General Biology II (w/Lab) Syllabus

BIO K122 (T1), Four sem. hrs. credits
CRN: 10694.116111
BIO K122 (T1A)
CRN: 10695
Spring 2017
Three Rivers Community College
574 New London Turnpike
Norwich, CT 06360

Instructor:
Professor William J. Dopirak, Jr.
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Office location: C-130
Office Hrs.
T/R 2:00-3:00pm; F 1:00-2:00pm
(Or by appointment)

Required Texts:

Borror, D.J. 1960. Dictionary of Word Roots and Combining Forms. Mayfield Publishing; Moutain View, California. p.134 *ISBN # 0-87484-053-8*

Catalog Description:

Prerequisite: BIO K121 with a "C" grade or better or permission of the instructor.
Corequisite: None required; CHE K122 is recommended.

This course is a continuation of General Biology I. Topics to be covered include taxonomy, the diversity of life forms from the microbes to the animals, the structures and functions of both plant and animal systems, as well as ecology, ecosystems and evolution. (For transfer credit, student should take both BIO* K121 and K122.) Three-hour lecture; one three-hour laboratory period.

Attendance Policy:

Students are expected to attend class and laboratory sessions regularly. If a class or lab is missed due to circumstances beyond your control, **please**, be sure to notify your instructor and make the necessary arrangements for obtaining the lecture notes. **You will be responsible** for the material.

Grade Evaluation:

There will be three unit examinations, three laboratory practicum's. There will be eleven quizzes. The lowest quiz grade will be dropped. Exam and quiz questions will consist of multiple choice and/or short answers. Lab journals: For each Phylum we cover in lab, you must pick three species (of your choosing) to systematically place in the respective taxa, and a brief summary of that species (natural history ect.).

Add/Drop Procedures:

Please consult the school catalog for this policy.

Suggestions for the course:

To gain a better understanding be sure to read the notes and review the phyla **before** coming to class. Also, be prepared to participate in classroom discussions.

Grading:

Final grade will based on the following:

Semester Grade*----------60%

Laboratory Grade£----------40%

100%

*Semester grade = 40% (Unit tests) + 20% (quizzes)

£Laboratory grade = 30% (Lab practicum's) + 10% (Lab manuals)

Final Grade:

100.0-99.0= A	90.4-87.5= B+	79.4-77.5= C+	69.4-63.5= D+
98.9-93.5= A	87.4-84.5= B	77.4-72.5= C	63.4-59.5= D
93.4-90.5= A-	84.4-79.5= B-	72.4-69.5= C-	59.4-00.0= F

College Withdrawal Policy:

A student who finds it necessary to discontinue a course once class has met must provide written notice to the registrar. **See Registrar for dates.** After that period, a student wishing to withdraw must obtain written authorization of the instructor to receive a "W" grade on their academic record, non-punitive grade indicating termination of class participation. Students who do not withdraw, but stop attending **will recieve** a grade of "F" for the final grade. **Verbal withdrawals cannot be accepted**.

Academic and Classroom Misconduct:

The instructor has the primary responsibility for control over classroom behavior and maintenance of academic integrity, and can order the temporary removal or exclusion from the classroom, and/or laboratory, of any student engaged in conduct violative of the general rules and regulation of the institution. Plagiarism, cheating, or any form of academic dishonesty is **prohibited**. Students guilty of academic dishonesty directly or indirectly will receive a **zero** for an exercise or exam and may receive an **F** for the course in addition to other possible disciplinary sanctions that maybe imposed through the regular institutional procedures. Any student that believes he or she has been erroneously accused may appeal the case through the appropriate institutional procedures if their grade was affected.

Disabilities Statement:

If you have a hidden or visible disability, which may require classroom or test-taking modifications, please see me as soon as possible. If you have not already done so, please be sure to register with the college disability counselors by contacting Student Services Office.

