Module 4 Organisms

TLI study Guide-Biology

1. What three domains is life organized into?
   1. Bacteria, Archaea and Eukarya
2. What is the main difference between these domains?
   1. Organisms in domains Bacteria and Archaea are all prokaryotic while organisms classified into the Eukarya domain are all eukaryotic
3. In addition to a group called protists, what kingdoms make up the Eukarya domain?
   1. Animals, Fungi and Plants
4. What are the 8 subsequently more specific taxonomic categories?
   1. Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species
5. What is a dichotomous key and how would you use it?
   1. A dichotamus key is a tool used to identify an organism by answering a series of questions. To use this kind of a key, I would repeatedly select one of two choices that match the characteristics of the organism in question leading (through a process of elimination) to the organism’s scientific name.
6. What are the two ways in which viruses are classified
   1. Shape and type of genetic material present (DNA or RNA)
7. What 2 parts are all viruses composed of?
   1. A nucleic Acid surrounded by a protein coat
8. What are the main differences between the lytic and lysogenic cycles of a virus?
   1. In a lytic cycle a virus infects a host cell, reproduces its components and leaves (destroying the cell by lysis or exocytosis) In a lysogenic cycle a virus incorporates its nucleic acid material into the genome of the cell after infectionand is replicated with the genome; eventually, this virus can become lytic
9. What are the two main reasons that viruses could be considered alive and 2 other reasons, which suggest that viruses are nonliving entities?
   1. Viruses could be considered alive because they: 1) possess their own genome and 2) they reproduce. However, they can also be considered nonliving since they do not have their own 1) metabolism and 2) they require a host cell to reproduce.
10. Why are viruses important to laboratory research and spread of infectious diseases?
    1. Viruses have been used in gene therapy as delivery mechanisms to replace mutated genes in cells of people with genetic diseases. Viruses cause many infectious diseases like Hepatitis, HIV/AIDS, and influenza (flu); they can spread by transfer of various body fluids.
11. What are the main benefits and challenges of sexual reproduction?
    1. Sexual reproduction which includes meiosis and fertilization increases genetic diversity within a species allowing for greater chance of survival in a changing environment. However, it requires that an individual find a partner, which can sometimes be problematic.
12. What is asexual reproduction and what 3 forms of this type of reproduction occur in different organisms?
    1. Asexual reproduction requires only one parent and results in the production of a genetically identical offspring. Prokaryotes replicate mostly through 1) binary fission, while some yeast use 2) budding and plants use 3) fragmentation. Rarely animals can use regeneration to reproduce asexually.
13. What is the life cycle of most plants, which include both a multicellular gametophyte (n) and a multicellular sporophyte (2n) stages?
    1. Alteration of Generations
14. What is metamorphosis; give one example of this process?
    1. Profound physical changes during maturation of living organisms from the juvenile to the adult form. A tadpole changing to a mature frog or a caterpillar changing to a mature butterfly.
15. What types of criteria are used to classify bacteria?
    1. Bacteria can be classified based on their shape (spheres, rods and spirals), type of cell wall (Gram-staining: positive or negative), and genome sequence (molecular systematic).
16. Why do bacteria adapt so well to their environment?
    1. Bacteria can adapt to a changing environment because they have very fast generation times, high mutation rates, and can incorporate some genetic materials from other bacteria.
17. What positive and negative roles do bacteria play with respect to other organism?
    1. Bacteria are critical to our would as decomposers and mutualistic partners of many organisms; for example, as nitrogen-fixing partners of plants and protectors against other pathogens in the human gut. Throughout human history bacteria have also been used to preserve foods through controlled fermentation (for example yogurt and pickles). In biotechnology bacteria are used to produce life saving medication like insulin. However, bacteria as pathogens can also cause infections and harm human beings and other organisms.
18. What are 3 unique features of plant-like protists and what is an example of one of these?
    1. Plant-like protists use sunlight as their energy source, contain chlorophyll and cary out photosynthesis. Example: algae
19. How are animal-like protists different from plant-like protists and what is an example an animal-like protest that lives in fresh water ponds?
    1. Animal-like protists are different from plant like ones because they have to ingest their energy. Paramecium is a protest that lives in fresh water ponds.
