

May 2018

Question 2

2.1) Explain what is meant by phylogeny
Is the evolutionary history of a species or a taxonomic group of organisms, particularly the difference & similarities among them. Phylogeny is represented by a tree diagram called a phylogenetic tree (family tree)

2.2) Distinguish between monophyletic
Monophyletic taxon is one that includes a group of organisms descended from a single ancestor. All the descendants of the most recent ancestor are included in this group of species.

Paraphyletic is a group of organisms that includes an ancestor and some but not all of its descendants.

2.3) Describe homology and homoplasy
Homology refers to a similar character emerged from a common ancestry. Homology results from divergent evolution

Homoplasy refers to a similar character, structure, or molecular sequence that does not emerge from a common ancestry. Homoplasy results from convergent evolution.

2.4) Differentiate between orthologous & paralogous genes.
Orthologous are homologous genes that are the result of a speciation event. Orthologous genes are diverged after evolution giving rise to different species during

Speciation, genes generally maintain a similar function to that of the ancestral gene and its function is maintained through speciation event, though variations may arise within the gene after the point in which the species divergent.

Paralogous are homologous genes that are the result of a duplication event. Paralogous genes are genes that diverged within one species. It is a new gene that hold a new function. Genes arising during gene duplication of copy of the gene with a new function, through it is often related to the role of the ancestral gene.

2.5 What are the three major branches in the Tree of life Eubacteria, archaea & Eukaryotes.

Question 3

Write explanatory notes on the structure & function of the following.

3.1 Stomata. are tiny openings or pores in plant tissue that allow for gas exchange. Stomata are typically found in plant leaves but can also be found in some stems. Specialized cells known as guard cells surround stomata & function to open & close stomatal pores. Stomata allow a plant to take in carbon dioxide which is needed for photosynthesis. They also help to reduce water loss by closing when conditions are hot or dry.

Guard cells are specialized cells in the epidermis of leaves, stems and other organs that are used to control gas exchange. They are produced in pairs with a gap between them that forms a stomatal pore. The stomatal pores are largest when water is freely available and the guard cells turgid, and closed when water availability is critically low & the guard cells become flaccid.

Petiole: Is the transition between the stem & the leaf blade called the leaf stalk. The petiole helps conduct energy that the leaves absorb from the sun during photosynthesis to all parts of the plant. It also serves to transport nutrients & water that are absorbed and passed through the xylem, to the leaf. It is also responsible for the dramatic way deciduous trees lose their leaves during autumn.

Question 4

Environmental adaptations may result in roots being modified for a variety of functions. Name at least 5 different type of modified roots & their function

<u>Modified roots</u>	<u>Functions</u>
<u>Prop roots</u>	They support the tall, top-heavy tree
<u>Storage roots</u>	To store water & food
<u>Strangling aerial roots</u>	To anchor on other trees
<u>Buttress roots</u>	Give architectural support to the trunks of trees
<u>Contractile roots</u>	Pull the plant a little deeper into the soil.
<u>Parasitic roots</u>	Penetrate the host plants & withdraw nutrients

Question 5

5.1 Describe how the carbon dioxide is picked at the tissues & deposited in the lungs

- * Carbon dioxide produced by the body
- * Carbon dioxide is carried in blood
- * That is produce through cellular respiration
- * Converted 2 bicarbonate ions
- * It is transported to the lungs
- * Protein in reaction catalysed by enzyme carbonic anhydrase.

5.2 Discuss the process of homeostasis

- * Means "steady state"
- * Referring to the maintenance of internal balance
- * In achieving homeostasis, animals maintain a relatively constant internal environment even when the external environment changes significantly.
- * The human body maintains a fairly constant temp

Question 6

Name the hormones secreted by the following glands

6.1 Anterior pituitary

- | | |
|--------------------------------|---|
| * Follicle-stimulating hormone | * Prolactin |
| | * Stimulates mammary gland |
| * Luteinizing hormone | * Growth hormone |
| * Stimulate ovaries & testes | * Stimulate growth & metabolic function |
| * Thyroid-stimulating hormone | |
| * Stimulate thyroid gland | |

6.2) Gonads

* Ovaries (female)

* Estrogens - stimulate uterine lining growth

* Progestins - promote uterine lining growth

* Testes (male)

* Androgens - support sperm formation

6.3) Adrenal glands

* Adrenal medulla - Epinephrine & Norepinephrine

* Raise blood glucose level & increase metabolic activities

* Adrenal cortex - Glucocorticoids raise blood levels
- Mineralocorticoids promote retention of Na⁺

6.4) Pineal Glands

* Melatonin - participates in regulation of biological regulation

Question 7

7.1 List 5 difference between monocotyledonous and dicotyledonous plants

Monocotyledonous

- 1 Cotyledonous
- Stem vascular bundles are scattered
- Leaf veins are parallel
- Flowers of 3
- Fibrous root system
- 1 Pollen opening

Dicotyledonous

- 2 cotyledonous
- Stem vascular bundles are arranged in a ring
- Have net-veined leaves
- Flowers of 4-5
- Taproot system
- 3 Pollen opening

7.2 Discuss two groups of defence mechanisms against harmful agents in the body

* Specific mechanisms

- Part of the immune system
- Consist of the humoral immune response
- And the cellular immune response
- That produce antibodies & defence cells against specific antigens.

* Non-specific mechanisms

- Fight in a general manner.
- Against any type of antigen.
- A series of defence mechanisms are included.
- Such as the skin barrier against foreign agents.
- The mucus & ciliated epithelium of the airway.

7.3 Distinguish between cytokines & interferons.

Cytokines

Are cell signalling molecules that aid cell to cell communication in immune response & stimulate the movement of cells towards sites of inflammation, infection, tumour & trauma. Cytokines effect changes in cellular behaviour that are important in a number of physiological processes, including reproduction, growth, development & injury repair.

Interferons

Are a group of signalling proteins made & released by a host cells in response to the presence of several pathogens, such as viruses, bacteria, parasites, & also tumor cells. Interferons are named for their ability to "interfere" with viral replication by protecting cells from virus infections.

7.4 Give two major functions of the complement system

Lysis - Polymerization of specific activated complement on a foreign cell or enveloped virus leads to the formation of pores.

Activation of inflammation - Several peptides produced by proteolytic cleavage of complement proteins bind to vascular endothelial cells & lymphocytes.

Opsonisation - Certain complement proteins can bind to virions.

Question 8

8.1 Distinguish between chondrichthyes & osteichthyes

<u>Chondrichthyes</u>	<u>Osteichthyes</u>
- Mostly marine with a heterocercal tail	- Developed bony fish with homocercal tail
- Endoskeleton cartilaginous	- Endoskeleton bony
- Skin with placoid scales	- Skin with mucous glands, ganoid, cycloid, ctenoid scales
- Gills 5-7 pairs without opercula	- Gills 4 pairs with opercula
- No air bladder or lungs	- Swim bladder present
- Cloaca presents	- Cloaca absent
- Large, oily liver for buoyancy	- Gas-filled swim bladder for buoyancy.
- The mouth is ventral in position	- The mouth is apical in position

8.2 Differentiate between closed & open circulatory systems
also give one example of an animal each

Open circulatory system

- In this system the circulatory fluid bathes the organs directly
- In these animals, the circulatory fluid is called hemolymph
- Spaces surrounding the organs
- Arthropods & most molluscs are example of this system.

Closed circulatory system

- Is the system in which a circulatory fluid called blood.
- It is confined to vessels
- It is distinct from interstitial fluid
- One or more hearts pump blood into large vessels.