MUHAMMAD IMRAN	BT101 - Ecology, Biodiversity & Evolution-I
CURRENT QUESTIONS SOLVED	FINAL TERM SEPTEMBER 2020
QUESTIONS 212	/ MCQs 26

1. The external factors which control the ecosystem are _ of internal factors. _____Independent
2. Fungi is ____ decomposer..... _____Primary
3. The orientation toward a factor is called ____.....____. Taxis
4. When a population reach a ____ there are more individual trying to use the same quantity of resources.....____high density
5. Complexity of ecosystem make it more_____..... _____Stable
6. Camouflage use of any combination of.....____ Colouration
7. Near the surface of earth ozone concentration about ___ ppm.....____0.04-0.15
8. The total average height of troposphere is _____km.....____13Km
9. Adult human body contain _____ of water.....____60%
10. What is the example of chemotrophs.....____Microbes
11. The rate that new organic matter by means of individual growth and reproduction in all herbivores..... _____Gross productivity.
12. Variety of tools to track size of population in one tool.....____Survivorship curve
13. 541 million years ago O2 made stable of atmosphere.....____ 13%
14. Region with identical climate have fauna and flora according to Buffon's law...____Different
15. Natural selection variation from a population by favoring one allele over other at a gene locus...____.Odd
16. First vertebrates possess amitotic eggs.....____.Reptile
17. Toxoplasmosis caused by toxoplasma virulent in immune suppressed individually...____AIDS
18. Rate at new organic matter formed in all herbivores.....____secondary productivity.
19. Example of winter sleep.....____bear
20. Speciation occur in single population.....____sympatric
21. Animal changes its color rapidly.....____chameleon
22. Above thermosphere is.....____exosphere
23. Symbiosis relationship between..... _____different species

24.bird voice box……_____syrinx

25.Extinct hippopotamus like……_____taxodon

26.sense organs widely dispersed in……_____Annelida

1-Ozone depleting substances? 2 marks (65ppt)

Ozone depleting substances are chemicals that destroy the earth's protective ozone layer. They include:

1. Halocarbon refrigerants
2. Solvents
3. Propellants in aerosols
4. Chlorofluorocarbons
5. Hydro chlorofluorocarbons
6. Methyl bromide
7. Carbon tetrachloride
8. Methyl chloroform
9. halon
10. hydrobromofluorocarbons (HBFCs)
11. methyl bromide (CH_3Br)
12. bromochloromethane (CH_2BrCl)

2-What is lysosome? (120ppt)

A **lysosome** is a membrane-bound cell organelle that contains digestive enzymes. ... They break down excess or worn-out cell parts. They may be used to destroy invading viruses and bacteria. If the cell is damaged beyond repair, **lysosomes** can help it to self-destruct in a process called programmed cell death, or apoptosis

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Lysosomes were discovered by the Belgian cytologist de Duve in the 1950s. Lysosomes are vesicles produced by the Golgi apparatus. Present in cytoplasm of eukaryotic cells. It contains degradative enzymes enclosed in a membrane.

Internal environment is acidic **(pH: 7)**

2 marks

3. Upper height and lower height of mesosphere (2)

The exact upper and lower boundaries of the mesosphere vary with latitude and with season (higher in winter and at the tropics, lower in summer and at the poles), but the lower boundary is usually located at altitudes from 50 to 65 kilometers (31 to 40 mi; 164,000 to 213,000 ft.) above the Earth's surface and the upper boundary (the mesopause) is usually around 85 to 100 kilometers (53 to 62 mi; 279,000 to 328,000 ft.).

4. Mesosphere boundaries and temperature. (2)

- Layer, directly above the stratosphere and directly below the thermosphere
- Lower boundary is 50 to 65 kilometres
- Upper boundary is around 85 to 100 kilometres
- It is called as “near space”.
- Temperatures in the upper mesosphere fall as low as −101 °C varying according to latitude and season.

Mesopause

- Boundary between the mesosphere and the thermosphere
- Height: 85 – 100 km
- Temperature: 100 – 102 °C

5. Height of stratosphere at equator and pol? (2)

- The second major layer of Earth's atmosphere
- Above the troposphere, and below the mesosphere

Height

- 20 km (66,000 ft; 12 mi) at equator
- 10 km (33,000 ft; 6.2 mi) at midlatitudes
- 7 km (23,000 ft; 4.3 mi) at the poles

6. What is food Web (2)

The sun is the ultimate source of energy for life on Earth. Without it, nothing would be able to survive. As a result, living things have evolved special ways to harness the energy of the sun and use it for their own well-being. They have also developed special relationships and interactions that allow energy to be transferred. Once the energy has been captured, it gets passed around through the various organisms in a particular area. This transfer of energy is called a **food web**.

series of organisms related by predator-prey and consumer-resource interactions; the entirety of interrelated **food chains** in an ecological community.

7. Phylum microsporidia (2)

Microsporidia are obligate intracellular spore-forming parasites that are fungi or closely related to them. **Microsporidia** used to be classified as protozoa.

- Members of the phylum are commonly called microsporidia
- Small, obligatory intracellular parasites
- Several species that parasitize beneficial insects.
- *Nosema bombicus* parasitizes silkworms

8. Feeding habits in mammals (2)

Some groups of **mammals** almost exclusively eat meat--take lions and tigers and other big cats as examples. Other **mammals** such as deer, cows and antelope are predominantly plant-eaters, living on a **diet** of leaves, shoots, fruits and bark

9. Define sere in own words. (2)

A seral community (or **sere**) is an intermediate stage found in **ecological** succession in an **ecosystem** advancing towards its climax community. In many cases more than one seral stage evolves until climax conditions are attained.

10. What is ecosystem. (2)

An ecosystem is **the basic unit** of the field of the scientific study of nature. According to this discipline, an ecosystem is a physically defined environment, made up of two inseparable components:

- **The biotope (abiotic):** a particular physical environment with specific physical characteristics such as the climate, temperature, humidity, concentration of nutrients or pH.
- **The biocenosis (biotic):** a set of living organisms such as animals, plants or micro-organisms, that are in constant interaction and are, therefore, in a situation of interdependence.

An ecosystem is a community of living organisms in conjunction with the nonliving components of their environment, interacting as a system. These biotic and abiotic components are linked together through nutrient cycles and energy flows.

- Community of living organisms in conjunction of its non-living components
- Non-living components
- Interaction as a system between both components

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11. Three orders of class reptiles with example. (2)

Classification

1. **Order Testudines**

Tortoises, turtles

2. Order Squamata

Snakes, lizards, worm lizards, Lizard like reptiles, single species, Sphenodon and Tuataras

1. **Order Crocodilia**
   Crocodiles, alligators, gavials

12. What is exoskeleton. (2)

An exoskeleton is the external skeleton that supports and protects an animal's body, in contrast to the internal skeleton of, for example, a human. In usage, some of the larger kinds of exoskeletons are known as "shells"

13. Process of heat formation in mammals (2)

Thermoregulation is the ability of an organism to keep its body temperature within certain boundaries, even when the surrounding temperature is very different. A thermoconforming organism, by contrast, simply adopts the surrounding temperature as its own body temperature, thus avoiding the need for internal thermoregulation. The internal thermoregulation process is one aspect of homeostasis:

14. Polyploidy and aneuploidy. (2)

1. Aneuploidy

Nondisjunction at a single chromosome results in an abnormal number of chromosomes.

2. Polyploidy

Product of nondisjunction during meiosis which results in additional copies of the entire genome.

Aneuploidy is a chromosomal mutation in which there is one or more extra chromosomes, or one or more fewer chromosomes. In humans, the genetic disorders Down syndrome and Turner's syndrome are examples of aneuploidy. Individuals with Down syndrome have three copies of chromosome 21, so their genomes contain 47 chromosomes rather than the usual 46. Individuals with Turner syndrome have only one sex chromosome, which is the X-chromosome, so their genomes contain 45 chromosomes.

Polyploidy is a chromosomal mutation in which a cell has entire extra sets of chromosomes. Instead of being diploid, in which the cell contains two sets of chromosomes, it may be triploid (three sets of chromosomes), or tetraploid (four sets of chromosomes). Polyploidy is common in plants, and plant growers may exploit this fact to produce plants with flowers having double petals. Polyploidy is generally lethal in animals.

15. Write the name of nitrogen fixing bacteria. (2)

Nitrogen-fixing bacteria are prokaryotic microorganisms that are capable of transforming nitrogen gas from the atmosphere into “fixed nitrogen” compounds, such as ammonia, that are usable by plants.

Microorganisms fixing Nitrogen

- *Azobacter*
- *Beijerinckia*
- *Azospirillum*
- *Clostridium*
- *Cyanobacteria*

- **Require the enzyme nitrogenase**
- **Inhibited by oxygen**
- **Inhibited by ammonia (end product)**

16. What is tropospheric ozone? (2)

- **Tropospheric Ozone**
  - Man- made pollutant in the lower atmosphere
  - Secondary air pollutant
  - Component of photochemical smog

Tropospheric ozone is a highly reactive oxidant that significantly reduces crop productivity as well as the uptake of atmospheric carbon by vegetation. Its effects on plants include impeded growth and seed production, reduced functional leaf area and accelerated ageing.

17. Write the sources of waste water (2)

Human excreta (feces, urine, blood and other bodily fluids) often mixed with used toilet paper or wet wipes; this is known as blackwater if it is collected from flush toilets

Washing water (personal hygiene, clothes, floors, dishes, cars, etc.), also known as greywater or sullage

Surplus manufactured liquids from domestic sources (drinks, cooking oil, pesticides, lubricating oil, paint, cleaning detergents, etc.)

1. Domestic wastewater from households
2. Municipal wastewater from communities (also called sewage)
3. Industrial wastewater from industrial activities
4. Agricultural wastewater from agricultural activities
5. Storm water

18. Define Aestivation (2)

Aestivation

Survival in extended period of drying. Avoid temperature damage and dehydration

Examples: Insects, frog, turtle

Aestivation or “summer sleep”, on the other hand, is the low metabolic process by the animals during summers.

19. Two heat producing mechanism in humans (2)

The external heat transfer mechanisms are radiation, conduction and convection and evaporation of perspiration. The process is far more than the passive operation of these heat transfer mechanisms, however. The body takes a very active role in **temperature** regulation.

20. What are aerosols? (2)

- Small (or “tiny”) solid particles or liquid droplets (excluding clouds and rain)
- Aerosols can be man-made (anthropogenic) or naturally occurring (like ocean salt, dust, plant emissions)
- Aerosols are not synonymous with pollution

- Some aerosols are very beneficial and, in fact, are required for precipitation processes to occur.

Aerosol is a word that is used to describe a mixture of small liquid and/or solid particles dispersed in a gaseous system, such as air. The word aerosol comes to us from "aero-," which refers to gas in general or air specifically (easy enough, right?) and "-sol,' which refers to a mixture of particulate matter in a fluid system (gas or air is a fluid).

The diameters of these small particles are roughly between 0.002 micrometers and 100 micrometers in size.

21. Net primary productivity of wetland and rain forest ecosystem. (2)

- **Wetlands and tropical rain forests:** 2000 g/m^2/ year

22. What is nucleus made up of? 2 marks

1. The nuclear envelope
2. Nucleoplasm and Chromatin (two major types of material)
3. The nucleolus
4. DNA

Two meters of human DNA fits into a nucleus that's 0.000005 meters across.

23. What is thylakoid write its function.

Thylakoids are membrane-bound compartments inside chloroplasts and cyanobacteria. They are the site of the light-dependent reactions of photosynthesis. **Thylakoids** consist of a **thylakoid** membrane surrounding a **thylakoid** lumen.

Thylakoids are the internal membranes of **chloroplasts** and cyanobacteria, and provide the platform for the light reactions of **photosynthesis**

24. Navigation in Birds

Navigation

Two forms of navigation

1. Route based navigation
2. Location based navigation

Animal navigation is the ability of many animals to find their way accurately without maps or instruments. Birds such as the Arctic tern, insects such as the monarch butterfly and fish such as the salmon regularly migrate thousands of miles to and from their breeding grounds,[1] and many other species navigate effectively over shorter distances.

25. Types of energy in ecosystem

Energy

Energy exists in several different forms

1. Light
2. Chemical-bond energy
3. Motion
4. Heat

All organisms need energy to function

26. What are the sources of inorganic plant and algae in water pollution?

Sources:

– Human and animal wastes, plant residues, atmospheric deposition, and fertilizer runoff

27. Write the main function of chloroplast.

Function

- Chlorophyll absorbs energy from light in form of photons.
- Transfer this energy to Photosystems present in thylakoid membrane.
- Photosystems convert light energy into chemical energy i.e. ATP and NADPH.
- ATP and NADPH are released into stroma.
- They are used to provide energy to run Calvin cycle in stroma to produce glucose.
- CO_2 and water are used as raw material for glucose synthesis.
- Synthesis of glucose and other oligosaccharides.

Synthesis of structural carbohydrates like cellulose and starch

28. Thermoregulation in Reptiles

The body temperature of a **reptile** will be exactly the same as its surroundings. **Reptiles** regulate their body temperature through what is called **thermoregulating**. Simply put this means basking in a warm area to heat up and moving to a cool are to cool down.

29. Activities contribute to biomagnification

- Increasing concentration of toxic substance
- In the tissues of tolerant organisms at successively higher levels in a food chain
- It occurs as result of three activities.

Concentration of the persistent toxins increases higher up the food chain.

1. Persistence

- Substance cannot be broken down by environmental processes

2. Food chain energetics

- Substance's concentration increases progressively as it moves up a food chain

3. Low or non-existent rate of internal degradation or excretion of the substance

- often due to water insolubility

30.process of decomposition

Decomposition is the process by which dead organic substances are broken down into simpler organic or inorganic matter such as carbon dioxide, water, simple sugars and mineral salts. The process is a part of the nutrient cycle and is essential for recycling the finite matter that occupies physical space in the biosphere. Bodies of living organisms begin to decompose shortly after death. Animals, such as worms, also help decompose the organic materials.

31. Explain the characteristics of nematodes

- hey are widely distributed, aquatic or terrestrial, parasitic or free-living.
- Their body is elongated, cylindrical, unsegmented, worm-like, bilaterally symmetrical and tapering at both ends.
- They are triploblastic animals with perivisceral cavity more extensive than that of **platyhelminths.**
- The body is of organ -system grade organization.
- The body is generally covered with thick, flexible multi-layered collagenous cuticle and often bears cuticle setae (hairs), spines or annulations.
- Cuticle moulted periodically.
- They have cellular or syncytial epidermis I.e. the nuclei are not separated from each other by cell membranes.
- They consist of only longitudinal muscle fibers with four bands.
- They lack true coelom. The body cavity is pseudocoel or blastocoel not lined by mesoderm and filled with parenchyma in most cases.
- They lack cilia.
- circulatory and respiratory systems are absent. i.e. respiration occurs through general body surface and aerobic in free-living form and anaerobic in parasitic form.
- Internal cephalization is present but externally there is little differentiation between the anterior and posterior region. i.e. distinct head is lacking. However, the mouth is present in the anterior region.
- The digestive system is complete with a distinct mouth and anus. Muscular pharynx and the inner surface of the gut usually not lined by cilia.
- Extracellular digestion occurs in them.
- The mouth is surrounded by six lips.
- Excretory without flame cell and nephridia. In the class Adenophorea glandular renette cells with the duct.
- The nervous system is not much developed. i.e. consists of circucumpharyngeal ring and longitudinal nerve cord.
- Sense organ are poorly developed in the form of papillae, which are well defined as amphid (in mouth) and plasmid (anus).
- Sexes are separate (gonochoristic). the male is smaller than females.
- Tubular gonad is present in them. Male genital duct leads into the cloaca. Female genital ducts with a separate opening.
- Amoeboid sperm cells.
- No asexual reproduction.
- Fertilization is internal or maybe cross or self.
- Development may be direct, with or without an intermediate host or indirect.
- Various lateral lines and pores are present on the surface of the body

32. Write the types of atmosphere

Layers of atmosphere

1. **Exosphere:** 700 to 10,000 km (440 to 6,200 miles)

2. **Thermosphere:** 80 to 700 km (50 to 440 miles)[12]
3. **Mesosphere:** 50 to 80 km (31 to 50 miles)
4. **Stratosphere:** 12 to 50 km (7 to 31 miles)
5. **Troposphere:** 0 to 12 km (0 to 7 miles)

33. Median eye in reptiles

- Median (parietal) eye that develops from outgrowths of the roof of the forebrain
- It is an eye with a lens, a nerve, and a retina.

The parietal **eye** is also known as the third **eye**, **median eye**, or pineal accessory apparatus. It is found in two distinct groups of **reptiles** (order Squamata, suborder Sauria [Lacertillia], and order Rhynchocephalia)

34. Write the Process of condensation

Condensation

- Opposite of evaporation
- Condensation occurs when a gas is changed into a liquid. When the water droplets formed from condensation are very small.
- They remain suspended in the atmosphere. These millions of droplets of suspended water form clouds in the sky or fog at ground level.

ondensation is the **process** where water vapor becomes liquid. It is the reverse of evaporation, where liquid water becomes a vapor. **Condensation** happens one of two ways: Either the air is cooled to its dew point or it becomes so saturated with water vapor that it cannot hold any more water. Dew Point.

35. Discus the decomposer with example

A decomposer is an organism that decomposes, or breaks down, organic material such as the remains of dead organisms. Decomposers include bacteria and fungi. These organisms carry out the process of decomposition, which all living organisms undergo after death. Decomposition is an important process because it allows organic material to be recycled in an ecosystem.

Examples of decomposers include bacteria, fungi, some insects, and snails, which means they are not always microscopic. Fungi, such as the Winter Fungus, eat dead tree trunks.

Decomposers can break down dead things, but they can also feast on decaying flesh while it's still on a living organism.

36. Types of omnivores

An **omnivore** is a kind of animal that eats either other animals or plants. Some **omnivores** will hunt and eat their food, like carnivores, eating herbivores and other **omnivores**. Some others are scavengers and will eat dead matter. Many will eat eggs from other animals.

Omnivores generally occupy the third trophic level alongside **meat**-eating carnivores. Omnivores are a diverse group of animals. Examples of omnivores include bears, birds, dogs, raccoons, foxes, certain insects, and even humans.

