BIO 1130FF

An Introduction to Organismal biology
Final examination
Worth 35% of your final grade

Friday, December 18, 2009

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

a) 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.

b) 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.

c) Do not place any answers on the question sheet.

d) This is not an open book exam.

e) **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

1. Basidiomycetes are the only fungal group capable of synthesizing lignin peroxidase (ligninase). What advantage does this group of fungi have over other fungi because of this capability?
   a. This fungal group can break down the tough lignin, which cannot be harnessed for energy, to get to the more useful cellulose.
   b. This enzyme releases heat energy from the breakdown of lignin that is used to kill off competing fungi.
   c. This is always the first group of fungi to begin any kind of plant decomposition.
   d. This is the only group of fungi that can use lignin for ATP production.

2. The cladistic approach to estimating phylogenetic trees is most like the approach of which species concept?
   a. Phylogenetic species concept
   b. Morphospecies concept
   c. Biological species concept

3. As plants made the evolutionary transition to a terrestrial existence, they benefited from adaptations that:
   a. increased the motility of their gametes on dry land.
   b. flattened the plant body to expose it to the sun.
   c. reduced the number and distribution of roots to prevent drying.
   d. provided mechanisms for gaining access to nutrients in soil.
   e. allowed stems and leaves to absorb water from the atmosphere.

4. Why are mycorrhizal fungi superior to plants at acquiring mineral nutrition from the soil?
   a. Fungi secrete extracellular enzymes that can break down large molecules.
   b. Fungi can transport compounds through their mycelium from areas of surplus to areas of need.
   c. Hyphae are 100 to 1000 times smaller than plant roots.
   d. All of the above answers apply.

5. Which body region of an insect bears the walking legs?
   a. head
   b. carapace
   c. abdomen
   d. thorax
   e. trunk

6. Which best describes a lichen?
   a. It is a fungus that breaks down rock to provide nutrients for an alga.
   b. It colonizes bare rocks and slowly degrades them to small particles.
   c. It spends part of the life cycle as a mycobiont and part as a fungus.
   d. It is an association between a basidiomycete and an ascomycete.
   e. It is an association between a photobiont and a fungus.

7. Which of these time intervals, based on plant fossils, came last (most recently)?
   a. Silurian-Devonian explosion with fossils of plant lineages that contain most of the major morphological innovations
   b. extensive growth of gymnosperm forests
   c. rise and diversification of angiosperms
   d. colonization of land by early liverworts and mosses
   e. carboniferous swamps with giant horsetails and lycophytes

8. Chromatin is made up of
   a. DNA and RNA.
   b. RNA and protein.
   c. DNA and protein.
   d. DNA only.

9. Which of these are structures in a gametophyte generation?
   a. leaves, stems, roots, flowers, cones
   b. antheridium, embryo, seed, spores, flower
   c. spores, egg, sperm, pollen, archegonium
   d. egg, sperm, zygote, embryo, seedling

10. This symbiotic association grows on rocks, where it begins the process of soil formation, and it is a major food source for caribou.
   a. endophytes
   b. ectomycorrhizal fungi
   c. arbuscular mycorrhizal fungi
   d. chytrids
   e. lichens

11. This group of fungi has the ability to penetrate its host's cell wall, thus increasing the efficiency with which materials are passed from fungus to host.
   a. ectomycorrhizal fungi
   b. arbuscular mycorrhizal fungi
   c. all of the above

12. Which of the following is not associated with meiosis?
   a. daughter cells identical to the parent cell
   b. variety in resulting cells
   c. chromosome number halved in resulting cells
   d. four daughter cells arising from one parent cell

13. Prior to the 1940s, many biologists thought that ____, being made up of 20 types of ____, was the best candidate for genetic material.
   a. DNA; nucleotides
   b. protein; amino acids
   c. protein; nucleotides
   d. DNA; amino acids

14. Which adaptation is unique to insects among all protostomes?
   a. the ability to consume terrestrial plants
   b. the ability to metamorphose
   c. the ability to parasitize other organisms
   d. the ability to move via jointed limbs
   e. the ability to move by flying

15. A homeowner noticed moss growing between bricks on his patio. Closer examination revealed tiny brown stalks with cuplike tops emerging from green leaflets. These brown structures were:
a. the sporophyte generation.
b. the gametophyte generation.
c. elongated haploid reproductive cells.
d. archegonia.
e. antheridia.