20. What is an example of a fungus like protist and what distinguishes it from other protist?
    1. Slime molds are fungus like protists which act as decomposers
21. How are protistss unlike other organisms and why are they important in our environment?
    1. Protists, unlike bacteria, are eukaryotes and unlike most other eukaryotes they are mostly unicellular. Protists are important to our environment because some decompose organic matter while other are the main food and oxygen source especially in acquatic ecosystems. Protists are also a source of important medicines and substances such as agar.
22. What is a very serious yet common disease in Africa caused by a pathogenic protist called a plasmodium?
    1. Malaria
23. Why did plants have to wait to move from aquatic environments to land and what two benefits did land offer?
    1. Once an ozone layer was formed which protected life from harmful UV rays, land offered many benefits to plants such as 1) bright sunlight 2) abundance of carbon dioxide 3) soil rich in minerals, and 4) initially few herbivores/pathogens (students need to list two of these)
24. What two changes in structure occurred to allow water-bound, algae-like, nonvascular plants to move to land and survive in the drier environment?
    1. Although, the first land plants were small and dependent on a constant supply of water, they differed from algae because they developed adaptations to protect them against drying out such as a 1) waxy covering and 2) walled spores with sporopllenin. They also were the first to have an alteration of generations life cycle and a apical meristem (quickly dividing cells at a tip).
25. What is the name for nonvascular plants, all of which do not have true vascular, leaf, stem, and root tissue (instead only rhizoids) and are dominated by a haploid gametophyte stage and what is the most common example of these types of plants?
    1. All nonvascular plants are called Bryophytes; mosses are the most common example.
26. What was a critical structural addition (and 2 of its components) that allowed plants to grow taller and rely less on watery environments?
    1. Development of vascular tissues including xylem (for water conduction) and phloem (for food conduction).
27. What is the most common example of a vascular plant that does not have seeds?
    1. ferns
28. What is a seed and why is it such an important adaptation for land plants?
    1. A seed is an embryo surrounded by a seed coat which contains stored food and is a result of fertilization between a sperm and an egg. Seeds are an important adaptation for land plants because they are even better able to succeed in producing a new plant in drier climates than spores. Seeds can be dormant for many years and once conditions are favorable, seeds (unlike spores) contain within them the nutrients necessary for germination.
29. Which division of plants are characterized by seeds, a large crown of compound leaves and a stout trunk.
    1. Cycads
30. How are gymnosperms and angiosperms similar and different from each other?
    1. Although both contain seeds, angiosperms grow flowers and are surrounded by an additional layer called the fruit.
31. What is the most common gymnosperm group?
    1. Conifers (cedars, pines, firs)
32. What are angiosperms the most successful group of plants?
    1. Since sexual reproduction leads to greaterdiversity and survival, angiosperms are so successful because they enlist the help of small animals through pollination to spread their sperm (within pollen) from one plant to another. The attractive flower and nutritious nectar serve as enticements for pollinators. Angiosperms also surround their seeds with fruit which aid in seed distribution (animals eat, transport and expel them).
33. What are the main two types of angiosperms?
    1. Monocots and Dicots (eudicots)
34. How are the structures of roots suited
    1. The structure of roots usually includes manyextensions (such as lateral roots or root hairs) to increase surface area for absorption of water and minerals. Roots can also extend deep and wide for greater support and to find more water.
35. What determines stem thickness in a plant?
    1. Since stems’ function is to support the plant and keep it upright, the heavier and taller the plant is, the more eigid, thick, and woody the stem will be. If a plant resides in a windy environment, its stem will be more flexible, while if a plant cannot continuously make food, stems can also store nutrients.
36. What critical metabolic process occurs in the leaves and how are they suited to this function?
    1. The usually broad and flat structure of leaves, which increases their surface area, enhances the rate of photosynthesis because a greater number of cells containing chloroplasts are exposed to the sun’s rays that are essential for this process.
37. What is the main function of a flower and what does a flower become?
    1. The main function of a flower is to attract pollinators and facilitate sexual reproduction; a flower with all of its parts, once fertilized, will form into a fruit with seeds that contain embryo(s).