37. Write the Function of ribosomes

Function of the Ribosome

Ribosomes = site of protein synthesis

- Assembles peptides in the nucleolus
- Exported into cytoplasm
- Wrapped inside vesicles

Ribosomes have two main **functions** — decoding the message and the formation of peptide bonds. These two activities reside in two large ribonucleoprotein particles (RNPs) of unequal size, the **ribosomal** subunits. Each subunit is made of one or more **ribosomal** RNAs (rRNAs) and many **ribosomal** proteins (r-proteins)

38. what is habitat? write its component

A habitat is a place where an organism makes its home. A habitat meets all the environmental conditions an organism needs to survive. For an animal, that means everything it needs to find and gather food, select a mate, and successfully reproduce

The main **components** of a **habitat** are shelter, water, food, and space. A **habitat** is said to have a suitable arrangement when **it** has the correct amount of all of these.

39. component of water pollutants

It includes detergents and other cleaning materials, surfactants, pesticides and other organic industrial wastes. Many of these materials are poisonous for living organisms and cause serious **water pollution** problems.

40. Overview of vestigial organs.

- Retention during the process of sexual reproduction of genetically determined structures or attributes
- That have lost some or all of their ancestral function in a given species.
- Vestigiality is loss of feature due to loss of its value in changed environment.
- The human vermiform appendix on the vestigial caecum.
- Blind cave fish has no eye
- Genes for functional eyes are still in their DNA

These 'useless' **body**-parts, otherwise known as vestigial organs, are remnants of lost functions that our ancestors possessed. They once represented a function that evolved out of a necessity for survival, but over time that function became non-existent.

41. Define tropic level.

The trophic level of an organism is the position it occupies in a food web. A food chain is a succession of organisms that eat other organisms and may, in turn, be eaten themselves. The trophic level of an organism is the number of steps it is from the start of the chain.

trophic level. Any of the sequential stages in a food chain, occupied by producers at the bottom and in turn by primary, secondary, and tertiary consumers. Decomposers (detritivores) are sometimes considered to occupy their own **trophic level**.

42. Write the levels of food chain

Food Chain

Food energy passes through different sequence.

Level 1: Primary producer

Level 2: Primary consumer

Level 3: Secondary consumer

Level 4: Tertiary Consumer

Level 5: Apex Predator

A food chain also shows how the organisms are related with each other by the food they eat. Each level of a food chain represents a different trophic level. Food chain only follows a direct, linear pathway of one animal at a time.

43. Define Heterotroph

A heterotroph is an organism that cannot produce its own food, instead taking nutrition from other sources of organic carbon, mainly plant or animal matter. In the food chain, heterotrophs are primary, secondary and tertiary consumers, but not producers

An organism that cannot synthesize its own food and is dependent upon complex organic substances for nutrition.

44. Define commensalism

Commensalism, in biology, a relationship between individuals of two species in which one species obtains food or other benefits from the other without either harming or benefiting the latter.

45. What is the effect of exponential decline of chemical bond energy in a trophic chain?

Exponential decline of chemical-bond energy in a trophic chain limits:

- Lengths of trophic chains
- Number of top level carnivores

46. What is meant by count shedding?

Countershading is a type of coloration commonly found in animals and means that the animal's back (dorsal side) is dark while its underside (ventral side) is light. This shading helps an animal blend in with its surroundings

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47. Write the economical importance of phylum myxozoa.

- The most economically important myxosporean is *Myxosoma cerebralis*.

The **economically** most significant diseases worldwide caused by myxosporeas in cultured fishes are PKD-Proliferative Kidney Disease, caused by a Malacosporea member, Tetracapsuloides bryosalmonae, and whirling disease, caused by a Myxosporea member Myxobolus cerebralis; both diseases affect salmonids.

48. Differentiate between top-down and bottom-up effect.

1. **Top-Down Effect**

Effect flows down through a trophic chain. From apex predator to lower trophic levels

2. **Bottom-Up Effect**

Effect flows up through a trophic chain. From primary producers to higher trophic levels

49. What is the role of university of Wisconsin_Madison Arboretum in restoration ecology?

Geologists from the University of Wisconsin-Madison backed up this theory be studying rocks and publishing the results in a 2008 issue of the journal Earth and Planetary Science Letters. "At [those levels of carbon dioxide], you would have had vicious acid rain and intense greenhouse [effects]. That is a condition that will dissolve rocks," said study team member John Valley.

50. What are the diagnostic features of phylum Mollusca?

- Body divided into three parts
- Head-foot, visceral mass and mantle
- Mantle secretes a calcareous shell
- Bilateral symmetry
- Coelom reduced to cavities surrounding the heart, nephridia and gonads

- They are bilaterally symmetrical.
- They are triploblastic, which three layers.
- They show organ system grade of organisation.
- The body is soft and unsegmented.
- Body is divisible into three regions – head, a visceral mass, and ventral foot.

- Body is covered by a mantle and shell.
- They can be found in different habitats, both aquatic and terrestrial.
- The body cavity is a haemocoel, through which blood circulates.
- The digestive system is well developed and complex. It has a radula, which is a rasping structure that has chitinous teeth. It is used in feeding.
- The nervous system is made up of paired ganglia, connectives, and nerves.
- The circulatory system is open, with heart and aorta.
- Respiration occurs through gills called ctenidia.
- The ventral muscular foot helps in locomotion.
- They have a pair of kidneys (metanephridia)
- Sexes are separate and reproduction is through sexual reproduction.
- Fertilisation can be internal or external.

51. When adaptations occur?

- Characteristics that increase the potential of an organism or species to successfully reproduce in a specified environment.
- Adaptation occurs when a change in a phenotype increases an animal's chance of successful reproduction.
- Change in environment is the force behind adaptations.
- It may result in the evolution of multiple new groups.
- To exploit the changed environment
- Adaptation is confused with fitness or adaptedness.

52. Function of amnion in amniotic egg.

Amnion protects embryo from desiccation,

The amnion, along with the chorion, yolk sac, and allantois, form a series of protective barriers that provide a life-support system for the developing embryo. The four membranes work to exchange oxygen and carbon dioxide between the embryo and the placenta, to provide nutrients to the embryo, and to remove nitrogenous wastes from the embryo.

The amnion forms a sac filled with amniotic fluid. The amniotic fluid acts as a buffer to protect the embryo from physical damage due to mechanical shock. The amniotic fluid also helps to prevent dehydration and desiccation by bathing the embryo. The amniotic fluid is released at birth when the amnion breaks. In humans, this is the phenomenon known as the mother's "waters" breaking.

53. Charcteristics of chordata? (141ppt)

- Fresh water, saltwater, on land
- Bilaterally symmetrical,
- Four unique characteristics present at some stage in development:
- Notochord, pharyngeal slits or pouches, dorsal tubular nerve cord, and postanal tail
- Presence of an endostyle or thyroid gland
- Complete digestive tract
- Ventral, contractile blood vessel (heart)

Characteristics Of Phylum Chordata

Phylum Chordata possesses the following characteristic features:

Notochord

It is a longitudinal, cartilaginous rod running between the nerve cord and the digestive tract. It acts as a support for the nerve cord and is replaced by the vertebral column after the embryonic stage in all vertebrates.

Dorsal Nerve Cord

It is a bundle of nerves running along the "back" and splits into the brain and the spinal cord. It is hollow and lies dorsal to the notochord.

Pharyngeal Slits

They are the openings which allow the entry of water through the mouth without entering the digestive system viz. they connect mouth and throat. All Chordates have these openings on the lateral sides of the pharynx at some stage of their life.

Post anal Tail

It is an extension of the body to the anus. In chordates, the tail is composed of **skeletal muscles** which help in locomotion in fish-like species. It is absent in most of the adult Chordates.

Other characteristics of chordates include:

1. Bilaterally symmetrical, triploblastic, coelomic and segmented body.
2. The body design is complex and well-differentiated.
3. The body has an organ system level of organization.

54. Types of grazing (22 ppt)

Types of Grazing

1. **Graminivory**

Feeding primarily on grass.Specifically "true" grasses in family Poaceae

Examples: Horses, cattle, hippopotamus, grasshoppers

2. **Coprophagy**

Feeding on grass, forbs, leafy weeds, fruits, tree bark

Heavy grazing for half an hour of grazing period

Followed by half an hour of selective feeding

Example: Horses, cattle, hippopotamus, grasshoppers

- Later feeding in intervals
- Eat their or other species's soft feces (caecotrophs)

55. Effect of habitat fragmentation? (51ppt)

Effects of Fragmentation

- Loss of biodiversity
- Threatening or extinction of species
- Genetic diversity is also fragmented.
- Small populations having smaller pool of fitness maintaining alleles to survive
- Gene flow and migration are reduced.
- Species do not migrate to fragments.
- Reproductive isolation and inbreeding
- It causes inbreeding depression.
- Inbreeding increases the level of homozygosity.
- Facilitating the expression of deleterious alleles that reduce the fitness
- It may result in local extinction.
- Genetic drift is increased.
- Random changes to the genetic make up of populations
- It leads to reductions in genetic diversity.
- Natural selection prefers large population size.
- Small population are weak in adaptations
- May be eliminated by the process of natural selection.
- Greatly affect the predator-prey dynamics of many species.
- By changing species diversity and population size
- Reduction in area of safe zones for prey making them vulnerable to predators
- It may increase their area of refuge on opposite

Effects of Habitat fragmentation

The impact of habitat fragmentation can be seen clearly in a study conducted in Manaus, Brazil, where the rain forest was commercially logged. Landowners agreed to preserve patches of rain forest of various sizes, and censuses of these patches were taken before the logging started, while they were still part of a continuous forest. After logging, species began to disappear from the now-isolated patches.

First to go were the monkeys, which have large home ranges. Birds that prey on the insects flushed out by marching army ants followed, disappearing from patches too small to maintain enough army ant colonies to support them. As expected, the extinction rate was negatively related to patch size, but even the largest patches (100 hectares) lost half of their bird species in less than 15 years. Because some species, such as monkeys, require large patches, large fragments are indispensable if we wish to preserve high levels of biodiversity. The take-home lesson is that preservation programs will need to provide suitably large habitat fragments to avoid this effect.

Habitat fragmentation usually occurs because of **human activities** such as new roads, parking lots and housing developments. Organisms need their specific habitat for survival, and fragmentation is a leading threat to many terrestrial animals. Not only are these animals separated from the resources they depend on, but they now have to travel across dangerous areas, such as roads, to reach those resources.

Habitat fragmentation from human activities is not limited to urban areas. Logging is a major cause of habitat fragmentation in forests. Logging creates clear-cut, open ground areas that were once protected by the cover of trees. Logging roads that are built for the logging trucks to travel on can also be cut through forests, disrupting the habitat. Habitats may also become fragmented by **natural processes**. Rivers serve as natural pathways for both terrestrial and aquatic animals. If the river floods, it may make passage across it by terrestrial animals impossible. On the other hand, aquatic animals that depend on the river to move between two different water bodies will not be able to travel from one place to another if the river dries up.

56. Note on biogeography? (76ppt)

Biogeography is the study of the distribution of species and ecosystems in geographic space and through geological time. Organisms and biological communities often vary in a regular fashion along geographic gradients of latitude, elevation, isolation and habitat area.

Biogeography, the study of the geographic distribution of plants, animals, and other forms of life. It is concerned not only with habitation patterns but also with the factors responsible for variations in distribution. Earth's floral regions Floral kingdoms, subkingdoms, and major regions of the world.

- Study of the geographic distribution of plants and animals
- Study the life-forms in different parts of the world have distinctive evolutionary histories
- Geographical regions have characteristic biotas. Closely related taxa tend to be closer together than more distantly related groups.
- Similar environments are found in different areas but the same species may not be found in all places where they could be
- Not closely related species in similar environments may appear similar due to convergence.

57. Phylum ciliophora? 5 marks (138 ppt)

- About 9,000 species
- Some of the most complex protozoa
- Ciliates are widely distributed in freshwater and marine environments.
- A few ciliates are symbiotic.
- Cilia for locomotion and for the generation of feeding currents in water
- Relatively rigid pellicle and more or less fixed shape
- Distinct cytostome (mouth) structure
- Dimorphic nuclei, macronucleus and micronuclei

Cilia and Other Pellicular Structures

- Shorter
- Widely distributed
- Similar like flagella
- Coordinated movement
- Connected basal bodies
- Give shape to organism
- Trichocysts are pellicular structures primarily used for protection.
- They are rodlike or oval organelles
- Oriented perpendicular to the plasma membrane
- Pellicle can discharge trichocysts, which then remain connected to the body by a sticky thread

Nutrition

- Ciliates like paramecium have oral groove on one side
- Cilia sweep small food particles toward the cytopharynx
- Food vacuole forms
- Break and circulate in endoplasm
- Free living ciliates prey upon protists and small animals
- Prey capture by fortuitous contact
- Ciliate *Didinium* feeds principally on Paramecium

Excretion

- Excretion of waste material by contractile vacuole.
- Exchange of gases through plasma membrane

Genetic Material

- A large, polyploid macronucleus regulates daily metabolic activities.
- One or more smaller micronuclei are the genetic reserve of the cell.

Reproduction

- Asexually reproduction is common.

Cell divided into two by mitosis through:

- Binary fission
- Budding

Reproduction

- Sexual reproduction
- Occurs when placed under stress
- Paramecia may engage in a process known as conjugation
- Exchange genetic material with other individuals
- Process may take many hours

Symbiotic Ciliates

- Most ciliates are free living.
- Some are commensalistic or mutualistic
- A few are parasitic.
- Large numbers of different species of ciliates also inhabit the rumen of many ungulates.
- These ciliates contribute to the digestive processes of their hosts.

The phylum Ciliophora includes some of the most complex protozoa. Ciliates are widely distributed in freshwater and marine environments. A few ciliates are symbiotic. Characteristics of the phylum Ciliophora include:

1. Cilia for locomotion and for the generation of feeding currents in water

2. Relatively rigid pellicle and fixed shape

3. Distinct cytostome

Cilia and Other Pellicular Structures

Cilia are generally like flagella, except that they are much shorter, more numerous, and widely distributed over the surface of the protozoan. Ciliary movements are coordinated so that ciliary waves pass over the surface of the ciliate. Many ciliates can reverse the direction of ciliary beating and the direction of cell movement. Basal bodies (kinetosomes) of adjacent cilia are interconnected with an elaborate network of fibers that are believed to anchor the cilia and give shape to the organism. Some ciliates have evolved specialized cilia. Cilia may cover the outer surface of the

protozoan. They may join to form cirri, which are used in movement. Alternatively, cilia may be lost from large regions of a ciliate. Trichocysts are pellicular structures primarily used for protection. They are rodlike or oval organelles oriented perpendicular to the plasma membrane. In Paramecium, they have a “golf tee” appearance. The pellicle can discharge Trichocysts, which then remain connected to the body by a sticky thread

Nutrition

Some ciliates, such as Paramecium, have a ciliated oral groove along one side of the body.

Cilia of the oral groove sweep small food particles toward the cytopharynx, where

a food vacuole forms. When the food vacuole reaches an upper size limit, it breaks free and circulates through the endoplasm. Some free-living ciliates prey upon other protists or small animals. Prey capture is usually a case of fortuitous contact. The ciliate Didinium feeds principally on Paramecium, a prey that is bigger than itself. Didinium forms a temporary opening that can greatly enlarge to consume its prey (figure 8.19).

Suctorians are ciliates that live attached to their substrate. They possess tentacles whose secretions paralyze prey, often ciliates or amoebae. The tentacles digest an opening in the pellicle of the prey, and prey cytoplasm is drawn into the suctorian through tiny channels in the tentacle. The mechanism for this probably involves tentacular microtubules (figure 8.20).

Genetic Control and Reproduction

Ciliates have two kinds of nuclei. A large, polyploid macronucleus regulates daily metabolic activities. One or more smaller micronuclei are the genetic reserve of the cell.

Ciliates reproduce asexually by transverse binary fission and, occasionally, by budding. Budding occurs in Suctorians and results in the formation of ciliated, free-swimming organisms that attach to the substrate and take the form of the adult. Ciliates reproduce sexually by conjugation. The partners involved are called conjugants. Many species of ciliates have numerous mating types, not all of which are mutually compatible.

Initial contact between individuals is apparently random, and sticky secretions of the pellicle facilitate adhesion. Ciliate plasma membranes then fuse and remain that way for several hours. The macronucleus does not participate in the genetic exchange that follows. Instead, the macronucleus breaks up during or after micronuclear events, and reforms from micronuclei of the daughter ciliates. After separation, the exconjugants undergo a series of nuclear divisions to restore the nuclear characteristics of the species, including the formation of a macronucleus from one or more micronuclei. Cytoplasmic divisions that form daughter cells accompany these events.

Symbiotic ciliates

Most ciliates are free living; however, some are commensalistic or mutualistic, and a few are parasitic. Balantidium coli is an important parasitic ciliate that lives in the large intestines of humans, pigs, and other mammals. At times, it is a ciliary feeder; at other times, it produces proteolytic enzymes that digest host epithelium, causing a flask-shaped ulcer. (Its pathology resembles that of Entamoeba histolytica.) B. coli is passed from one host to another in cysts that form as feces begin to dehydrate in the large intestine. Fecal contamination of food or water is the most common form of transmission. Its distribution is potentially worldwide, but it is most common in the Philippines. Large numbers of different species of ciliates also inhabit the rumen of many ungulates (hoofed animals). These ciliates contribute to the digestive processes of their hosts.

58. What is trichocyst? (138 ppt)

Trichocysts are pellicular structures primarily used for protection. They are rodlike or oval organelles oriented perpendicular to the plasma membrane. In Paramecium, they have a “golf tee” appearance. The pellicle can discharge Trichocysts, which then remain connected to the body by a sticky thread.

Trichocyst, a structure in the cortex of certain ciliate and flagellate protozoans consisting of a cavity and long, thin threads that can be ejected in response to certain stimuli. Trichocysts may be widely distributed over an organism or restricted to certain areas (e.g., tentacles, papillae, around the mouth).

59. What is parastism? (26ppt)

Parasitism, relationship between two species of plants or animals in which one benefits at the expense of the other, sometimes without killing the host organism.Parasites may be characterized as ectoparasites—including ticks, fleas, leeches, and lice—which live on the body surface of the host and do not themselves commonly cause disease in the host; or endoparasites, which may be either intercellular (inhabiting spaces in the host’s body) or intracellular (inhabiting cells in the host’s body).

The word parasite is derived from the Latin form of the Greek word, meaning “one who eats at the table of another”. Parasitism is generally defined as a relationship between the two living species in which one organism is benefitted at the expense of the other. The organism that is benefitted is called the parasite, while the one that is harmed is called the host.

