Chapter 22. Descent with Modification: A Darwinian View of Life
Due: September 12, 2016 at 10am

Definitions, Explanations or Lists (answer as part of your notes: not to be submitted)

Write down the 3 key concepts of the chapter.
2 definitions of evolution
scala naturae
Lamarck's two mechanisms
adaptations
Contribution of Thomas Malthus to Darwin's thinking
List the 4 types of evidence that support Darwin's ideas
Homology
Understand tree thinking by carefully reading Fig. 22.17
convergent evolution/analogy

Assigned Question (to be submitted via Moodle by 10 am on September 14)

1. Explain the evolution of the long neck of the giraffe using Darwin's logic (i.e. 2 observations and 2 inferences from page 491; page 458 of the 9th edition). Your answer should be about 4 sentences long – i.e. rewrite the 2 observations and 2 inferences specifically for the case of giraffes. **Make sure your answer is specifically about giraffes and necks.**
2. What was the most difficult **or** intriguing topic of Chapter 22? Write 1-3 sentences about what you didn't understand **or** found most interesting.

Review Exercises (think about these questions, but don't submit)

1. Try the 5 multiple choice questions at the end of the chapter (you should be getting about 70% of the multiple choice questions correct).
2. Explain how Darwin used artificial selection as part of his argument about the power of natural selection.
3. Give a Lamarckian explanation for the evolution of running speed in cheetahs.
4. Are Darwin's ideas just a theory?
5. If natural selection is more a process of "editing" than a creative mechanism, how are beautiful adaptations like the giraffe's neck created?
6. What kind of evidence would you use to convince a creationist that evolution is an historical fact?
7. Why is it crucial to construct evolutionary trees based on homologies rather than analogies (convergent evolution)?

Chapter 23. The Evolution of Populations
Due: September 14, 2016

Definitions, Explanations or Lists (not to be submitted)

Write down the 4 key concepts of the chapter.
Is the individual or the population the smallest unit of evolution?
microevolution
mechanism responsible for adaptive evolution
particulate hypothesis of inheritance
discrete vs. quantitative characters
geographic variation
mutation
population
gene pool
5 conditions for a Hardy-Weinberg equilibrium
genetic drift, bottleneck effect and founder effect
gene flow
fitness
3 modes of natural selection
Sexual selection
3 mechanisms that preserve genetic variation

Assigned Question (submit via Moodle)

1. How do diploidy and heterozygote advantage help preserve genetic variation within a population? Write 1-2 sentences for each.
2. What was the most difficult **or** intriguing topic of Chapter 23? Write 1-3 sentences about what you didn't understand **or** found most interesting.

Review Exercises (not to be handed in)

1) Try the 6 multiple choice questions at the end of the chapter.
2) Natural selection acts on individuals, but populations evolve. Explain.
3) Is natural selection synonymous with evolution?
4) Natural selection can't cause evolution because it acts on phenotypes not genotypes. True or false? Explain.
5) How do diploidy and heterozygote advantage preserve genetic variation within a population?
6) Why are cocktails of drugs required for an effective treatment of HIV?
7) Does natural selection make perfect organisms?

Chapter 24. The Origin of Species
Due: September 21, 2016

Definitions, explanations, lists (not to be handed in)

Write down the 4 key concepts of the chapter.
speciation
micro- and macro-evolution
biological species concept
reproductive isolation
5 prezygotic barriers
3 postzygotic barriers
morphological species concept
allopatric speciation
sympatric speciation
polyploid speciation
autopolyploid speciation
allopolyploid speciation
punctuated equilibria

Assigned Questions (hand in)

1) What are the strengths and weaknesses of the morphological species concept? Write 2-3 sentences. (5 points)
2) What was the most interesting or confusing part of the readings for chapters 24, 25 and 26? (2 points)

Review Exercises (not to be handed in)

Try the 7 multiple choice questions at the end of the chapter.

1) How might an imperfect fossil record give the impression of the 'punctuated equilibrium' view of speciation?
2) How is the process of evolution revealed by the imperfections of living organisms?
3) Why do freshwater habitats have more species of fishes than an equivalent area of ocean?

Chapter 25. The History of Life on Earth: Table 25.1 & page 548 (514); 556-560 (521-524); 565-567 (529-530)

Definitions, explanations, lists (not to be handed in)

Names, dates and causes of the two famous episodes of mass extinction
Adaptive radiations

Review Exercises

1) How does a new kingdom or phylum evolve?
2) How long does it take for biodiversity to recover following a mass extinction? What are the implications of the 6th mass extinction?

