Name: _____
Student No:_____

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

April 14, 2011

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 20 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 170 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.

Stomochord

The hollow, flexible tube found in hemichordates that runs along the dorsal axis of its length. They arise in embryonic development in outpockets from the roof of the embryonic gut. They extend dorsally from the pharynx to the proboscis in aduls and serve to communicate with the oral cavity. The walls are composed of epithelial cells but ciliated and glandular cells are also present.
Example: Branchiostoma (lancelate)

Placoid scale

The placoid scale is a special scale found in cartilaginous fishes example: Sharks. They are composed of dentine and are extensions of the spine. On shark skins, their purpose is counter-balance the effect of turbulence that a smooth skin would create against the water. They create micro-turbulence so that sharks can glide successfully through the water without added friction. They align in one direction.

Lateral line

The lateral line is the sensory system of most fishes, excluding hagfish. It consists of neuro-mast cells that sense vibrations in the water that help fishes know what is approaching them and what kind of environment they are in. It is a line on the lateral side of fishes that includes sense organs and canals underneath to detect waves and movement in the water. The internal canals contain sensory ampullae.

Kingdom Animalia

Kingdom Animalia is a taxon (the highest taxon) that includes multicellular ingestive heterotrophs that have cells with different functions. All animalia evolved from a single choanocyte ancestor. All animalia have collagen. The diversity ranges from sponges to cnidarians, molluscs, arthropods to mammals. An example of an animal is a starfish.

Aortic arches

In annelids, aortic arches are 5 blood vessels that pump blood in the opposite direction which is vital for giving nutrients to the reproductive structures.
In vertebrates, the aortic arches are a series of 6 paired embryological vascular structures which will eventually give rise to major arteries in vertebrates. There are 6 in fishes, 5 in cartilaginous fish and eventually dwindle down to 4 by the time tetrapods arise. Heart pools the blood first, pumps it into the arches that will be aerated through the gills in fishes and through the rest of the body in tetrapods.

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Jugular vein

The jugular vein is a vein that brings de-oxygenated blood from the head back to the heart. This happens through the superior vena cava. There are two sets: external and internal jugulars. They meet up with blood coming back from the appendages in the subclavian veins. This part of the circulatory (in particular, the veinous circulation) of all tetrapods.

Dual circulatory system

The dual circulatory system is a circulatory system that consists of 2 loops - one loop goes to the lungs (pulmonary) and one goes to body (systemic). Dual circulatory systems are only found in terrestrial vertebrates, and exist in a sort of half-way form in amphibians. This type of circulatory system is found in amphibians, birds, reptiles and mammals.

Hepatic portal

The hepatic portal is a system of veins comprising the hepatic portal vein and its tributaries. Capillaries from the intestinal wall pick up nutrients and transfer them to the liver. This is where capillaries interact with the liver tissue. It deals with toxins and wastes from the digestive system. This is part of the venous circulation of all vertebrates.

Ommatidium

The ommatidium is the optical unit of the compound eye. They are fundamental units for creating the image. They are optically isolated by pigment cells that surround it. From a series of light-sensitive retinular cells that respond to different wavelengths of light, their response corresponds to three primary colors. Each of the individual pictures produced combines in the arthropod brain to create the final image. These are found only in arthropoda, specifically in atelocerates and crustacea.

Hemimetabolus life cycle

A hemimetabolous life cycle is an arthropod life cycle in which the juvenile stage resembles the adult stage, except that it doesn't have wings. The juvenile and the adult hence compete for the same resources, which doesn't allow for as much diversification as the holometabolous life style. Example: Grasshoppers.

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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 In reptiles, the teeth are uniformly conical and are referred to as
_____ a. apicodont.
_____ b. heterodont.
_____ c. conodont.
__X__ d. homodont.
_____ e. thecodont.