A few examples of parasites are tapeworms, fleas, and barnacles. Tapeworms are flatworms that are found attached to the insides of the intestines of animals such as cows, pigs, etc.. They feed on the host's partly digested food, depriving it of the nutrients.

60. Analogy & homology? (78 ppt)

Homology involves the study of organs that have evolved from same origin or from common ancestor but have different functions. For example, wings of bat and hands of humans.

Analogy involves the study of organs that are evolved from different ancestors but perform a similar function.For example, wings of bat and wings of insects.

61. Water cycle? (43 ppt)

Water cycle, also called hydrologic cycle, cycle that involves the continuous circulation of water in the Earth-atmosphere system. Of the many processes involved in the water cycle, the most important are evaporation, transpiration, condensation, precipitation, and runoff. Although the total amount of water within the cycle remains essentially constant, its distribution among the various processes is continually changing.

Stages of Water cycle

1. Evaporation
2. Transpiration
3. Condensation
4. Precipitation
5. Surface Run off
6. Infiltration

Evaporation

In evaporation, water changes from its liquid state to a gaseous state. Some of the water in the oceans and freshwater bodies, such as lakes and rivers, is warmed by the sun and evaporates. During the process of evaporation, impurities in the water are left behind. As a result, the water that goes into the atmosphere is cleaner than it was on Earth.

Condensation

- Opposite of evaporation
- Condensation occurs when a gas is changed into a liquid. When the water droplets formed from condensation are very small.
- They remain suspended in the atmosphere. These millions of droplets of suspended water form clouds in the sky or fog at ground level.

Precipitation

- Under right temperature and atmospheric pressure conditions
- Small droplets of water in clouds form larger droplets and precipitation occurs.
- The raindrops fall to Earth.

Surface Runoff

Much of the water that returns to Earth as precipitation runs off the surface of the land

Flows downhill into streams, rivers, ponds and lakes. Small streams flow into larger streams, then into rivers, and eventually the water flows into the ocean. Surface runoff is an important part of the water cycle. Much of the water returns again to the oceans, where a great deal of evaporation occurs.

62. Role of molecular biology in evoloution? (79ppt)

Recently, molecular biology has yielded a wealth of information on evolutionary relationships. Just as animals can have homologous structures, animals may also have homologous biochemical processes. Ultimately, structure and function are based on the genetic blueprint found in all living animals: the DNA molecule. Related animals have similar DNA derived from their common ancestor. Because DNA carries the codes for proteins that make up each animal, related animals have similar proteins. With the modern laboratory technologies now available, zoologists can extract and analyze the structure of proteins from animal tissue, and compare the DNA of different animals. By looking for dissimilarities in the structure of related proteins and DNA, and by assuming relatively constant mutation rates, molecular biologists can estimate the elapsed time since divergence from a common ancestral molecule.

The field overlaps with other areas of biology and chemistry, particularly genetics and biochemistry. Molecular biology chiefly concerns itself with understanding the interactions between the various systems of a cell, including the interrelationship of DNA, RNA and protein synthesis and learning how these interactions are regulated. Researchers in molecular biology use specific techniques native to molecular biology, but increasingly combine these with techniques and ideas from genetics and biochemistry. There is not a hard-line between these disciplines as there once was.

Molecular biology is the study of molecular underpinnings of the process of replication, transcription and translation of the genetic material. The central dogma of molecular biology where genetic material is transcribed into RNA and then translated into protein, despite being an oversimplified picture of molecular biology, still provides a good starting point for understanding the field. Much of the work in molecular biology is quantitative, and recently much work has been done at the interface of molecular biology and computer science in bioinformatics and computational biology. As of the early 2000s, the study of gene structure and function, molecular genetics, has been amongst the most prominent sub-field of molecular biology.

63. Effects of light pollution? (60 ppt)

Effects of Light Pollution

While many people choose to dismiss light pollution as being the price of modern life, it has serious effects on everything around it.

1. Effects on People

The wrong kind of light, or too much light has been proven to have adverse health effects and decreases the quality of life. Humans living on Earth possess a particular circadian rhythm programmed in their DNA, requiring a regular pattern of light during the day and dark during the night.
When these natural circadian rhythms get disrupted, it can have an adverse impact on health and cause cancer, cardiovascular disease, depression, and insomnia.

2. Effects on Animals

Lights can attract or repel animals and insects. Most animal life functions on a diurnal or nocturnal system that is thrown out of sync by light pollution. This can place entire species in danger.
The effect of light pollution falls severely on regions that had previously been untouched by humans. Animals in these areas may react quite sensitively to the changes in their natural environment. They may move to other places with lower light pollution, or unwanted species get attracted to human areas.

3. Effect on the Earth and Ecosystem

The Earth's ecosystem is dependent on cycles of natural light. Since these ecosystems are usually quite sensitive to changes in their environment, they may not be able to adapt to new artificial conditions developed from human-made light pollution.

Skyglow alone can cause a loss in growth protection as the reflected light off the atmosphere will prevent the natural UV rays from reaching the Earth. This disrupts growth and decay cycles that our food, air and water supply is dependent on.

4. Sleeping Problems

People usually prefer sleeping in a dark environment, and sufficient sleep is vital for our physical and also for our mental health. Many people are uncomfortable with distractions from light when they are sleeping.

When the environment is changed into a brighter state, people may suffer from sleeping issues that can result in serious health conditions.

5. Effects on Traffic

Too much lighting or the wrong angle caused by light pollution may also have an adverse effect on traffic as it may cause temporary blindness. This can be dangerous when it comes to driving a car. If the driver's sight is adversely impacted through excessive light clusters on certain streets, the probability of accidents may increase.

Light pollution even increases the danger to people as it can interfere with critical navigational systems for trains, planes and even automobiles.

6. Air Pollution

Light pollution also leads to air pollution affecting the atmosphere. Since for the illumination at night, huge amounts of electricity are used, this leads to a high level of CO2 emissions and other harmful gases.

7. Waste of Resources

Excessive use of light means the use of many fossil fuels at an increasing level. For example, lights need electricity, and in order to produce electricity, huge amounts of coal are used in industrial processes. This means we are also indirectly contributing to the depletion of natural resources like coal.

64. Genetic drift with example? 2 marks (89 ppt)

Genetic drift is change in allele frequencies in a population from generation to generation that occurs due to chance events. To be more exact, genetic drift is change due to "sampling error" in selecting the alleles for the next generation from the gene pool of the current generation. Although genetic drift happens in populations of all sizes, its effects tend to be stronger in small populations.

example

A population of 100 rabbits lives in the woods. The rabbits have many different coat colors: black, brown, tan, white, grey, and even red. In the population, the different alleles that create coat color are equally distributed. A disease comes into the rabbit population and kills 98 of the rabbits. The only rabbits that are left are red and grey rabbits, simply by chance. The genes have thus "drifted" from 6 alleles to only 2. **This is an example of a bottleneck effect.**

65. Phylum plathyelminthes and classifications ? 5 marks (145 ppt)

Platyhelminthes are triploblastic, bilaterally symmetrical, dorsoventrally flattened, acoelomate flatworms with organ grade of construction without a definite anus, circulatory, skeletal or respiratory system but with Protonephridial excretory system and mesenchyme filling the space between the various organ of the body.

Classification

1) Class Turbellaria (Free-Living Flatworms)
2) Class Monogenea
3) Class Trematoda (Flukes)
4) Class Cestoidea (Tapeworms)

The phylum Platyhelminthes (plate-hel-minthez) (Gr. platys, flat helmins, worm) contains over 20,000 animal species. Flatworms range in adult size from 1 mm or less to 25 m (Taeniarhynchus saginatus) in length. Their mesodermally derived tissues include a loose tissue called parenchyma (Gr. patency, anything poured in beside) that fills spaces between other more specialized tissues, organs, and the body wall. Depending on the species, parenchyma may provide skeletal support, nutrient storage, motility, reserves of regenerative cells, transport of materials, structural interactions with other tissues, modifiable tissue for morphogenesis, oxygen storage, and perhaps other functions yet to be determined. This is the first phylum covered that has an organ-system level of organization—a significant evolutionary advancement over the tissue level of organization. The phylum is divided into four classes the Turbellaria consists of mostly free-living flatworms, whereas the (2) Monogenea, (3) Trematoda, and (4) Cestoidea contain solely parasitic species.

Characteristics of the phylum Platyhelminthes include:

- Usually flattened dorsoventrally, triploblastic, acoelomate, bilaterally symmetrical
- Unsegmented worms (members of the class Cestoidea are strobilated)
- Incomplete gut usually present; gut absent in Cestoidea
- Somewhat cephalized, with an anterior cerebral ganglion and usually longitudinal nerve cords
- Protonephridia as excretory/osmoregulatory structures 6. Hermaphroditic; complex reproductive systems
- The digestive system is incomplete or absent. There is a single opening which leads to a well-developed gastro-vascular cavity. The anus is absent. There is no true stomach structure. In a few species, the digestive system is completely absent.
- Respiratory and circulatory systems are absent. Respiration generally occurs through diffusion through the general body surface.
- The excretory system has protonephridia with the flame

- There is primitive nervous system present.
- These animals are hermaphrodites.
- Sexual reproduction happens through gametic fusion.
- Asexual reproduction also happens in a few species through regeneration and fission.
- Fertilization is internal.
- The life cycle of these organisms can be complex, especially if they are parasitic, as this may involve one or more host animals.

The different classes under this phylum are:

- Turbellaria
- Trematoda
- Cestoda

Examples

- Taenia (Tapeworm)
- Fasciola (Liver fluke)
- Taenia saginata (Beef tapeworm)
- Echinococcus granulosus – The dog tapeworm
- Planaria (freshwater flatworm)

66. What is speciation? (100-101 ppt)

Speciation, the formation of new and distinct species in the course of evolution. Speciation involves the splitting of a single evolutionary lineage into two or more genetically independent lineages.

Speciation is how a new kind of plant or animal species is created. **Speciation** occurs when a group within a species separates from other members of its species and develops its own unique characteristics.

67. Reproduction in arthropods? (153ppt)

Reproductive System

- Mostly dioecious
- Paired genital opening
- Male often packages sperm in a spermatophore
- Transfer them into the female genital tract
- Copulation occurs.
- Sperms are transferred via modified pedipalp

Arthropods reproduce sexually and asexually. In most terrestrial arthropods, sexual reproduction is carried out internally. With most aquatic animal, sexual reproduction occurs externally. During asexual reproduction, parthenogenesis occurs. Parthenogenesis is when unfertilized eggs can develop into an arthropod.

Arthropods reproduce by sexual reproduction, which involves the generation and fusion of gametes. Most arthropods are either male or female, and they undergo internal fertilization. Once the egg has been fertilized, the female usually lays the egg, and it continues developing outside of the mother's body. During most of their life cycle, arthropods have the segmented bodies described earlier. Early on in arthropod development, however, some species exist in intermediate stages that are very different from the adult form. These are called **larval stages.** None of the arthropod larval stages include the **trochophore larva** that is characteristic of mollusk and annelid development. You are probably most familiar with this process in caterpillars that form a cocoon in which they undergo a drastic change in form called **metamorphosis,** ultimately emerging as a moth or butterfly. Development involving larval stages is called indirect development. There are also many species, such as spiders, that undergo direct development, in which the young hatch looking essentially like a smaller version of the adult. These species do not go through larval stages or metamorphosis.

68. Survival of the fittest? (87ppt)

- Because resources are limited, existence is a constant struggle.
- Higher rate of population growth causes depletion of resources.
- Therefore, many individuals die.
- Darwin reasoned that the individuals that die are those with the traits (variations) that make survival and successful reproduction less likely.
- Traits that promote successful reproduction are said to be adaptive.

"**Survival of the fittest**" is a phrase that originated from Darwinian evolutionary theory as a way of describing the mechanism of natural selection. The biological concept of fitness is defined as reproductive success. In Darwinian terms the phrase is best understood as "Survival of the form that will leave the most copies of itself in successive generations."

Although selection is often characterized as "survival of the fittest," differences in survival are only one component of fitness. Even if no differences in survival occur, selection may operate if some individuals are more successful than others in attracting mates. In many territorial animal species, for example, large males

mate with many females, and small males rarely get to mate. Selection with respect to mating success is termed sexual selection

69. Define transpiration, ground water and percolation? (44 ppt)

Transpiration

Plants absorb water from the soil. Water moves from the roots through the stems to the leaves. Water reaches the leaves. Some of it evaporates from the leaves, adding to the amount of water vapor in the air. This process of evaporation through plant leaves is called transpiration. In large forests, an enormous amount of water will transpire through leaves.

Groundwater

Water moves through the soil and rock layers. Many of the impurities in the water are filtered out. This filtering process helps clean the water.

Percolation (Infiltration)

Percolation is an important process. Rain water soaks into (infiltrates) the ground, into the soil and underlying rock layers. Some of this water ultimately returns to the surface at springs or in low spots downhill. Some of the water percolates underground It is called **groundwater**.

70. Examples of zoomastigophoras? (129ppt)

Examples:

1. ***Trypanosoma brucei***

- It has three sub species.

1. **T*. b. brucei***

- Parasite of non human
- Common host are mammals of Africa

2. *T. b. gambiense*

- Causes sleeping sickness in humans

3. *T. b. rhodesiense*

- Causes sleeping sickness in humans.

71. What is species?

a group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding.

The definition of a **species** is a group of animals, plants or other living things that all share common characteristics and that are all classified as alike in some manner. An **example** of a **species** is all human beings.

72. Types of biological clocks?

Biological clocks are an organism's innate timing device. They're composed of specific molecules (proteins) that interact in cells throughout the body. **Biological clocks** are found in nearly every tissue and organ

Biological Clocks

- Diurnal

Distribution, sleep-wake cycle

- Annual

Reproduction, migration

73. Binomial numen culture? (109ppt)

the system of nomenclature in which two terms are used to denote a species of living organism, the first one indicating the genus and the second the specific epithet.

---

a system of **nomenclature** in which each species is given a unique name that consists of a generic and a specific term.

The binomial system of nomenclature brings order to a chaotic world of common names.

Common names vary from country to country, and from region to region within a country.

There was need of globally recognized names.

In binomial system, no two kinds of animals have the same binomial name.

Every scientific name has two parts:

1. First from genus
2. Second from species

Names are written in italics

73. Properties of phylum porifera?(142ppt)

Characteristic Features of Phylum Porifera

- They are generally marine aquatic organisms, with a few freshwater species.
- Their bodies are asymmetrical.
- Body shape can be cylindrical, vase-like, rounded or sac-like.

- They are diploblastic animals with two layers, the outer dermal layer and the inner gastral layer. There is a gelatinous, non-cellular mesoglea, in between these two layers. This contains many free amoeboid cells.
- The body has many pores called the ostia and a single large opening called osculum at the top.
- Spongocoel is the body cavity that is present.
- They have the characteristic canal system for the flow of water through the body.
- Sense organs are absent.
- There is an endoskeleton present with calcareous spicules (calcium carbonate) or siliceous spicules (silica) or sponging fibres (protein).
- Sexes are not separate.
- Asexual reproduction is seen through budding, fragmentation. Sexual reproduction is seen in certain species, through gametic fusion.

74. What is productivity of trophic level?(08 ppt)

Productivity of trophic level

Rate at which the organisms in the trophic level collectively synthesize new organic matter (new tissue substance). Energy is lost through respiration at every level.

1. **Primary productivity (PP)**

Organic matter produced by photosynthesis

- **Vascular plants;** major contribution in PP
- **Others;** algae, mosses, liverworts
- **PP is function of various factors;** water, temperature, soil

Gross primary production (GPP) is the amount of chemical energy as biomass that primary producers create in a given length of time.

1 a . Gross primary productivity (GPP)

Raw rate at which the primary producers synthesize new organic matter

1 b. Net primary productivity

= GPP – Respiration

- NPP varies with seasonal changes

- Measured in mass/unit area/year

Some fraction of this fixed energy is used by primary producers for cellular respiration and maintenance of existing tissues (i.e., "growth respiration" and "maintenance respiration"). The remaining fixed energy (i.e., mass of photosynthate) is referred to as **net primary production** Some fraction of this fixed energy is used by primary producers for cellular respiration and maintenance of existing tissues (i.e., "growth respiration" and "maintenance respiration"). The remaining fixed energy (i.e., mass of photosynthate) is referred to as **net primary production.**

1. Secondary productivity

The rate that new organic matter is made by means of individual growth and reproduction in all the herbivores. Each heterotroph trophic level has its own secondary productivity.

75. Difference between Gpp and Npp?(ppt08)

1 a . Gross primary productivity (GPP)

Raw rate at which the primary producers synthesize new organic matter

1 b. Net primary productivity

= GPP – Respiration

- NPP varies with seasonal changes
- Measured in mass/unit area/year

76.According to Darwin what is the meant of phenomenan of variation?

“Darwin theory of the mechanism of evoloution begins with the variation that exist among the organisms within a species.Individuals of one generation are qualtatively different form one another”

77. Cammoufalge? (28 ppt)

Camouflage is the use of any combination of materials, coloration, or illumination for concealment, either by making animals or objects hard to see, or by disguising them as something else. Examples include the leopard's spotted coat, the battledress of a modern soldier, and the leaf-mimic katydid's wings

78. Evidence of the natural selection? (82ppt)

Darwin based his theory on many solid evidences from his observations and collected samples.

Three major evidences:

1. Geology

2. Fossil Evidences
3. Galápagos islands

Geology

- Darwin was impressed by Charles Lyell and James Hutton' s ideas of geology.
- Theory of uniformitarianism

Theory states:

Changes in the earth's crust throughout history have resulted from the action of uniform, continuous processes.

Theory of uniformitarianism planted two ideas in Darwin's mind:

(1) The earth could be much older than 6,000 years.

(2) If the face of the earth changed gradually over long periods, living forms also change during that time?

Gradual changes over the time with changing environment was foundation of theory of natural selection.

79. write a note on Origin of eukaryota? 5 marks (115ppt)

Endosymbiotic Theory

- Chloroplasts and Mitochondria evolved from symbiotic bacteria that lived inside of a larger prokaryote.
- Also known as Symbiogenesis
- Chloroplasts evolved from endocytosis of cyanobacteria
- Mitochondria evolved from endocytosis of aerobic bacteria.

Evidence of evolution of mitochondria

- Membranes- Have double cell membranes
- DNA- Have circular DNA, like bacterial genome
- Reproduction- via budding, just like bacteria
- Size- similar size to bacteria (1-10 microns)
- Multicellularity
- Cell specialization, larger size, more complexity
- Volvox algae with division of labor

80. Kingdom of eukaryota(115 ppt)

- Organisms whose cells have a nucleus enclosed within membranes.
- Contain other membrane-bound organelles such as mitochondria and the Golgi apparatus.
- Can be multicellular unlike to other domains.