Chapter 26. Phylogeny and the Tree of Life: Pages 574-578 (536-540); Fig. 26.10)

Definitions, explanations, lists (not to be handed in)

Write down the key concepts 1-4 and 6.
Phylogeny
Taxonomy
binomial naming system
phylogenetic tree
monophyletic group
paraphyletic group
polyphyletic group

Review Exercises (not to be handed in)

1. Try questions 1, 2, 3, 5, 6 in Testing Your Understanding.
2. Try the "Draw it" question in Fig. 26.5.
3. Why are phylogenetic trees considered to be hypotheses?
4. List the levels in a hierarchical classification from smallest to largest for two icons of Canada: the maple tree and the beaver.

Chapter 27. Bacteria and Archaea
Due: October 3, 2016

Definitions, explanations, lists (not to be handed in)

Write down the 6 key concepts for the chapter.
Function of the cell wall
Peptidoglycan
Rank 3 types of prokaryotes in terms of the amount of peptidoglycan in their cell wall
plasmid
binary fission
endospores
transformation, transduction, conjugation
4 major modes of nutrition of prokaryotes
obligate aerobes
obligate & facultative anaerobes
nitrogen fixation
biofilms
habitats &/or metabolism of 3 main groups of extremophiles
endo- and exo-toxins

Assigned Questions (submit your answer on Moodle)

1. Could eukaryotes live without the presence of prokaryotes on earth? Could prokaryotes live without eukaryotes on earth? Your answer should be 2-3 sentences long.
2. What was the most difficult or confusing topic of Chapter 27? Write 1-3 sentences telling me what you didn't understand.

Review Exercises (don't hand in; think about them)

Try the 6 multiple choice questions at the end of the chapter.

1. Answer true or false to the following statements: (a) the biomass of prokaryotes is 10x greater than all eukaryotes; (b) most organisms on earth are prokaryotic; and (c) most described species on earth are prokaryotic.
2. We often preserve fruit by making jam or drying it. How does this work? Your answer should be about 2-4 sentences long.
3. The production of antibiotics by bacteria is the ecological equivalent to what behaviour in birds?
4. What does biodegradable mean?
5. Do bacteria have sex? What about sexual reproduction?
6. Why are gram-negative bacteria typically more pathogenic than gram-positive bacteria?

Chapter 28. Protists (Due: Oct. 12, 2016)

Definitions, explanations, lists (your notes)

Write down the 7 key concepts of the chapter.
endosymbiosis and secondary endosymbiosis
list the 5 supergroups of eukaryotes
distinguishing features of excavates
list the three major subgroups forming the excavates
distinguishing feature of chromalveolates
two major groups of chromalveolates?
List the 3 groups of alveolates
Distinguishing feature of alveolates
Distinguishing feature of Stramenopiles
4 major groups of stramenopiles
alternation of generations
distinguishing feature of rhizarians
list the 3 major groups of rhizarians
2 major groups in the Archaeoplastids
2 major groups of the Unikonts
3 major groups of amoebozoans

Assigned Question (submit via Moodle)

1) Protists are simple as organisms but complex as cells. Explain. Write 1-3 sentences. (4 points)
2) What was the most confusing or interesting aspect of Chapter 28? Write 1-3 **sentences**. (2 points)

Review Exercises (not to be submitted)

Try the 6 multiple choice questions in Test Your Understanding.

3) Would you rather be a stalk cell or a fruiting body cell in a cellular slime mould? How do they prevent cheating?
4) Given the recent advances in eukaryotic systematics, how would you define a protist?
5) *Paramecium* have sex without reproduction. Explain
6) What would you call an individual in a cellular slime mould?
7) Why do water moulds look superficially like fungi?

Chapter 29. Plant Diversity I (Due: Oct. 17, 2016)

Definitions, explanations, lists (not to be submitted)

Write down the 3 key concepts of the chapter.
Age of multicellular life on land?
Closest living relative of land plants?
Sporopollenin
List and define the 4 derived characteristics that are common to all land plants.
cuticle
gametophyte
sporophyte
vascular tissue
dominant phase of bryophyte life cycle
dispersal phase of mosses?
dominant phase of fern life cycle
xylem
lignin
phloem

Assigned Question (Submit via Moodle)

1.What characteristic of ferns limit them to damp environments? Write 1-2 sentences.

Review Exercises (think about these)

Try the 7 multiple choice questions in Test Your Understanding.

1. Given that mosses generally live in wet habitats, how do they survive in cold, dry habitats, such as the Arctic?
2. Coal is composed of the remains of what organisms?

Chapter 30. Plant Diversity II (Due: Oct. 17, 2016)

Definitions, explanations, lists (not to be submitted)

Write down the 4 key concepts of the chapter.
seed
pollen grain
naked seeds
4 phyla of living gymnosperms
flower
fruit
double fertilization
endosperm

Assigned Questions (submit via Moodle)

1.Why is the loss of pollinating insects such a threat to agriculture? Write 1-2 sentences.
2.What was the most confusing or fascinating concept in chapters 29 and 30? Write 1-3 sentences.