2.2 Tubular nerve cord and pharyngeal gill slits are considered to be evidence of evolutionary ties between _____ and chordates.
_____ a. echiurans
_____ b. echinoderms
_____ c. phoronids
_____ d. sipunculans
__X__ e. hemichordates

2.3 In the cuticle of terrestrial arthropods all but which of the following is true
_____ a) the chitin and protein in the exocuticle are chemically cross linked to each other
_____ b) waxes in the procuticle waterproof the whole cuticle
_____ c) moulting starts with apolysis
__X__ d) the only living layer is the epidermis
_____ e) the endocuticle is recycled and used to build new procuticle

2.4 A nontaxonomic designation that applies to all vertebrates except fishes is _____ (adaptations to life on land are found in some members of any group of this designation).
__X__ a. tetrapod
_____ a. gnathostome
_____ c. apod
_____ d. agnatha
_____ e. amniote

2.5 Among insects with _____ metamorphosis, immatures are called larvae because they are very different from the adult in body form, behavior, and habitat.
_____ a. ametabolous
__X__ b. holometabolous
_____ c. paurometabolous
_____ d. hemimetabolous
_____ e. chrysalous

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2.6 The tough, leathery polysaccharide in the arthropod procuticle is
_____ a. lipoprotein.
_____ b. calcium carbonate.
_____ c. scleroprotein.
__x__ d. chitin.
_____ e. glycogen.

2.7 In birds and reptiles, the excretion of _____, conserves water.
_____ a. urea
_____ b. ammonia
_____ c. creatine
_____ d. creatinine
__x__ e. uric acid

2.8 In their reproductive habits, the monotremes are
_____ a. parthenogenetic.
__x__ b. oviparous.
_____ c. viviparous.
_____ d. ovoviparous.
_____ e. marsupian.

2.9 Reptiles of the _____ lineage had one opening in the temporal region of the skull.
_____ a. diapsid
__x__ b. synapsid
_____ c. triapsid
_____ d. amphiapsid
_____ e. anapsid

2.10 Pulmonary ventilation in lunged amphibians is accomplished by
_____ a. the diaphragm.
__x__ b. the ribs.
_____ c. ram ventilation.
_____ d. a buccal pump.
_____ e. countercurrent exchange.

2.11 A mammal that feeds on the flesh of another animal is called a/an
__x__ a. carnivore.
_____ b. herbivore.
_____ c. insectivore.
_____ d. omnivore.
_____ e. frogivore.

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2.12 In their feeding habits, most adult amphibians are
_____ a. herbivores.
__x__ b. carnivores.
_____ c. sanguinivores.
_____ d. frugivores.
_____ e. scavengers.

2.13 A common chamber that receives excretory, digestive, and reproductive products is the
_____ a. rectal gland.
_____ b. rectum.
_____ c. colon.
_____ d. pyloric cecum.
__x__ e. cloaca.

2.14 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

2.15 Which of the following structures are not included in the mouthparts of insects?
__x__ a) pedipalps
_____ b) labrum
_____ c) mandibles
_____ d) maxillae
_____ e) hypopharynx

2.16 In the inner ear of fishes, the _____ detects rotational movements.
_____ a. sacculus
__x__ b. semicircular canal
_____ c. eustachian tube
_____ d. utriculus
_____ e. lateral canal

2.17 The food of a crayfish is sorted according to size by setae in the:
_____ a. Gastrolith
_____ b. hepatopancreas
__x__ c. gastric mill
_____ d. cardiac stomach
_____ e. pyloric stomach

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2.18 The circulatory system of acorn worm sends blood anteriorly into a series of sinuses called the _____, which filters excretory wastes.
_____ a. nephridium
_____ b. flame bulb
_____ c. renette
__x__ d. glomerulus
_____ e. renal corpuscle

2.19 Mammals have teeth that are differentiated into a variety of tooth types. This condition is known as
_____ a. Diphyodont
__x__ b. Heterodont
_____ c. Monodont
_____ d. Homodont

2.20 Body wall muscles of fishes are arranged in bundles called
_____ a. somites.
_____ b. lamellae.
_____ c. tagmata.
__x__ d. myomeres.
_____ e. laterals.

2.21The large pinching claws of a crayfish or lobster occur on appendages called the:
__x__ a. chelipeds
_____ b. chelicera
_____ c. uropods
_____ d. Swimmerets
_____ e. Mandibles

2.22 The opening between the right and left atria of a mammalian fetal heart is the
_____ a. ductus venosus.
_____ b. foramen magnum.
_____ c. semilunar valve.
_____ d. ductus arteriosus.
__x__ e. foramen ovale.