- Cells make different types of tissues and systems
- Animals and plants are common examples.
- Evolved 2.7 billion years ago

Classification

1. Kingdom Protista (unicellular eukaryotes)
2. Kingdom Plantae
3. Kingdom Fungi
4. Kingdom Animalia

81-Describe evoloution and palentology?(77ppt)

Paleontology is the study of fossils. It provides some of the most direct evidence for evolution. Fossils (to dig) are evidence of plants and animals that existed in the past and have become incorporated into the earth's crust.

Evolution is change in the heritable characteristics of biological populations over successive generations

82-What is nematocyst?(144ppt)

- Fluid-filled, intracellular capsule enclosing a coiled, hollow tube
- A lid like operculum caps the capsule at one end
- The cnidocyte has a modified cilium called a **cnidocil**
- On stimulation, cnidocil discharge a coiled tube

a specialized cell in the tentacles of a jellyfish or other coelenterate, containing a barbed or venomous coiled thread that can be projected in self-defence or to capture prey.

83-Charecteristics of mammailian?(162 ppt)

- Endothermic
- Have hair
- Mammary gland
- Specialized teeth
- Skin is thick and protective
- Three middle ear Ossicles
- Parental care

84-Excertory system of amphbia?(158ppt)

Excretory System

Nitrogenous waste products are ammonia or urea

Fresh water species excrete ammonia

Terrestrial species excrete urea

Osmoregulation by regulating excess of water and conserve essential ions (Na, Cl and other ions)

85-Grass productivity?(ppt 08)

Gross primary production (GPP) is the amount of chemical energy as biomass that primary producers create in a given length of time.

86-Who proposed natrual selection and when?(75ppt)

Darwin influenced by Malthus's ideas, proposed the ground breaking "Theory of natural selection" in 1859.

87-Types of genetic drift?(89ppt)

Two special cases of genetic drift have influenced the genetic makeup in a population.

1. **Founder Effect**
2. **Bottleneck Effect**

Founder Effect

- When a few individuals from a parental population colonize new habitats.
- The new colony that emerges from the founding individuals is likely to have a distinctive genetic makeup
- Far less variation than the larger population

Founder effect: The original population (left) could give rise to different founder populations (right).

Bottleneck Effect

- It occurs when number of individuals in a population is drastically reduced.
- Mostly by any disaster e.g. natural catastrophy, over hunting, habitat damage
- Survivors have gene pool not representing the initial population.

88-Energy flow process?(ppt 06)

Small fraction of solar energy (1%) is consumed in photosynthesis. Transformed into chemical-bond energy. 99% solar energy is converted into heat. Chemical-bond energy is passed from one heterotroph trophic level to the next Loss of 90% energy from one level to next

89-Tropical cascade?(53ppt)

Trophic Cascade

Powerful indirect interactions that can control entire ecosystems. Occurs when a trophic level in a food web is suppressed.

Example: Removal of the top predator can alter the food web dynamics

Impacts of climate and human activity on ecosystem

90-Diff between primary &2ndry treatment of waste water?(ppt 72)

Primary Treatment

Mechanical process

- Screening
- Grinding
- Grit Chamber (heavy particles - “grit”)
- Sedimentation Tank (suspended solids - “sludge”)
- Chlorination of effluent

Secondary Treatment

- Biological process
- Uses bacteria to remove organic matter dissolved in water (ODW) and lower BOD

51-Main body parts of hemichordata?(156ppt)

Body divided into three region

1. **Proboscis**
2. **Collar**
3. **Trunk**

92-Strcture and function of golgi appratus?(119ppt)

Golgi Body

- Named after Camillo Golgi
- An Italian biologist who discovered the organelle with a light microscope in 1897**.**

Structure

- Located near the end of the ER close to the nucleus
- Composed of several layers of cisternae (fluid-filled sacs)

Functions

- *cis* is first cisternae.
- *trans* is final cisternae.

- From trans, proteins are packaged into vesicles destined to lysosomes, secretory vesicles, or the cell surface.
- Transport vesicles are used to move back and forth between the ER and Golgi bodies
- One side of the Golgi body receives transport vesicles produced by the ER.
- This side is called cis face.
- Opposite side releasing vesicle is trans face.
- The Golgi body marks and sorts the molecules into different groups.
- These groups are sent in secretory vesicles inside or outside of the cell.
- Proteins are modified before sending by adding specific sugar molecules are added to a core oligosaccharide that is attached to a protein.

94-Different types of pseudopodia?(130ppt)

Types of pseudopodia

Majorly amoeba has four types

1. Lobopodia
2. Filopodia
3. Reticulopodia
4. Axopodia

95-What is cytoskeleton? 2 marks (125ppt)

The cytoplasm of all eukaryotic cells is crisscrossed by a network of protein fibers that supports the shape of the cell and anchors organelles to fixed locations. This network, called the cytoskeleton, is a dynamic system, constantly assembling and disassembling. Individual fibers consist of polymers of identical protein subunits that attract one another and spontaneously assemble into long chains. Fibers disassemble in the same way, as one subunit after another breaks away from one end of the chain.

- Cytoskeleton provides support and shape to cell
- Present in both eukaryotic and prokaryotic cell.
- It is a network of protein fibers
- Supporting cell shape
- Anchoring organelles within the cell

The cytoskeleton is a network of filaments and tubules that extends throughout a cell, through the cytoplasm, which is all of the material within a cell except for the nucleus. It is found in all cells, though the proteins that it is made of vary between organisms. The cytoskeleton supports the cell, gives it shape, organizes and tethers the organelles, and has roles in molecule transport, cell division and cell signaling.

96-Habitat fragmentation effect on ecosystem?(51ppt)

Effects of Fragmentation

- Loss of biodiversity
- Threatening or extinction of species
- Genetic diversity is also fragmented.
- Small populations having smaller pool of fitness maintaining alleles to survive
- Gene flow and migration are reduced.
- Species do not migrate to fragments.
- Reproductive isolation and inbreeding
- It causes inbreeding depression.
- Inbreeding increases the level of homozygosity.
- Facilitating the expression of deleterious alleles that reduce the fitness
- It may result in local extinction.
- Genetic drift is increased.
- Random changes to the genetic make up of populations
- It leads to reductions in genetic diversity.
- Natural selection prefers large population size.
- Small population are weak in adaptations
- May be eliminated by the process of natural selection.
- Greatly affect the predator-prey dynamics of many species.
- By changing species diversity and population size
- Reduction in area of safe zones for prey making them vulnerable to predators
- It may increase their area of refuge on opposite

97-Classes of theria?(162ppt)

Theria has 3 infra classes

Infraclass Ornithodelphia Beaked

Example: Monotremes

Infraclass Metatheria Viviparous; primitive placenta

Example: Marsupials

Infraclass Eutheria

Example: Placentals

98-Types of autotrophs?(04ppt)

Types of Autotrophs

1. Photoautotrophs

- Photosynthetic organisms

- Examples: plants, algae, and cyanobacteria
- Photosynthesis

$6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$

- Main input of free energy into the biosphere

2. Chemoautotrophs

- Occurs in dark habitats. They obtain energy by means of inorganic oxidation reactions. Convert toxic molicules into glucose

Example: Microbes, mussels

99-Activities contribute to biomagnification?(69 ppt)

1. Persistence

- Substance cannot be broken down by environmental processes

2. Food chain energetics

- Substance's concentration increases progressively as it moves up a food chain

3. Low or non-existent rate of internal degradation or excretion of the substance

- often due to water insolubility

100-Features of echinodermata?154(ppt)

- 7000 species are exclusively marine
- Pentaradial symmetry
- Skeleton consists of a series of calcium carbonate plates called Ossicles
- Water vascular system
- Series of water-filled canals, and their extensions called tube feet
- Hemal system derived from coelomic cavities
- Nervous system consist of nerve net, nerve ring and radial nerves

101-Types of succession?(21ppt)

Types of Succession

Primary

Occurring in an environment in which new substrate devoid of vegetation and other organisms usually lacking soil

Secondary

An event reduces already established ecosystem.

102-Types of plathylminthes?

Classification

1) Class Turbellaria (Free-Living Flatworms)
2) Class Monogenea
3) Class Trematoda (Flukes)
4) Class Cestoidea (Tapeworms)

103-Natural selection feature?

- Variation. Organisms (within populations) exhibit individual variation in appearance and behavior.
- Inheritance. Some traits are consistently passed on from parent to offspring. ...
- High rate of population growth.
- Differential survival and reproduction.

104-Oscillating and frequency selection?(ppt96)

Oscillating Selection

- In some cases, selection favors one phenotype at one time and another phenotype at another time.

Example: Medium ground finches of the Galápagos Islands

- In times of drought, the supply of small, soft seeds is depleted.
- But there are still enough large seeds around.
- Consequently, birds with big bills are favored.
- However, when wet conditions return, the ensuing abundance of small seeds favors Oscillating Selection
- However, when wet conditions return, the ensuing abundance of small seeds favors birds with smaller bills.

Frequency dependent selection

This type of selection favors certain phenotypes depending on how commonly or uncommonly they occur**.**

It has two types:

1. **Negative**
2. **Positive**

Negative frequency dependent selection

- Rare phenotypes are favored by selection

- Making them more common thus maintaining variation.

Reason:

- Commonly abundant animals are easy and recognized prey for predators.
- Animals having rare alleles for that trait will have higher chances to survive.

Example:

- Fish predation on an insect, the water boatman, which occurs in three different colors.
- Experiments indicate that each of the color types is preyed upon disproportionately.
- Fish eat more of the common-colored insects than uncommon colors.

105-Benefits of atomsephere?(ppt41)

The Earth's atmosphere protects and sustains the planet's inhabitants by providing warmth and absorbing harmful solar rays. In addition to containing the oxygen and carbon dioxide, which living things need to survive, the atmosphere traps the sun's energy and wards off many of the dangers of space.

106-Name of different stages of foraging?(23ppt)

These stages form a foraging Cycle.

1. **Search**
2. **Assessment**
3. **Capture**
4. **Handling**

107-Charcteristics of bacteria?(113ppt)

- Average bacteria 0.5 - 2.0 µm in diameter.
- Surface Area ~12 µm^2
- Volume is ~4 µm
- Surface Area to Volume is 3:1

- Gel-like matrix of water, enzymes, nutrients, wastes and gases and contains cell structures like numerous ribosomes and polysomes.
- No endoplasmic reticulum and no membrane bound organelles.
- Location of growth, metabolism, and replication.

108-Source of land pollution?(55ppt)

Sources

- Littering
- Herbicides, insecticides, and pesticides
- Construction debris and waste
- Mining waste
- Overcrowded landfills
- Deforestation
- Chemical and nuclear plants
- Industrial factories
- Oil refineries
- Human sewage
- Oil and antifreeze leaking from motor vehicles

109-Adaptdness?

Adaptedness or fitness: is a measure of the capacity for successful reproduction in a given environment. • Not every characteristic is an adaptation to some kind of environmental situation. • Neither adaptations lead to perfection.

110- How digestion occur in class Pisces??(157 ppt)

Digestion

• Herbivore, carnivore and omnivore

• Complete gut

• With stomach/without stomach

• Liver, pancreas, pyloric caeca and endocrine system help in digestion.

111-What is aposepatism?(32ppt)

Aposematism is the advertising by an animal to potential predators that it is not worth attacking or eating. This unprofitability may consist of any defences which make the prey difficult to kill and eat, such as toxicity, venom, foul taste or smell, sharp spines, or aggressive nature.

112-Trophic level process energy?

"The amount of the heat energy at each trophic level decreases as it moves through an ecosystem.As little as 10% of the energy is transferred to the next trophic level the rest is lost largely through metabolic process as a heat".

113-Frequency depend selection?(ppt95)

Frequency dependent selection

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It has two types:

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Negative frequency dependent selection

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Reason:

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Example:

- Fish predation on an insect, the water boatman, which occurs in three different colors.
- Experiments indicate that each of the color types is preyed upon disproportionately.
- Fish eat more of the common-colored insects than uncommon colors.

Positive frequency-dependent selection

- Favours common forms
- It tends to eliminate variation from a population.

Example:

- Predators don't always select common individuals.
- Both positive and negative frequency dependent selections play their role in evolutionary processes.
- There cannot be a standard rule of selection around the globe for one trait.

Frequency-dependent selection may favor either rare or common phenotypes in some circumstances, the fitness of a phenotype depends on its frequency within the population, a phenomenon termed frequency-dependent selection. This type of selection favors certain phenotypes depending on how commonly or uncommonly they occur. Negative frequency-dependent selection in negative frequency-dependent selection, rare phenotypes are favored by selection. Assuming a genetic basis for phenotypic variation, such selection will have the effect of making rare alleles more common, thus maintaining variation. Negative frequency-dependent selection can occur for many reasons. For example, it is well known that animals or people searching for something form a "search image."

That is, they become particularly adept at picking out certain objects. Consequently, predators may form a search image for common prey phenotypes. Rare forms may thus be preyed upon less frequently an example is fish predation on an insect, the water boatman, which occurs in three different colors. Experiments indicate that each of the color types is preyed

upon disproportionately when it is the most common one; fish eat more of the common-colored insects than would occur by chance alone.

Another cause of negative frequency dependence is resource competition. If genotypes differ in their resource requirements, as occurs in many plants, then the rarer genotype will have fewer competitors. When the different resource types are equally abundant, the rarer genotype will be at an advantage relative to the more common genotype.

Positive frequency-dependent selection Positive frequency-dependent selection has the opposite effect; by favoring common forms, it tends to eliminate variation from a population. For example, predators don't always select common individuals. In some cases, "oddballs" stand out from the rest and attract attention. The strength of selection should change through time as a result of frequency-dependent selection.

Negative e frequency-dependent selection

Rare genotypes should become increasingly common, and their selective advantage will decrease correspondingly. Conversely, in positive frequency dependence, the rarer a genotype becomes, the greater the chance it will be selected against

114-Types of ecological pyramids?(10ppt)

Ecological Pyramid refers to a graphical (pyramidal) representation to show the number of organisms, biomass,

and productivity at each trophic level.

There are three different types of ecological pyramids to illustrate ecosystems:

1**. Pyramid of energy**: represents how much energy is available in each trophic level

2. **Pyramid of numbers**: represents the actual number of organisms present in each trophic level

3. **Pyramid of biomass:** represents the total mass of living things in each trophic level

115-Respiratory system in amphbia?(158 ppt)

Respiratory System

- Cutaneous respiration (salamander 30 to 90%)
- Buccopharyngeal respiration (1 to 7% total gas exchange)
- Pulmonary ventilation
- Sac like lungs

116-Realized niche?(ppt20)

Realized Niche

The actual set of environmental conditions, including the presence or absence of other species, in which the species can establish a stable population.

117.What is ecological niche

An ecological niche describes how a species lives and interacts with other organisms in a habitat. It can be thought of as the role or job that a species has in nature

118-Compartive anatomy?(78ppt)

Comparative anatomy is the study of similarities and differences in the anatomy of different species. It is closely related to evolutionary biology and phylogeny (the evolution of species).

119-Principle of Camouflage?(28ppt)

Principles of Camouflage

1. Crypsis

Objects hide and hard to see

2. Mimicry

Disguising them as something else

3. Motion dazzle

Using visual illusions

- Protect without hiding

120-Basic charecteristics of class pices?157ppt

• In oceans and freshwater habitats around the world

• Streamlined body

• Fins and tail for locomotion

• Can be very fast swimmers like sharks

• Endoskeleton of cartilage or bones

• Use gills for respiration

121-What are the evoloutionary adapation of the class pisces(157ppt)

Streamlined body (boat-shaped): Streamlined body produces little resistance in water during

swimming.

Swim bladder_ Swim bladders are hydrostatic organ. Fish can change its gravity by filling gas in the swim bladder. So the fish can float higher or skin lower in water.

Fins: Fins and tail for locomotion

Circulatory system: Their heart has two chambers. It has afferent (which supplies blood to gills) and efferent (it carry away blood from gills) branchial system.

Respiratory system: In most fishes, the respiratory organs are gills

112-What is endomembrane system?

The endomembrane system (endo- = "within") is a group of membranes and organelles in eukaryotic cells that works together to modify, package, and transport lipids and proteins.

The **endomembrane system** is composed of the different membranes that are suspended in the cytoplasm within a eukaryotic cell. These membranes divide the cell into functional and structural compartments, or organelles

123-What is diff between idiobiont & koidiobiont?(26 ppt)

Idiobiont parasitoids

- Sting their prey on capture
- Either killing them outright or paralysing them immediately

Koinobiont parasitoids

- Flies as well as wasps
- Lay their eggs inside young hosts, usually larvae.
- Allowed hosts to grow
- Parasitoids emerge as adults, leaving the prey dead, eaten from inside

124-Causes of extinction?(48 ppt)

- Habitat loss
- Deforestation
- over-hunting
- introduction or removal of species,
- pollution and
- climate change are the major causes of species extinction.

125-Phyletic gradulaism?(105)

Evolutionary changes are occurring gradually over millions of years. This concept, called phyletic gradualism.

126-Classes of colentrate (143ppt)

Classification

1. Class Hydrozoa

2. Class Scyphozoa

3. Class Cubozoa

4. Class Anthozoa

127-Sources of nitrogen?(45ppt)

Sources of Nitrogen

- Lightning
- Inorganic fertilizers
- Nitrogen Fixation
- Animal Residues
- Crop residues
- Organic fertilizers

128-Class aves? Five characteristics of Aves (ppt 160).

- Endothermic
- Spindle shaped body with four divisions
- Head, neck, trunk and tail
- Forelimbs modified for flying
- Epidermal covering of feathers and leg scales
- Presence of beak or bill
- Fully ossified skeleton with air cavities
- Covering of feathers is called a plumage

129-Write down the name of horse like animal which is near to extinction?

- (Thoantherium)

130-Explain troposehre?(ppt37)

The lowest layer

• All weather conditions take place here. Conventional aviation takes place here.

It contains:

• 75% of the atmosphere's mass

• 99% of the total mass of water vapor and aerosols

• The total average height of the troposphere is 13 km.

Properties

• Composition of air is homogenous except water vapors.

• Temperature of the troposphere decreases with altitude.

• Ground absorbs most of the sun's energy

• It makes the lower levels of the atmosphere warm.

• Radiating of heat away from earth at the top of the atmosphere

• It results in the cooling of that part of the atmosphere.