16. As you stroll through a moist forest, you are most likely to see a _____.
a. zygote of a green alga.
b. gametophyte of a moss.
c. sporophyte of a liverwort.
d. gametophyte of a fern.

17. Which set contains the most closely related terms?
a. megasporangium, megaspore, egg, ovule
b. megasporangium, megaspore, pollen, ovule
c. microsporangium, microspore, egg, ovary
d. microsporangium, microspore, carpel, ovary

18. Which of these is a major trend in land plant evolution?
a. the trend toward a gametophyte-dominated life cycle
b. the trend toward a sporophyte-dominated life cycle
c. the trend toward smaller size
d. the trend toward larger gametophytes

19 If there are 20 centromeres in a cell at anaphase, how many chromosomes are there in each daughter cell following cytokinesis?
a. 30
b. 40
c. 20
d. 10
e. 80

20. Why have biologists hypothesized that the first land plants had a low, sprawling growth habit?
a. Land animals of that period were small so they needed short plants to eat.
b. Only fossilized plants exhibit this habit.
c. The ancestors of land plants, green algae, lack the structural support to stand erect in air.
d. Land animals of that period consumed erect plants.
e. At the time of the first land plants, the atmosphere had oxygen mainly close to the ground.

21. In DNA the pyrimidines are
a. thymine and adenine.
b. adenine and guanine.
c. thymine and cytosine.
d. adenine and cytosine.

22. A trait common to all fungi is:
    a. reproduction via spores.
    b. parasitism.
    c. septate hyphae.
    d. a dikaryotic phase inside a zygospore.
    e. plasmogamy after an antheridium and ascogonium come into contact.

23. The chief characteristic used to classify fungi into the major fungal phyla is:
    a. nutritional dependence on nonliving organic matter.
    b. recycling of nutrients in terrestrial ecosystems.
    c. adaptations for obtaining water.
    d. features of reproduction.
    e. cell wall metabolism.

24. Which feature(s) do ferns share with all other land plants?
    a. sporophyte and gametophyte life cycle stages
    b. gametophytes supported by a thallus
    c. dispersal of spores from a sorus
    d. asexual reproduction by way of gemmae
    e. water uptake by means of rhizoids

25. Which of the following fungal reproductive structures is diploid?
    a. Basidiocarps
    b. Ascospores
    c. Conidia
    d. Gametangia
    e. Zygospores

26. Which part of a mollusk secretes the shell?
    a. visceral mass
    b. radula
    c. trochophore
    d. head-foot
    e. mantle

27. In a cladistic analysis, a systematist groups together organisms that share:
    a. derived homologous traits.
    b. derived homoplasious traits.
    c. ancestral homologous traits.
    d. ancestral homoplasious traits.
    e. all of the above

28. The evolutionary history of a group of organisms is called its:
    a. classification.
    b. taxonomy.
    c. phylogeny.
    d. domain.
    e. outgroup.

29. Which evolutionary innovation was most significant in helping tetrapods move to dry terrestrial environments?
    a. bone
    b. limb specialization
    c. endothermy
    d. the lung
    e. the amniotic egg

30. A monophyletic taxon is one that contains:
    a. an ancestor and all of its descendants.
    b. an ancestor and some of its descendants.
    c. organisms from different evolutionary lineages.
    d. an ancestor and those descendants that still resemble it.
    e. organisms that resemble each other because they live in similar environments

31. Which of the following would be useful in creating a phylogenetic tree of a taxon?
    a. Morphological data from fossil species
    b. Genetic sequences from living species
    c. Behavioral data from living species
    d. All of the above
    e. None of the above

32. To construct a cladogram by applying the principles of parsimony to molecular sequence data, one would:
    a. start by making assumptions about variations in the rates at which different DNA segments evolve.
    b. group together organisms that share the largest number of ancestral sequences.
    c. group together organisms that share derived sequences, matching the groups to those defined by morphological characters.
    d. group together organisms that share derived sequences, minimizing the number of hypothesized evolutionary changes.
    e. identify derived sequences by studying the embryology of the organisms.