- Matt Liscum, Counselor: (860)215-9265 (Room A-113)
  - Learning Disabilities
  - ADD/ADHD
  - Autism Spectrum
  - Mental Health Disabilities

- Elizabeth Willcox, Advisor: (860)215-9289 (Room A-113)
  - Medical Disabilities
  - Mobility Disabilities
  - Sensory Disibility

BIO K122 General Biology II
Tentative Schedule
Spring 2017
Lecture: 2:00pm-3:15pm **(T&R)** Room **A-221 Laboratory:** 1:30pm-4:15pm (**W**) Room **A-215**

Date	**Topic**
01/19	Introduction, BIO I review
01/24	Principles of evolution
01/25	**LAB -**Systematic classification "Kingdom fastenales" and "*Caminalcules*"
01/26	**Quiz 1 -** Geological timescale
01/31	Prokaryotes, Archaebacteria
02/01	**LAB -** Gram staining
02/02	**Quiz 2**Eubacteria - Protista
02/07	Protista (cont.)
02/08	**LAB -** Protists/Algae
02/09	**Quiz 3-** Diatoms – Chromists (algae)
02/14	Protozoans (cont.)
02/15	**Lab Practicum I**
02/16	**Quiz 4 -** Kingdom Plantae
02/21	Kingdom Plantae (cont.)
02/22	**LAB** Kingdom Plantae
02/23	**UNIT EXAM I**
02/28	Kingdom Fungi
03/01	**LAB -** Kingdom Fungi
03/02	**Quiz 5 -** Minor invertebrates
03/07	Poriferans
03/08	**LAB** - Sponges - Crustaceans
03/09	**Quiz 5 -** Annelids
03/14	**SPRING BREAK**
03/15 & 16	**NO CLASSES**
03/21	**Quiz 6 –** Platyhelminthes
03/22	**Lab Practicum II**
03/23	**Quiz 7 –**Minor invertebrates
03/28	Annelids
03/29	**LAB** - grasshopper/crayfish dissection
03/30	**Quiz 8 –** Arthropods
04/04	Arthropods (cont.)
04/05	**LAB** squid and sea star dissection
04/06	**UNIT EXAM II**
04/11	Echinoderms
04/12	**LAB -** Mystic Aquarium (*field excursion*)
04/13	**Quiz 9 -** Amphibians
04/18	Fish
04/19	**LAB** - Perch & shark dissection
04/20	**Quiz 10** - Reptiles
04/25	Reptiles & Birds
04/26	**LAB** - Owl pellet investigation
04/27	**Quiz 11** Birds (cont.)
05/02	Mammals
05/03	**LAB** - Mink dissection
05/09	Mammals (cont.)
05/10	**LAB PRACTICAL III**
05/11	**Quiz 12 -** Review for Exam III
05/16	**UNIT EXAM III (Final)**

Syllabus Revisions:
This schedule may be subject to change as the instructor sees fit. Any changes will be announced by the instructor in advance.

Course Objectives: BIO K122 - General Biology II

1. The student will be able to name the Kingdoms of the life forms and the main traits of each Kingdom.
2. The student will be able to name the major taxonomical units these Kingdoms.
3. The student will be able to explain the criteria used to distinguish the phyla of these Kingdoms.
4. The student will be able to explain the criteria that are used for grouping plants.
5. The student will be able to explain the characteristics used to place single-celled organisms into a classification system.
6. The student will be able to give examples and state unique characteristics of various Prokaryotae, Protista and Fungi.
7. The student will be able to give the characteristics of the main groups of plants.
8. The student will be able to demonstrate the life cycle of mosses and ferns.
9. The student will be able to demonstrate the basic life cycles in plants.
10. The student will be able to distinguish between perfect and imperfect flowers.
11. The student will be able to list the parts of a flower and state the function of each part.
12. The student will be able to list in sequence the major events in the reproductive portion of the life cycle of a flowering plant.
13. The student will be able to explain germination in both monocots and dicots.
14. The student will be able to identify and use the following criteria in the classification of the Kingdom Animalia:
    - **a.** Shape (symmetry)
    - **b.** Skeletons
    - **c.** Body layers (germ layers)
    - **d.** Body cavities
    - **e.** Systems
    - **f.** Embryonic development
    - **g.** Segmentation
15. The student will be able to classify the animals by phyla.
16. The student will be able to identify the characteristics of each animal group with emphasis on distinguishing characteristics for each particular phyla.
17. The student will be able to review in detail the anatomy of one or more animals within each taxonomic group.
18. The student will be able to summarize the various systems characteristic of each phyla. These will include the digestive, circulatory, excretory, respiratory and reproductive systems.
19. The student will be able to understand the role of the skeletal and muscular systems in support and movement.
20. The student will be able to demonstrate knowledge of the heart and vessel structure and function.
21. The student will be able to demonstrate knowledge of the structure and function of the lymphatic system.
22. The student will be able to demonstrate knowledge of the composition and circulation of human lymphatic fluid.
23. The student will be able to demonstrate knowledge of the composition and function of blood.
24. The student will be able to explain the phases of the respiratory process.
25. The student will be able to demonstrate knowledge of the structure and function of the respiratory passageways.
26. The student will be able to name, describe the location and give the general functions of each of the digestive organs.