2.23 Food trapped on the inner surface of the pharyngeal basket of a tunicate is passed to this structure before moving into the digestive system
_____ a. Urostyle
_____ b. Stomochord
__x__ c. Endostyle
_____ d. Prosostyle

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2.24 Only in the _____ reptiles is the ventricular septum in the heart complete.
__x__ a. crocodilies
_____ b. lizzards
_____ c. dinosaurs
_____ d. turtles

2.25 The cartilagenous fishes belong to the class
_____ a. Gnathostomata.
__x__ b. Chondrichthyes.
_____ c. Elasmobranchii.
_____ d. Agnatha.
_____ e. Osteichthyes.

2.26 In some sea stars, the aboral surface contains pincerlike structures called _____, which are used for protection and clearing the surface of debris.
__x__ a. pedicellariae
_____ b. chelicerae
_____ c. chelipeds
_____ d. chelae
_____ e. maxiIlipeds

2.27 Birds are capable of flight because they have
_____ a. Wings and a lightweight skeleton
_____ b. Highly efficient respiratory and digestive system
_____ c. A high-pressure circulatory system and well developed nervous and sensory systems
__x__ d. All of these.

2.28 The part of the bird feather that emerges from the follicle is known as the
__x__ a. Quill
_____ b. Vane
_____ c. Barb
_____ d. Barbule

2.29 The excretory system of insects works by
_____ a. excreting wastes across the digestive system membrane.
_____ b. active transport of just the waste molecules across the tubules.
__x__ c. transport of all ions and solutes across the tubule and retrieval of water and useful ions in the rectum.
_____ d. excretion of the wastes through coxal glands

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2.30 Which of the following structures are not included in the mouthparts of insects?
_____ a) pedipalps
_____ b) labrum
_____ c) mandibles
_____ d) maxillae
_____ e) hypopharynx

2.31 Gas exchange across the skin is called
_____ a. ram ventilation.
_____ b. countercurrent exchange.
_____ c. cutaneous respiration.
_____ d. buccopharyngeal exchange.
_____ e. branchial respiration.

2.32 Mammals have all the following types of teeth except:
_____ a. Incisors
_____ b. Molars
_____ c. Dentaries
_____ d. Canines
_____ e. Premolars

2.33 Birds do, but reptiles do not have
_____ a. Scales
_____ b. Bladders
_____ c. Endothermy
_____ d. Internal fertilization

2.34 Sea stars, sea urchins, and sea cucumbers belong to the phylum
_____ a. Echinodermata.
_____ b. Radiata.
_____ c. Deueterostomia.
_____ d. Taroigrada.
_____ e. Phoronida.

2.35 Which of the following is not a role of the water vascular system in echinoderms
_____ a. Gas exchang
_____ b. Excretion
_____ c. Digestion
_____ d. Locomotion
_____ e. Circulation

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2.36 The correct order for layers of the arthropod exoskeleton from outside to inside is
_____ a. endocuticle-epicuticle-exocuticle.
__X__ b. endocuticle-exocuticle-epicuticle.
_____ c. exocuticle-endocuticle-epicuticle.
_____ d. epicuticle-exocuticle-endocuticle.
_____ e. exocuticle-epicuticle-endocuticle.

2.37 The major secretory and absorptive structures of the sea star digestive system are the
_____ a. cardiac stomachs.
_____ b. rectal ceca.
_____ c. Polian vesicles.
__X__ d. pyloric ceca.
_____ e. pyloric stomachs.

2.38 Which of the following structures are not included in the mouthparts of insects?
__X__ a. pedipalps
_____ b. labrum
_____ c. mandibles
_____ d. maxillae
_____ e. hypopharynx

2.39 Unique characteristics of echinoderms include all of the following EXCEPT
_____ a. an endoskeleton of plates or ossicles.
__X__ b. marine, freshwater, and terrestrial species.
_____ c. pedicellariae.
_____ d. dermal branchiae.
_____ e. a water-vascular system.

2.40 A portion of the tubule system of their nephrons allows mammals to produce urine that is 2 to 22 times as concentrated as their blood. This part of the tubular system is called the
__X__ a. loop of Henle.
_____ b. ureter.
_____ c. urethra.
_____ d. glomerulus.
_____ e. Malpighian loop.