33. In what way are monotremes similar to more ancestral chordate lineages, as opposed to more recently evolved mammals?
    a. Monotremes perform external fertilization; other mammals perform internal fertilization.
    b. Monotremes perform little parental care; other mammals use lactation to feed offspring.
    c. Monotremes exchange gases through their skin; other mammals use lungs.
    d. Monotremes lay eggs; other mammals bear live young.
    e. Monotremes do not have jaws; other mammals do.

34. Your professor wants you to construct a phylogenetic tree of orchids. She gives you tissue from seven orchid species and one lily. What is the most likely reason she gave you the lily?
    a. To see if you were paying attention
    b. To see if the lily and the orchids show all the same shared derived characters (synapomorphies)
    c. To serve as an out-group
    d. To see if it's a cryptic orchid species

35. The embryo doesn't grow larger during the stage known as cleavage. What is going on in the embryo during this process?
    a. Cleavage is just the stage at which cells begin to differentiate; that is, endodermal cells start to look different from ectodermal and mesodermal cells.
    b. Cleavage is the process by which the polarity of the cell is established; that is, the anterior is distinguished from the posterior.
    c. Cleavage is the formation of the gastropore that is used to differentiate protostomes and deuterostomes.
    d. The cells are dividing at this stage, but all the cytoplasm is being split between resulting cells without the formation of new cytoplasm.

36. Which of the following is a correct element of alternation of generations?
    a. Two spores unite to form a zygote.
    b. The sporophyte is diploid and produces spores.
    c. The gametophyte is diploid and produces gametes.
    d. The gametophyte is haploid and produces spores.
    e. The sporophyte is haploid and produces gametes.

37. The wings of birds, the legs of pigs, and the flippers of whales provide an example of:
    a. vestigial structures.
    b. homologous structures.
    c. acquired characteristics.
    d. artificial selection.
    e. uniformitarianism.

38. Somatic cells of roundworms have four chromosomes. How many chromosomes would you find in an ovum from a roundworm?
    a. four
    b. two
    c. eight
    d. a diploid number

39. Fungi have an extremely high surface-area-to-volume ratio. What is the advantage of this to an organism that gets most of its nutrition through absorption?
    a. The larger surface area allows for more material to be transported through the cell membrane.
    b. This high ratio creates more room inside the cells for additional organelles involved in absorption.
    c. This high ratio means that fungi have a thick, fleshy structure that allows the fungi to store more of the food it absorbs.
    d. The lower volume prevents the cells from drying out too quickly, which can interfere with absorption.

40 The presence of a lophophore in a newly discovered species would suggest which of the following?
    a. This species grows by shedding its cuticle.
    b. This species is a suspension feeder.
    c. This species is probably an arthropod.
    d. This species grows by shedding its exoskeleton.

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Total points for both parts of the exam is 100 pts

December 18, 2009
Part B: Written questions

a) Place your name and student number in the space provided below. Be sure only your student number, is on the top of each of the following pages – the exam will be separated and if you name is not on a page your mark will be zero for that page. This part of the exam is worth 60 points.

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 of 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 six pages including this one in part B of the exam, be sure you have all seven pages

Name: _____

Student number: _____

18 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.

