Name: _____
Student No:_____

BIO 2135 - Animal Form and Function
Final Examination
Worth 35 % of the final grade

April 22, 2007

a) Place your name and student number in the space provided below. Be sure that your name, or student number, is on the top of each page.

b) Check to be sure that you exam is complete with a total of 21 pages including this one

c) Answer all questions in the space provided on the exam. Do not transfer answers to the back of the page.

d) Answer the essay question at the end of the exam in the examination booklet that has been provided. Be sure that your name and student number is on the cover of the examination booklet. Double spaced please!

e) The exam is marked out of 155 points

f) This is not an open book exam.

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30pts Part 1. Briefly explain what each of the following biological terms means. Where possible include an example in your explanation from a group or an organism to which the term applies.

Kingdom Animalia

{Multicellular/eukaryotes}{heterotrophic}{No cell walls} 1,1,1

Madreporite

{External opening}{watervascular system} {of Echinoderms or an echinoderm example} 1,1,1,

Endostyle

{produces mucus that traps food}{ciliated groove in pharynx send food to digestive system} (ex: early chordates Tunicate, amphioxous, Branchiostoma, Cephalochardata, Urochordata} 1,1,1

Glycolysis

{Metabolic process}{breaks down glucose}{into two molecules of pyruvate} 1,1,1

Glomerulus

{Excretory structure that filters blood}{Blood pressure drives the filtration through thin semipermeable membrane} {In hemichrodata/nephron in chordates}

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Placoid scale

{Cartilagenous fish/Chondrichtheys}{formed and/or anchored in dermis} {made or dentin or enamel}{backwords pointing tooth} point each to a maximum of three

Subclavian vein and artery

{All tetrapods}{blood supply to the appendages}{properly name the pectoral appendages} 1,1,1

Opercular gill

{Outer covering of the gill} {Moves away from body pulling water out of the pharynx and across gill} {boney fishes}

Shark's spiral valve

{Modification of the intestine}{slows the movement of food}{Sharks – chondrichtheyes}

Intercostal muscles

{Muscles between the ribs}{enlargement and contraction changes shape of rib cage inflating the lungs} {Reptiles, birds, mammals – any example from these groups} 1,1,1

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40 pts Part 2: Answer each of the following multiple choice questions by placing and X in the space to the left of the correct choice. There is only one correct answer for each question and questions have either 4 or 5 answers to choose from. **Be sure your X doesn't cross over two answers – if it does the question will be scored as 0.**

2.1 A ventral plate of bone called the _____ is present in the anterior, ventral trunk region of amphibians. This plate provides support for the forelimbs and protection for internal organs.

_____ a. ilium

_____ b. coccyx

__X__ c. sternum

_____ d. ischium

_____ e. scapula

2.2 Term that best describes animals having a constant body temperature.

_____ a. poikiothermic

__X__ b. homeothermic

_____ c. ectothermic

_____ d. endothermic

2.3 Specializations of the digestive tract of most herbivores reflect the difficulty of digesting foods rich in

_____ a. plant protein.

_____ b. carotene.

_____ c. bacteria.

__X__ d. cellulose.

_____ e. phytolipids.

2.4 Mammals have all the following types of teeth except:

_____ a. incisors

_____ b. molars

__X__ c. dentaries

_____ d. canines

_____ e. premolars

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2.5 The major excretory product of most mammals is

_____ a. ammonia.

_____ b. uric acid.

_____ c. guanine.

_____ d. creatine.

__**X**__ e. urea.

2.6 Which of the following is the reason that birds don't usually eat leafy vegetative materials.

_____ a. they don't like the taste

_____ b. it's not available in all habitats

__**X**__ c. it's too low in calories

_____ d. they can't chew it because they haven't any teeth

2.7 The body regions of acornworms are _____, collar, and trunk.

_____ a. porosoma

_____ b. opisthosoma

_____ c. head

_____ d. cephalothorax

__**X**__ e. proboscis

2.8 An advancement that reptiles show over amphibians is

_____ a. a tough, scaly skin that provides protection against desiccation.

_____ b. a copulatory organ for internal fertilization.

_____ c. a shelled egg that can be laid on dry land.

_____ d. more muscular jaws.

__**X**__ e. All of the above are reptilian advancement.

2.9 Marine bony fish

_____ a. gain water by osmosis

_____ b. absorb salt through the gills

__**X**__ c. must drink water to compensate for water loss

_____ d. neither loose nor gain water

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2.10 The most primitive of the early fishes were the