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40 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 Like terrestrial insects, this part of the epicuticle protects spiders against water loss. _____Waxes_____

3.2 Based on neurological evidence, the atelloceratan head consists of this many segments. _____Six_____

3.3 Number of chambers in a bird's heart. _____Four_____

3.4 In insects there are no wings attached to this thoracic segment. _____First_____

3.5 An insect's Malpighian tubules empty their contents into this part of the gut. _____

3.6 A reptile's embryo is bathed in this fluid. _____Amniotic_____

3.7 The only living part of the arthropod exoskeleton. _____Epidermis_____

3.8 The arms of a sea star are connected to this part of the animal (two words). _____Central disc_____

3.9 The number of sets of teeth that diphyodont mammals have. _____Two_____

3.10 Sea urchin shells are also called this. _____Tests_____

3.11 Instead of the lungs expanding and contracting in birds it is these that do that. _____Air sacs_____

3.12 Urochordates have these; one is incurrent, the other excurrent. _____Siphons_____

3.13 In this type of insect flight muscle, there is one nerve impulse for each contraction of the muscle. Direct

3.14 The class of vertebrates all have a single opening in the skull to accommodate the jaw muscles. _____Synapsids_____

3.15 All chelicerates have this type of feeding strategy and are this. _____Predaceous_____

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3.16 A terrestrial insect may swallow this to help escape from the old cuticle. Air

3.17 Modifications of the apocrine glands to nourish the young are one of the possible origins of these glands in mammals. Mammary

3.18 The anterior tagma of a chelicerate. Prosoma

3.19 Spiders use these to feed rather than mandibles. Chelicera

3.20 Water moves through the gill slits into this space before leaving the lancelet. Pharynx

3.21 Most insects don't see this color in the spectrum. Red

3.22 Digestion of these large polymers in the old cuticle recycles N-acetyl glucosamine and help build the new cuticle. Proteins

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

3.24 Hairs in mammals grows out of this. Follicles

3.25 The endocuticle and exocuticle combine to form this in arthropods. Procuticle

3.26 This type of mammal carries its young in a pouch. Marsupials

3.27 When present these vesicles act as reservoirs that store water for the water vascular system. Polian

3.28 In addition to large eyes, insects also have these eyes. Simple

3.29 Spider webs are used to trap these. Insects

3.30 Reptiles, birds and mammals are distinguished from fishes and amphibians in that their embryos develop in this fluid filled sac. Amnion

3.31 You won't find these skeletal elements in an agnathan. Vertebrae

3.32 The transition from a tadpole to an adult frog. Metamorphosis

3.33 The nitrogenous waste of insects (two words). Uric acid

3.34 Most digestion of food for a spider occurs as a result of extracorporeal digestion. _____

3.35 The presence of fore and hind limbs identifies amphibians and all the vertebrates to follow as this group of animals. Tetrapods

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3.36 In their evolution, an insect's wings are this type of character.