131-Charcteristics of protista?(127ppt)

• Protists are unicellular.

• It cannot be implied that they are simple.

• Often they are more complex than any particular cell in multicellular organism.

• Organelles that are similar to the organelles of other eukaryotic cells carry out specific functions in protists.

• Some protozoan organelles, however, reflect specializations for unicellular lifestyles.

132-Annelida cicrculation?(149ppt)

Circulation

- Segmented vessels expand and may be contractile
- Expanded segmented vessels surround the esophagus
- Propel blood between dorsal and ventral blood vessels
- Branches from the ventral vessels supply the intestine and body wall.

133-Arhtropoda reproductive system?(153ppt)

Reproductive System

- Mostly dioecious
- Paired genital opening
- Male often packages sperm in a spermatophore
- Transfer them into the female genital tract
- Copulation occurs.
- Sperms are transferred via modified pedipalp

134-Theory of natural selection?(ppt85)

The theory of evolution by natural selection, first formulated in Darwin's book "On the Origin of Species" in 1859, is the process by which organisms change over time as a result of changes in heritable physical or behavioral traits

135-Types of speciation?

There are five types of speciation:

- allopatric,
- peripatric,
- parapatric,

- sympatric
- artificial.

.

136-Carbon cycle?(ppt42)

Carbon is main component of living organisms. 20% of human body is carbon by weight. CO_2 is major source of carbon. Atmosphere contains about 750 billion metric tons of carbon in form of CO_2. Photosynthetic organisms take in CO_2 from the atmosphere

Synthesize the carbon containing organic compounds This process is sometimes called **carbon fixation.** Animals eat plants and make their own organic compounds. Production of energy by breakdown of these organic compounds in respiration.

Respiration releases CO_2 in air. Decaying organisms also produce CO_2.

CO_2 released in air is again available for plants. In aquatic ecosystem, CO_2 reacts with the water to form bicarbonate ions. Dissolved CO_2 and bicarbonates are used by algae and aquatic plants in photosynthesis.

Methanogens, for example, are microbes that produce methane (CH_4) instead of CO_2.

Methane released in air is oxidized into CO_2. Amount of CO_2 made by breakdown of organic compounds almost matches the amount of CO_2 used.

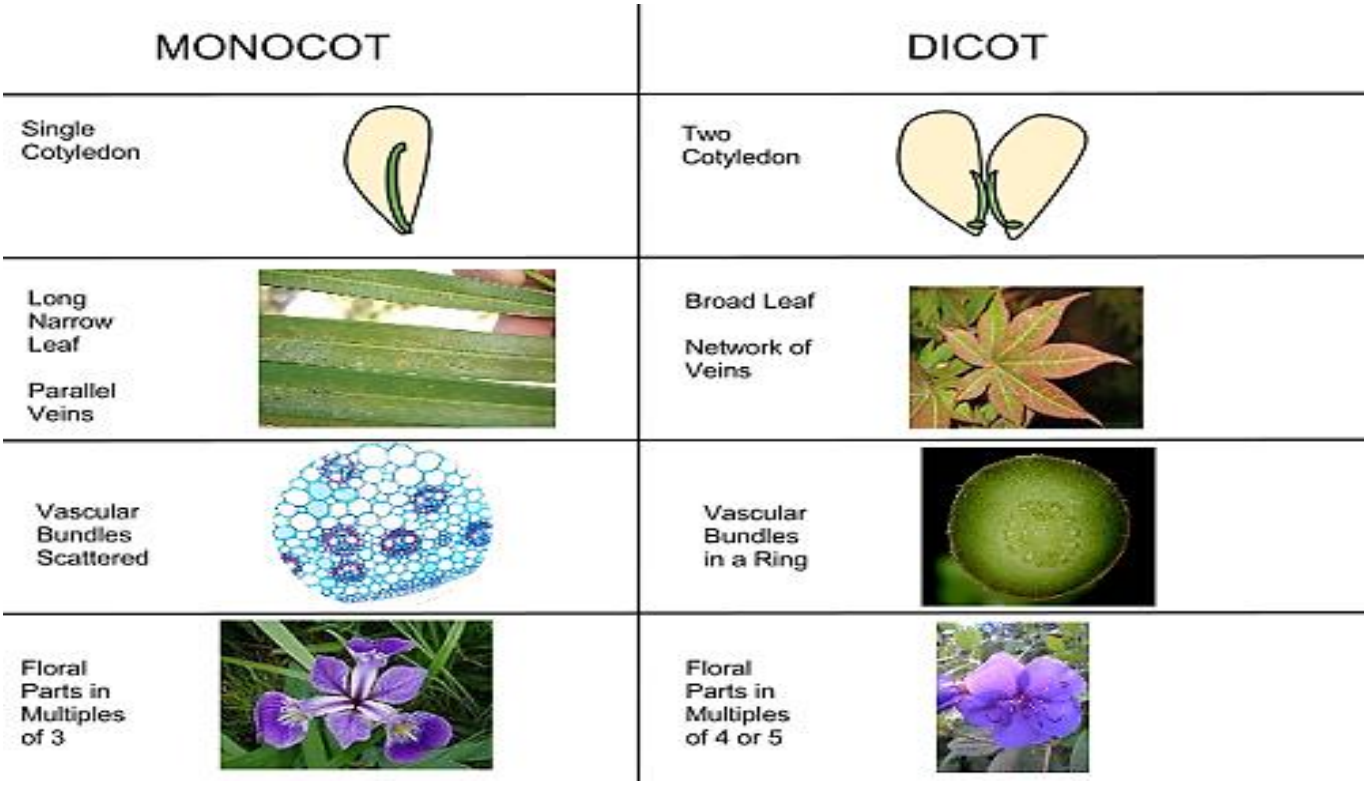
Small mis-matches can have large consequences.

137-Thermosephere?(ppt40)

The **thermosphere** is the layer in the Earth's atmosphere directly above the mesosphere and below the exosphere. Within this layer of the atmosphere, ultraviolet radiation causes photoionization/photodissociation of molecules, creating ions; the **thermosphere** thus constitutes the larger part of the ionosphere.

- Layer, directly above the mesosphere and below the exosphere
- **Height**: 80 km
- Extreme ultraviolet radiation causes photoionization/photodissociation of molecules, creating ions
- Known as ionosphere

138-Monocot & dicot?(164)



Flowering plants are divided into **monocots** (or **monocotyledons**) and **dicots** (or **dicotyledons**). This comparison examines the morphological differences in the leaves, stems, flowers and fruits of monocots and dicots.

Comparison chart

Dicot versus Monocot comparison chart

	Dicot	Monocot
Embryo	As the name suggests, the dicot embryo has two cotyledons.	Monocotyledons have one cotyledon in the embryo.
Leaf venation	Leaf veins are reticulated (branched).	Leaf veins are parallel.
Type of leaves	Dorsiventral	Isobilateral
Stomata in leaves	Some dicots are epistomatous i.e., they have stomata only on one surface on their leaves.	Monocots are amphistomatous i.e., monocot leaves have stomata on both the upper and lower surface.
Bulliform cells	Dicot leaves do not have bulliform cells.	Many monocots have bulliform cells on their leaves to regulate the loss of water.

Dicot versus Monocot comparison chart

	Dicot	Monocot
Flowers	Petals in multiples of four or five. May bear fruit (if tree).	Petals in multiples of three.
Root Pattern	Taproot system	Fibrous roots
Secondary growth	Often present	Absent
Stem and vascular system	Bundles of vascular tissue arranged in a ring. The vascular system is divided into a cortex and stele.	Bundles of vascular tissue scattered throughout the stem with no particular arrangement, and has no cortex.
Pollen	Pollen with three furrows or pores.	Pollen with a single furrow or pore.
Presence or absence of wood	Both herbaceous and woody	Herbaceous
# of seed leaves	2 seed leaves	1 seed leaf
Examples	Legumes (pea, beans, lentils, peanuts) daisies, mint, lettuce, tomato and oak are examples of dicots.	Grains, (wheat, corn, rice, millet) lilies, daffodils, sugarcane, banana, palm, ginger, onions, bamboo, sugar, cone, palm tree, banana tree, and grass are examples of plants that are monocots.

139-Ways of reproductive isolation?(101ppt)

Ways of Reproductive Isolation

1. **Premating isolation**

Geographical Isolation –

prevents mating from taking place

- Barriers, such as rivers or mountain ranges, may separate subpopulations.

Mechanical Isolation –

If courtship behavior patterns of two animals are not mutually appropriate for each other. Mating does not occur.

Temporal Isolation –

type of reproductive isolation due to reproducing at different times.

Behavioral Isolation –

- reproductive isolation due to differences in mating or courtship behavior.
- Even though they are able to physically interbreed.

Example: Different ways to decorate nests to attract females**.**

- **Satin bowerbird & MacGregor's Bowerbird**

Ecological Isolation –

reproductive isolation due to living in different parts of the habitat (microhabitats)

- Rarely come in contact with each other
- Two closely-related birds of the Turdus genus
- Blackbird (*Turdus merula*)
- Ring ouzel (*Turdus torquatus)*
- Population of the blackbird is a woodland species.
- Ring ouzel is a moorland breeding species.
- Both are ecologically isolated and developed into two different species.

140-Balanced polymorphism?(98ppt)

Balanced Polymorphism

It occurs when different phenotypes are maintained at relatively stable frequencies in the population. Resemble a population in which disruptive selection operates.

Example:

Sickle cell anemia is homozygous recessive trait.

Most common in Africa where malaria is common as well.

Heterozygous alleles carriers are less more susceptible to malaria.

Homozygous dominant alleles carriers are more susceptible to malaria.

Homozygous recessive alleles carriers have low survival due to anemia.

141-Bottleneck effect?(ppt90)

Genetic drift can cause big losses of genetic variation for small populations.

Population bottlenecks occur when a population's size is reduced for at least one generation. Because genetic drift acts more quickly to reduce genetic variation in small populations, undergoing a bottleneck can reduce a population's genetic variation by a lot, even if the bottleneck doesn't last for very many

generations. This is illustrated by the bags of marbles shown below, where, in generation 2, an unusually small draw creates a bottleneck.

Reduced genetic variation means that the population may not be able to adapt to new selection pressures, such as climatic change or a shift in available resources, because the genetic variation that selection would act on may have already drifted out of the population.

Bottleneck Effect

- It occurs when number of individuals in a population is drastically reduced.
- Mostly by any disaster e.g. natural catastrophy, over hunting, habitat damage
- Survivors have gene pool not representing the initial population.

- Decreases in genetic diversity make populations less likely to withstand environmental stress.
- More susceptible to extinction
- Decreases in genetic diversity make populations less likely to withstand environmental stress.
- More susceptible to extinction

142-Composition of matrix in mitochondria? 5 marks (122ppt)

- Enclosed in inner membrane
- Gel like consistency ,Dense , homogenous.
- Contains 2/3 rd of total protein of mitochondria.
- Contains enzymes, DNA genome, ribosomes, tRNA, granules, fibrils and tubules.

In the mitochondrion, the **matrix** is the space within the inner membrane.The mitochondrial matrix contains the mitochondria's DNA, ribosomes, soluble enzymes, small organic molecules, nucleotide cofactors, and inorganic ions

143-How much carbon is persent in atomsphere in terms of tons?

Atmosphere contains about 750 billion metric tons of carbon in form of CO_2.

144- Write down the coxal gland and Malpighian tubules? (152ppt))

Excretion

1. Coxal glands
2. Malphigian Tubules

1. Coxal glands

- Paired
- Thin walled

- Absorb nitrogenous waste and excrete through excretory pore

The **coxal gland** is a **gland** found in some arthropods, for collecting and excreting urine. They are found in all arachnids (with the exception of some Acari), and in other chelicerates, such as horseshoe crabs. The **coxal gland** is thought to be homologous with the antennal **gland** of crustaceans.

2. Malpighian tubules

- Absorb waste material from the blood and empty them into the gut tact
- Major excretory product is uric acid
- Uric acid is excreted as a semisolid with little water loss

145-What is fossil?(ppt77)

A fossil is any preserved remains, impression, or trace of any once-living thing from a past geological age. Examples include bones, shells, exoskeletons, stone imprints of animals or microbes, objects preserved in amber, hair, petrified wood, oil, coal, and DNA

146-Evoloution of 3rd atomsphere?(ppt34)

Third Atmosphere

- Constant rearrangement of continental plates
- Inflow and outflow of CO_2 from large continental carbonate stores
- O_2 synthesized in photosynthesis was being used in reducing materials
- Gradually, it was shifted to oxidizing atmosphere instead of reducing
- 541 million years ago, O_2 made stable 15% of atmosphere.

147-How many kinds of selection?(ppt97)

Three kinds of Selection

1. Disruptive Selection
2. Directional Selection
3. Stabilizing Selection

148-What is allopatric speciation?(102ppt)

Geographical isolation of subpopulations from one another is called allopatric speciation

Allopatric speciation, also known as geographic **speciation**, is **speciation** that occurs when biological populations of the same species become isolated due to geographical changes such as mountain building or social changes such as emigration

149-What is parapatric speciation with example?(103ppt)

Parapatric Speciation Parapatric speciation is extremely rare. It occurs when populations are separated not by a geographical barrier, such as a body of water, but by an extreme change in habitat. While populations in these areas may interbreed, they often develop distinct characteristics and lifestyles

Parapatric speciation is the type of speciation when the species are separated due to an extreme change in their habitat when they enter a new habitat.

150-Strcture and function of microfilaments?(126ppt)

Microfilaments, also called **actin filaments**, are polymers of the protein actin that are part of a cell's cytoskeleton. They are long chains of G-actin formed into two parallel polymers twisted around each other into a helical orientation with a diameter between 6 and 8nm

- Microfilaments, also called actin filaments, are polymers of the protein actin that are part of a cell's **cytoskeleton**.
- They are long chains of G-actin formed into two parallel polymers twisted around each other into a helical orientation with a diameter between 6 and 8nm.
- Common to all eukaryotic cells, these filaments are primarily structural in function and are an important component of the cytoskeleton, along with microtubules and often the intermediate filaments. They are the smallest filaments of the cytoskeleton.
- Their functions include cytokinesis, amoeboid movement and cell motility in general, changes in cell shape, endocytosis and exocytosis, cell contractility and mechanical stability.

Functions

- In association with myosin, microfilaments help to generate the forces used in cellular contraction and basic cell movements.
- Eukaryotic cells heavily depend upon the integrity of their actin filaments in order to be able to survive the many stresses they are faced with within their environment.
- Microfilaments play a key role in the development of various cell surface projections including filopodia, lamellipodia, and stereocilia. The filaments are also hence involved in amoeboid movements of certain types of cells.
- Another important function of microfilaments is to help divide the cell during mitosis (cell division). Microfilaments aid the process of cytokinesis, which is when the cell "pinches off" and physically separates into two daughter cells.
- Microfilaments as a part of the cytoskeleton keep organelles in place within the cell. They provide cell rigidity and shape.
- They can depolymerize (disassemble) and reform quickly, thus enabling a cell to change its shape and move

Microfilaments :**(actin filaments)**

Structure

- Thinnest class of fibers
- Solid rods of protein, actin
- Twisted double chain of actin subunits
- About 7 nm in diameter

Functions

- 3-D network inside cell membrane

- In muscle cells, actin filaments interact with myosin filaments to create muscle contraction.

- Cell movement
- Intracellular transport/trafficking
- Maintenance of eukaryotic cell shape
- Cytokinesis
- Cytoplasmic streaming

151-Digestive system of plathylminthes?(146ppt) 122-What is panting?

Digestion and Nutrition

- Marine turbellarians lack the digestive cavity
- Other turbellarians have digestive tracts that are lobed
- Food digestion is partially extracellular
- Pharyngeal glands secrete enzymes that help break down food into smaller units
- Digestion is completed in intracellular vesicles

152-Nervous system of ecchinoderm?(ppt155)

Nervous System

- Nervous system consist of nerve net, nerve ring and radial nerves
- Statocysts and other complex photoreceptor

153-Factors affecting reproductive level of an organism?

Factors affecting reproductive rate

- Number of offspring produced
- Likelihood of survival to reproductive age
- Duration of the reproductive period
- Length of time to reach maturity
- Environmental factors

154-How microbiology affects evoloution?(ppt79)

Molecular biology has yielded a wealth of information on evolutionary relationships.

• Related animals have similar DNA derived from their common ancestor.

• Molecular biologists can estimate the elapsed time since divergence from a common ancestral molecule

by looking for:

• Extraction and analysis of the structure of proteins from animal tissue, and compare the DNA of different animals.

• Dissimilarities in the structure of related proteins and DNA

• By assuming relatively constant mutation rates

155.Birds flying types

kinds of flight

- Birds wing act as airfoil
- Horizontal flight
- Gliding flight
- Flapping flight
- Soaring flight

156. How much carbon dioxide from burning of gasoline? Ppt 64

20% and 13 % of carbon dioxide emissions comes from the burning of gasoline in internal-combustion engines of cars and trucks.

157. Types of Parasites 2 marks

Types of Parasites

3. Endo parasites

- Examples: Liver fluke, tape worm, nematodes

4. Ectoparasites

- Examples: Ticks, mites, fleas, mosquito, lice

158. What is sympatric speciation

Sympatric speciation is the evolution of a new species from a surviving ancestral species While both continue to inhabit the same geographic region

159. What is panting?

Panting, a method of cooling, used by many mammals, most birds, and some reptiles, accomplished by means of the evaporation of water from internal body surfaces.

3 marks

160. Fittest model according to Darwin (3)

Survival of the Fittest

- Because resources are limited, existence is a constant struggle.
- Higher rate of population growth causes depletion of resources.
- Therefore, many individuals die.
- Darwin reasoned that the individuals that die are those with the traits (variations) that make survival and successful reproduction less likely.
- Traits that promote successful reproduction are said to be adaptive.

Survival of the fittest" is a phrase that originated from Darwinian evolutionary theory as a way of describing the mechanism of natural selection. The biological concept of fitness is defined as reproductive success. In Darwinian terms the phrase is best understood as "Survival of the form that will leave the most copies of itself in successive generations."

Although selection is often characterized as "survival of the fittest," differences in survival are only one component of fitness. Even if no differences in survival occur, selection may operate if some individuals are more successful than others in attracting mates. In many territorial animal species, for example, large males mate with many females, and small males rarely get to mate. Selection with respect to mating success is termed sexual selection

161. Consumers resources system (3)

Consumer–resource interactions are the core motif of ecological food chains or food webs, and are an umbrella term for a variety of more specialized types of biological species interactions including prey-predator (see predation), host-parasite (see parasitism), plant-herbivore and victim-exploiter systems.

