

BIO 1130FF

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

Saturday, November 8, 2014

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

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Multiple choice questions - Place your answers on the answer sheet

- FF.1 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.
- FF.2 Theoretically, the production of sterile mules by interbreeding between female horses and male donkeys should
- cause convergent evolution.
 - weaken the intrinsic reproductive barriers between horses and donkeys.
 - eventually result in the formation of a single species from the two parental species.
 - strengthen postzygotic barriers between horses and donkeys.
 - result in the extinction of one of the two parental species.
- FF.3 The snake family Typhlopidae consists of small, burrowing species with vestigial eyes. They are found in Australia, sub-Saharan Africa, India and some adjacent areas, and South America. What is the most likely explanation for this distribution?
- rafting to the different continents from the point of origin on one of these continents
 - origin on the super continent Gondwana followed by continental drift and some range expansion
 - convergent evolution in the different regions
 - all of the above
- FF.4 The purple non-sulfur bacterium *Rhodospirillum* grows best as a photoheterotroph. What are the most favorable sources of energy and carbon for this bacterium?
- glucose
 - light and CO₂
 - fructose and light
 - methane and CO₂
- FF.5 Microbiologists use the Gram stain to aid in identification of bacteria. What is the major difference between Gram-positive and Gram-negative bacteria?
- structure of the lipids in the plasma membrane
 - presence or absence of muramic acid in the cell wall
 - presence or absence of outer membrane
 - presence or absence of peptidoglycan in the cell wall
- FF.6 Which of the following is not characteristic of ciliates?
- They have two or more nuclei.
 - Most live as solitary cells in fresh water.
 - They are relatively complex cells.
 - They use cilia as locomotory structures or as feeding structures.
 - They can exchange genetic material with other ciliates by the process of mitosis.
- FF.7 An early consequence of the release of oxygen gas by plant and bacterial photosynthesis was to
- change the atmosphere from oxidizing to reducing.
 - prevent the formation of an ozone layer.
 - make life on land difficult for aerobic organisms.
 - make it easier to maintain reduced molecules.
 - cause iron in ocean water and terrestrial rocks to rust (oxidize).

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- FF.8 Though plants, fungi, and prokaryotes all have cell walls, we place them in different taxa. Which of these observations comes closest to explaining the basis for placing these organisms in different taxa, well before relevant data from molecular systematics became available?
- Some closely resemble animals, which lack cell walls.
 - Some have cell walls only for support.
 - Some have cell walls only for protection from herbivores.
 - Their cell walls are composed of very different biochemicals.
 - Some have cell walls only to control osmotic balance.
- FF.9 Which of these is the most common compound in the cell walls of gram-positive bacteria?
- lignin
 - protein
 - lipopolysaccharide
 - peptidoglycan
 - cellulose
- FF.10 Consider the following data: (a) Most ancient eukaryotes are unicellular. (b) All eukaryotes alive today have a nucleus and cytoskeleton. (c) Most ancient eukaryotes lack a cell wall. Which of the following conclusions could reasonably follow the data presented?
- The first eukaryote may have been photosynthetic.
 - The first eukaryote may have been anaerobic.
 - The first eukaryote may have been capable of phagocytosis.
 - The first eukaryote may have been very similar to a plant cell.
- FF.11 Male frogs give calls that attract female frogs to approach and mate. Researchers examined mating calls of closely related tree frogs in South America. What outcomes can occur where the ranges of two species overlap?
- The species will interbreed, eventually fusing over time.
 - A stable hybrid zone will form if hybrids are better adapted to the area of overlap than either parent species is.
 - Species will continue to diverge and be isolated by behavioral or genetic mechanisms.
 - All of the above is possible outcomes.
 - None of the above is a possible outcome
- FF.12 Which of the following is a structure that permits bacterial conjugation to occur?
- endospore
 - cell wall
 - sex pilus
 - flagellum
 - capsule
- FF.13 Carbon is an important element for biology because
- It has the ability to form six covalent bonds.
 - Of the variety of carbon skeletons and functional groups that can be built on them.
 - Carbon is so rare, organisms conserve it highly.
 - It has very high electronegativity and forms highly stable bonds.

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- FF.14 If two species of lizards do not mate because their mating rituals differ greatly, this is known as
- ecological isolation.
 - mechanical isolation.
 - temporal isolation.
 - behavioural isolation.
- FF.15 Which of the following statements about the lysogenic cycle of a phage is false?
- After infection the viral genes immediately turn the host cell into a virus-producing factory, and the host cell then lyses.
 - The phage DNA is incorporated into the host cell's DNA.
 - The phage genome replicates along with the host genome.
 - Certain environmental triggers can cause the phage to exit the host genome, switching from the lysogenic to the lytic cycle.
- FF.16 Which of the following events marks the start of the Proterozoic eon?
- explosion of marine invertebrates and multicellular life
 - The dominance of anaerobic life
 - A stable oxygen environment and the appearance of protists
 - The origins of life
- FF.17 Meteorite impacts during the stabilizing phase of the Hadean Eon did which of the following
- increased the amount of water on the planet
 - flash sterilized the planet
 - created the moon that circles the earth
 - all of the above
- FF.18 This heavy metal is abundant in the core of the earth and the other planets closest to the sun
- Lead
 - Silica
 - Iron
 - Copper
- FF.19 The process by which bacterial genes from one bacterium are transferred to another via a virus is called _____.
- translation
 - transformation
 - transduction
 - transcription
- FF.20 An organism that obtains its energy from sunlight is a(n)
- phototroph.
 - chemotroph.
 - autotroph.
 - heterotroph.