__X__ a. agnathans.

_____ b. gnathostomes.

_____ c. acanthodians.

_____ d. lobe-finned fishes. X

_____ e. ray-finned fishes.

2.11 The major nitrogenous waste of bony fishes is

__X__ a. ammonia.

_____ b. urea.

_____ c. uric acid.

_____ d. guanine.

_____ e. creatine.

2.12 In the crocodilians, a plate of bone called the _____ separates nasal and mouth passageways.

_____ a. sternohyoid

_____ b. pharynx

_____ c. nasopharynx

___X__ d. secondary palate

_____ e. hyoid apparatus

2.13 Reptiles are a paraphyletic group because

_____ a. they do not have a common ancestor.

_____ b. they have a common ancestor.

__X__ c. they do not include all the descendents of the common ancestor.

_____ d. they include all the descendents of the common ancestor.

2.14 These glands are associated with hair follicles and secrete oil.

_____ a. eccrine

__X__ b. sebaceous

_____ c. sudoriferous

_____ d. apocrine

_____ e. musk

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2.15 The _____ of most birds has a large, medial keel for attachment of flight muscles.

_____ a. synsacrum

___**X**__ b. sternum

_____ c. uncinate

_____ d. scapula

_____ e. humerus

2.16 Contraction of the _____ forces water into the tube feet of the water vascular system.

___**X**___ a. ampullae

_____ b. lateral canals

_____ c. polian vesicles

_____ d. hemal rings

_____ e. Tiedemann bodies

2.17 In amphibians, a _____ valve in the conus arteriosus or ventral aorta helps direct blood into pulmonary and systemic circuits.

_____ a. bicuspid

_____ b. tricuspid

_____ c. mitral

_____ d. semilunar

___**X**___ e. spiral

2.18 In the cephalochordates the V-shaped muscle units are called

_____ a. gill bars.

___**X**___ b. myomeres.

_____ c. lateral somites.

_____ d. metapleural folds.

_____ e. chevrons.

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2.19 Nutritionally, tunicates (urochordates) are

__**X**__ a. filter feeders.

_____ b. parasitic.

_____ c. mutualistic.

_____ d. commensalistic.

_____ e. predators.

2.20 Exchange of respiratory gases in acornworms is accomplished

_____ a. diffusion in alveolar lungs.

_____ b. active transport in the tracheal system.

__**X**__ c. diffusion across the body wall.

_____ d. facilitated diffusion in dermal branchiae.

_____ e. facilitated diffusion in book gills.

2.21 Birds are

_____ a. synapsids

__**X**__ b. diapsids

_____ c. anapsids

_____ d. aviapsids

2.22 In frogs, long hind limbs and powerful muscles form an efficient _____ system for jumping.

__**X**__ a. lever

_____ b. undulatory

_____ c. hydrostatic

_____ d. accordion

_____ e. pulley

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2.23 In chordates, the _____ are a series of openings in the pharyngeal region, between the digestive tract and the outside of the body.

__**X**__ a. gill slits

_____ b. atriopores

_____ c. stoma

_____ d. diverticulae

_____ e. siphons

2.24 Muscles called _____ are responsible for making hairs stand on end.

_____ a. follicular erectors

_____ b. pelage adductors

_____ c. pelage abductors

_____ d. vibrissal erectors

__**X**__ e. arrector pili

2.25 A designation that applies to all vertebrates except fishes is _____ .

__**X**__ a. tetrapod

_____ b. gnathostome

_____ c. apod

_____ d. agnatha

_____ e. amniote

2.26 The lancelet, Amphioxus, is supported during swimming and burrowing by its:

_____ a. vertebral column.

_____ b. myomeres.

_____ c. hydroskeleton.

__**X**__ d. notochord.

_____ e. axostyle.

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2.27 The excretory organs of mammals are