Gondwana

large supercontinent in the southern hemisphere
appears during Cambrian period
fuses to form Pangea
Starts breaking about 130 mya
Supercontinent forms South America, India, Australia and Antarctica

Synapsid

one opening in the skull for the muscles that move the jaw
one temporal fenestra or arches for jaw muslces
lineage of reptiles that evolves into mammals
amniote skull morphologies
ex. humans

Chorion

outer membrane in amniote egg
outer covering of the insect egg
surrounds the developing embryo
protects from water loss
allows gas exchange

Therapsid

reptile ancestor to the mammals
warm blooded
specialized teeth
glandular teeth
sensory hairs/whiskers

Mechanical taxonomy

created by Linnaeus
organizing lists of organisms into groups/categories
nested structure/hiearchical structure
based on similiarities in appearance (morphologies)

Paraphyletic

taxon/group of related organisms
share a phylogeny in evolutionary history
includes the ancestor to the group but not all of the descendents
birds were paraphyletics to the other reptiles

Anything written below this line will not be marked.

24 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.

2.1 In non vascular plants this stage of the life cycle dominates. Gametophyte

2.2 Type if cell division that the spore mother cell in a moss sporangium undergoes when it produces spores. Meiosis

2.3 When the water absorbing and anchoring structures of a plant lack vascular tissue they are referred to as these. Rhizoids

2.4 This membrane surrounds the embryo and all the other membranes found in a reptiles egg. Chorion

2.5 Nitrogenous wastes generated by a reptile embryo are stored here. Allantois

2.6 In a taxon characters found in the ancestor of the group are considered this, and its not a statement on their value! Primitive

2.7 The female cones of a pine are located on this part of the tree. Top

2.8 The female embryonic protective device of gymnosperms and angiosperms. Seed

2.9 Functionally the cells of the fruiting bodies of mushrooms have this chromosome compliment. N + N

2.10 Both algae and plants have cell walls made of this, another indication that plants evolved from an algal ancestor. Cellulose

2.11 In vascular plants the cellulose cell wall is the Primary cell wall.

2.12 Birds and insects both fly and have wings, but they don't share a common ancestor so their wings are considered as being this type of character. Homoplasy

2.13 The feeding strategy of fungi. Saprophytic

2.14 Mode of locomotion used by moss sperm to reach the egg. Swim

2.15 This biopolymer on the surface of leaves helps prevent water loss. Wax

2.16 Unlike other multicellular organisms the nuclei of the mating types remain separate and the cell is referred to as being a Heterokaryotic mycelium.

2.17 The water proof layer of a leaf. Cuticle

2.18 Cladistics uses these characters to unravel the evolutionary relationships between different groups of organisms. Derived

2.19 Birds and insects both fly and have wings, but they don't share a common ancestor so their wings are considered as being this type of character. Cladograms

2.20 This term describes the relationship between algae and fungi in lichens. Symbiosis

2.21 In the life cycle of a gymnosperm pine, this type of spore is wind born. Microspore

2.22 This part of the cuticle contains waxes that waterproof the cuticle of an insect. Epicuticle

2.23 This gamete is produced inside a mosses antheridial head. Sperm

2.24 You won't find this stage in a hemimetabolous insect. Pupa

18 pts Part 3: Answer the following two questions in the space provided.

6 pts 3.1 What is double fertilization, what taxon of organisms uses it and why was it advantageous for that taxon?

occurs in angiosperms
1 sperm nucleus fertilizes the egg to create a zygote
2nd sperm = nucleus fertilizes the endosperm
3n = endosperm (triploid)
polyploidy (not tolerable in animals)
endosperms provide a supply of nutrients
embryo's do no synthesize

6 pts 3.2 Some organisms are better at surviving a mass extinction, what is a mass extinction and what characteristics are shared by those that are more likely to survive?

loss of more than 50% of the species
survival: generalist, not specialist
small size insect = more global distribution,
better chances of surviving than big animals
plants = spores and seeds are small,
disperse gobally increasing the chance
of survival somewhere else

6 pts 3.3 The amphibian skeleton is an imperfect solution to life on land, Why and what is required to overcome the problem?

appendages are attached to the axial skeleton
girdles (pectoral & pelvic are the attachment points)
limbs positioned on the side
pushes up to lift the body off the ground
alternating movement of limbs restricts affects the use of lungs
position of limbs underneath animal