

# BIO 1130FF

An introduction to Organismal biology  
Midterm examination  
Worth either 15% or 20% of your final grade

Saturday, November 7, 2015

**Part A: Multiple choice questions**  
**26 points (1 point/question)**

Fill in the bubbles for your name and student number and BIO1130FF for the course code. Fill in the same information in text in the boxes above the bubbles.

Use only a pencil to fill in the answer sheet. If you erase a question be sure to erase all of the pencil mark. Don't place any marks anywhere on the sheet other than where the bubbles are for personal information or your answers.

Do not place any answers on the question sheet.

This is not an open book exam.

**CAUTION to minimize paper waste this part of the exam has been printed back to back**

**NOTE:** If you do not fill in the student number and course code as **BIO1130FF** it will be impossible to identify your answer sheet and you will receive a **ZERO** for this part of the exam

FF1 What is the main structure of a virus?

- a. RNA surrounded by a nuclear envelope.
- b. Nucleic acid molecules surrounded by a protein coat or capsid.
- c. Single cell with nucleus and organelles.
- d. A cytoplasm enclosed by a membrane.

FF2 Which of the following statements about viral envelopes is correct?

- a. They contain glycoproteins of viral origin.
- b. They are located between the virus's capsid and its nucleic acid.
- c. They are composed of a lipid bilayer derived from the viral membrane.
- d. They are composed of peptidoglycan, the same material as bacterial cell walls.

FF.3 Small circles of DNA that occur in bacteria in addition to the main circular chromosomal DNA molecule are called

- a. transformants.
- b. plastids.
- c. plasmids.
- d. plasmitrons.

FF.4 What is the primary ecological role of prokaryotes?

- a. adding methane to the atmosphere
- b. parasitizing eukaryotes, thus causing diseases
- c. metabolizing materials in extreme environments
- d. breaking down organic matter
- e. serving as primary producers in terrestrial environments

FF.5 The two rounds of genomic duplication that occurred in the early evolution of vertebrates is an example of this type of chromosomal mutation (Choose the most precise answer).

- a. Translocation
- b. Polyploidy
- c. Alloplody
- d. Duplication
- e. Autopoloidy

FF.6 Four of the five population attributes can be calculated with the Hardy-Weinberg equation. Select the EXCEPTION.

- a. the frequency of a dominant allele
- b. the frequency of homozygous dominant genotypes
- c. the frequency of mutation
- d. the frequency of heterozygotes
- e. the frequency of a recessive allele

FF.7 In a single molecule of water, two hydrogen atoms are bonded to a single oxygen atom by

- a. ionic bonds.
- b. polar covalent bonds.
- c. nonpolar covalent bonds.
- d. van der Waals interactions.
- e. hydrogen bonds.

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FF.8 Bacteria participate in the nitrogen cycle through which mechanism?

- a. nitrification
- b. nitrogen fixation
- c. decomposition
- d. denitrification
- e. all of the above

FF.9 If we want to know the percentage of particular genotypes within an actual population, assuming complete dominance and two alleles, the one measurement we have to actually make is of the frequency of the

- a. dominant phenotypes.
- b. heterozygous phenotypes.
- c. homozygous dominant genotypes.
- d. recessive phenotypes.
- e. heterozygous genotypes.

FF10 Viruses are considered nonliving because they

- a. lack a nucleus.
- b. lack a cell wall.
- c. cannot reproduce outside a host cell.
- d. contain RNA as their genetic material.

FF.11 You measure the variation in toe length of all the students in your class and arrive at numbers that reflect a wide range of variation, with some short toes, some long and just about every length in between those two extremes. Your conclusion is that toe length is subject to

- a. quantitative variation.
- b. allele polymorphism.
- c. qualitative variation.
- d. microevolution.

FF.12 Radiometric dating is a technique used to determine the age of rocks. Geologists have used this technique to determine that:

- a. Earth is about 6.2 trillion years old, and life appeared on Earth about 4.9 trillion years ago.
- b. Earth is about 4.6 million years old, and life appeared on Earth about 4.4 million years ago.
- c. Earth is about 6.2 thousand years old, and life appeared on Earth about 6 thousand years ago.
- d. Earth is about 4.6 billion years old, and life appeared on Earth about 3.4 billion years ago.

FF.13 Which of the following characteristic would likely be true for a bacterium that stains positive in a gram stain test?

- a. Thicker peptidoglycan in cell wall
- b. Less sensitive to penicillin
- c. Two cell membranes
- d. No plasma membrane

FF.14 Microevolution can be said to have taken place when

- a. several mutations occur in a population.
- b. a population has different forms of the same gene.
- c. a feature of an individual animal changes through use or disuse.
- d. a population experiences a shift in allele frequencies.
- e. a mutation occurs in a population.