_____ a. protonephridia.

_____ b. renal glands.

_____ c. green glands.

__**X**__ d. metanephric kidneys.

_____ e. Malpighian tubules.

2.28 The vertebral column of a bird has been modified so it is

_____ a. much longer and more flexible.

_____ b. springy and elastic to store energy for flight.

__**X**__ c. rigid with many vertebrae fused together.

_____ d. broad to assist in aerodynamic lift.

_____ e. no longer connected to the ribs.

2.29 The lateral line of a shark is used for

__**X**__ a. detecting and locating objects and moving animals in the water.

_____ b. excretion of urea and water.

_____ c. detecting odors.

_____ d. secreting mucus as a swimming lubricant.

_____ e. detecting the heat of prey animals.

2.30 Modern adult echinoderms have a form of symmetry known as

_____ a. asymmetry.

__**X**__ b. pentaradial.

_____ c. triradial.

_____ d. bilateral.

_____ e. trilateral.

2.31 In sea stars, thin folds of the body wall that function in respiration are called

_____ a. filamentous gills.

_____ b. ctenidia.

_____ c. polian vesicles.

_____ d. book gills.

__**X**__ e. dermal branchiae.

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2.32 The original function of the water vascular system of echinoderms was probably

_____ a. locomotion.

__**X**__ b. feeding.

_____ c. excretion.

_____ d. respiration.

_____ e. circulation.

2.33 Like the Chordata, the Hemichordata possess a:

_____ a. buccal diverticulum.

_____ b. notochord.

__**X**__ c. dorsal nerve cord.

_____ e. cranium.

_____ f. closed circulatory system

2.34 Fatty acids enter the Kreb's cycle by first being converted to

_____ a. trioses

_____ b. lactate

_____ c. pyruvate

__**X**__ d. acetyl-CoA

_____ e. glucose

2.35 Which of the following is not a characteristic of most adult tunicates?

_____ a. they are sessile

_____ b. they are filter feeders

__**X**__ c. they have a cranium

_____ d. the adults don't have a notochord

_____ e. they have a mantle

2.36 How the cartilaginous fish oxygenate blood in the gills

__**X**__ a. ram ventilation.

_____ b. cutaneous respiration.

_____ c. buccopharyngeal exchange.

_____ d. branchial respiration.

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2.37 Cartilagenous fish maintain neutral bouancy using

_____ a. swim bladder

_____ b. high levels of urea in the blood

__**X**__ c. oils

_____ d. none of the above – they must continuously swim other wise they sink

2.38 Saccate metanephridia are found in

_____ a. annelids

__**X**__ b. crustacean

_____ c. molluscs

_____ d. flatworms

_____ e. none of the above

2.39 Tetrapods originated in the _____ period.

_____ a. Permian

_____ b. Cambrian

_____ c. Carboniferous

__**X**__ d. Devonian

_____ e. Silurian

2.40 Structures in each arm of a sea star include the gonads, the system that works the tube feet, and

_____ a. kidneys.

_____ b. hearts of a circulatory system.

__**X**__ c. pyloric ceca that produce digestive fluids for extracellular digestion.

_____ d. the intestine that collects large amounts of wastes to expel through the anus.

_____ e. gills.

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30 pts Part 3: 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.

3.1 This structure on the ventral surface of the urochordate pharynx uses cilia to propel food into the digestive tract. **Endosytle**

3.2 Describes the structure of the dorsal chordate nerve cord. **Hollow**

3.3 Without any limbs to hold onto captured prey many snakes immobilize their victims using this. **Venom / stragulation**

3.4 The appearance of radial symmetry in the echinoderms is referred to as this type of evolutionary event. **Secondary / derived**

3.5 Another name for the digestive caeca found in the arms of a sea star; it's the same as the stomach to which they are attached. **Pyloric**

3.6 When an enzyme is present, the energy required to get a reaction started is **Lower** than if the enzyme was not there.