Derived

3.37 The number of pairs of wings found on most insects. Two

3.38 Larval lampreys are found in this type of environment. Freshwater

3.39 In sea stars, gas exchange occurs in the tube feet and these (Two words). Dermal branchia

3.40 The water vascular system is also called this type of system.

Ambulacral

Part 4 starts on the following page

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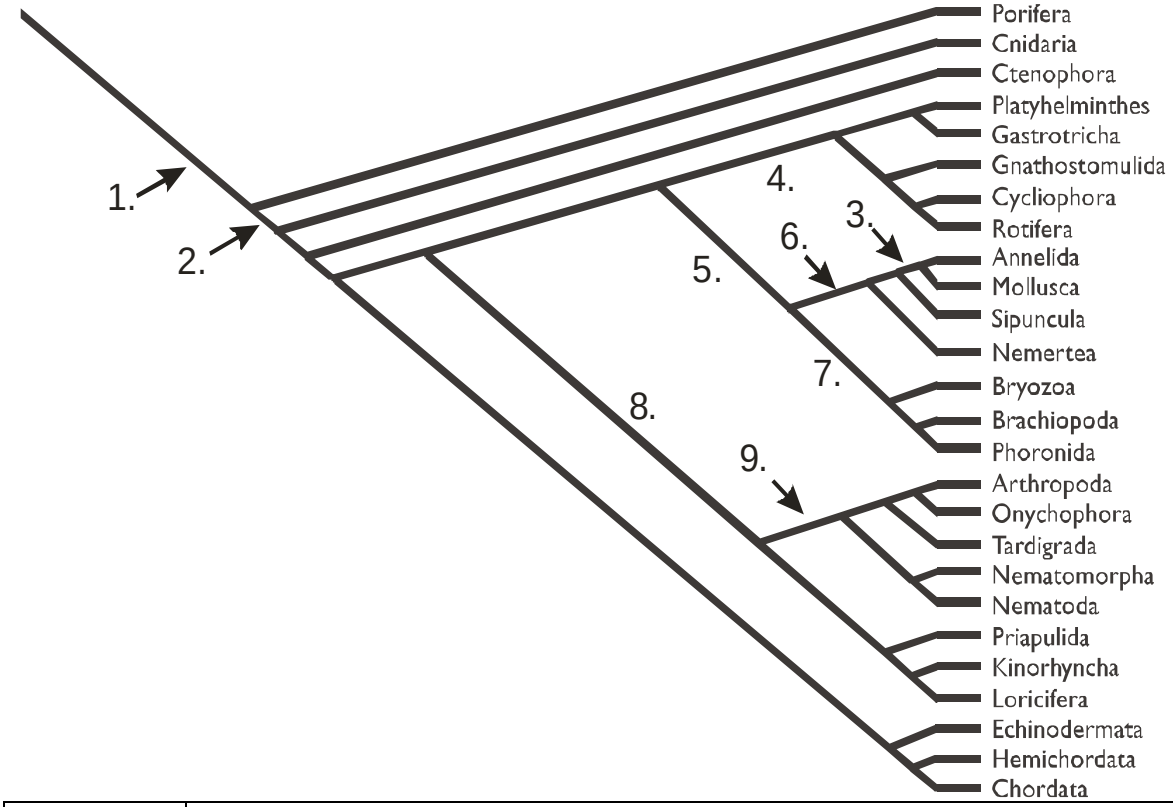
10 pts Part 4 Using the numbers shown on the cladogram describe 5 of the 9 indicated events that defined the evolution of the major animal groups. Be sure to enter the character number in the table.



Character #	Description
1	Multicellular hetereotrophs; have collagen. Choanocyte ancestor. Division of labour in the cells.
2	Septate junctions develop between epithelial cells and choanocytes are lost.
3	Schizocoel and metanephridia filter the coelomic fluid.
4.	In platyzoa, the coelom is lost and both the metanephridia and circulatory system are lost.
5.	Spiral cleavage.
6.	Trochophore larval stage.
7.	Tripartite coelom; U-Shaped gut. Sessile with the presence of a lophophore.
8.	Ecdysozoa - presence of a thick, moulted cuticle of protein reinforced by alpha chitin or beta chitin; loss of coelom - only present in the larval stages; loss of surface ciliature
9.	Scalids arranged in rings around a retractable introvert & pharynx retractor muscles penetrate the brain.

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

5.1 What is a hydrostatic skeleton? Use two examples to show how it is used for locomotion.

A hydrostatic skeleton is a fluid filled and closed cavity surrounded by a body wall containing muscles oriented in different directions. Muscular contractions maintaining the rigid form or change the shape of the organism allows for movement. The gastrovascular cavity is an important component of the hydrostatic skeleton in cnidarians, for example.

Example #1: Sea Anemones (cnidarians)
-have a gastrovascular cavity that is surrounded by epitheliomuscular cells
-water contracts the myonemes of the muscle cells as it moves through the cavity
-this creates contraction and lengthening of the muscles (since water is incompressible)
-allows for the sea anemone to creep across the substrate with its pedal disk
-also allows for contractions of the gut associated with feeding, and for defensive measures (retractor muscles that control the cnidoglandular lobes of acontia)

Example #2: Tube feet in echinoderms (starfish)
-have a water vascular system
-each tube foot functions as an independent hydrostatic skeleton
-water goes through the madreoporite -> through a stone canal -> through radial canals off which branch lateral canals that ultimately lead to the tube foot
-contractions allow the tube foot to travel along the substrate.