27. The student will be able to list the various digestive enzymes secreted by the digestive glands and describe the function of each.
28. The student will be able to define nutrition, nutrients and essential nutrients.
29. The student will be able to list and give the general function of the major vitamins.
30. The student will be able to define excretion and identify all of the systems involved in the process.
31. The student will be able to demonstrate knowledge of the structure, location and function of the excretory organs such as the kidneys, ureters, bladder and urethra.
32. The student will be able to demonstrate knowledge of the physiology of excrement formation.
33. The student will be able to demonstrate knowledge of cell types found in nervous systems.
34. The student will be able to demonstrate knowledge of the electrochemical changes associated with impulse transmission and synaptic transmission.
35. The student will be able to demonstrate knowledge of the structure, organization and function of the brain.
36. The student will be able to demonstrate knowledge of the structure, organization and function of the spinal cord.
37. The student will be able to demonstrate knowledge of the structure, organization and function of the autonomic nervous system.
38. The student will be able to demonstrate knowledge of the structure and function of the specialized sensory receptors and organs.
39. The student will be able to demonstrate knowledge of the structure and function the sensory receptors and organs.
40. The student will be able to identify, give the location and secretion of the various endocrine glands.
41. The student will be able to demonstrate knowledge of the identity, source and function of the hormones.
42. The student will be able to demonstrate knowledge of the regulation of hormone secretion.
43. The student will be able to demonstrate knowledge of the structure, location and function of the reproductive anatomy.
44. The student will be able to demonstrate knowledge of the physiological changes relative to the reproductive cycles.
45. The student will be able to demonstrate knowledge of the process of gametogenesis.
46. The student will be able to demonstrate knowledge of fertilization and embryonic development.
47. The student will be able to define predation.
48. The student will be able to explain the relationship and interaction between the predator and prey.
49. The student will be able to define symbiosis and describe the different symbiotic relationships.
50. The student will be able to recognize the various tropic levels of energy and the characteristics of the various organisms in each level.
51. The student will be able to identify a food chain, food web, and the pyramid of energy.
52. The student will be able to recognize the living and non-living factors and their interaction within an Ecosystem.

TOPICAL OUTLINE - Biology K122 General Biology II

1. Evolution: Introduction and Historical Background
2. Evidence
  A. Fossil Record
  B. Biogeography
  C. Comparative Anatomy
  D. Embryological Development
  E. Molecular Data
3. The modern concepts of evolution
  A. Microevolution
    1. Population Genetics
    2. Mutation
    3. Genetic Drift
    4. Gene Flow
    5. Selective Pressures
      a. Natural Selection
      b. Sexual Selection
  B. Macroevolution
    1. Speciation: Gradualism and Punctuated Equilibrium
      a. Sympatric
      b. Allopatric
      c. Parapatric
    2. Reproductive Isolation
      a. Pre-zygotic
      b. Post-zygotic
    3. Geographic Isolation
      a. Abrupt
      b. Clines
  C. Chemical Evolution
4. Primate Evolution
5. Evolution vs. Creation

Three Domains (Super Kingdoms) of Life

I. Bacteria (19 sub-divisions): Most of the known prokaryotes
  Kingdom Eubacteria (true bacteria)
    Division (Phylum) Proteobacteria: N – Fixing bacteria
    Division (Phylum) Cyanobacteria: Blue-green bacteria
    Division (Phylum) Eubacteria: True Gram positive bacteria
    Division (Phylum) Spirochetes: Spiral bacteria
    Division (Phylum) Chlamydiae: Intracellular parasites

II. Archaea (16 sub-divisions): Prokaryotes inhabiting extreme environments
  Kingdom Crenarchaeota: Thermophiles
  Kingdom Euryarchaeota: Methanogens & Halophiles
  Kingdom Korarchaeota: Some hot water springs

III. Eukarya: Eukaryotic cells
  Kingdom Protista
  Kingdom Plantae
  Kingdom Fungi
  Kingdom Animalia

Domain (Superkingdom) Prokaryota

Two kingdoms:

Kingdom Archaebacteria

Division Mendosicutes

Class Euryarchaeota – (methanogens)

Group Halobacteriales – (salt-loving)

Group Archaeoglobales – (sulfate-reducing)

Class Crenarchaeota – (thermoacidophils)

Kingdom Eubacteria

Division Firmicutes – (Gram positive bacteria)

Division Gracilicutes – (Gram negative bacteria)

Division Tenericutes – (lack cell walls)

Domain (Superkingdom) Eukaryota

Four Kingdoms

Kingdom Protista

Fungus like protistans:

Phylum Oomycota - Watermolds (downy mildews)

Phyla Acrasiomycota and Myxomycota - Slime Molds

Amoeboid protozoans

Phylum Sarcodina – Foraminiferans & Heliozoans

Ciliated protozoans

Phylum Ciliophora - *Paramecium* spp.

Flagellated protozoans

Phylum Mastigophora

Euglenoids

Phylum Euglenophyta - *Euglena* spp.

Dinoflagellates

Phylum Pyrrophyta

Diatoms

Phylum Bacillariophyta – diatoms

Radiolarians

Phylum Actinopoda

Zoomastigota

Phylum Zoomastigina

Algae – (Chromists)

Phylum Chrysophyta – Golden algae
Phylum Haptophyta - Coccoliths
Phylum Rhodophyta - Red algae
Phyllum Xanthophyta – Yellow algae
Phylum Phaeophyta - Brown algae
Phylum Chlorophyta - Green algae

Kingdom Fungi

Phylum Ascomycota - Sac Fungi
- **Class Ascomycetes**
- **Class Pneumocystidomycetes**
- **Class Schizosaccharomycetes** - yeasts
- **Class Taphrinomycetes**

Phylum Basidiomycota - Club Fungi
- **Class Basidiomycetes –** true mushrooms
- **Class Urediniomycetes –** rusts
- **Class Ustilaginomycetes -** smut
- **Class Wallemiomycetes -** xerophilic fungi

Phylum Zygomycota – zygosporangium
- **Class Trichomycetes**
- **Class Zygomycetes**

Phylum Deuteromycota (Imperfect fungi) -ringworm
- **Subphylum Chytridiomycota**
- **Subphylum Glomeromycota**

Kingdom Plantae
Avasular seedless plants:

Phylum Anthocerotophyta - hornworts
Phylum Hepatophyta – liverworts
Phylum Bryophyta – mosses
- **Class Andreaeopsida**
- **Class Sphagnopsida**

Seedless vascular plants:

Phylum Lycophyta - club mosses
Phylum Psilophyta - whisk ferns
Phylum Sphenophyta – horsetails
Phylum Pterophyta – true ferns

Kingdom Plantae (cont.)

Seed bearing plants:

Gymnosperms

Phylum Cycadophyta – cycads
Phylum Ginkgophyta – gingko
Phylum Gnetophyta – gnets
Phylum Coniferophyta (Pinophyta) - conifers
Order Coniferales:
Family Pineaceae
Family Abies (Fir)
Family Cedrus (Cedar)
Family Picea (Spruce)
Family Pinus (Pine)
Family Tsuga (Hemlock)
Family Sequoia (sequoia)
Family Juniperus (Juniper)

Seed bearing plants

Angiosperms

Phylum Magnoliophyta (Anthophyta) - flowering plants
Subclass Magnoliidae
Class Magnoliopsida –Dicotyledons
Order Amborella – amboerellas
Order Nymphaeales – water lily family
Order Illiciales – star anise
Order Papaverales - poppy family
Order Caryophyllales - cacti
Order Celastrales – bittersweet
Order Cornales - dogwood family
Order Magnoliales – magnolias, tulip trees, nutmeg
Order Laureles - laurel trees & shrubs, cinnamon
Order Piperales- black & white pepper
Order Fagales – oaks, chestnuts, beeches
Order Aristolochiales – birthwort
Order Gentianales –coffee family
Order Geraniales – geranium family
Order Haloragales – water milfoil
Order Euphorbiales – boxwood family
Order Rosales – rose family
Order Fabales – milkweed
Order Ranunculales - buttercup family
Order Capparales – mustard family
Order Apiales – carrot family
Order Nepenthales – pitcher plants
Order Hamamelidales – witch hazel
Order Trochodendrales – wheel trees
Order Scrophulariales – olive family
Order Theales – tea family

Kingdom Plantae (cont.)