3.7 The unique shape of a sharks tail, which has a dorsal lobe that is much larger than the ventral lobe. **Heterocercal**

3.8 Vertebrates with jaws are collectively called this. **Gnathostomes**

3.9 Cartilaginous supporting rod of a chordate. **Notochord**

3.10 Number of chambers in an agnathan's heart. **Two**

3.11 Term used to describe animals that can't generate enough heat to regulate their body temperature and instead use external sources. **Ectotherm**

3.12 The radial canals of an echinoderm's water vascular system are connected to these canals, and then to the tube feet. **Lateral**

3.13 These teeth, which you would find in predatory mammals, are missing in an herbivore. **Canines**

3.14 Bony fish are efficient at extracting oxygen from the water because of this; it describes how the two fluids flow past each other. **Countercurrent**

3.15 The number of sets of teeth that diphyodont mammals have. **Two**

3.16 The only type of fin found in a cephalochordate. **Caudal**

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3.17 Life's process are regulated and kept in balance, a biological process referred to as this. __**Homeostasis**_____

3.18 These keep the fluids on both echinoderm body cavities moving. _**Cilia**_____

3.19 To be able to keep amphibian skin moist you'll find many of these in the skin. _**Glands**_____

3.20 Without bilateral symmetry, we refer to the main surface opposite the mouth in echinoderms as this side of the animal. _**Aboral**_____

3.21 The final step in digestion is to break down the biopolymers of protein, carbohydrate, and lipids into these so that they can be used by the cell. **Monomers/subunits**

3.22 Not all of a mammal's teeth do the same thing, a condition referred to as this. **Heterodont**

3.23 Electron transport system is found on this part of mitochondria. __**Cristae**_____

3.24 Bony fish maintain neutral density using this. **Swim bladder**

3.25 If the sugars and amino acid monomers that result from digestion are formed inside the cell it's this type of digestion. _**Intracellular**_____

3.26 Conversion of glucose to lactate is this type of glycolysis. __**Anaerobic**_____

3.27 Urochordates have these; one is incurrent, the other excurrent. **Siphons**

3.28 One type of agnathan is the lamprey, the other is this. _**Hagfish**_____

3.29 This secretes the outer covering of an adult urochordate. __**Mantle**_____

3.30 This type of mammal carries its young in a pouch. _**Marsupials**_____

Marsupials

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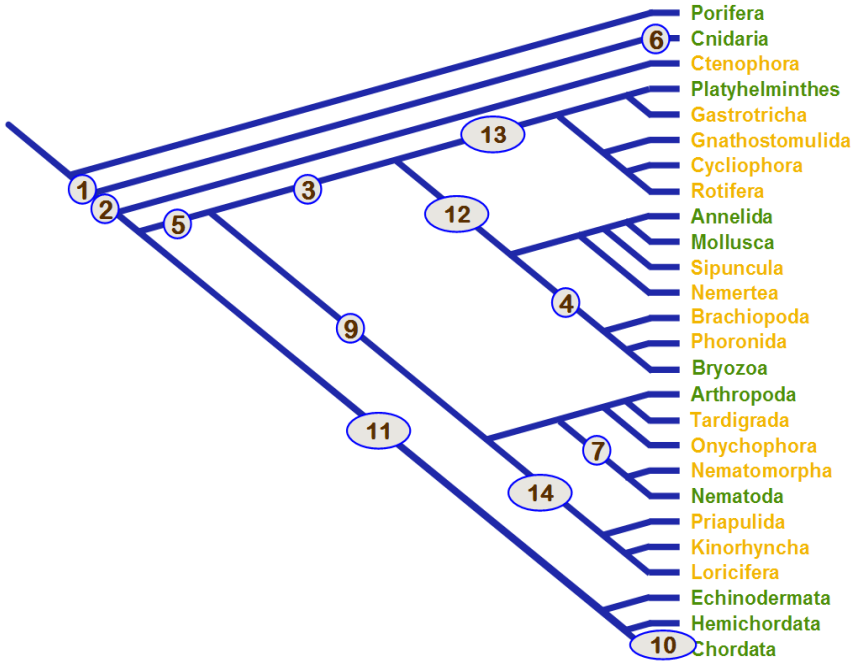
10 pts Part 4 Complete the following table by placing the number on the cladogram or the information in the table.