Review Exercises

Try the Test Your Understanding multiple-choice questions.
What is the function of double fertilization in angiosperms? Write 1-3 sentences.
What tissue provides the bulk of all food for humans? Write 1-2 sentences.
Where is the male gametophyte in the life cycle of a seed plant?
What is the female gametophyte in angiosperms called?
Why did amphibians and seedless plants decline in abundance during the Permian, while conifers and reptiles increased in abundance?
Explain how xylem tissue is important for humans.
What is the newest phylum to appear on earth?

Chapter 31. Fungi (Due: October 24, 2016)

Definitions, explanations, lists

Write down the 5 key concepts of the chapter.
Nutrition of fungi
yeast
Hyphae
Mycelium
Coenocytic
Mycorrhizae
spore
plasmogamy
heterokaryon/dikaryon
karyogamy
mold
unique feature of Chytrids
unique feature of zygomycetes
defining feature of an ascomycete
defining feature of basidiomycetes
lichen

Assigned Question (hand in)

1) If the stomach is the location for digestion in most animals, where is the "stomach" of the fungi? Write 1-2 sentences. (2 points)

Review Exercises

Try the 6 multiple choice questions.
1) What is the dispersal phase of a fungus?
2) Why do you think plants and fungi invaded terrestrial habitats at about the same time?
3) How are truffles like flowering plants?
4) What do people mean when they say that someone is growing like a mushroom?
5) What is the best shape for an absorptive organism? How do fungi accomplish this?

Chapter 32. Introduction to Animal Diversity **(Due: October 24, 2016)**

Definitions, explanations, lists (not to be handed in)

Write out the 4 key concepts of the chapter.
Animal
Nutrition of animals
blastula
gastrula/gastrulation

Cambrian explosion
radial symmetry
bilateral symmetry
cephalization
tissues
ectoderm and endoderm
diploblastic
mesoderm
triploblastic
coelom
3 major ways of distinguishing protostomes from deuterostomes

Assigned Question (hand in)

1. What happened during the Cambrian explosion? Write 1-2 sentences. (2 points)
2. What was the most confusing or difficult concept in Chapter 31 or 32? Write 1-3 sentences. (2 points)

Review Exercises

Try the 5 multiple-choice questions.

1) Why is cephalization an indicator of an active life style (i.e. not sedentary)?
2) What are the 3 germ layers and what part of the gastrula do they develop from?
3) Why can't protostomes have identical twins?

Chapter 52. An Introduction to Ecology and the Biosphere: Due Nov. 7, 2016

Definitions, explanations, lists (don't submit)

Write down the 4 key concepts of the chapter.
Ecology
List the first 4 hierarchical scales of ecology. I regard the top two as less important.
list 4 major physical factors that are important components of climate
biome
ecotone
salt concentration of freshwater vs. marine biomes
photic zone
estuary
dispersal

Assigned Questions (submit via Moodle)

1. Describe what summer and winter in Montreal would be like if the earth was tilted by 30 degrees rather than 23.5 degrees. (2-4 sentences; 4 points)
2. What abiotic factor changes the most as one moves from the upper to the lower intertidal zone? (1-2 sentences; 2 points)
3. What was the most confusing or interesting part of the chapter? Answer in 1-2 sentences. (2 points)

Review Exercises (don't submit)

1. Try the 10 multiple-choice questions.
2. The tundra receives little precipitation, yet mosses flourish. Explain.
3. What is the oldest biome on earth?
4. What is the 'largest' biome on earth?
   Where does most of the organic matter in a stream come from?
5. Draw a hypothetical rectangular continent that stretches from 90^{o} north to 90^{o} south latitude. Overlay the major terrestrial biomes that will occur on this continent.
6. What is the only biome that is named after a group of animals?
7. In which biome do protists contribute most of the primary production?
8. Why do Newfoundland and Iceland have similar climates, despite the difference in latitude?
9. Which direction does the wind blow during the day and at night near an ocean: onshore or offshore? Why?
10. Why do biological communities on the top of mountains often resemble those found in the Arctic?
11. How fast did the American beech move since the last ice age? How fast will they have to move if climate change predictions are accurate?

12. Life in a tropical rainforest is vertically stratified. What abiotic factor probably changes most dramatically across strata?
13. What is the 'largest' biome on earth?
14. Why is Vancouver warmer than Montreal in the winter, even though Montreal is at lower latitude?

