) the Arctic Circle has a higher albedo
D) all of the above
E) "a". and "b" only.

54) The wavelength of visible light falls (approximately) between:
A) 0.2 and 2.0 nm
B) 0.002 and 0.02 km
C) 0.2 and 2.0 µm
D) 0.4 and 0.8 µm
E) "b". and "c".

55) If the temperature of the sun is 5778 K, at what rate does it emit shortwave radiation?
A) 63 MW m^{-2} B) 3.276 x 10^{-4} W m^{-2} **C) 6.320 x 10^{7} W m^{-2}** D) 6.32 x 10^{7} W m^{-2} E) 6.319 x 10^{15} W m^{-2}

56) Which is the correct SI unit for volume?
A) L B) tonne C) km^3 **D) m^3** E) m

57) In a 4.33 km^2 watershed, 22 mm of rain falls in one day. 51% that rainfall is converted into runoff. What is the volume of runoff leaving the watershed?
A) 49 m^3 **B) 4.9 x 10^{4} m^3** C) 4.9 x 10^{-3} km^3 D) 48,600 m^3 E) 5.08 mm

58) Given the data in the above question, what was the total volume of rain that fell on the watershed?
A) 0.1 km^3 B) 4.9 x 10^{4} m^3 C) 0.09526 km^3 **D) 9.5 x 10^{-5} km^3** E) 95,260 m^3

59) The diameter of Earth is 12 756 km. It makes one full spin in 24.0 hours. Given that the circumference of a circle/sphere is calculated as diameter x π, how fast is the spin of the earth at the equator?
A) 1669.8 km hr^{-1} **B) 492 m s^{-1}** C) 1.7 x 10^{3} km hr^{-1} D) 532 km hr^{-1} E) 1.7 x 10^{6} m s^{-1}

60) Given the data in question 59, if you walked around the equator at a speed of 4 km hr^{-1}, how long would it take you to walk around the entire equator and arrive back at where you started?
A) 417 days B) 10,019 hours C) 400 days D) 1 year **E) c AND d**

END OF EXAM