5.2 Compare the circulatory system of a bony fish and a bird.

Similarities:
-they are both closed circulatory systems
-both have a heart, from which branches a dorsal aorta and from the dorsal aorta are arteries/veins that branch off further
BONY FISH:
-have only 1 circulatory loop
-the systemic arches are paired
-circulatory system is associated with the swim bladder where blood from the heart is made available by close association of the veins that come out and the capillaries that come in
-from the dorsal aorta, there is an ovale (area for adding and taking away oxygen in the swim bladder) which connects to a gas gland that supplies the gasses necessary to maintain the swim bladder followed by a rete mirable ((complex of arteries and veins lying very close to each other that uses counter-current blood flow within the net; exchanges gasses between vessels so that the 2 blood streams maintain a gradient with respect to oxygen)
BIRD:
-have a dual circulatory loop
-have 1 loop that goes to the systemic (body) and one that goes to the lungs (pulmonary)
-have lost their left systemic arch and kept the right one to maintain a light weight so they are able to fly
-the circulatory system contains a dorsal aorta that goes off the heart to supply the body -> which has branches that are specialized (not seen in the fish) for areas, such as iliac, gonads, caudal etc....

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5.3 What are the similarities and differences in how the muscles work during insect indirect and direct flight.

SIMILARITIES:
-nerve pulses are needed in order to control the flight (the difference is in how much input is needed)
-has to do with control of the notum (when the notum is pulled down, the wings are pulled up and vice versa)
-Dorsal ventral muscles control the movement of the notum in both mechanisms

DIFFERENCES

1) Direct flight
-needs a nerve impulse for each contraction of the muscle
-is good for insects with a large wing surface area
-basic mechanism: the dorsoventral muscles pull the notum down, push the wing up -> the cuticle gets stretched on one side, then pulls back, brings the wing down the wing pivots up against the notum which pulls it back into place
-

2) Indirect flight
-only needs one nerve impulse, after that the wings can continue to beat indefinitely until the insects lands on the ground
-the cuticle acts like a spring instead, and so when the cuticle is c ompressed as the wing is lowered, the spring pulls the cuticle the rest of the way
-the elastic protein is resilin and it is the most perfect elastic in the world (retains 99% of its elasticity after compression)
-the snap from the click mechanism means that the notum pops up very quickly, the notum rises quickly and when it goes down the dorso-ventral muscles lengthen very quickly and the cycle continues

5.4 Why is the skin of an amphibian suited for the way these animals live?

The skin is a respiratory surface in amphibians. Gas exchange can occur across the surface, rather than through the lungs which most amphibians don't really use. The skin is suited for how the animals live because amphibians usually live in moist environments. They also spend the larval stage portion of their life in the water. Thus, they have not completed the transition to land and using their skin as a respiratory surface is fine because they live near or in water.
The skin has mucus glands underneath the epidermal layer in order to keep the skin slimy and maximize its surface as a gas exchange.
The skin also has poison glands which can emit poison to ensure protection for the amphibian.
Because of the environment that most amphibians are found in, the skin is good for gas exchange because they will not lose much moisture because they have an environment that is plentiful in moisture.

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5.5 What are the main parts of the vertebrate digestive system and what are their respective functions

Main parts of the vertebrate digestive system:
1) Mouth - where food enters.
2) Salivary glands - to help lubricate/do some intiial digestion of the food
3)Esophagus - the food then travels down to the esophagus to the stomach
4) Stomach - acidic digestion occurs here
5) Small intestine - additional basic digestion occurs here with the help of pancreatic enzymes (secreted by the pancreas)
6) Large intestine - where more digestion occurs and nutrients are absorbed across the large surface area. Microvilli aid in enhancing the surface area for absorption.
7) Liver - important for detoxifying the blood and removing toxins in the body
8) Gall bladder - secretes emulsifying agents to break down fats
9) Rectum - where fecal waste is stored until it is ready to evacuate them via the anus

5.6 What is the difference between complete and incomplete metamorphosis in insects? Is there any advantage of one over the other?

Incomplete metamophorsis: the juvenile looks quite similar to the adult, except that it is missing wings.
Complete metamorphosis: the juvenile is completely different from the adult. Often this involves a pupa stage and a transformation into the adults.
Yes, there is an advantage of one over the other.
In complete metamorphosis, the juvenile and adult feed on different resources so they don't have to compete with each other.
Also, in complete metamorphosis the juvenile is dedicated solely to acquiring food. It has cells programmed in its embryonic development to grow into adult structures, but this takes a lot of metabolic energy that it can get from its food.
In incomplete metamorphosis, the juvenile has to feed and grow adult structures at the same time - so holometabolous insects actually conserve energy.
Therefore, the holometabolous insects (ones that undergo complete metamorphosis) have an advantage over hemimetabolous (incomplete metamorphosis) insects which explains why they are more diverse.

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5.7 How does the tube foot work?