162. how does pollution be classified (3)

Types of Pollution

- Land
- Air
- Water
- Light
- Noise

Pollution can be **classified** according to the environment (air, water, and soil) in which it occurs or according to the type of pollutant (lead, mercury, carbon dioxide, solid waste, noise, biocide, heat, etc.) by which **pollution** is caused.

163. What are the conditions for natural selection (3)

Conditions of natural selection

- Three conditions must be met for natural selection to occur.

1. Variation must exist among individuals in a population.

Natural selection works by favoring individuals with some traits over individuals with alternative traits. If no variation exists, natural selection cannot operate.

2. Variation among individuals must result in differences in the number of offspring surviving in the next generation.

- Because of their phenotype or behavior
- Some individuals are more successful than others in producing offspring.
- Although many traits are phenotypically variable, individuals exhibiting variation do not always differ in survival and reproductive success.

3. Variation must be genetically inherited.

- For natural selection to result in evolutionary change, the selected differences must have a genetic basis.
- Not all variations has a genetic basis. It can be environmental.
- Even genetically identical individuals may be phenotypically quite distinctive if they grow up in different environments.
- When phenotypically different individuals do not differ genetically, no evolutionary change will have occurred.

164. Thermosphere importance. (3)

It is located above the mesosphere and is the fourth layer of the earth. Its temperature changes with solar activity. In its interior sublayer i.e. ionosphere the radio waves are reflected. The boundary between the **thermosphere** and the exosphere is called Thermopause.

The thermosphere is very high above the **Earth** and is distinguished by an increase in **temperature** with altitude. The density of the air is extremely low, but the activity of the molecules are very high due to the amount of **energy** they are receiving from the sun. Individual molecules can be as warm as 2000 degrees C

These light displays are the northern and southern lights. The **thermosphere** is the largest layer of the earth's atmosphere. Although it is known that temperatures in the **thermosphere** can reach 2000 degrees Celsius or more, actually reading the temperature is difficult for scientists. This is because the air is so thin

165. Explain evolution with cytochrome C (3)

- Evolutionary changes whether over long period or rapid are result of change in genetic make up.
- DNA

Changes in the base sequences in DNA and amino acids in proteins

Cytochrome c is a protein present in the cellular respiration pathways in all eukaryotic organisms.

Closely related organisms have similar *cytochrome c* molecules.

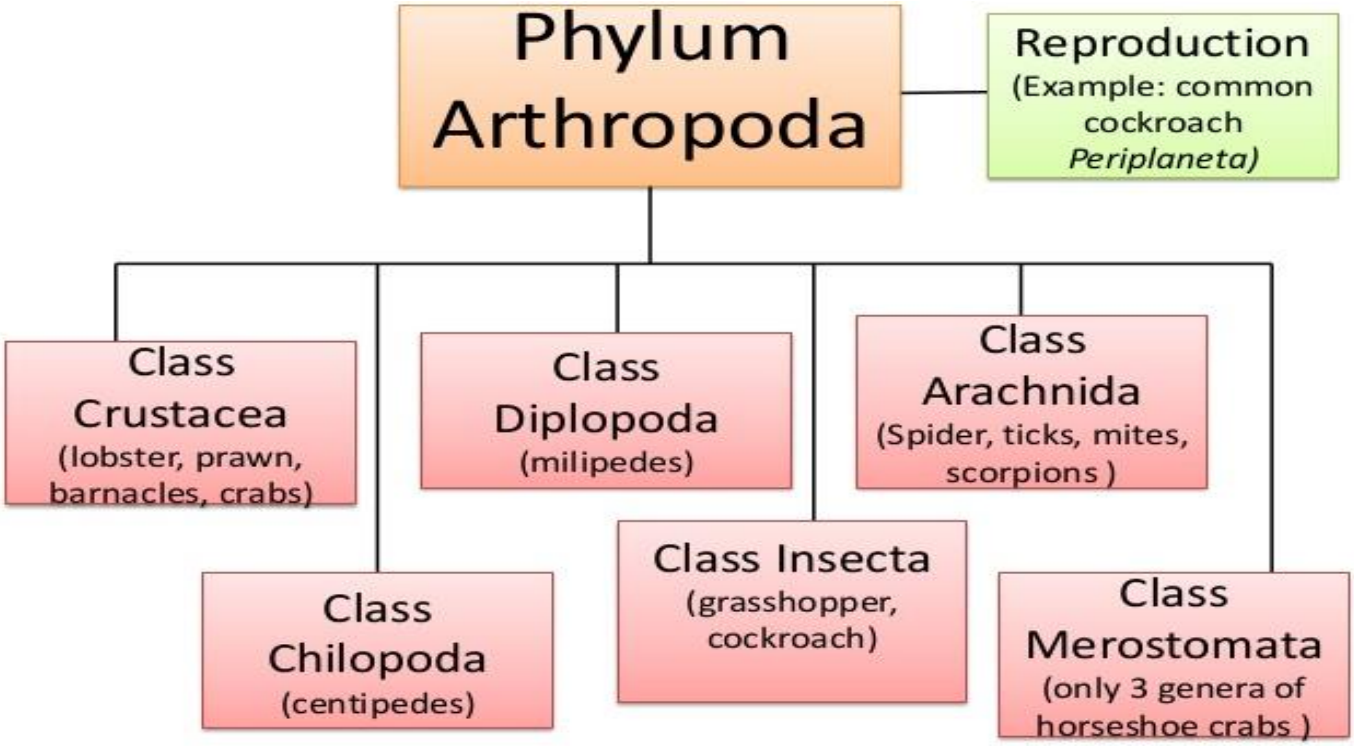
Structure of *cytochrome c* has changed so little during hundreds of millions of years.

It is said to have been conserved evolutionarily. Highly conserved proteins can help establish evolutionary relationships among distantly related organisms.

Not all proteins are conserved as rigorously as *cytochrome c*.

Less conserved proteins are useful for looking at relationships among more closely related animals.

166. 6 Classes of arthropods. (3)



167. Classes of invertebrates (3)

Classification of Invertebrata

1) Porifera
2) Cnidaria
3) Echinodermata
4) Platyhelminthes
5) Nematoda
6) Annelida
7) Arthropoda
8) Mollusca

168. What is Crypsis (3)

In ecology, **crypsis** is the ability of an animal to avoid observation or detection by other animals. It may be a predation strategy or an antipredator adaptation. Methods include camouflage, nocturnality, subterranean lifestyle and mimicry.

169. What is highly conserved part in birds (3)

All birds are easily recognizable as they because of highly conserved structures

1. **Feathers**
2. **Bills**
3. **Body form**

Particular parts of birds, however, are less conservative and have a higher rate of change.

170. Characteristics of ER (Endoplasmic reticulum) (3)

The interior of a eukaryotic cell is packed with membranes so thin that they are invisible under the low resolving power of light microscopes. This endomembrane system fills the cell, dividing it into compartments, channeling the passage of molecules through the interior of the cell, and providing surfaces for the synthesis of lipids and some proteins. The presence of these membranes in eukaryotic cells marks one of the fundamental distinctions between eukaryotes and prokaryotes. The largest of the internal membranes is called the **endoplasmic reticulum** (ER). Endoplasmic means "within the cytoplasm," and reticulum is Latin for "a little net." Like the plasma membrane, the ER is composed of a phospholipid bilayer embedded with proteins. It weaves in sheets through the interior of the cell, creating a series of channels between its folds. Of the many compartments in eukaryotic cells, the two largest are the inner region of the ER, called the cisternal space or lumen, and the region exterior to it, the cytosol, which is the fluid component of the cytoplasm containing dissolved organic molecules such as proteins and ions.

171. What is limits selection (3)

1. Evolution requires genetic variation

2. Gene interactions affect fitness of alleles

3. Genes have multiple effects

172. different types of flagella. (3)

1. **Monotrichous;** one flagella
2. **Lophotrichous;** tuft at one end
3. **Amphitrichous**; both ends

4. **Peritrichous;** all around bacteria.

173. What is convention current? (3)

Convection currents transfer heat from one place to another by mass motion of a fluid such as water, air or molten rock. The heat transfer function of convection currents drives the earth's ocean currents, atmospheric weather and geology.

174. Types of symbiosis (3)

Types

1. **Mutualism**
2. **Commensalism**
3. **Parasitism**

175. Define mimicry and its types. (3)

- The resemblance of one species to another for protective or aggressive purposes
- Different from camouflage
- They imitate instead of hiding by camouflage strategies

Mimicry is the resemblance of one organism to another, usually as the result of evolution in response to a selective advantage. **Mimicry** can involve physical or behavioural traits, and well-studied examples are Batesian and Mullerian **mimicry**.

Types of Mimicry

On basis of adopting different models to mimic:

1. Batesian Mimicry
2. Mullerian Mimicry

176. What are monogamous, polygynous and polyandrous. (3)

- Monogamous (single male pair with single female)
- Polygynous (male mates more then one female)
- Polyandrous (female mates more than one male)

5 marks

177. Phylum actinopoda/characteristics and division of subphylum actinopoda (5)

- Mostly marine
- Spherical, planktonic
- Axopodia supported by microtubules
- Includes marine radiolarians with siliceous tests
- About 3,000 species.

Classified into further three super classes.

1. Foraminiferans
2. Heliozoans
3. Radiolarians

1. Foraminiferans

- Primarily a marine group of amoebae
- Possess reticulopodia and secrete a test that is primarily calcium carbonate
- As they grow, they secrete new, larger chambers that remain attached to the older chambers.
- Foram tests are abundant in the fossil record since the Cambrian period.
- Make up a large component of marine sediments
- Resulted in limestone and chalk deposits at sea bottom.

2. Heliozoans

Aquatic amoebae that are either planktonic or live attached by a stalk to some substrate. Either naked or enclosed within a test that contains openings for axopodia.

3. Radiolarians

- Planktonic marine and freshwater amoebae
- They are relatively large; some colonial forms may reach several centimeters in diameter.
- They possess a test (usually siliceous) of long, movable spines and needles or of a highly sculptured and ornamented lattice.
- After death, tests drift to the ocean floor.
- Some of the oldest known fossils of eukaryotic organisms are radiolarians.

Explain what Darwin found on Galapagos island (5)

`Galapagos Islands

On its trip up the western shore of South America, the HMS *Beagle* stopped at the Galápagos Islands, which are named after the large tortoises that inhabit them (Sp. *Galapagos,* tortoise). The tortoises weigh up to 250 kg, have shells up to 1.8 m in diameter, and live for 200 to 250 years. The islands' governor pointed out to Darwin that the shapes of the tortoise shells from different parts of Albemarle Island differed. Darwin noticed other differences as well. Tortoises from the drier regions had longer necks than tortoises from wetter habitats. In spite of their differences, the tortoises were quite similar to each other and to the tortoises on the mainland of South America. Darwin reasoned that the island forms were derived from a few ancestral animals that managed to travel from the mainland, across 900 km of ocean.

Because the Galápagos Islands are volcanic and arose out of the seabed, no land connection with the mainland ever existed. One modern hypothesis is that tortoises floated from the mainland on mats of vegetation that regularly break free from coastal riverbanks during storms. Without predators on the islands, tortoises gradually increased in number. Darwin also explained some of the differences that he saw. In dryer regions, where vegetation was sparse, tortoises with longer necks would be favored because they could reach higher to get food. In moister regions, tortoises with longer necks would not necessarily be favored, and the shorter-necked tortoises could survive. Darwin made similar observations of a group of dark, sparrow like birds.

Although he never studied them in detail, Darwin noticed that the Galápagos finches bore similarities suggestive of common ancestry. Scientists now think that Galápagos finches also descended from an ancestral species that originally inhabited the mainland of South America. The chance arrival of a few finches, in either single or multiple colonization events, probably set up the first bird populations on the islands. Early finches encountered many different habitats, all empty of other birds and predators. Ancestral finches, probably seed eaters, multiplied rapidly and filled the seed-bearing habitats most attractive to them. Fourteen species of finches arose from this ancestral group, including one species found on small Cocos Island northeast of the Galápagos Islands. Each species is adapted to a specific habitat on the islands.

Pioneer evolutionary scientist Charles Darwin (1809–1882) studied what later became known as directional selection while he was in the Galapagos Islands. He observed that the beak length of the Galapagos finches changed over time due to available food sources. When there was a lack of insects to eat, finches with larger and deeper beaks survived because the beak structure was useful for cracking seeds. Over time, as insects became more plentiful, directional selection began to favor finches with smaller and longer beaks that were more useful for catching insects.

Fossil records show that black bears in Europe decreased in size during periods between continental glacial coverage during the ice ages, but increased in size during the glacial period. This was likely because larger individuals enjoyed an advantage under conditions of limited food supplies and extreme cold.

178. Explain Feeding level of organisms. (5)

Feeding Levels

Food energy passes through different sequence.

Example: plants → grass hopper → frog → snake → hawk

Many plant species eaten by insects.

Many insects species eaten by frogs

Trophic Level

Trophic level of an organism is position it occupies in a food chain.

Food Chain

Linear network of links to pass energy in form of food. Simplified abstractions of real food webs, but complex in their dynamics

Feeding Levels

This complexity is organized by ecologists. Recognized limited number of feeding or trophic levels

Food Chain

Food energy passes through different sequence.

Level 1: Primary producer

Level 2: Primary consumer

Level 3: Secondary consumer

Level 4: Tertiary Consumer

Level 5: Apex Predator

A food chain also shows how the organisms are related with each other by the food they eat. Each level of a food chain represents a different trophic level. Food chain only follows a direct, linear pathway of one animal at a time.

Food Chain

Detritivore and decomposers can be at trophic level as well. They return nutrients back in soil to be available for producers.

179. Metamorphosis and its types. (5)

Metamorphosis, in biology, striking change of form or structure in an individual after hatching or birth. Hormones called molting and juvenile hormones, which are not species specific, apparently regulate the changes.

Metamorphosis is a process by which animals undergo extreme, rapid physical changes some time after birth. The result of metamorphosis may be change to the organism's entire body plan, such as a change in the animal's number of legs, its means of eating, or its means of breathing.

In species that use metamorphosis, metamorphosis is also typically required for sexual maturity. Pre-metamorphic members of these species are typically unable to mate or reproduce.

Types of Metamorphosis

Complete Metamorphosis

In complete metamorphosis, a larva completely changes its body plan to become an adult. The most famous example is that of the butterfly, which starts out as a worm-like, leaf-eating caterpillar and transforms into a flying, nectar-drinking creature with an exoskeleton.

Organisms that undergo complete metamorphosis are called "holometabolous," from the Greek words "holo" for "complete" or "whole," "meta" for "change," and the noun "bole" for "to throw." "Holometabolous," then, means "completely changing," or "wholly changing."

This transformation is so swift and complete that the caterpillar must spin a cocoon and lie dormant for weeks while its body undergoes these radical changes.

Other animals which transform from a worm-like larval stage into an animal that looks completely different include beetles, flies, moths, ants, and bees.

Incomplete Metamorphosis

In incomplete metamorphosis, only some parts of the animal's body change during metamorphosis. Animals that only partially change their bodies as they mature are called "hemimetabolous," from the Greek words "hemi" for "half," "meta," for "change," and the verb "bole" for "to throw."

"Hemimetabolous," then, is a word meaning "half-changing."

Cockroaches, grasshoppers, and dragonflies, for example, hatch from eggs looking a lot like their adult selves. They do acquire wings and functioning reproductive organs as they grow, but they do not completely remake their bodies like their completely metamorphosing cousins do.

180. Gene flow in ecosystem (5)

- Gene flow can be either a constructive or a constraining force.
- It can spread a beneficial mutation that arises in one population to other populations.
- Gene flow can impede adaptation within a population by the continual flow of inferior alleles from other populations.
- Natural selection is removing inferior alleles while gene flow can bring them back.

Example:

- **Heavy metals tolerance**

181. effects of noise pollution (5)

Effects

- Noise pollution can damage physiological and psychological health.
- High blood pressure, stress related illness, sleep disruption, hearing loss, and productivity loss
- It can also cause memory loss, severe depression, and panic attacks.

182. Water pollution (5)

Water pollution

Water pollution is the pollution of bodies of water, such as lakes, rivers, seas, the oceans, as well as groundwater. It occurs when pollutants reach these bodies of water, without treatment. Waste from homes, factories and other buildings get into the water bodies and as a result water gets contaminated.

Water pollution causes

Sewage and waste water Inadequate sewage collection and treatment are sources of water pollution. According to the United Nations, more than 80% of the worldwide wastewater goes back in the environment without being treated or reused.

Urbanization and deforestation Even though it does not have a direct impact on water quality, urbanization and deforestation have a lot of indirect effects. For instance, cutting down trees and concreting over large areas generates an acceleration of flows which does not give enough time for water to infiltrate and be purified by the ground.

Agriculture has an impact on water pollution due to the use of chemicals such as fertilizers, pesticides, fungicides, herbicides or insecticides running off in the water, as well as livestock excrement, manure and methane (greenhouse effect). Regarding aquaculture, pollution is directly in the water, as excess food and fertilizers are causing dystrophication

Industries produce a lot of waste containing toxic chemicals and pollutants. A huge amount of the industrial waste is drained in the fresh water which then flows into canals, rivers and eventually in the sea. Another source of water pollution is the burning of fossil fuels, causing air pollution like acid rain which then flows to streams, lakes, and other stretches of water.

Water pollution effects

On environment Water pollution truly harms biodiversity and aquatic ecosystems. The toxic chemicals can change the color of water and increase the amount of minerals - also known as eutrophication - which has a bad impact on life in water. Thermal pollution, defined by a rise in the temperature of water bodies, contributes to global warming and causes serious hazard to water organisms**.**

On human health Water pollution has very negative effects on public health. A lot of diseases result from drinking or being in contact with contaminated water, such as diarrhea, cholera, typhoid, dysentery or skin infections. In zones where there is no available drinking water, the main risk is dehydration obviously.

Water pollution prevention

Wastewater treatment Wastewater treatment consists of removing pollutants from wastewater through a physical, chemical or biological process. The more efficient these processes are, the cleaner the water becomes.

Green agriculture Globally, agriculture accounts for 70% of water resources, so it is essential to have climate-friendly crops, efficient irrigation that reduces the need for water and energy-efficient food production. Green agriculture is also crucial to limit the chemicals that enter the water.

Storm water management Storm water management is the effort to reduce runoff of rainwater or melted snow into streets, lawns and other sites and the improvement of water quality" according to the US Environmental Protection Agency (EPA). It is important to avoid pollutants from contaminating the water and helps to use water more efficiently.