- FF.15 Which type of bond must be broken for water to vaporize?
- hydrogen bonds
  - polar covalent bonds
  - ionic bonds
  - nonpolar covalent bonds
  - covalent bonds
- FF.16 When the sequence of the human genome was published what was the approximate percentage of the genome that was viral DNA?
- 15%
  - 8%
  - 2%
  - 0% - None
- FF.17 The enzyme reverse transcriptase is used by HIV viruses to catalyze the synthesis of \_\_\_\_\_.
- RNA from a template DNA strand
  - DNA from a template RNA strand
  - RNA from a template RNA strand
  - DNA from a template DNA strand
- FF.18 Modern wheat contains a complete set of Chromosomes from three different species. This is an example of which type of chromosomal mutation? (Choose the most precise answer.)
- Translocation
  - Polyploidy
  - Allopolyploidy
  - Duplication
  - Autopolyploidy
- FF.19 Which of these statements about prokaryotes is correct?
- Bacterial cells conjugate to mutually exchange genetic material.
  - Their genetic material is confined within a nuclear envelope.
  - Genetic variation in bacteria is not known to occur, nor should it occur, because of their asexual mode of reproduction.
  - They divide by binary fission, without mitosis or meiosis.
- FF.20 This part of the bacterial flagellum spans across the membranes and cell wall and is anchored in place by protein rings.
- Flagellum
  - hook
  - Motor
  - Filament

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- FF.21 An Eastern European immigrant carrying the allele for TaySachs disease settled in a small village on the St. Lawrence River. Many generations later, the frequency of the allele in that village is statistically higher than it is in the immigrant's homeland. What microevolutionary principle does this story describe?
- founder effect
  - natural selection
  - Hardy-Weinberg genetic equilibrium
  - neutral variation
  - bottle neck effect
- FF.22 Which free-living cells were the earliest contributors to the formation of Earth's oxidizing atmosphere?
- endosymbionts
  - mitochondria
  - seaweeds
  - cyanobacteria
  - chloroplasts
- FF.23 A prophage is a/an \_\_\_\_\_.
- virus that attacks bacteria but does not cause disease in animals or plants
  - viral genome, integrated into the host cell chromosome
  - infective particle made up of nucleic acid and protein
  - virus that is capable of entering the lytic but not lysogenic cycle
- FF.24 RNA molecules can both carry genetic information and be catalytic. This supports the proposal that
- RNA was the first hereditary information.
  - free nucleotides would not have been necessary ingredients in the synthesis of new RNA molecules.
  - protocells had an RNA membrane.
  - RNA could make energy.
  - RNA is a polymer of amino acids.
- FF.25 Which of these is the smallest unit upon which natural selection directly acts?
- a population's gene frequency
  - an individual's genome
  - an individual's genotype
  - an individual's phenotype
  - a species' gene frequency
- FF.26 When a gamete receives the same number of chromosomes as a somatic cell,
- an unreduced gamete is formed and autopolyploidy is present.
  - a reduced gamete is formed and autopolyploidy is present.
  - a reduced gamete is formed and allopolyploidy is present.
  - an unreduced gamete is formed and allopolyploidy and autopolyploidy are present.

**BIO 1130 An Introduction to Organismal Biology**  
**Midterm examination**  
**Worth either 15% or 20% of your final grade**  
**Total points for both parts of the exam is 80 pts**

**Saturday, November 7, 2015**

**Part B: Written questions**

- a) Place your name and student number in the space provided below. Be sure that your student number is on the top of each of the following pages – the exam will be separated. **ONLY** place your student number on the pages where indicated
- b) Answer all questions in the space provided on the exam. Do not transfer answers to the back of the page.
- c) You may use either pencil or ink for your answers.
- d) Answers as written paragraphs are preferred but point form is acceptable as long as the points are logically organized and not random statements or facts
- e) This is not an open book exam.
- f) Cell phones must be in your bag or at the front of the room, **NOT** in your pockets or on the desk.
- g) There are five pages including this one in part B of the exam, be sure you have all five pages.
- h) Enter the multiple choice exam code in the space provided

**Name:** \_\_\_\_\_

**Student number:** \_\_\_\_\_

**Multiple Choice Exam Code (MM or FF):** \_\_\_\_\_

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STUDENT NUMBER: \_\_\_\_\_

Don't enter your name.

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**12 pts Part 1.** Briefly explain what each of the following terms means or the biological contribution made by the person. Where possible include an example in your explanation from a group or an organism to which the term or name applies.

