BIODIVERSITY

CHAPTER 1

LEARNING OUTCOMES

1.1 Biodiversity And Classification

a) State the types of biodiversity (genetic, species and ecosystem).

b) State hierarchical classification

c) Explain briefly the Three-domain system (Carl Woese, 1977) - Bacteria, Archaea and Eukarya based on rRNA base sequence.

1.2 Domain Bacteria And Domain Archaea

a) State the two domain of prokaryotes, Bacteria (*E.coli*) and Archaea (*Sulfolobus* sp.)

b) Differentiate between the two domain of prokaryotes. Bacteria (*E. coli*) and Archaea (*Sulfolobus* sp.) based on: cell wall structure, association of histone to DNA, structure of membrane lipids

c) Describe the diversity of bacteria

I. cell shape (coccus,bacillus,spirillum and vibrio)

II. Gram-stain (Gram-positive, Gram-negative)

d) Explain the roles of bacteria: Recycling of chemical elements in ecosystem (nitrogen fixation, e.g *Rhizobium* sp.), Symbiotic (enterobacteria e.g *E. coli* in human intestine), Pathogenic (e.g *Salmonella* sp.) , In research and technology (bacteria plasmid).

1.3 Diversity Of Bacteria: (Experiment 1- Diversity Of Bacteria)

1.4 Domain Eukarya: Kingdom Protista

a) State the unique characteristics of Protista

b) State the classification of Protista based on the unique feature:

i. Two major phyla of algae (photosynthetic pigment): Chlorophyta (*Chlamydomonas* sp.); Phaeophyta (*Fucus* sp.)

ii. Four major phyla of Protozoa (locomotion): Euglenophyta (*Euglena* sp.); Rhizopoda (*Amoeba* sp.); Ciliophora (*Paramecium* sp.); Apicomplexa (*Plasmodium* sp.)

c) Explain the roles of Protista in ecological community:

Roles in CO_2 fixation (e.g. phytoplankton), Food source (*Chlorella* sp.), Eutrophication /algal bloom (green algae), Red tide (dinoflagellates), Human health (*Plasmodium* sp. – malaria), Sewage treatment (e.g. Protozoa)

1.5 Domain Eukarya Kingdom Fungi

a) State the unique characteristics of Fungi.

b) State the classification of Fungi phyla based on the spore bearing structure: Zygomycota (*Rhizopus* sp.); Ascomycota (*Penicillium* sp.); Basidiomycota (*Agaricus* sp.)

c) Explain the role of Fungi: Decomposer, Symbionts, Pathogens, Commercial importance in food production (yeast in fermented food), Pharmaceutical (*Penicillium* sp. produce penicillin).

1.6) Domain Eukarya: Kingdom Plantae

a) Describe alternation of generation as the unique characteristic of Plantae.
b) State the classification of Plantae into four groups: Bryophytes, Pteridophytes, Gymnosperms, Angiosperms

1.6.1 Bryophytes

a) Describe the unique characteristics of bryophytes
b) State the classification of bryophytes into three division/phyla: Hepatophyta (*Marchantia* sp.), Bryophyta (*Polytrichum* sp.) , Anthocerophyta (*Anthoceros* sp.)
c) State the terrestrial adaptation for bryophytes.

1.6.2 Pteridophytes

a) Describe the unique characteristics of the pteridophytes
b) State the classification of pteridophytes into two divisions/ phyla: Lycophyta (*Lycopodium* sp., *Selaginella* sp.) Pterophyta (*Dryopteris* sp.)

1.6.3 Brophytes and Pteridophytes (Experiment 2)

a) Observe the diversity of species in Brophytes and Pteridophytes
b) Construct scientific drawing of Brophytes and Pteridophytes

1.6.4 Gymnosperms

a) Describe the unique characteristics of Gymnosperms.
b) State the classification of gymnosperms into four divisions/phyla: Cycadophyta (*Cycas* sp.), Coniferophyta (*Pinus* sp.), Ginkgophyta (*Ginkgo biloba*) Gnetophyta (*Gnetum* sp.)

1.6.5 Angiosperms

a) Describe the unique characteristics of angiosperms (Phylum Anthophyta)

1.6.6 Evolutionary relationship in plant kingdom

a) Explain the evolutionary relationship among groups in the plant Kingdom. (bryophytes to angiosperms) based on: size, dominance of gametophytes and sporophytes, dependence of gametophytes and sporophytes, water dependence in fertilization, presence of complexity of vascular tissues. embryo protection.

1.7 Domain Eukarya: Kingdom Animalia

a) Describe the unique characteristics of Kingdom Animalia
b) State the classification of Animalia into nine phyla: Porifera,Cnidaria, Platyhelminthes, Nematoda, Annelida, Arthropoda, Mollusca, Echinodermata and Chordata
c) Discover the unique characteristics of the following Phyla: Porifera (e.g. *Leucosolenia* sp.), Cnidaria (e.g. *Obelia* sp.), Platyhelminthes (e.g. *Taenia* sp.), Nematoda (e.g. *Ascaris* sp.), Annelida (e.g. *Pheretima* sp.), Arthropoda (e.g. *Valanga* sp.), Mollusca (e.g. *Achatina* sp.), Echinodermata (e.g. *Asterias* sp.), Chordata (e.g. *Amphioxus* sp.)
d) Explain evolutionary relationship of animal based on their: level of organization, germ layers, body symmetry, body coelom and segmentation

OBJECTIVE QUESTIONS

1.1 BIODIVERSITY AND CLASSIFICATION

1. Who organized living things by creating binomial nomenclature?
   A. Carolus Linnaeus
   B. Robert Hooke
   C. Anton van Leeuwenhoek
   D. James Watson

2. Taxonomy is the science of
   A. making new biological series
   B. generating cladograms that represent evolutionary relationships between organisms
   C. naming, describing and classifying organisms
   D. conserving biodiversity

3. Taxonomy is one of important aspect in biology. Which of the following is not the advantage of taxonomy?
   A. Taxonomy enable ecologist to discover ecological relationship between organism and the environment.
   B. Taxonomy provides evidence to support organic evolution.
   C. Taxonomist uses an artificial classification system. This approach is simply to classify and is objective.
   D. Taxonomy make the study of morphology, anatomy and physiology easier.