38. What are the 4 main components of a flower, which parts are male, which parts are female (label the figure below)?
    1. Sepals, Petals, Stamen(male), Carpel (female)





1. What is the main purpose of epidermal tissue and where is it located in plants?
   1. Epidermal tissue forms the outermost layer of plants that covers and protects them and regulates gas/water exchange between them and the outside world.
2. Which tissue forms the inner part of the plant that mostly functions to provide structure and storage?
   1. Ground Tissue
3. What are the two types of vascular tissues and what are their functions?
   1. Xylem is a network of tubular, dead cells that transport water and minerals; Phloem is a set of connected living cells that transport nutrients such as sugars dissolved in water.
4. Why are plants so important to other organisms?
   1. Because plants harness the energy from the sun through photosynthesis, many organisms rely on them for food. Plants also provide habitats for many animals and they have been used as sources of numerous medications.
5. How would you compare asymmetric, radial and bilateral symmetries of animal body plans (include a simple drwing and examples)?
   1. While asymmetric body plans are irregular (sponges), an animal with radial symmetry can be divided into roughly equal parts with lines through the center of it’s body (jellyfish) and animals with bilateral symmetry can be divided into approximately equal mirror left and right halves with a line through the middle of their body (crabs).



1. What is homeostasis and using thermoregulation; explain how homeostasis is maintained?
   1. Homeostasis is the tendency to return specific conditions to an optimal range of values. For example if an animal overheats homeostasis mechanisms will cool its body by evaporative cooling (sweating) and if an animal body gets too cold, these mechanisms will heat it by shivering.
2. What main characteristic distinguishes invertebrates from vertebrates?
   1. Invertebrates do not have a backbone while vertebrates do.
3. Given the names of the 8 phyla of invertebrates (Porifera, Cnidaria, platyhelminthes, Nemotoda, Molluska, Arthropoda, Annelida, Echinodermata) and 7 classes of vertebrates (Agnatha, Chondrichthyes, Osteichthyes, Amphibia, Aves, Mammalia), what is one organism example of eache and what one characteristic differentiates each group (match)?
   1. Invertebrate Phyla
      1. Porifera: (sponges) are asymmetric without true tissues
      2. Cnidaria: (jellyfish) have only two cell layers and stinging cells (nematocysts)
      3. Platyhelminthes: (flatworms) simplest bilateral animals with three cell layersand no body cavity (acoelomates)
      4. Nemotoda: (roundworms) have an incomplete body cavity (pseudocoelomates)
      5. Molluska: (snails) have a muscular foot and a shell
      6. Arthropoda: (insects) have an exoskeleton and jointed appendages
      7. Annelida: (earthworms) have a full body cavity (coelomates)
      8. Echinodermata: (starfish) have an endoskeleton and tube feet
   2. 7 classes of vertebrates
      1. Agnatha: (lampreys and hagfish) jawless fish
      2. Chondrichthyes: (sharks and rays) cartilaginous fish
      3. Osteichthyes: (ray-finned like herring and lobe-finned like lungfish\_ bony fish
      4. Amphibia: (frogs) live on land and in water
      5. Reptilian: (crocodiles) ectothermic, covered by scales, lay amniotic eggs.
      6. Aves: (birds) endothermic, winged, lay eggs and have feathers and beaks
      7. Mammalia: (humans) produce milk for young and have hair (characteristics included here are only examples, students can list match others)
4. What are the main cells, divisions and functions of the nervous system in mammals?
   1. Neurons form the central (brain and spinal cord) and peripheral nervous system, which senses, interprets and responds to internal and external signals.
5. How is the nervous system progressively more complex and larger in various animal groups (from sponges and jellyfish to bilateria)?
   1. While sponges have no nervous system and jellyfish have a simple nerve net, Bilateria (all more complex animal groups) have a nervous system containing a brain, a spinal cord, and peripheral nerves. The size of this system increases from a few hundred cells in the simplest worms to over 100 billion in humans.
6. What are the main components and functions of a respiratory system in people?
   1. Respiratory system is made up of a throat, a trachea, bronchi and lungs containing alveolar sacs. Its functions include exchanging carbon dioxide produced by body’s cells for oxygen needed throughout the body for cellular respiration.