183. Invasive species (5)

Invasive species

Introduced species threaten native species and habitats & Human influence on colonization

Colonization, a natural process by which a species expands its geographic range, occurs in many ways: A flock of birds gets blown off course, a bird eats a fruit and defecates its seed miles away, or lowered sea levels connect two previously isolated landmasses, allowing species to freely move back and forth. Such events—particularly those leading to successful establishment of a new population—probably occur rarely, but when they do, the resulting change to natural communities can be large. The reason is that colonization brings together species with no history of interaction.

Consequently, ecological interactions maybe particularly strong because the species have not evolved ways of adjusting to the presence of one another, such as adaptations to avoid predation or to minimize competitive effects. The paleontological record documents many cases in which geologic changes brought previously isolated species together, such as when the Isthmus of Panama emerged above the sea approximately 3 Mya, connecting the previously isolated fauna and flora of North and South America. In some cases, the result has been an increase in species diversity, but in other cases, invading species have led to the extinction of natives.

184. sub phylum mastigophora detail? (5)

- Unicellular or colonial
- Locomotion by flagella, pseudopodia, or both
- Autotrophic (self-nourishing), saprozoic (living in decaying organic matter), or heterotrophic (obtains energy from organic compounds)
- Single type of nucleus
- Sexual reproduction (usually)

Phylum Mastigophora has two classes.

1. Phytomastigophora
2. Zoomastigophora

1. Phytomastigophora

- Have flagella for locomotion
- Posses chlorophyll
- Mainly autotrophs
- Some heterotrophs
- Produce a large portion of the food in marine food webs
- Much of the oxygen used in aquatic habitats comes from photosynthesis by these marine organisms.
- Common marine phytomastigophore are dinoflagellates.
- They contain two flagella.
- Contain chlorophyll, xanthophyll pigments, which gives golden brown color
- Chloroplasts change coloration of water
- Gymnodinium produce toxins – “red tides”
- Algal blooms, consume most of O_2 in water.

Euglena

- Freshwater
- Chloroplast has a pyrenoid
- Involved in carbon fixation and starch formation and its storage
- Orients towards light
- Stigma covers photoreceptors at base of flagellum
- Stigma permits light in one direction
- Euglena flagella are haploid
- Flagella reproduce by binary fission- longitudinal
- Sexual reproduction is still unknown

Volvox

- Colonial flagellate
- Embedded in a spherical, gelatinous matrix
- Individual cells posses two flagella
- Asexual reproduction occurs in spring and summer.
- Sexual reproduction occurs in autumn.

Some species of Volvox which reproduce in summer has:

1. **Dioecious**
2. **Monoecious**

- Specialized cells differentiate into macrogametes or microgametes.
- Macrogametes are large, filled with nutrient reserves, and nonmotile.
- Microgametes form a packet of flagellated cells (sperms).
- That leaves the parental colony and swims to a colony containing macrogametes.

Syngamy occurs.

- Zygote undergoes meiosis to retain haploidy.
- Product of meiosis undergoes mitotic division.
- Daughter colonies are released from zygotic capsule.

2. **Zoomastigophora**

- Lack chloroplast
- Heterotrophic or saprozoic
- Parasites of humans

Examples:

2. ***Trypanosoma brucei***

- It has three sub species.

2. **T*. b. brucei***

- Parasite of non human
- Common host are mammals of Africa

2. *T. b. gambiense*

- Causes sleeping sickness in humans

3. *T. b. rhodesiense*

- Causes sleeping sickness in humans.

Tsetse flies is the intermediate host for all three sub species.

- Trypanosoma reproduce asexually.
- In gut of fly for 10 days
- Migrate to salivary glands
- Transform into fly after 15 to 35 days.
- Infected Tsetse fly bites another host
- Parasite travel with salivary secretion
- Enter into blood of human
- Multiply asexually
- Inside host, they live in the blood, Lymph, spleen, central nervous system and cerebrospinal fluid
- When parasite enters into central nervous system
- Symptoms includes apathy, mental dullness, and lack of coordination.
- May be fatal

185. Theory of "inheritance of acquired characteristics or soft inheritance"? 5 marks (80 ppt)

Jean Baptiste Lamarck (1744–1829) was a distinguished French zoologist. His contributions to zoology include important studies of animal classification. Lamarck, however, is remembered more for a theory of how change occurs. He believed that species are not constant and that existing species were derived from preexisting species. Lamarck's rather elaborate explanation for evolutionary change involved a theory that was widely accepted in the early 1800s called the **theory of inheritance of acquired characteristics.**

- If an organism developed a characteristic feature through adapting to a new way of life during its lifetime, it would pass this on to its offspring
- The classic example given is that of the giraffe's neck.
- As the giraffe's ancestors searched for a richer food supply they stretched to reach higher branches in trees.
- Thus their stretched bodies were passed onto their offspring.
- Characteristics acquired during the lifetime of a parent are not passed onto the offspring.
- Changes only in the germ cells/DNA are transferred to next generation.
- Modern genetics confirmed germ plasm theory.

186. Plasmodium life cycle (5)

Plasmodium is a genus of unicellular eukaryotes that are obligate parasites of vertebrates and insects. The life cycles of **Plasmodium** species involve development in a blood-feeding insect host which then injects parasites into a vertebrate host during a blood meal.

The malaria parasite develops both in humans and in the female *Anopheles* mosquitoes. The size and genetic complexity of the parasite mean that each infection presents thousands of antigens (proteins) to the human immune system.

The parasite also changes through several life stages even while in the human host, presenting different antigens at different stages of its life cycle. Understanding which of these can be a useful target for vaccine development has been complicated. In addition, the parasite has developed a series of strategies that allow it to confuse, hide, and misdirect the human immune system.

1. Malaria infection begins when an infected female *Anopheles* mosquito bites a person, injecting *Plasmodium* parasites, in the form of sporozoites, into the bloodstream.
2. The sporozoites pass quickly into the human liver.
3. The sporozoites multiply asexually in the liver cells over the next 7 to 10 days, causing no symptoms.
4. In an animal model, the parasites, in the form of merozoites, are released from the liver cells in vesicles, journey through the heart, and arrive in the lungs, where they settle within lung capillaries. The vesicles eventually disintegrate, freeing the merozoites to enter the blood phase of their development.*
5. In the bloodstream, the merozoites invade red blood cells (erythrocytes) and multiply again until the cells burst. Then they invade more erythrocytes. This cycle is repeated, causing fever each time parasites break free and invade blood cells.
6. Some of the infected blood cells leave the cycle of asexual multiplication. Instead of replicating, the merozoites in these cells develop into sexual forms of the parasite, called gametocytes, that circulate in the blood stream.
7. When a mosquito bites an infected human, it ingests the gametocytes, which develop further into mature sex cells called gametes.
8. The fertilized female gametes develop into actively moving ookinetes that burrow through the mosquito's midgut wall and form oocysts on the exterior surface.
9. Inside the oocyst, thousands of active sporozoites develop. The oocyst eventually bursts, releasing sporozoites into the body cavity that travel to the mosquito's salivary glands.
10. The cycle of human infection begins again when the mosquito bites another person.

187. write a note on circulatory system of mammals? 5 marks

Circulatory System

- Four chambered heart
- Have two atria and two ventricle
- Separate systematic and pulmonary circuit
- Distribute the respiratory gases and nutrients in the fetus

188. Pineal glands function in birds. (5)

The pineal gland is a small, pea-shaped gland in the brain. Its function isn't fully understood. Researchers do know that it produces and regulates some **hormones**, including melatonin. Melatonin is best known for the role it plays in regulating sleep patterns.

The pineal gland plays a key role in the control of the daily and seasonal rhythms in most vertebrate species. In most non-mammalian species, including birds, the pineal gland contains a self-sustained circadian oscillator and several input channels to synchronize the clock, including direct light sensitivity.

10 marks

189. Environmental factors that affect population growth 10 Marks

- Carrying capacity of environment affect population growth.
- Environmental resistance
- Growth rate gets smaller as approaches the carrying capacity

Environmental factors affect population growth.

- Climate
- Food
- Space
- Competition

Logistic growth curves reflect limited resources placing an upper limit on population size. A logistic growth curve is an S-shaped (sigmoid) curve that can be used to model functions that increase gradually at first, more rapidly in the middle growth period, and slowly at the end, leveling off at a maximum value after some period of time.

A group of individuals of the same species living in the same area is called a population. The measurement of how the size of a population changes over time is called the population growth rate and it depends upon the population size, birth rate and death rate. As long as there are enough resources available, there will be an increase in the number of individuals in a population over time, or a positive growth rate. However, most populations cannot continue to grow forever because they will eventually run out of water, food, sunlight, space or other resources. As these resources begin to run out, population growth will start to slow down. When the growth rate of a population decreases as the number of individuals increases, this is called logistic population growth.

190. Discuss different types of selection and their maintenance in detail with example. 10 Marks

Three kinds of Selection

4. Disruptive Selection
5. Directional Selection
6. Stabilizing Selection

Disruptive Selection

- Selection acts to eliminate intermediate types

Example:

Different beak sizes of seed cracker finches

- Populations of these birds contain individuals with large and small beaks
- Very few individuals with intermediate-sized beaks
- Large beaked birds can open the tough shells of large seeds.
- Birds with the smaller beaks are more adept at handling small and soft seeds.
- Birds with intermediate-sized beaks are unable to open large and small seeds properly.
- Selection eliminates birds with intermediate-sized beaks.
- Disrupting the population into two phenotypically distinct groups; large and small.

Directional Selection

- Elimination of one extreme from an array of phenotypes
- Genes promoting this extreme become less frequent in the population
- Eventually disappear

Stabilizing Selection

- Elimination of both extremes from an array of phenotypes
- Increase in frequency of the already common intermediate type
- No change in the most common phenotype of the population
- Making it even more common by eliminating extremes.

191. K and R selected species 10 Marks

r-selected species

- High growth rates
- Typically exploit less crowded ecological habitats
- Produce many offspring
- Relatively low probability of surviving to adulthood
- High reproductive rate supports their survival.
- Especially in unstable environment

Traits of r-selected species

- High rate of reproduction
- Small body size
- Early maturity onset
- Short generation time
- Ability to disperse offspring widely

Examples: bacteria, grasses, cephalopods, rodents

k-selected species

- Living at densities close to carrying capacity
- Typically are strong competitors in such crowded habitats.
- Invest more heavily in fewer offspring
- Relatively high probability of surviving to adulthood
- Survive in stable environment
- Ability to compete successfully for limited resources is crucial
- Populations of k-selected organisms typically are very constant in number.
- Close to the maximum that the environment can bear

Traits of k-selected species

- Large body size
- Long life expectancy
- Production of fewer offspring
- Often require extensive parental care until they mature
  Examples: humans, whales, parrots, eagles

192. Detail note on lysosomes. 10 Marks

Lysosomes were discovered by the Belgian cytologist de Duve in the 1950s. Lysosomes are vesicles produced by the Golgi apparatus. Present in cytoplasm of eukaryotic cells. It contains degradative enzymes enclosed in a membrane.

Internal environment is acidic **(pH: 7)**

Functions

Lysosomes are known to contain:

1. More than 60 different enzymes
2. More than 50 membrane proteins

Wide variety of hydrolytic enzymes (acid hydrolases) that break down macromolecules such as

1. Nucleic acids
2. Proteins
3. Polysaccharides

- Carrying out digestion
- Recycling of cellular organelles
- The breakdown of viruses and other cellular invaders
- Single-celled organisms, such as amoebas, use lysosomes to digest their food since they have no process for extracellular digestion.

193. Write the evolutionary feature regarding parasitism. 10 Marks

Evolutionary strategies of Parasitism

1. **Parasitic castrators**

- Partly or completely damages the reproductive system of host
- Other systems are left intact

- Host's energy used for growth of parasites

2. Directly transmitted

- Do not need vector for transmission to host
- Single host life cycle

3. Vector transmitted

- Need a vector for transmission to final host
- Life cycle involves an intermediate host.
- Do not sexually reproduce in intermediate hosts

4. Parasitoids

- Mostly are insects
- Sooner or later kill their host

Types:

1. Idiobiont
2. Koinobiont

Idiobiont parasitoids

- Sting their prey on capture
- Either killing them outright or paralysing them immediately

Koinobiont parasitoids

- Flies as well as wasps
- Lay their eggs inside young hosts, usually larvae.
- Allowed hosts to grow
- Parasitoids emerge as adults, leaving the prey dead, eaten from inside

5. Micropredators

- **Attacks more than one host**
- **Reducing each host's fitness**
- **Most micropredators are hematophagic, feeding on blood.**

Types of Parasites

3. Endo parasites

- Examples: Liver fluke, tape worm, nematodes

4. Ectoparasites

- Examples: Ticks, mites, fleas, mosquito, lice

194. Difference between grazers and browsers. 10 Marks

Different feeding strategies

Major strategies:

1. Grazers
2. Browsers

1. Grazers

Feeds on plants such as grasses, soft flowering plants (forbs) and algae. Plants are not killed.

Examples: Deer & Snails

Types of Grazing

3. **Graminivory**

Feeding primarily on grass.Specifically "true" grasses in family Poaceae

Examples: Horses, cattle, hippopotamus, grasshoppers

4. **Coprophagy**

Feeding on grass, forbs, leafy weeds, fruits, tree bark

Heavy grazing for half an hour of grazing period

Followed by half an hour of selective feeding

Example: Horses, cattle, hippopotamus, grasshoppers

- Later feeding in intervals
- Eat their or other species's soft feces (caecotrophs)

Example: Rabbit

2. Browsers

Feed on non-grass plant material

Leaves, soft shoots, twigs, fruits, woody plants such as shrubs

Examples: Goats, deer, giraffe, elephants

Herbivory

- **Over browsing**

- Introduction of herbivores
- Low productivity of native plants
- Less predation pressure

Defense against Herbivory

1. Tolerance
2. Resistance

- Physical/Mechanical defense

Thorns, hair, resins, silica deposits in cell wall, resins make plants inedible

- Chemical defense

- **Chemical defense**

- Terpenes, phenols, alkaloids
- Give bitter taste to plants
- Affect nervous system of herbivore

195. What are herbivore & note on herbivory. 10 Marks

Herbivory

- Consumers of plants
- Anatomically and physiologically adapted to eating plant material
- Mutualistic gut flora e.g. cellulose digesting bacteria
- Important role in food chain

Different feeding strategies

Major strategies:

3. Grazers
4. Browsers

2. Grazers

Feeds on plants such as grasses, soft flowering plants (forbs) and algae. Plants are not killed.

Examples: Deer & Snails

Types of Grazing

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- **Chemical defense**

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- Give bitter taste to plants

Affect nervous system of herbivore

196. Detailed note on phosphorus cycle. 10 Marks

Phosphorus is important component of:

1. Nucleic acids
2. Membrane phospholipids
3. ATP

Phosphorus is mainly found in water, soil and rock in form of phosphates. The phosphorus cycle is the movement of phosphorus to and from between environment and organisms. Unlike to carbon and nitrogen, Phosphorus cannot be found in air in the gaseous state. Phosphate salts are released from rocks through weathering. Dissolve in soil water and will be absorbed by plants. This is the slowest cycle.

Animals absorb phosphates by eating plants or herbivores. When animals and plants die, phosphates will return to the soils or oceans again during decomposition. After that, phosphorus will end up in sediments or rock formations again, remaining there for millions of years. Eventually, phosphorus is released again through weathering and the cycle starts over. Like nitrogen, increased use of fertilizers increases phosphorus runoff into our waterways and contributes to eutrophication.

197. Define polymorphism with significance in evolution. 10 Marks

- Polymorphism occurs in a population when two or more distinct forms exist

- Without a range of phenotypes between them.

Balanced Polymorphism

It occurs when different phenotypes are maintained at relatively stable frequencies in the population. Resemble a population in which disruptive selection operates.

Example:

Sickle cell anemia is homozygous recessive trait.

Most common in Africa where malaria is common as well.

Heterozygous alleles carriers are less more susceptible to malaria.

Homozygous dominant alleles carriers are more susceptible to malaria.

Homozygous recessive alleles carriers have low survival due to anemia.

Therefore, heterozygous are more successful in survival and reproductive potential than two others.

- Heterozygote superiority
- It leads to balanced polymorphism
- Because perpetuation of the alleles in the heterozygous condition maintains both alleles at a higher frequency
- Frequency of homozygous phenotypes will be lower than heterozygous.
- This is Balanced polymorphism.

198. Write the composition of atmosphere. 10 Marks/5 Marks

Comprised of a mixture of:

1. Invisible permanent gases
2. Variable gases
3. Suspended microscopic particles

1. Permanent Gases

Form a constant proportion of the total atmospheric mass

2. Variable Gases

Distribution and concentration varies in space and time

3. Aerosols

Suspended particles and liquid droplets (excluding cloud droplets)

1. Permanent Gases

- 78% Nitrogen (N_2)
- 21% Oxygen (O_2)
- <1% Argon (Ar)

Relative percentages of the permanent gases remain constant up to 80 - 100km high. Turbulent mixing causes atmospheric composition to be fairly homogenous. Called as **Homosphere**

2. Variable Gases

- **Water vapor (H_2O):** 0 to 4%
- **Carbon Dioxide (CO_2):** 0.038%
- **Methane(CH_4):** 0.00017%
- **Ozone(O_3):** 0.000004%

Variable Water vapors

- Water vapor is invisible.
- Its not cloud droplets.
- 3rd major component
- Surface percentages vary between <1% in desserts to 4% in tropics.
- Typical mid-latitude value is about 1-2%.

Variable Carbon Dioxide

- Small percentage of total atmosphere (380 ppm)
- But, very important green house gas

Mauna Loa Observatory CO_2 trace (annual variations embedded in the long-term record)

Variable Ozone

- Near the surface, ozone concentrations about 0.04-0.15 ppm
- In the upper atmosphere ozone concentration can reach ~15 ppm
- Upper atmospheric ozone is vital to blocking harmful radiation
- Ozone near the surface, however, harmful to life

Variable Methane

- Concentrations of about 1.7 ppm
- Extremely potent green house gas - 21 times more powerful by weight than carbon dioxide
- Unexpected increase in last 400,000 years
- Increase attributed to agriculture, industries, bio-mass and fossil fuel burning

3. Aerosols

- Small (or “tiny”) solid particles or liquid droplets (excluding clouds and rain)
- Aerosols can be man-made (anthropogenic) or naturally occurring (like ocean salt, dust, plant emissions)
- Aerosols are not synonymous with pollution

Some aerosols are very beneficial and, in fact, are required for precipitation processes to occur

Composition of atmosphere

A planet's initial atmospheric composition is related to the chemistry and temperature of the local solar nebula during planetary formation and the subsequent escape of interior gases. The original atmospheres

started with a rotating disc of gases that collapsed to form a series of spaced rings that condensed to form the planets. The planet's atmospheres were then modified over time by various complex factors, resulting in quite different outcomes.