4. Three domain classification was proposed by
   A. Carl Woese
   B. Cavalier smith
   C. R.H.Whittaker
   D. Aristotle

5. The correct order of classification from the BROADEST group to the most narrow is:
   A. Species, Genus, Family, Order, Class, Phylum, Kingdom
   B. Kingdom, Phylum, Class, Family, Order, Genus, Species
   C. Kingdom, Family, Order, Phylum, Class, Genus, Species
   D. Kingdom, Phylum, Class, Order, Family, Genus, Species

6. Which classification level would contain the greatest number of species?
   A. Class
   B. Division of phylum
   C. Domain
   D. Family

7. *Zea mays* is the scientific name of the corn plant. *Zea* is the _____name.
   A. Class
   B. Division
   C. Genus
   D. Family

8. How would the scientific name of the yellow perch, *Perca flavescens*, be abbreviated?
   A. *Perca f.*
   B. *Perca Fl.*
   C. *P. flavescens*
   D. *Perca. fl.*

9. Which kingdom contains the protozoa, slime molds and algae?
   A. Prokaryotae
   B. Fungi
   C. Protista
   D. Plantae

1.2 DOMAIN BACTERIA AND DOMAIN ARCHAEA

1. Which of following statements about bacteria is FALSE?
   A. A small percentage of bacteria are pathogenic
   B. Some bacteria can photosynthesize
   C. Bacteria are important decomposers
   D. Bacteria are not cellular and are sometimes not classified as life forms

2. Gram-positive bacteria would stain _____ in a gram-stain because of a thick layer of _____ in their cell walls.
   A. Green; peptidoglycan
   B. Purple; peptidoglycan
   C. Green; cellulose
   D. Purple; polysaccharides

3. Penicillin works most effectively against gram-positive bacteria because:
   A. Penicillin affects cell membranes
   B. They have a thick peptidoglycan cell wall and penicillin affects the synthesis of peptidoglycan
   C. They have special protein channels that allow penicillin to enter the cell and halt the cell cycle
   D. They are smaller than gram-negative bacteria and thus, easily take up penicillin by diffusion

4. The most significance difference between the Archaea and the bacteria is:
   A. Lack of a nuclear envelope in the Archaea
   B. The absence of the 70S ribosomes in the bacteria
   C. The presence of a single filament flagellum in the bacteria
   D. The absence of peptidoglycans in the cell walls of Archaea

5. Which statement about bacterial cell walls is FALSE?
   A. Cell walls prevent cells from bursting in hypotonic environment.
   B. Cell walls prevent cells from dying in hypertonic condition
   C. Bacterial cell walls are similar in function to the cell walls of many protists, fungi and plants
   D. Cell walls provide the cell with a degree of physical protection from the environment

6. Which statement about gram-negative bacteria is CORRECT?
   A. Penicillin are the best antibiotics to use against them.
   B. They often possess an outer membrane containing toxic lipopolysaccharides
   C. Their chromosomes are composed of DNA tightly wrapped around large amounts of histone protein
   D. Their cell wall are primarily composed of peptidoglycan.

7. Which of these are the differences between bacteria and Archaea?
   I. Cell wall
   II. Lipids in the membrane plasma
   III. The presence of the membrane bounded organelles

IV. The association of DNA to histone protein

A. I, and II only
B. II and II only
C. I, II, III
D. I, II and IV

8. Which of the following organism is gram-negative bacteria?
A. *Escherichia coli*
B. *Streptococcus* sp.
C. *Staphylococcus aureus*
D. *Chlamydomonas* sp.

9. Which of the following statements about bacteria is false?
A. A small percentage of bacteria are pathogenic.
B. Some bacteria can photosynthesize
C. Bacteria are important decomposers.
D. Bacteria are not cellular and are sometime not classified as life forms.

10. Bacteria:
A. are incapable of locomotion
B. move by pili
C. move by cilia
D. move by rotating flagella

11. Rod-shaped bacteria are called
A. bacilli
B. diplococci
C. vibrio
D. spirillum

1.4 DOMAIN EUKARYA: KINGDOM PROTISTA

1. Most protozoa may be characterized as:
A. Autotrophic
B. heterotrophic
C. photosynthetic
D. chemotrophic

2. Most protists are:
A. aquatic
B. parasitic
C. terrestrial
D. arboreal

3. Members of phylum _____ move via pseudopodia
A. Rhizopoda
B. Ciliophora
C. Oomycota
D. Zoomastigina

4. Pseudopodia are used by Amoeba for ingesting food as well as for:
A. Reproduction
B. Excretion
C. Digestion
D. Movement

5. Malaria is caused by an ___ which is carried to a host by a _____.
A. apicomplexan; fly
B. apicomplexan; mosquito
C. apicomplexan; body louse
D. actinopod; fly

6. Members of this phylum have both plant-like and animal-like characteristics, making classification difficult.
A. Chlorophyte
B. Rhodophyta
C. Euglenophyta
D. Dinoflagellata

7. Members of which phylum are one of the most important producers in marine ecosystem, although sometimes they form blooms known as red tides?
   A. Chlorophyta
   B. Rhodophyta
   C. Euglenophyta
   D. Dinoflagellata

8. Members of the phylum __ are thought to have given rise to plants
   A. Chlorophyta
   B. Rhodophyta
   C. Euglenophyta
   D. Dinoflagellata

9. Which of the following is FALSE for protists?
   A. They can be autotrophic or heterotrophic.
   B. They can be prokaryotic or eukaryotic
   C. They can be single-celled or multi-celled.
   D. They can be mobile or immobile.