7. How do different animals obtain oxygen from their environment?
   1. Although cells of all animals require oxygen, when the organisms are small or thin like jellyfish, sponges flatworms and roundworms, gas exchange can occur by direct diffusion without a respiratory system. Earthworms use their outer moist skin and insects use external openings that lead to their internal tubes called trachea as their respiratory organs, while amphibians use both lungs and the skin. Mollusks like fish and echinoderms obtain oxygen through gills from an aqueous environment. Reptiles have alveoli but lack the extensive airway tree found in mammalian lungs. Birds do not inflate their lungs or air sacs since they lack a diaphragm and mammals have the most extensive surface area due to extensive alveolar sacs.
8. What is the main organ and the main functions of the excretory system?
   1. The main organ of the excretory system is the kidney; its functions are to filter blood, retain or excrete water, and excrete wastes (such as nitrogen containing urea), excessive compounds and salts to maintain homeostasis.
9. How do the excretory systems of different animals compare?
   1. Although all animals need to excrete unnecessary and toxic materials, the simplest animals do this directly between their cells and the environment, flatworms and earthworms use a nephridium, while insects use malpighian tubes. Animals that live in the water are either osmoconformers (maintain same body salt) concentrations as outside) such as crabs or osmoregulators (internal salt concentrations are kept lower than those of their surrounding marine environment) such as fish. All vertebrate have paired kidneys.
10. What function do the vessels and pump of the circulatory system perform?
    1. They transport blood that contains oxygen, carbon dioxide, nutrients, wastes and chemical signals (hormones) throughout the body. The circulatory system also plays a role in thermoregulation by constricting vessels to conserve heat and dilating them to remove heat.
11. Which animals are ectothermic vs. endothermic and how do these processes compare?
    1. Reptiles, amphibians, and fish are ectothermic (body temperature depends on outside temperature), While birds and mammals are endothermic (body temperature is kept in a narrow range regardless of outside temperatures due to high internal metabolic rates).
12. How would you compare the circulatory systems of different animals; is their circulatory system open or closed; how many chambers does their heart have?
    1. Most invertebrates have an open circulatory system (blood bathes organs directly) while annelids and vertebrates have a closed circulatory system (blood does not leave vessels). Fish have two chambered hearts (single pump), amphibians and some reptiles have a 3 chambered heart and birds and mammals have a 4 chambered heart (double pump).
13. What are the main functions of the digestive system’s 5 components?
    1. Mouth allows intake and initial breakdown of food; Esophogus allows for transport of food; Stomach mixes and digests food particles; small intestine absorb nutrients and Large intestine reabsorb water and excrete bile and feces.
14. How have body cavity types changed over the course of animal evolution?
    1. Most of the earliest animals such as flatworms do not have a body cavity (Acoelomates), roundworms have a partial cavity (Pseudocoelomates), and earthworms have a full body cavity (Coelomates) like most animals that evolved after them.
15. What 3 characteristics distinguish fungi from plants and animals?
    1. (1) Unlike animals, fungi have cell walls, but unlike plants whose cell walls are made of cellulose, fungi cell walls are made of chitin (2) Fungi are heterotrophic – they cannot perform photosynthesis like plants and unlike most animalsfungi are immobile and decompose not ingest other organisms. (3) Some fungi are single celled organisms that can divide by budding unlike plant and animal cells.
16. Why are fungi important to plants and to us?
    1. (1) Fungi form a symbiotic relationship with plant roots called mycorrhizae where the fungi form and extensive network of fibers which expands the surface area for absorption of water and minerals by the plants. (2) Scientist have isolated many antibiotics from fungi which also provide us with food, and since they are decomposers, fungi recycle organic compounds for organisms to use again
17. What are 6 examples of rare plants and Animals that inhabit Arkansas?
    1. Yellow-crested orchid
    2. Wild hyacinth
    3. Purple beardtongue
    4. Red-cockaded woodpecker
    5. Eastern collared lizard
    6. Hell Creek Cave Crayfish

( the above are examples; there are many more)