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- FF.21 Which organisms represent the common ancestor of all photosynthetic plastids found in eukaryotes?
- autotrophic euglenids
 - red algae
 - dinoflagellates
 - diatoms
 - cyanobacteria
- FF.22 Viroids are defined as _____.
- proteinaceous infectious particles
 - plant pathogens that consist of strands or circles of DNA
 - strands or circles of RNA with a protein coat
 - infective RNAs made of strands or circles of naked RNA
- FF.23 Imagine that you are given some chemoorganotrophic bacteria to grow. What should you use as a source of energy for this type of bacteria?
- sugar
 - ammonia
 - light
 - methane
 - any of the above
- FF.24 Protobionts (protocells) are
- a group of abiotically produced inorganic molecules surrounded by a membrane-like structure.
 - a group of abiotically produced organic molecules surrounded by a membrane-like structure.
 - a group of biotically produced inorganic molecules surrounded by a membrane-like structure.
 - a group of biotically produced organic molecules surrounded by a membrane-like structure.
- FF.25 Earth is approximately _____ years old.
- 3.6 billion
 - 2.6 million
 - 1 billion
 - 4.6 billion
- FF.26 Many scientific probes sent to other parts of the solar system are looking for signs of something so far known to exist only on Earth, namely _____.
- Life.
 - Carbon.
 - Gold.
 - Nitrogen.
 - Water

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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) There are five pages including this one in part B of the exam, be sure you have all five pages.
- g) 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.

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.

Kinesin

Synapomorphy

Sympatric speciation

Eukaryote cilia

STUDENT NUMBER: _____

Don't enter your name.

28 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 Bacteria that get their ATP from existing high energy bonds and carbon from carbon dioxide. _____
- 2.2 One of the advantages of a membrane surrounding the nucleus is that this part of gene expression is restricted to the nucleus. _____
- 2.3 These forces held the Earth's atmosphere in place. _____
- 2.4 The number of peripheral microtubular doublets in either a cilium or flagellum. _____
- 2.5 Because of its stability and structure this biopolymer is not a good candidate as the first self-replicating set of molecules. _____
- 2.6 The highly organized charged surface of these inorganic compounds may have been critical for the assembly of some of the first self replicating biopolymers. _____
- 2.7 This process creates mRNA from DNA. _____
- 2.8 Abundant bacterial cytoplasmic inclusion involved in protein production. _____
- 2.9 This geological eon is the youngest and shortest. _____
- 2.10 This eon occurs between the Proterozoic and Hadean. _____
- 2.11 Fungal-like protists use this type of nutritional strategy (Two words). _____
- 2.12 The domain that doesn't include prokaryotes. _____
- 2.13 The space between the two lipid layers of the Gram-negative bacterium. _____
- 2.14 This chromosomal mutation associated with meiosis increases genetic variation in Eukaryotes (Two words) _____
- 2.15 Viroids are made up of this type of molecular polymer. _____
- 2.16 Monophyletic groups have this number of ancestors. _____
- 2.17 As an antibiotic, penicillin affects which part or layer of the bacterial cell wall. _____
- 2.18 This common gas in today's atmosphere was absent in the Hadean atmosphere.

STUDENT NUMBER: _____

Don't enter your name.

- 2.19 Cladists build these to depict the evolution of taxa and how they are related to each other. _____
- 2.20 The membrane system surrounding the nucleus is only one part of this larger membrane system of cells. _____
- 2.21 Mitochondrial DNA takes this bacterial shape. _____
- 2.22 This is the more fluid of the two types of cytoplasm found in an amoeba. _____
- 2.23 If a bacterium gets its high energy electrons from minerals or inorganic chemical elements you will see this as a part of the name describing their metabolism. _____
- 2.24 This essential component required for translation is missing in a virus. So viruses have to use the ones in the host cell. _____
- 2.25 This mucilaginous glycocalyx surrounds the bacterial cell wall. _____
- 2.26 Catalytic ribozymes are evidence that this being the first self replicating biopolymer. _____
- 2.27 The vacuole found in freshwater protists is involved in osmoregulation. _____
- 2.28 When the second flagellum appeared in the bikonts it was used for this activity. _____

Part three of the exam is on the next page

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Don't enter your name.

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

3.1 What evidence places the Archea as the sister group to the Eukarya?

3.2 Endosymbiosis was an important event in eukaryote evolution. What is endosymbiosis and give three examples.