Tube foot
-the tube foot is an extension of the water vascular system
-they are anchored by a valve that shuts (controls the water that will come in to contract the muscles)
0when water comes through the lateral canals to the tube foot, the foot has muscles along the side that contract
-contractions of the ampulla at the top of the foot extend the foot out
-the tube foot acts like a lever because it can b moved in any direction
-nervous system has control of the tube foot so that all the tube feet move simultaneously
-on the outside, the tube feet have suckers that act as suction cups that still stick and un-stick so that the tube feet can move
-although one moving doesn't sound impressive, a lot of them moving in the starfish can enable the entire organism to move, albeit very slowly.

5.8 Briefly explain how the insect compound eye forms an image.

-the insect compound eye is made up of lots of individual optical units (ommatidia)
-the insect compound eye forms an image through what is called "the visual mosaic model"
-the outer pieces of the ommatidia are the faceted pieces that are the edges of the lens
underneath are retinular cells important for picking up sensory information
the ommatidia are cells that sense light, surrounded by pigment cells that sense light that comes in from their own lens
they have a lens that collects light, a cone that focuses into a bead of light and shoots it down the retinular cells (Rhabdome - 8 cells)
-when the light is shot down, each cell is stimulated
-it creates a multicellular pixel
-combination of one multicellular pixel with multiple pixels in the compound eye creates a finer resolution with more ommatidia
-image is formed through the cooperation of all of the individual optic units

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5. 9 How does a Malpighian tubule work?

Malpighian tubule
-a unique pumping system to make a filtrate or arthropod blood
-use uric acid
-they have a potassium pump that pumps potassium into the lumen of the tubule, which creates a positive charge
-the lumen then develops a positive charge, which creates an electrochemical gradient that draws chloride ions in
-the chloride increases ionic concentration, which pulls water in
when water is pulled in, everything that is small enough to go across the membrane goes across the malpighian membrane (selectively permeable)
-a filtrate of the hemolymph is generated by the potassium pump
0it joins the undigested food and enteres into the rectum
-water is recovered and any essential nutrients/salts are recovered
the cuticulin layer in the hindgut prevents uric acid from coming through - which recycles everything out of the rectum
-a very efficient use of metabolic water means that the malpighian tubules allow some insects to live for a very long time without a single drop of water

5.10 How do sharks and boney fish maintain neutral buoyancy, why is it important?

SHARKS:
-have cartilage, which is denser than water (even though it is lighter than bone)
-they need to maintain neutral buoyancy otherwise they will sink because of their weight in the water
-cartilage is a derived characteristic, so that's part of the reason why sharks can maintain neutral buoyancy
-another reason is squalene (shark oil) which is produced by the liver
-oil is less dense than water, so by manipulating the production of shark oil, sharks can maintain neutral buoyancy at any depth.

BONY FISH:
-use a swim bladder
-their bones are heavier
-the swim bladder is closely associated to the circulatory system
-gas gland fills the swim bladder with air or takes it away depending on the fish's needs
-the swim bladder lets the fish have neutral buoyancy in the water b/c it makes it lighter than the surrounding water

Name: _____
Student No:_____

20 pts Part 7: Answer the essay question in the examination booklet that has been provided. Please Write double spaced please, its much easier to read (Thanks)!

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

Osmoregulation and excretion are closely related processes in animals and where an animal lives often affects how it can carry out these processes. Using an example organism from each of the three categories compare excretion and osmoregulation processes paying attention to the structures involved and the nature of the metabolic waste that is excreted.

A) An acoelomate organism
B) A terrestrial protostome
C) A marine deuterostome

A) ACOELOMATE
-example platyhelminthes environment in which they live: they are parasites in another host's digestive system
-they are very flat
-they have a good enough surface to volume ratio to simply use simple diffusion
-because they live in a moist environment (either in freshwater or in a host digestive tract), their metabolic waste is ammonia.

B) TERRESTRIAL PROTOSTOME
-example: an earthworm
-they live in a relatively moist environment
-they use metanephridia to filter out their metabolic wastes (contains both ammonia and urea)

C) MARINE DEUTEROSTOME
-example: a starfish
-the metabolic waste is filtered through simple diffusion through the dermal branchia and the tube feet of the water vascular system.
-because they are in a marine environment, they don't have much of an excretory system and can simply use passive diffusion
-metabolic waste is ammonia.