10. The large seaweeds belong to which group?
   A. Cyanobacteria
   B. Red algae
   C. Green algae
   D. Brown algae

11. Listed below are the characteristics of an organism,
   - Unicellular, round-shaped
   - Green in colour
   - Has a cup-shaped chloroplast

   The organism belongs to phylum
   A. Euglenophyta
   B. Phaeophyta
   C. Chlorophyta
   D. Rhizopoda

12. Which of the following statements is true about green algae?
   A. They are non-photosynthetic
   B. Their main energy storage is starch
   C. They are unicellular protists
   D. They perform asexual reproduction only.

13. Which of the following protists is unicellular and heterotrophic?
   A. Algae
   B. Amoeba
   C. Paramecium
   D. Both *Amoeba* and *Paramecium*

14. Which of the following organism is not a protozoans?
   A. *Paramecium*
   B. *Euglena*
   C. *Amoeba*
   D. *Fucus*

15. Flagellum is used by *Euglena* for:
   A. movement
   B. excretion
   C. reproduction
   D. avoiding predation

16. In *Paramecium*, the surface of the cell is covered by thousands of short, hair-like _____
   A. plasmodesmata
   B. pseudopods
   C. flagella
   D. cilia

17. In freshwater ciliates, special organelles called _____ control water regulation.
   A. flagella
   B. contractile vacuole
   C. lysosome

D. peroxisome

1.5 DOMAIN EUKARYA KINGDOM FUNGI

1. Which of the following is NOT a characteristic of Fungi?
   A. Membrane-bounded nuclei
   B. Mitochondria
   C. Cell wall of lipopolysaccharides
   D. Primarily terrestrial in habitat

2. The cell wall of fungi are composed of:
   A. cellulose
   B. lipid
   C. glycogen
   D. chitin

3. An example of a unicellular fungus is:
   A. a mold
   B. a mushroom
   C. a yeast
   D. a rust

4. A _____ is a filament that makes up the vegetative body of most fungi
   A. thallus
   B. protonema
   C. fruiting body
   D. hypha

5. Which group of fungi have hyphae that are multinucleate and not divided by septa?
   A. Monokaryotic
   B. Unicellular
   C. Zygomycete
   D. Coenocytic

6. A _____ is a tangled mat of hyphae.
   A. Sporocarp
   B. Sporangia
   C. Zygospore
   D. Mycellium

7. Most fungal spores are _____ reproductive cells that are produced _____
   A. motile; sexually only
   B. motile asexually only
   C. nonmotile; sexually only
   D. nonmotile; sexually or asexually

8. An example of a member of phylum Zygomycota is:
   A. the common edible mushroom
   B. yeast
   C. the black bread mould
   D. the truffle

9. The vegetative body of a fungus is made up of tiny filament know as
   A. septa
   B. thallus
   C. hyphae
   D. fruiting body

10. Which of the following is incorrectly matched?
    A. Basidiomycota – club fungi
    B. Ascomycota – sac fungi
    C. Ascomycota – yeast
    D. Zygomycota – lichens

11. The following are mode of asexual reproduction in fungi except
    A. fragmentation
    B. budding
    C. conidia
    D. basidiospore

12. Which of the following do all fungi have in common?
    A. Meiosis in basidia

B. Coenocytic hyphae
C. Sexual in life cycle
D. Absorption of nutrients

13. In septate fungi, what structure allow cytoplasmic streaming to distribute needed nutrients, synthesized compounds and organelles throughout the hyphae?
A. Chitinous layers in cell walls
B. Pores in septal walls
C. Complex microtubular cytoskeletons
D. Tight junctions that form in septal walls between cells.

14. Mushrooms with gills, typically available in supermarkets, have meiotically produce spores located in or on _____ and belong to the phylum _____ .
A. asci; Basidiomycota
B. hyphae; Zygomycota
C. basidia; Basidiomycota
D. hyphae; Ascomycota

15. Fungi are like animals because...
A. they all reproduce sexually.
B. they get their food from other organisms.
C. they can move from one place to another.
D. They are not like animals.

16. Sexual reproduction involves ascospores that are produced in ascus and asexual reproduction involved conidia is known as
A. Basidiomycetes
B. Ascomycota
C. Zygomycota
D. Fungomycota

17. In sac fungi, karyogamy and meiosis occur in
A. ascospores
B. antheridia
C. asci
D. basidia

18. All fungi share which of the following characteristics?
A. Symbiotic
B. Heterotrophic
C. Pathogenic
D. Flagellated

19. Basidiomycetes differ from other fungi in that they
A. Have no known sexual stage
B. Have long-lived dikaryotic mycelia
C. Produce resistant sporangia that are initially heterokaryotic before karyogamy and meiosis occur.
D. Have members that are symbionts with algae in lichen.

20. Fungi get their food by
A. Eating bugs
B. Absorbing sunlight
C. Releasing chemicals that breakdown organic matter and absorb the nutrients
D. Through animal waste and decaying wood

1.6 DOMAIN EUKARYA: KINGDOM PLANTAE

1. Lack true roots and use tiny hair-like stems for absorption of water and nutrients from the soil
   A. Bryophytes
   B. Angiosperms
   C. Gymnosperm
   D. Conifers

2. Each of the following is a general characteristic of bryophytes except
   A. a cellulose cell wall
   B. vascular tissues
   C. chlorophylls a and b
   D. being eukaryotic

3. Which of the following was an evolutionary adaptation vital to the survival of the bryophyte?
   A. The switch from the gametophyte to the sporophyte as the dominant generation of the life cycle.
   B. The development of branched sporophytes.
   C. The birth of pollination.
   D. The packaging of gametes into the gametangia.