Prion

Disruptive selection

Missense mutation

Cenozoic

STUDENT NUMBER: \_\_\_\_\_

Don't enter your name.

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**30 pts Part 2:** Fill in the missing word, or provide the one word answer in the space provided at the end of the sentence. If the line is missing, add it to the end of the line.

- 2.1 Halophile bacteria love this. \_\_\_\_\_
- 2.2 Geological eras are combined into these larger units of time. \_\_\_\_\_
- 2.3 The sun is this kind of reactor. \_\_\_\_\_
- 2.4 This term describes the explosion of multicellular animal life forms that appeared 540 million years ago. \_\_\_\_\_
- 2.5 These vents are ruptures in the earth's crust in the deep parts of the oceans and may be a source of the first organic molecules. \_\_\_\_\_
- 2.6 The sum of the components of the Hardy-Weinberg equilibrium equation is always equal to this value. \_\_\_\_\_
- 2.7 These little hairs found on the surface of some bacteria are important for making cell to cell connections during conjugation. \_\_\_\_\_
- 2.8 If the insect that forms the golden rod gall lived in a habitat with only predatory wasps and no woodpeckers, the shift in the size of the gall to larger galls would be an example of this type of selection. \_\_\_\_\_
- 2.9 The energy source for creating the concentration gradient across the bacterial cell membrane that fuels the bacterial molecular motor. \_\_\_\_\_
- 2.10 This one carbon hydrocarbon gas was present in the earth's original atmosphere. \_\_\_\_\_
- 2.11 The region where genetic exchange occurs between two ring species is referred to as this type of zone. \_\_\_\_\_
- 2.12 Efforts by conservation agencies to bridge the gap between small isolated populations of the same species are an example of this type of microevolutionary source of change (Two words). \_\_\_\_\_
- 2.13 The engine for a bacterial flagellum is fuelled by the creation of a concentration gradient of these across the membrane. \_\_\_\_\_
- 2.14 The product of binary fission is two of these cells. \_\_\_\_\_
- 2.15 Because this gas was missing the first forms of life lived under these conditions and had this type of metabolism. \_\_\_\_\_
- 2.16 When a new dominant male takes over a pride of lions he eliminates the young cubs. This is an example of \_\_\_\_\_, a specific type of sexual selection involving male choice.

STUDENT NUMBER: \_\_\_\_\_

Don't enter your name.

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- 2.17 Solid, small lipid droplets suspended in solution but lacking an aqueous core. \_\_\_\_\_
- 2.18 This element is produced by dying red stars and is found throughout the universe. \_\_\_\_\_
- 2.19 If both alleles for a character are the same the organism is considered to be this. \_\_\_\_\_
- 2.20 From about 4,800 Ma to 3,800 Ma this eon saw the formation of our solar system and the planet earth. \_\_\_\_\_
- 2.21 In this stage of the viral life cycle, the viral genome is combined with the bacterial genome. \_\_\_\_\_
- 2.22 Bacterial reproduction where plasmids carry pieces of one bacterial genome and combine it with another's. \_\_\_\_\_
- 2.23 For the bacterial reproduction by transduction you need the help of this type of virus. \_\_\_\_\_
- 2.24 This abbreviation describes events that happened between 4.1-3.8 billion years ago. \_\_\_\_\_
- 2.25 One of the probable events that occurred between 3.8-4.1 billion years ago is that Uranus and this planet switched their relative positions orbiting the sun. \_\_\_\_\_
- 2.26 Water is a major component of these large intergalactic travelling objects. \_\_\_\_\_
- 2.27 The distinction between the different Domains was first identified using the sequence of nucleotides in this macromolecular polymer. \_\_\_\_\_
- 2.28 This hypothesis attempts to explain the origins of the first lipid layers surrounding an aqueous core. \_\_\_\_\_
- 2.29 When one compound is oxidized there is always another that has been reduced. The two are referred to as being this (Two words) \_\_\_\_\_
- 2.30 Non-random mating is also referred to as this type of selection. \_\_\_\_\_

**Part three of the exam is on the next page**

STUDENT NUMBER: \_\_\_\_\_

Don't enter your name.

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**12 pts Part 3:** Answer the following two questions in the space provided. Each question is worth 6 points

3.1 Describe the differences between the three multicellular Eukarya Kingdoms using a cladogram with these differences mapped as symplesiomorphies and autapomorphies.

3.2 Obtaining a carbon source for building organic molecules and harnessing the energy to do it is the basis of the metabolic diversity of Bacteria. Explain the differences or similarities between the following three: Photoheterotrophs, Chemoorganoheterotrophs, and Chemolithotrophs. Be sure to identify if any of these are found in Eukaryotes.