Chapter 53. Population Ecology (Due: Nov. 14, 2016)

Definitions, explanations, lists (not to be submitted)

Write down the 6 key concepts of the chapter.
Population
Density
Dispersion
2 processes that add to and 2 processes that remove from a population
List the 3 patterns of dispersion and give an example of each.
Survivorship curve
carrying capacity
life history
semelparity
iteroparity
K-selection
r-selection
density independent
density dependent
metapopulation
demographic transition
ecological footprint

Assigned Questions (submit via Moodle)

1. In a cohort of a population, 10% of individuals that are alive at the beginning of the year die each year. Try plotting such a "curve" on a graph with (i) an arithmetic y-axis and on a graph with (ii) a logarithmic y-axis. No need to submit these graphs. What shape does the curve look in each case? What type of survivorship curve is represented by the data? (4 points)
2. What was the most confusing or intriguing part of the chapter? Write 1-2 **sentences**. (2 points)

Review Exercises (not to be submitted)

Try the self-quiz.

1. Why do cicadas wait 13 or 17 years between breeding rather than 16 or 18 years?
2. Can a population be regulated by both density dependent and density independent mechanisms? Give an example.
3. What are the ecological implications of Canada's high population growth rate?
4. What causes the 10-year cycle of snowshoe hares? Write 2-3 **sentences**.

Chapter 54. Community Ecology (due November 21, 2016)

Definitions, explanations, lists (not to be submitted)

Write down the first 5 key concepts of the chapter.
Community or biological community
competition
competitive exclusion principle
ecological niche
fundamental and realized niche
character displacement
predation
Batesian and Mullerian mimicry
Mutualism
species richness
relative abundance of species
food chain and food web
dominant species
keystone species
bottom-up and top-down models
nonequilibrial model of communities
intermediate disturbance hypothesis
ecological succession
2 key predictions of island biogeography theory

Assigned Questions (Submit your answers via Moodle)

1. Why are palatable fruit often brightly coloured whereas palatable animals are cryptically coloured? Write 2-4 sentences. (4 points)
2. In which type of mimicry is the model negatively affected by the mimic? Explain. Write 1-2 sentences. (2 points)
3. What was the most confusing or interesting part of the chapter? Write 1-2 sentences. (2 points)

Review Exercises (Not to be submitted)

Try the multiple-choice questions at the end of the chapter.
1. What would happen if you didn't cut your lawn?
2. Is primary succession more or less common than secondary succession?
3. If your goal was to preserve the biodiversity of Canada, would you opt for one large park or many smaller parks (that summed to the same size as the large park)?
4. If disturbance helps contribute to biodiversity in a community, why isn't human disturbance such as logging beneficial?

5. Why do large areas of land or large islands have more species than smaller areas or islands? Write 2 or 3 sentences.

Chapter 55. Ecosystems (Due: Nov. 28, 2016)

Definitions, explanations, lists (not to be submitted)

Write down the 5 key concepts of the chapter.
Ecosystem
primary producers
primary, secondary and tertiary consumers
decomposers
primary production
GPP, NPP and NEP
eutrophication
secondary production
trophic efficiency
biogeochemical cycles
the 2 processes that run the carbon cycle?
nitrogen fixation

Assigned Questions (submit via Moodle)

1) A fisheries biologist wants to increase the production of lake trout in a lake where there are no forage fish (smaller species of fish that eat zooplankton and are eaten by lake trout). Without forage fish, lake trout eat zooplankton. What are some of the likely consequences of stocking forage fish into such a lake? Answer in 2-4 sentences. (4 points)
2) What is the single most important factor limiting primary production in oceans? Answer in 1-2 sentences. (2 points)
3) What was the most confusing or interesting part of Chapter 55? Answer in 1-2 sentences. (2 points)

Review Exercises (not to be submitted)

Try the 8 multiple choice questions.

1) What would happen if decomposition stopped?
2) List two emergent properties of ecosystems. How is the phosphorus cycle fundamentally different from the carbon and nitrogen cycles?
3) Which of the 3 ecological pyramids is always observed – i.e. is a law of physics?
4) What is the ultimate fate of all energy flowing through ecosystems (see Fig. 55.4)?
5) Nitrogen is abundant in the atmosphere and yet often limits primary production. Explain.
6) Why does CO_2 concentration vary seasonally in the atmosphere?
7) How is the phosphorus cycle fundamentally different from the carbon and nitrogen cycles? Answer in 1-2 sentences.
8) Energy flows but nutrients cycle. Explain using the laws of thermodynamics.

9) People are vegetarians for many different reasons. What is the "ecological" reason for being a vegetarian?
10) How does agriculture help to accelerate the cultural eutrophication of lakes?
11) From a nutrient cycling point of view, what is the cause of acidic precipitation and global warming?
12) How does logging contribute to the eutrophication of receiving waters?