4. Which of the characteristics is shared by algae and seed plants?
   A. Embryo development within gametangia
   B. Roots and shoot
   C. Chloroplast
   D. Pollen

5. Which of the following characteristics are not found in all vascular plants?
   A. Dominant sporophyte generation
   B. Production of seeds
   C. Lignified xylem
   D. Phloem tissue

6. One of major distinctions between plants and the green algae is that
   A. Only green algae have flagellated swimming sperm.
   B. Embryos are not retained within parental tissues in green algae.
   C. Meiosis proceeds at a faster pace in green algae than in plants.
   D. Chlorophyll pigments in green algae are different from those in green plants.

7. Which of the following statements are true about the plants in the phylum Bryophyta?
   I. They have true roots.
   II. They are non-vascular plants
   III. Gametophyte generation is dominant
   IV. Sporangium is the sporophyte generation

   A. I, II and III
   B. I, II and IV
   C. II, III and IV
   D. I, II, III and IV

8. Mosses are characterized by which of the following?
   A. A dominant gametophyte with dependent sporophyte
   B. A dominant gametophyte with independent sporophyte
   C. A dominant sporophyte with independent gametophyte
   D. A dominant sporophyte with gametophyte reduced to a few cells

9. Examples of these plants include mosses, liverworts, and other plants with no xylem or phloem
   A. dicot

B. vascular plant
C. monocot
D. non-vascular plant

10. Which of the following plants are non-vascular plants?
A. Ferns
B. Mosses
C. Conifers
D. Flowering plants

11. Bryophytes are the simplest group of terrestrial plants. What adaptations have taken place to adopt life on land?
I. Their gametes develop within gametangia.
II. They have well-developed structural system.
III. They are covered by a waxy cuticle.
IV. They produce seed that protected by their fruits.

A. I and II
B. I and III
C. II and III
D. II and IV

12. One type of asexual reproduction in liverworts involves:
A. seta
B. gemmae
C. fronds
D. archegonia

13. In mosses, the ____ grows into the leafy gametophyte plant.
A. protonema
B. seta
C. capsule
D. prothallus

14. Prothallus is a _____
A. sporophytic stage of fern
B. gametophytic stage of fern
C. sporophytic stage of mosses
D. gametophytic stage of mosses

15. Which of the following sequences of phyla shows the plant evolution from simple to complete?
A. Pterophyta – Bryophyta – Coniferophyta – Ginkgophyta
B. Bryophyta – Gnetophyta – Pterophyta – Angiospermophyta
C. Bryophyta – Pterophyta – Coniferophyta – Angiospermophyta
D. Pterophyta – Bryophyta – Coniferophyta - Angiospermophyta

16. Which of the following statements is true about the prothallus of Dryopteris?
A. Haploid and dependent on the sporophyte generation
B. Diploid and dependent on the gametophyte generation
C. Haploid and free living
D. Diploid and free living

17. Spore-producing sori are located on the undersides of the leaves of a
A. fern frond
B. monocot sporophyte
C. liverworts gametophyte
D. fern gametophyte

18. Which of the following statements are rue about gymnosperms?
I. Have cones as reproductive organs
II. Ovules are not protected by ovary
III. Seed is not protected by pericarp
IV. Spores are dispersed by wind

A. 1, II and IV
B. I, III and IV
C. II, III and IV
D. I, II, III and IV

19. Which of the following produces naked seeds?
    A. Angiosperms
    B. Ferns
    C. Gymnosperms
    D. Bryophytes

20. Which of the following are the characteristics of plants from the class Dicotyledoneae of the phylum Angiospermophyta?
    I. In the stem, vascular bundles are arranged in a ring form
    II. In the roots, the xylem is located at the centre
    III. have tap roots
    IV. Floral parts are divisible by four or five

    A. I, II and III
    B. I, II and IV
    C. II, III and IV
    D. I, II, III and IV

21. A heterosporous plant is one that
    A. Produce a gametophyte that bears both antheridia and archegonia.
    B. Produce microspores and megaspores, which give rise to male and female gametophyte.
    C. Produces spores all year long instead of during just one season
    D. Reproduces only sexually.

22. Which of the following explain the relationship between *Zea Mays* and *Pinus*?
    A. Same order, different families
    B. Same class, different orders
    C. Same phylum, different class
    D. Same kingdom, different phylum

23. Which of the following is not a characteristic that distinguishes gymnosperms and angiosperms from other plant?
    A. Alternation of generation
    B. Ovules
    C. Integuments
    D. Pollen

24. The most diverse, successful and familiar group of plants today are the:
    A. gymnosperms
    B. bryophytes
    C. ferns
    D. angiosperms

25. Both gymnosperms and angiosperms
    A. are heterosporous
    B. possess vascular tissues
    C. produce seed
    D. all of the above

26. Most conifers have separate male and female reproductive on the same tree. This condition is referred to as:
    A. dioecious
    B. monoecious
    C. homosporous
    D. heterosporous

27. Conifers have several adaptive features to reduce water loss. Which one of the following is incorrect?
    A. Needle like leaves
    B. thick cuticle
    C. sunken stomata
    D. producing pollen grains

28. In flowering plants, the ____is the site of meiosis and ultimately, the production of pollen.
    A. stigma
    B. style
    C. anther
    D. carpel