Character #	Description
1.	Gap junctions between epithelial cells
2.	**True tissues with a basement membrane**
3.	**Spiral cleavage**
4.	Lophophore and U shaped gut
9.	**Thick moulted cuticle with alpha chitin or collagen** **Loss of cilia, coelom absent**
	Blastopore becomes the mouth
10.	**Notochord, post anal segmenetation, pharynx with endostyle, ventral heart**
	Collagenous cuticle, long but no circular muscles
8.	**Ignore – label missing in the diagram**
6.	**Cnidocytes, planula larva, polyp, epitheliomusculature**
12.	Lophotrochozoa: Either a lophophore or a trochophore larval stage

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30 pts Part 5: Answer 6 of the following 10 questions in the space provided:

5.1 What are the functional and evolutionary differences between anapsid, diapsid and synapsid skulls?

{Number of openings in the skull}{temporal muscle/jaw muscles and connection to the skull}{Anapsid – no opening} {Synapsid – one opening} {Dipasids – two openings}

5.2 Briefly describe the origins of the vertebrate jaw, why was its evolution such and important innovation?

{Gill arches supported opening the pharynx} {hinged/joint in middle} {anterior most folded on each other closing off mouth} {More effective capture of pre} {Held onto by the jaw – or inside the mouth}

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5.3 Sea stars are often predators, what kind of prey do they feed on and how do they ingest and digest the food they capture?

{slow moving or sessile – clams chorals} {Invert cardiac stomach} {secrete enzymes to liquefy their prey} {Food into pyloric stomach} {Final digestion in the pyloric ceaca}

5.4 Describe how an acorn worm filters metabolic wastes from its blood.

{Proboscis complex} {Heart vesicle squeezes blood vessel against stomochord} {Filtrate enters glomerulus} {Glomerulus drains into proboscis coelom} {Pore in the proboscis to the outside}

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5.5 Ancestrally vertebrates had six aortic arches, this number decreases in the various classes. Briefly explain the changes that occur in each of the Vertebrate classes

{2-6 remain in Chondrichtheyes}
{3, 4 and 6 in Amphibia }
{4 and 6 in reptiles}
{right 4 and 6 in birds}
{left 4 and 6 in mammals}

5.6 The adaptation of birds to flight involved modifications in both weight and power to fuel flight. Why were the two necessary and give one example of modifications that involve weight and another example for power.

Power to increase the energy available to fuel flight and weight so that they were lighter and able to fly (2pts)
Power – higher body temperature, high nutrient food, homeothermy – regulate their body temperature, increased respiratory efficiency
Weight – hollow bones, increased body surface with feathers, decrease number of organs (only one ovary etc. 1 pt to a maximum of 3 for the examples chosen

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5.7 Why are tunicates (Urochordates) so important in our understanding of the origins of the Chordata?

{Ancestral chordate characters all found in the larval stage} then the traits {Pharyngeal gills slits in the openings of the feeding basket} {notochord – skeletal element of movement} {tail – post anal segmentation used for swimming in conjunction with dotochord} {dorsal hollow nerve cord above the notochord} point each, no point if they just list the character without a bit of explanation}

5.8 What is the origin of the vertebrate nephron?

{Glomerulus produces filtrate into coleom} {near by metanephridium collects waste} {metanepfridium repeat down length of embryo) {drain into archinephric duct} {metanephridia and glomerulus ultimately fuse – bowman's capsule} point each

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5.9 How is the frog's appendicular and axial skeleton modified for its unique form of locomotion.

{unique form of locomotion is jumping/saltatorial}
Axial skeletal modification {Formation of the urostyle formed from a fusion of vertebrate}
Appendicular skeletal modification {Lengthening of hind leg } {lengthened by fusion of tibia and fibula}{lengtheneing of tarsal bones} {size of the foot itself with large phalanges}{

Must have first two and any three for appendicular modifications

5.10 What is the importance of the hepatic and renal portal systems and just what is a portal system in animals that have both?

{portal system definition of blood vessels with capillaries at but ends, without a direct connection to the heart – 2 pts}

Hepatic {between digestive system and livers} {toxins in food are captured by liver before blood flows out} {liver absorbs nutrients before blood passes out the body

Renal {between caudal/tail and kidney} {High levels of metabolic waste generated in caudal system are removed before blood enters general circulation}

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15 pts Part 6: Answer the essay question in the examination booklet that has been provided. **Please Write double spaced**.

HINT: You may find it advantageous to organize your thoughts in point form using the first page of your examination booklet

Microphagy is a common feeding strategy in many of the animals that we have looked at during the course. What is microphagy and what are common problems and ways they are solved with this feeding strategy? Discuss this using two protostomes, two deuterostomes and a parazoan in your answer.