Class Liliopsida - Monocotyledons
Order Arales – Duckweed
Order Commelinales – Spiderwort
Order Zingiberaceae– banana, ginger
Order Arecanae – palms
Order Commelinanae – grasses & sedges
Order Araneae – skunk cabbage, Jack-in-the-pulpit
Order Alismatales – agave, aloe, yucca
Order Poales – pineapple plant
Order Asparagales – onion, garlic, orchids
Order Liliales – lilies, tulips

Kingdom Animalia

Invertebrate Animals

Phylum Placozoa – simplest of the animals
Phylum Porifera – Sponges
Class Calcarea – calcified sponge
Class Hexactinellida – glass sponge
Class Desmospongiae – commercial sponge
Class Sclerospongiae –coralline sponge

Radiate Animals

Phylum Ctenophores - Comb jellies
Phylum Cnidaria
Class scyphozoa – jellyfish
Class anthozoa - anemones and corals
Class hydrozoa – hydrozoans

Animals with bilateral symmetry

Acoelomate animals
Phylum Nemertea - ribbon worms
Phylum Gnathostomulida - jaw worms
Phylum Aschelminthes
Class Nematoda – round worms
Phylum Platyhelminthes - flatworms
Class Turbellaria – planarians
Class Monogenea - parasitic flukes
Class Trematoda - flukes
Class Cestoda – tapeworms

Pseudocoelomates
Phylum Gastrotricha
Phylum Kinorhyncha
Phylum Loricifera
Phylum Priapulida
Phylum Entoprocta – bryozoans
Phylum Acanthocephala – thorny-headed worms
Phylum Rotifera

Kingdom Animalia: Invertebrate Animals: (cont.)

Coelomate animals

Protostome coelomates:

Phylum Mollusca - snails, bivalves, squid
- **Class Gastropoda** - snails, slugs, nudibranchs
- **Class Bivalvia** – clams, mussels, & oysters
- **Class Cephalopoda**-squid, octopuses, nautiluses, & cuttlefish
- **Class Polyplacophora –** marine chiton

Phylum Annelida - segmented worms
- **Class Polychaeta** – bristled worms
- **Class Oligochaeta** - earthworms
- **Class Hirunidea-** leeches
- **Class Pogonophora** – bearded worms

Phylum Sipuncula – peanut worms
Phylum Echiura – spoon worms
Phylum Tardigrada – water bears

Phylum Arthropoda - insects, crustaceans
- **Class Onychophora –** velvet worms
- **Class Pauropoda –** pauropods
- **Class Diplopoda –** millipedes
- **Class Chilopoda –** centipedes
- **Class Insecta –** uniramians
  - **Order Anoplura-** sucking lice
  - **Order Coleoptera –** weevils & beetles
  - **Order Collembola –** springtails
  - **Order Dermaptera** - the earwigs
  - **Order Thysanoptera** – thrips
  - **Order Diplura –** jawed bristle-tails
  - **Order Ephemeroptera** – mayflies
  - **Order Odonata –** dragonflies
  - **Order Plecoptera –** stoneflies
  - **Order Grylloblattodea –** ice bugs
  - **Order Orthoptera –** grasshoppers & crickets
  - **Order Phasmids –** stick insects
  - **Order Embioptera -** webspinners
  - **Order Dictyoptera –** roaches & mantids
  - **Order Isoptera –** termites
  - **Order Psocoptera –** book lice
  - **Order Mallophaga –** biting lice
  - **Order Hemiptera –** true bugs
  - **Order Neuroptera –** lacewings, dobsonflies, antlions
  - **Order Mecoptera –** scorpion flies
  - **Order Lepidoptera –** Butterflies & moths
  - **Order Trichoptera –** caddisflies
  - **Order Homoptera -** cicadas, hoppers, & aphids
  - **Order Diptera –** true flies
  - **Order Siphonoptera –** fleas
  - **Order Hymenoptera –** bees, wasps, and ants