29. Which of the following characteristics are similar between *Zea Mays* and *Dryopteris*?
    A. Presence of vascular tissue
    B. Double fertilization
    C. Water dependent male gametes
    D. Free living gametophyte generation

1.7 DOMAIN EUKARYA: KINGDOM ANIMALIA

1. What is the phylogenetic system of classification based on?
   A. Evolutionary relationship
   B. Chemical constituents
   C. Morphological features
   D. Cytological characteristics

2. Coelom is a type of body cavity which is completely lined with
   A. Ectoderm
   B. Mesoderm
   C. Endoderm
   D. Protoderm

3. Which of the following phyla of the animal kingdom has the following characteristics: no symmetry, no coelom and no segment?
   A. Porifera
   B. Nematoda
   C. Cnidaria
   D. Annelida

4. What is the hollow center of a sponge called?
   A. spongocoel
   B. stomach
   C. ostia
   D. spicules

5. What is the name of the exit opening at the top of the spongocoel?
   A. spicule
   B. ostia
   C. pore
   D. osculum

6. These cells carry nutrients to all parts of the sponge.
   A. collar cells
   B. amoebocytes
   C. flagella cells
   D. choanocytes

7. Almost all sponge species ingest their food by a special process called:
   A. ostia feeding
   B. pore feeding
   C. filter feeding
   D. pinacytosis

8. What type of cells create the current that circulates water through the sponge body?
   A. choanocytes
   B. pinacocytes
   C. amoebocytes
   D. archaeocytes

9. Sponges are _____, meaning there are both male and female cells in one individual.
   A. dioecious
   B. trioecious
   C. hermaphrodite
   D. plioecious

10. The hard "skeleton" structures in a sponge are called...
    A. Spongin
    B. Spicules
    C. Amebocytes
    D. Pinococytes

11. What are the cells in the sponge that are primarily responsible for trapping food particles from circulating water?

A. Amoebocytes
B. Choanocytes
C. Mesohyl cells
D. Epidermal cells

12. An animal is diploblastic, radially, symmetrical, has a single opening for ingestion and egestion and it is dimorphic. How is this animal classified?
A. As a porifera
B. As a cnidarian
C. As a platyhelminth
D. As a protozoan

13. Which of the following is a correct description of the Cnidarian digestive tract?
A. A complete digestive tract consisting of two openings.
B. A complete digestive tract consisting of one opening
C. An incomplete digestive tract consisting of two openings.
D. contains only a mouth and an internal cavity.

14. Cnidarians are the most primitive organism with
A. coelom
B. triploblastic body wall
C. excretory cells
D. nerve net

15. Which of the following is diploblastic phylum of aquatic predators?
A. Cnidaria
B. Annelida
C. Mollusca
D. Echinodermata

16. Which of the following characteristics do Platyhelminthes and Cnidarians have in common?
A. The present of complicated reproductive system
B. Diploblastic condition
C. Three germ layers and no coelom
D. No true body cavity

17. Platyhelminthes are known as _____
A. roundworms
B. flatworms
C. segmented worms
D. spherical

18. Platyhelminthes have _____ circulatory system.
A. no
B. central
C. open
D. closed

19. Which of the following statements regarding parasitic flatworms is true?
I. Parasitic flatworms have well-developed sensory and nervous systems.
II. They absorb nutrients from the host
III. They utilize a secondary host to transport the species to a primary host

A. I only
B. I and II only
C. II and III only
D. I, II and III

20. As a group, how do poriferans, cnidarians and Platyhelminthes differ from other animal phyla?
A. They are radially symmetrical
B. They do not have body cavity
C. They are diploblastic
D. They lack true tissues

21. Which animal phyla is associated with pseudocoelomate?
A. Nematoda
B. Porifera
C. Cnidaria
D. Platyhelminthes

22. Which statement about earthworm is true?
    I. They are hermaphrodites.
    II. Most segments have a pair of nephridia that function to remove waste.
    III. The setae are attached to parapodia on most segments.
    A. I only
    B. I and II only
    C. II and III only
    D. I, II and III

23. A characteristic feature of annelids is
    A. Nematocysts, which are stinging structures on their tentacles
    B. Collar cells which pump water through their bodies.
    C. Metameric segmentation which is the repetition of organs and tissues at intervals along the body.
    D. Radula which is a ribbon of small teeth used in feeding

24. During copulation, two earthworms are held together by mucus secreted by the
    A. Clitellum
    B. Gizzard
    C. Metanephridia
    D. Anus

25. Which of the following is an advantage of the coelom formation in the body of some annelids?
    I. The digestive system can move independently of the body wall: therefore peristalsis can occur anytime
    II. The coelom can acts as the main excretory organ because its fluid is able to eliminate waste products.
    III. The coelom is able to function as a hydrostatic skeleton that is able to change its shape without changing its volume

    A. I only
    B. I and II only
    C. II and III only
    D. I, II and III

26. A cross section of the body of animal has the following structures from the outer layer to the inside, chaetae, cuticle, epidermis, circular muscles, longitudinal muscles, nephridium, gut muscles and gut. This animal is from the phylum
    A. Coelentrata
    B. Nematoda
    C. Mollusca
    D. Annelida

27. Nematodes and arthropods are superficially alike in that they
    A. moult a resistant cuticle
    B. have larvae that differ in appearance from adults
    C. show evidence of previous radial symmetry
    D. depend on a body cavity for locomotion

28. Why are annelids, arthropods and molluscs placed in the same clade?
    A. They are triploblastic
    B. They are protostomes
    C. They are bilaterally symmetrical
    D. They are deuterostomes

29. The most successful phylum in the animal kingdom, in terms of numbers and diversity of distributions is
    A. mammals
    B. aves
    C. annelids
    D. arthropods

30. Individuals in a cnidarian colony that have different body forms is an example of
A. radial symmetry
B. polymorphism
C. morphogenesis
D. polyploidy

31. Which of the following typical structure characteristics of all adult arthropods?
I. Triploblastic
II. Tracheal system
III. Coelomate
IV. Jointed exoskeleton

A. I, II and III
B. I, III and IV
C. II, III and IV
D. I, II, III and IV

32. Amphibia, Reptilia and Mammalia have similarities because all of them
A. are unable to control their body temperature
B. have hearts with four chambers
C. have pharyngeal gill slits at an
D. early stage of their development produce eggs that have shells

33. Which of the following organism are deuterostomes?
A. Molluscs
B. Echinoderms
C. Chordates
D. B and C

34. Echinoderms are
A. deuterostomes
B. protostomes
C. radiate
D. acoelomates

36. Which of the following is a distinct characteristic of echinoderms?
A. Nervous system
B. Excretory system
C. Calcareous endoskeleton
D. Respiratory system

37. Which of the following is true about echinoderms?
I. Water vascular system
II. No excretory organs
III. Exclusively marine habitat

A. I only
B. I and II only
C. II and III only
D. I, II and III

38. Which of the following is a characteristic of adult echinoderms?
A. Spiral cleavage
B. Gastrovascular cavity
C. Exoskeleton
D. Radial symmetry

39. In most echinoderms, the larva exhibit
A. Radial symmetry
B. Bilateral symmetry
C. Asymmetry
D. A flexible notochord

40. While working in your garden, you discover a worm-like, segmented animal with two pairs of jointed legs per segment. The animal is probably a
A. millipede
B. centipede
C. caterpillar
D. polychaete worm

41. Which of the following is not a characteristic of most members of the phylum Annelida?
A. Hydrostatic skeleton
B. Segmentation
C. Pseudocoelom

D. Metanephridia

42. What is true of echinoderms?
A. They have an endoskeleton of hard calcareous plates
B. Tube feet provide motility
C. They have a pseudocoelom
D. A and B

43. Nematode worms and annelid worms share which of the following features?
A. Presence of hydrostatic skeleton
B. Presence of circulatory system
C. Presence of segmentation
D. Presence of body cavity

44. Which of the following characteristics is found in all molluscs?
A. All molluscs have shells
B. All molluscs are herbivores
C. All molluscs have mantle
D. All molluscs are aquatic

45. Which of the following physiological systems is possessed by both Annelida and Mollusca?
A. Endoskeletons
B. Gills
C. Tracheal system
D. Hydrostatic skeleton

46. A notochord is
A. Located under the ventral surface of the body.
B. A rudimentary internal skeleton made of cartilage
C. Found only in primitive chordate
D. All of the above

47. Which of the following is true about pharyngeal slits?
A. Unique chordate characteristic
B. Found in fish, crabs and aquatic insects
C. Found in higher invertebrates and vertebrates
D. Present in annelids and nematodes

STRUCTURED QUESTIONS

1. **FIGURE 1** below shows the structure of *Rhizopus.*

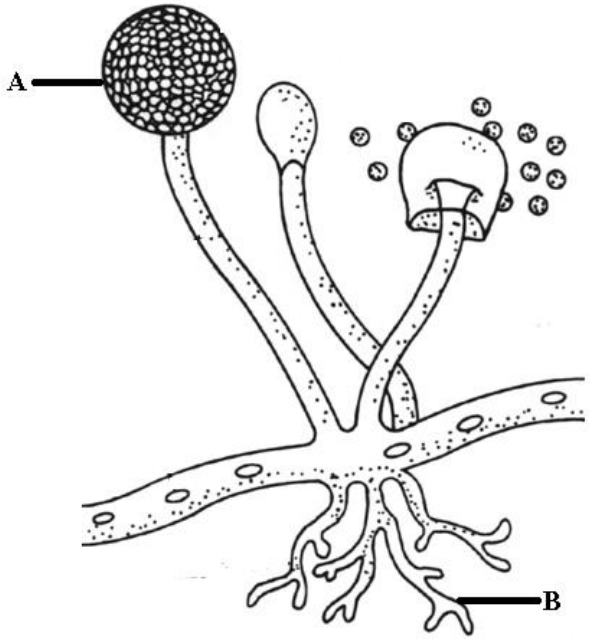


FIGURE 1

a) Label structure **A** and **B**.

[2 *marks*]

_____

_____

b) Name TWO other major phyla of fungi based on types of spore-bearing structure.

[2*marks*]

_____

_____

c) List the importance of fungi.

[2 *marks*]

_____

_____

d) State and describe the nutritional mode of *Rhizopus*?

[4*marks*]

_____

_____

_____

2. **FIGURE 2** shows the classification of Kingdom Fungi.

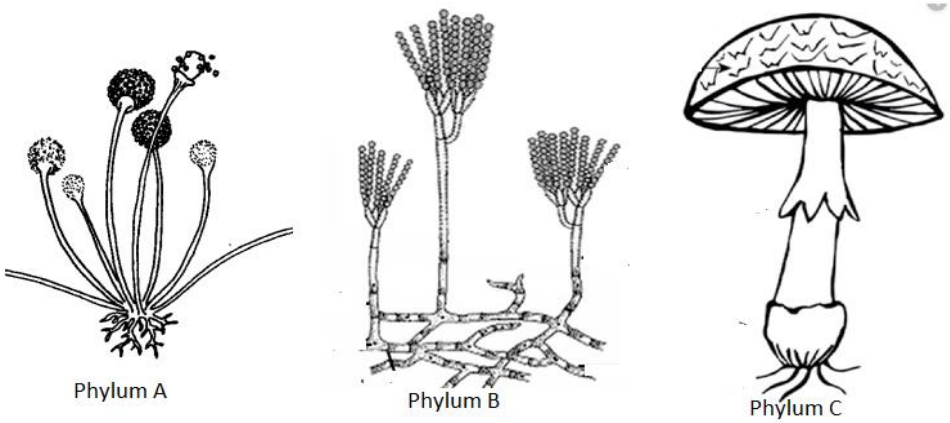


FIGURE 2

a) State the phyla A, B and C

[3 *marks*]

_____

_____

_____

b)Name the sexual spores for phyla B and C

[2 *marks*]

_____

_____

c) Explain the characteristic that shows fungi are plant-like and animal-like.