Kingdom Animalia - **Phylum Arthropoda: (cont.)**

Subphylum Crustacea – "insects of the sea"
Subclass Cephalocarida - horseshoe shrimp
Subclass Branchiopoda
Order Anostraca – brine shrimp
Order Notostraca – tadpole shrimp
Order Conchostraca – clam shrimp
Order Cladocera - water fleas
Subclass Mystacocarida- mustache shrimp
Subclass Copepoda - copepods
Order Calanoida
Order Cyclopoida
Order Harpacticoida
Subclass Branchiura - fish lice
Subclass Ostracoda - seed shrimp
Subclass Cirripedia – barnacles
Subclass Malacostraca
Order Mysidacea - opossum shrimp
Order Isopoda – pill bugs
Order Amphipoda – scud
Order Cumacea – hooded shrimp
Order Euphausiacea – krill
Order Decapoda
Suborder Dendrobranchiata - prawn
Suborder Pleocyemata– shrimp, lobsters & crabs

Subphylum Chelicerata
Class Arachnida
Order Acari – mites & ticks
Order Opiliones – daddy long-legs
Order Uropygi – whip scorpion
Order Pseudoscorpiones – pseudoscorpion
Order Scorpiones – scorpion
Order Araneae – spiders
Class Merostomata – horseshoe crab
Class Pycongonida – sea spiders

Deuterostome Animals

Phylum Echinodermata
Class Asteroidea – sea stars
Class Ophiuroidea – brittle stars
Suborder Euryalida – basket stars
Class Echinoidea – sea urchins
Class Holothuroidea – sea cumbers
Class Crinoidea – sea lilies & feather stars

Phylum Chordata
Subphylum Hemichordata – acorn worms
Subphylum Urochordata – tunicates (sea squirts, salps)
Subphylum Cephalochordata – lancelets

<u>Kingdom Animalia</u> - **Phylum Chordata: (cont.)**

Subphylum Vertebrata

Superclass Agnatha – jawless fish

Class Cephalaspidomorphi – lamprey eel

Class Pteraspidomorphi – hagfish

Superclass Gnathostomata – jawed fish

Class Chondrichthyes – sharks & rays

Class Osteichthyes – bony fishes

Class Amphibia

Order Apoda – Caecilians

Order Caudata- salamanders

Order Anura – frogs

Class Reptilia

Order Rhynchocephalia – beaked reptiles

Order Testudines – tortoises & turtles

Order Crocodylia

Family Gavialidae – caimans

Family Crocodylidae – crocodiles

Family Alligatoridae – alligators

Order Squamata – lizards

Order Serpentes- snakes

Class Aves

Order Struthioniformes – ostriches

Order Sphenisciformes – penguins

Order Procellariiformes – albatrosses, petrels

Order Ciconiiformes – herons, storks

Order Anseriformes – swan, geese, ducks

Order Falconiformes – eagles, hawks, falcons, vultures

Order Galliformes – turkeys

Order Columbiformes – pigeons, doves

Order Strigiformes – owls

Order Apodiformes – hummingbird, swift

Order Piciformes – woodpeckers, toucans

Order Psittaciformes – parrots, cockatoos, macaws

Order Passeriformes – sparrows, finches, jays, crows, robins, wrens, starlings

Class Mammalia

Subclass Prototheria – egg-laying mammals

Subclass Metatheria – pouched mammals

Subclass Eutheria – placental mammals

Order Edentata – ant-eaters, armadillos, sloths

Order Insectivora- shrews, moles, hedgehogs

Order Chiroptera – bats

<u>Kingdom Animalia</u> - **Phylum Chordata: (cont.)**

Order Lagomorpha – rabbits, hares, pikas
Order Rodentia - most gnawing animals (squirrels, rats, mice, porcupines, beavers, ect.)
Order Carnivora – wolves, cats, bears, otters, mink, ect.
Order Pinnipedia – seals, walruses, sea lions
Order Proboscidea – elephant
Order Sirenia – sea cows (manatees, dugongs)
Order Perissodactyla – odd-toed ungulates (rhinos, horses)
Order Artiodactyla – even-toed ungulates (camels, deer, bison, sheep, goats, antelopes, giraffes)
Order Tubulidentata – aardvarks
Order Cetacea – whales, dolphins, porpoises
Order Primates
  Suborder Strepsirhini – lemurs
  Suborder Haplorhini
    Infraorder Tarsiiformes – tarsiers
    Infraorder Platyrrhini – new world monkeys
      Family Cebidae – spider monkeys, howler monkeys
    Infraorder Catarrhini – old world monkeys, hominoids
      Superfamily Cercopithecoidea – baboons, macaques
      Superfamily Hominoidea – apes, humans
        Family Hylobatidae – gibbon
        Family Pongidae – chimpanzees, gorillas, orangutans
        Family Hominidae – extinct & extant human species