[2 *marks*]

_____

_____

d) Give THREE unique characteristics of the Kingdom Fungi

[3 *marks*]

_____

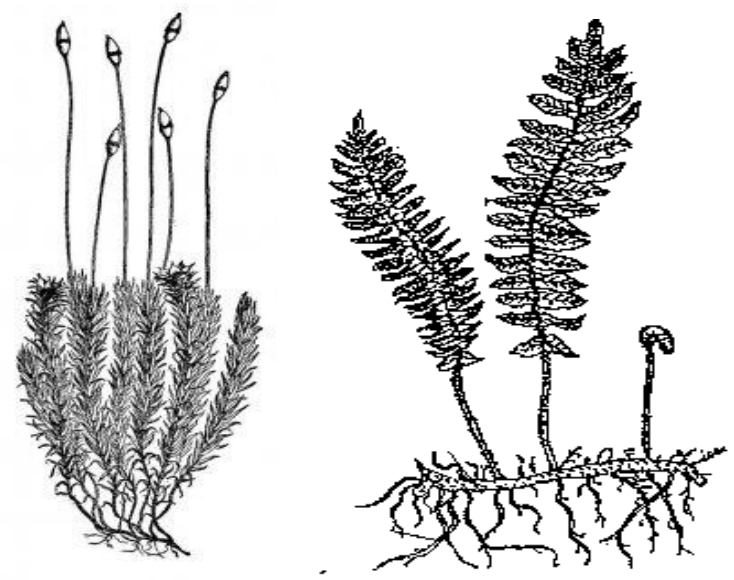
_____

3. Fill in the blanks in the table below

Phyla	Common name	Hypha organization	Reproduction		Example
Zygomycota			asexual		
			sexual		
Ascomycota			asexual		

			sexual		
Basidiomycota			asexual		
			sexual		

4. **FIGURE 3** below shows TWO types of plant that may be found in the same habitat.



Plant A **Plant B**

FIGURE 3

a) State the name of each plant and its phylum.

[2 *marks*]

_____

_____

b) State the terrestrial adaptations of **Plant A**.

[2 *marks*]

_____

_____

c) Compare **Plants A** and **B**.

[4 *marks*]

_____

_____

d) **Plant B** have both a sporophyte and gametophyte generation. Give **TWO** distinct differences between the **Plant B** sporophyte and gametophyte.

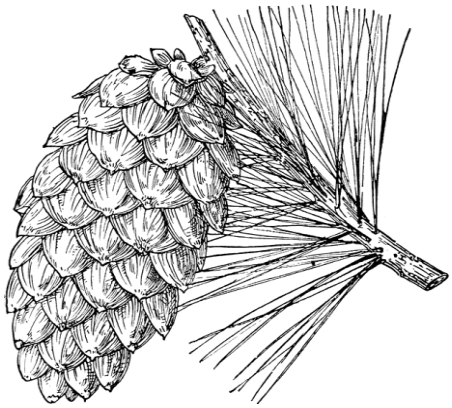
[2 *marks*]

_____

_____

5. **FIGURE 4** shows two type of plants.

Plant A



Plant B

FIGURE 4

a) Name the phyla and give an example for each.

[4 *marks*]

_____

_____

_____

b) State how **plant A** and **plant B** reproduce.

[2 *marks*]

_____

_____

c) What is the dominant generation of plant in **FIGURE 4**.

[1 *mark*]

_____

d) Which plant is considered as more advanced? Explain.

[3 *marks*]

_____

_____

6. Complete the table below with a tick / if the statement is true or a cross × if it is not true

Characteristics	Bryophytes	Pteridophytes	Gymnosperms	Angiosperms

Contain vascular tissue				
Gametophyte generation dominant				
Sporophyte generation dominant				
Contain free swimming sperms				
Homosporous				
Heterosporous				

7. Complete the table below for differences between angiosperms and gymnosperms.

Characteristics	Angiosperms	Gymnosperms
Ovule		
Phloem		
Xylem		
Reproductive structure		
Double fertilization		
Seed		

8. Complete the table based on the evolutionary relationships among groups in the plant kingdom.

	Bryophytes	Pteridophytes	Gymnosperms	Angiosperms
Size				
Dominant generation				
Dependence of gametophytes and sporophytes				
Water dependence in fertilization				
Presence of vascular tissues				
Embryo protection				

9. **FIGURE 5** shows two organisms from different phylum.

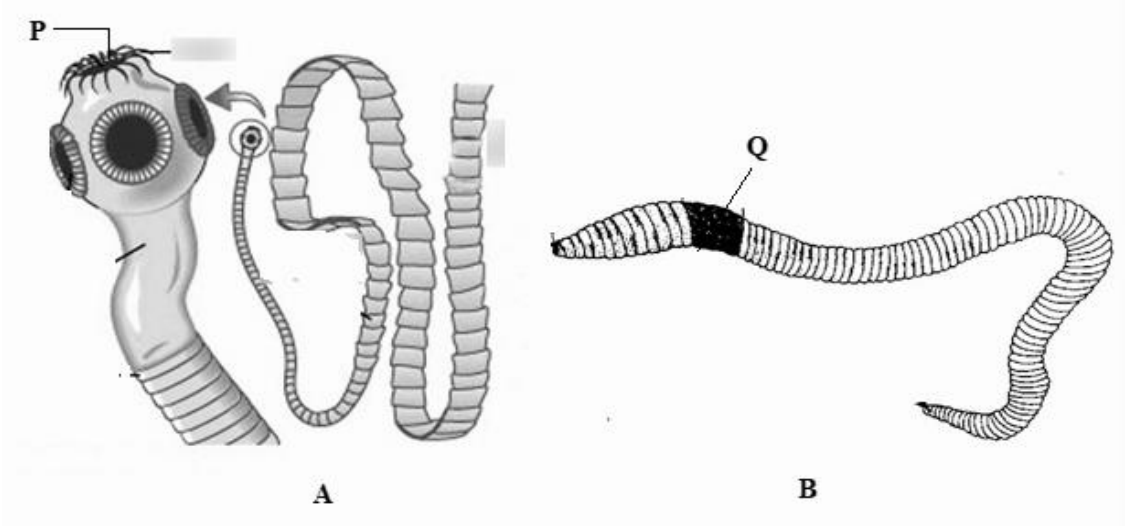


FIGURE 5

a) State the phylum for organisms above.

[2 *marks*]

_____

_____

b) Name structure P and state the function.

[2 *marks*]

_____

_____

c) Organism A and B are hermaphrodites. Explain.

[1 *mark*]

_____

d) Name **Q** and explain the function .

[2 *marks*]

_____

_____

e) Differentiates organism **A** and organism **B**.

[3 *marks*]

_____

_____

_____

10. **FIGURE 6** shows the life cycle of organism under Kingdom Animalia.

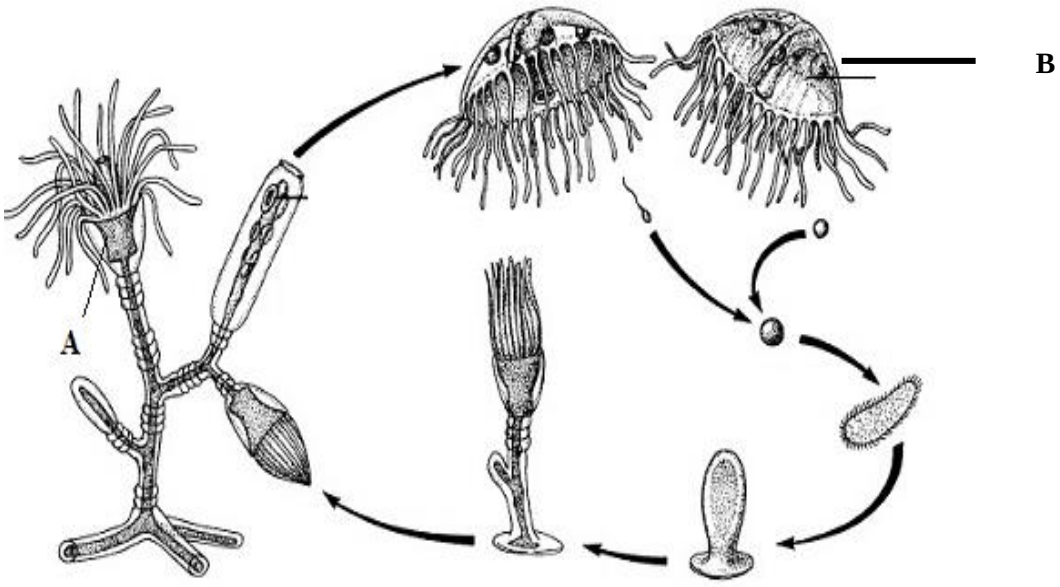


FIGURE 6

a) Identify the species and state its phylum.

[2 *marks*]

_____

_____

b) State structure labelled **A** and **B**.

[2 *marks*]

_____

_____

c) Why this organism is considered as dimorphism?

[2 *marks*]

_____

_____

d) Give **TWO** differences between the two body forms of this organism.

[2 *marks*]

_____

_____

e) Complete the table for the differences between phyla Platyhelminthes, Nematoda and Annelida.

	PLATYHELMINTHES	**NEMATODA**	**ANNELIDA**
Embryonic Germ Layers			
Symmetry			
Segmentation			
Body cavity (coelom)			
Digestion			
Circulation			
Respiration			
Excretion			

ESSAY QUESTIONS

1. a) Arthropod have highly diverse phylum of Animalia. State the factors contributing the successful of arthropod compared to other.

[10 marks]

b) Compare between the phylum Platyhelminthes and phylum Annelida.

[10 marks]

2. a) List down the unique characteristics of the phylum Cnidaria

[10 marks]

c) Differentiate between plant from the group conifers and angiosperms.

[10 marks]

3. a) Describe the unique characteristics of the Phylum Chordata.

[10 marks]

b) Discuss evolutionary relationship of animals based on their :

i. level of organization
i. germ layers
ii. body plan (symmetry)
iii. body cavity (coelom)
iv. Segmentation / metamerism [10 marks]

4. a) Explain characteristics that distinguish each of the following group of plants.

i. Bryophytes
ii. Pteridophytes
iii. Gymnosperms
iv. Angiosperms

[12 marks]

b) Explain the evolutionary relationships among groups in the plant kingdom based on :

i. Size
ii. Dominant generation
iii. Dependence of gametophytes and sporophytes
iv. Water dependence in fertilization
v. Presence of vascular tissues
vi. Embryo protection

[8 marks]

5. a) Explain why bryophytes are considered to be more advanced than green algae but more primitive than fern. [10 marks]