The atmospheres of the planets Venus and Mars are primarily composed of carbon dioxide, with small quantities of nitrogen, argon, oxygen and traces of other gases. The composition of Earth's atmosphere is largely governed by the by-products of the life that it sustains. Dry air from Earth's atmosphere contains 78.08% nitrogen, 20.95% oxygen, 0.93% argon, 0.04% carbon dioxide, and traces of hydrogen, helium, and other "noble" gases (by volume), but generally a variable amount of water vapor is also present, on average about 1% at sea level.

The low temperatures and higher gravity of the Solar System's giant planets—Jupiter, Saturn, Uranus and Neptune—allow them more readily to retain gases with low molecular masses. These planets have hydrogen–helium atmospheres, with trace amounts of more complex compounds. Two satellites of the outer planets possess significant atmospheres. Titan, a moon of Saturn, and Triton, a moon of Neptune, have atmospheres mainly of nitrogen. When in the part of its orbit closest to the Sun, Pluto has an atmosphere of nitrogen and methane similar to Triton's, but these gases are frozen when it is farther from the Sun.

Other bodies within the Solar System have extremely thin atmospheres not in equilibrium. These include the Moon (sodium gas), Mercury (sodium gas), Europa (oxygen), Io (sulfur), and Enceladus (water vapor).The first exoplanet whose atmospheric composition was determined is HD 209458b, a gas giant with a close orbit around a star in the constellation Pegasus. Its atmosphere is heated to temperatures over 1,000 K, and is steadily escaping into space. Hydrogen, oxygen, carbon and sulfur have been detected in the planet's inflated atmosphere.[

Atmosphere, containing abundant oxygen in gross chemical disequilibrium with surface organic carbon and gases such as methane, is testament to life’s ability to efficiently convert light energy into chemical energy, some of which is stored in the chemical disequilibrium between the atmosphere and surface.

most of its global circulation.

200. Explain four postulate of Darwin theory. 10 Marks

Theory has four major postulates.

Each postulate describes the driving force behind evolution.

First Postulate

1. Competition

All organisms have a far greater reproductive potential than is ever realized. For example, a female oyster releases about 100,000 eggs with each spawning, a female sea star releases about 1 million eggs each season, and a female robin may lay four fertile eggs each season. What if all of these eggs were fertilized and developed to reproductive adults by the following year? A half million female sea stars (half of the million eggs would produce females and half would produce males), each producing another million eggs, repeated over just a few generations would soon fill up the oceans! Even the adult female robins, each producing four more robins, would result in unimaginable resource problems in just a few years.

Second Postulate

2. Variations

2. Inherited variations arise by random mutation. Seldom are any two individuals exactly alike. Some of these genetic variations may confer an advantage to the individual possessing them. In other instances, variations may be harmful to an individual. In still other instances, particular variations may be neither helpful nor harmful. (These are said to be neutral.) These variations can be passed on to offspring.

Third Postulate

3. Survival of the Fittest

3. Because resources are limited, existence is a constant struggle. Many more offspring are produced than resources can support; therefore, many individuals die. Darwin reasoned that the individuals that die are those with the traits (variations) that make survival and successful reproduction less likely. Traits that promote successful reproduction are said to be adaptive

Fourth Postulate

4. Transfer of adaptive traits to next generation

4. Adaptive traits are perpetuated in subsequent generations. Because organisms with maladaptive traits are less likely to reproduce, the maladaptive traits become less frequent in a population and eventually are eliminated

201. Note on mosaic evolution 10 Marks

A species is a mosaic of different molecules and structures that have evolved at different rates. Some molecules or structures are conserved in evolution.

Others change more rapidly. The basic design of a bird provides a simple example.

All birds are easily recognizable as they because of highly conserved structures

4. **Feathers**
5. **Bills**
6. **Body form**

Particular parts of birds, however, are less conservative and have a higher rate of change.

Wings have been modified for:

1. Hovering (humming bird)
2. Soaring (eagle, vulture)
3. Swimming (swans, ducks)

Legs have been modified for:

1. Wading (stork, heron)
2. Swimming (penguin, duck)
3. Perching (sparrow, parrot)

Mosaic evolution

A species is a mosaic of different molecules and structures that have evolved at different rates. Some molecules or structures are conserved in evolution; others change more rapidly. The basic design of a bird provides a simple example. All birds are easily recognizable as birds because of highly conserved structures, such as feathers, bills, and a certain body form. Particular parts of birds, however, are less conservative and have a higher rate of change. Wings have been modified for hovering, soaring, and swimming. Similarly, legs have been modified for wading, swimming, and perching. These are examples of **mosaic evolution.**

Mosaic evolution, the occurrence, within a given population of organisms, of different rates of evolutionary change in various body structures and functions. An example can be seen in the patterns of development of the different elephant species. The Indian elephant underwent rapid early molar modification with little foreshortening of the forehead. The African elephant underwent parallel changes but at different rates: the foreshortening of the forehead took place in an early stage of development, molar modification occurring later.

Similarly, in man there was early evolution of structures for bipedal locomotion, but during the same time there was little change in skull form or brain size; later, both skull and brain evolved rapidly into the state of development associated with modern human species. The phenomenon of mosaic evolution would seem to indicate that the process of natural selection acts differently upon the various structures and functions of evolving species. Thus, in the case of human development, the evolutionary pressures for upright posture took precedence over the need for a complex brain. Furthermore, the elaboration of the brain was probably linked to the freeing of the forelimbs made possible by bipedal locomotion. Analysis of incidences of mosaic evolution adds greatly to the body of general evolutionary theory.

201. Mode of natural selection? 10 Marks

Natural selection is the process by which the better genetic variations become more common in successive generations of a population. The central concept of natural selection is the evolutionary fitness of an organism. Fitness means an organism's ability to survive and reproduce. Organisms produce more offspring than can survive and these offspring vary in fitness. These conditions produce struggle for survival among the organisms of population . The organisms with favourable variations are able to reproduce and pass these variations to their next generations. the favourable variations are "selected for" their transmission to next generations, while the unfavourable variations are "selected against" their transmission to next generations. As a result of natural selection, the allele that gives more ftness of characteristics (favourable variations) than other alleles becomes more common within population. So, the individuals with favourable variations become a major part of population while the individuals with harmful or unfavourable variations become rarer.

202. Write note on global warming? 10 Marks

Global warming is the phenomenon of a gradual increase in the temperature near the Earth's surface. This phenomenon has been observed over the past one or two centuries. This change has disturbed the climatic pattern of the earth. However, the concept of global warming is quite controversial but the scientists have provided relevant data in support of the fact that the temperature of the Earth is rising constantly.

There are several causes of global warming, which have a negative effect on humans, plants and animals. These causes may be natural or might be the outcome of human activities. In order to curb the issues, it is very important to understand the negative impacts of global warming.

Effects of Global Warming

Following are the major effects of global warming:

Rise in Temperature

Global warming has led to an incredible increase in earth's temperature. Since 1880, the earth's temperature has increased by ~1 degrees. This has resulted in an increase in the melting of glaciers, which have led to an increase in the sea level. This could have devastating effects on coastal regions.

Threat to the Ecosystem

Global warming has affected the coral reefs that can lead to a loss of plant and animal lives. Increase in global temperatures has made the fragility of coral reefs even worse.

Climate Change

Global warming has led to a change in climatic conditions. There are droughts at some places and floods at some. This climatic imbalance is the result of global warming.

Spread of Diseases

Global warming leads to a change in the patterns of heat and humidity. This has led to the movement of mosquitoes that carry and spread diseases.

Decrease in the Human Population

Due to an increase in floods, tsunamis and other natural calamities, the population of humans tend to decrease. Also, the spread of diseases leads to a decrease in the human population.

Loss of Natural Habitat

A global shift in the climate leads to the loss of habitats of several plants and animals. In this case, the animals need to migrate from their natural habitat and many of them even get extinct. This is yet another major impact of global warming on biodiversity.

Evidence for warming can be seen in many ways. For example, on a worldwide statistical basis, ice on lakes and rivers forms later and melts sooner than it used to; on average, ice-free seasons are now 2.5 weeks longer than they were a century ago. Also, the extent of ice at the North Pole has decreased substantially, and glaciers are retreating around the world.

Unchecked global warming could affect most terrestrial ecoregions. Increasing global temperature means that ecosystems will change; some species are being forced out of their habitats (possibly to extinction) because of changing conditions, while others are flourishing. Secondary effects of global warming, such as lessened snow cover, rising sea levels, and weather changes, may influence not only human activities but also the ecosystem.

For the IPCC Fourth Assessment Report, experts assessed the literature on the impacts of climate change on ecosystems. concluded that over the last three decades, human-induced warming had likely had a discernible influence on many physical and biological systems (p. 81). Schneider *et al*. (2007) concluded, with very high confidence, that regional temperature trends had already affected species and ecosystems around the world. With high confidence, they concluded that climate change would result in the extinction of many species and a reduction in the diversity of ecosystems.

- **Terrestrial ecosystems and biodiversity**: With a warming of 3 °C, relative to 1990 levels, it is likely that global terrestrial vegetation would become a net source of carbon (Schneider *et al*., 2007:792). With high confidence, Schneider *et al*. (2007:788) concluded that a global mean temperature increase of around 4 °C (above the 1990-2000 level) by 2100 would lead to major extinctions around the globe.
- **Marine ecosystems and biodiversity**: With very high confidence, Schneider *et al*. (2007:792) concluded that a warming of 2 °C above 1990 levels would result in mass mortality of coral reefs globally. In addition, several studies dealing with planktonic organisms and modelling have shown that temperature plays a transcendental role in marine microbial food webs, which may have a deep influence on the biological carbon pump of marine planktonic pelagic and mesopelagic ecosystems.
- **Freshwater ecosystems**: Above about a 4 °C increase in global mean temperature by 2100 (relative to 1990-2000), Schneider *et al*. (2007:789) concluded, with high confidence, that many freshwater species would become extinct

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- There is a gradual increase in the average temperature of the Earth's atmosphere in the last 100 years.

- It has risen about 1°C since 1900.
- Sources: Greenhouse effect, pollution, deforestation
- The atmospheric concentration of CO_2 measured from Antarctic ice core data implies that Earth's climate has being pretty stable over the past 400,000 years.
- It also shows a rapid increase of about 30% in the past few centuries.
- From 270 ppm (parts per million) to 370 ppm

Precise measurements of atmospheric CO_2 concentration is available only in the last few decade

Information about atmospheric CO_2 concentration and temperatures in the past can be inferred by several different methods:

1. **Tree-ring**
2. **Deep ocean sediment**
3. **Ice core records**
4. **Corals**

- Located high in mountains and in polar ice caps
- Ice has accumulated from snowfall over many millenia.
- Scientists drill through the deep ice to collect ice cores.
- These cores contain dust, air bubbles, or isotopes of oxygen, that can be used to interpret the past climate of that area.
- An increase in atmospheric temperature will lead to the increase in the water vapor content of the troposphere.
- Because water vapor is a strong greenhouse gas, the increase in H_2O vapor in turn causes enhanced greenhouse effect.
- Raising the temperature more
- Higher atmospheric temperature will cause more evaporation of water.
- Which leads to even higher temperature.
- Clouds reflect sunlight
- They decrease the solar energy input into Earth's atmosphere during the day
- But they trap IR radiation from the Earth in night
- CO_2 cycle is thermostat of earth.
- If Earth warms up a bit, then:
- Carbonate minerals formation in the oceans at a higher rate.
- The rate at which the oceans dissolve CO_2 gas increases
- Pulling CO_2 out of the atmosphere
- The reduced atmospheric CO_2 concentration leads to a weakened greenhouse effect
- That counteracts the initial warming and cools the planet back down.
- If Earth cools a bit
- Carbonate minerals formation slows down in the oceans. The rate at which the oceans dissolve CO_2 gas decreases, allowing the CO_2 released by volcanism to build back up in the atmosphere. The increased CO_2 concentration strengthens the greenhouse effect and warms the planet back up

203. Vascular and non-vascular plants? 10 Marks

1. **Non Vascular Plants**

Example:

- Moss, liverworts

1. **Vascular Plants**

Examples:

- Angiosperms and gymnosperms

Vascular Tissue

- A series of vessels (xylem and phloem) that extend from roots to leaves
- Phloem cells move carbohydrates and other nutrients
- Xylem cells move water and dissolved minerals

Non Vascular Plants

- Bryophytes

Examples:

- Mosses, liverworts
- Reproduce by spores
- Nonvascular
- Require standing water for reproduction

Vascular Plants

1. **Seedless**
2. **Gymnosperms**
3. **Angiosperms**

Seedless vascular plants

- Ferns, club mosses, and horsetails
- Require free water for fertilization
- Reproduce with spores

Gymnosperms

- In order to move away from water, plants must produce seeds in protected structures
- Gymnosperms are cone bearing plants
- Separate male and female cones

Examples:

- **Conifers**

Angiosperms

- Flowers are the reproductive part of the plant
- Some have separate male and female plants
- Some have male and female flowers on the same plant
- Most have flowers with male and female parts

- Produce fruits and seeds

Types

1. **Monocot**
2. **Dicot**
    - Named for number of seed leaves
    - Organization of vascular tissue
    - Flower parts
    - Germination of seed

204.R-selected species? 10 Marks

r-selected species

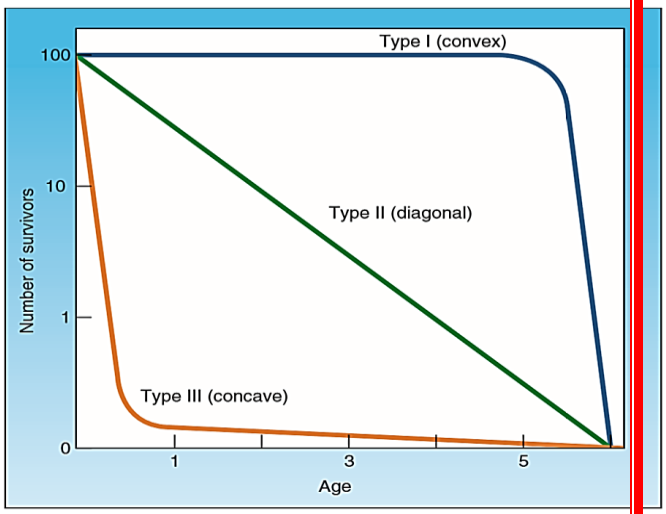
- High growth rates
- Typically exploit less crowded ecological habitats
- Produce many offspring
- Relatively low probability of surviving to adulthood
- High reproductive rate supports their survival.
- Especially in unstable environment

r-selected species are those that emphasize high growth rates, typically exploit less-crowded ecological niches, and produce many offspring, each of which has a relatively low probability of surviving to adulthood (i.e., high r, low K). A typical r species is the **dandelion** (**genus Taraxacum**).

205.Note on survivorship curve? 10 marks

Survivorship Curve

- Y-axis is a logarithmic plot of numbers of survivors
- X-axis is a linear plot of age



Kinds of Survivorship Curve

Type 1 (Convex)

Populations survive to an old age, then die rapidly.

Unimportance of environmental factors in influencing mortality

Potential life span

Example: Humans

Type II (Diagonal)

- Constant probability of death throughout lives
- Influence of environmental factors on mortality
- Mortality independent of age
- **Example**: birds, rodents

Type III (Concave)

- High juvenile mortality
- Influence of environmental factors and less resistance of juveniles on mortality
- Lower mortality in adults
- **Example**: Fish

Animal populations change over time as a result of birth, death, and dispersal. One way to characterize a population with regard to the death of individuals is with survivorship curves. The Y-axis of a survivorship graph is a logarithmic plot of numbers of survivors, and the X-axis is a linear plot of age. There are three kinds of survivorship curves. Individuals in type 1 (convex) populations survive to an old age, and then die rapidly. Environmental factors are relatively unimportant in influencing mortality, and most individuals live their potential life span. Some human populations approach types I survivorship.

Individuals in type II (diagonal) populations have a constant probability of death throughout their lives. The environment has an important influence on death and is no harsher on the young than on the old. Populations of birds and rodents often have type II survivorship curves. Individuals in type III (concave) populations experience very high juvenile mortality. Those reaching adulthood, however, have a much lower mortality rate. Fishes and many invertebrates display type III survivorship curves

206. Phylum apicomplexan? 10 Marks

- Parasitic
- Having apical complex used for penetrating host cells
- Cilia and flagella are lacking, except in certain reproductive stages.
- About 5, 500 species
- Single type of nucleus
- Sexual and asexual phases in life cycle

Class Sporozoea

- Name derived from most sporozoeans producing a resistant spore or oocyst following sexual reproduction
- Some species cause a variety of diseases in domestic animals and humans.
- **Example**: plasmodium, coccidians

Life cycle of sporozoeans

- **Three stages of life:**

1. Schizogony
2. Merogony
3. Gametogony

Schizogony and Merogony

- Multiple fission of an asexual stage in host cells to form many more (usually asexual) individuals
- Which are called **merozoites.**

- They leave the host cell and infect many other cells.
- Merozoites undergo gametogony
- Begins the sexual phase of the life cycle
- The parasite forms either microgametocytes or macrogametocytes.
- Microgametocytes undergo multiple fission to produce biflagellate microgametes
- That emerge from the infected host cell.
- The macrogametocyte develops directly into a single macrogamete.
- A microgamete fertilizes a macrogamete to produce a zygote
- That becomes enclosed and is **called an oocyst.**
- Zygote undergoes meiosis.
- The resulting cells divide repeatedly by mitosis.
- This process, called sporogony, produces many rod-like sporozoites in the oocyst.

Plasmodium

- Causes malaria in humans
- Very common apicomplexan.
- Globally, an estimated 3.4 billion people in 92 countries are at risk of being infected with malaria.

Coccidiosis

- Disease of poultry, sheep, cattle, and rabbits
- Two genera, Isospora and Eimeria have important parasites.

Cryptosporidium (coccidian)

- Chronic diarrhea in AIDS patients
- Only known protozoan to resist chlorination
- Virulent in immunosuppressed individuals

Toxoplasmosis

- Caused by Toxoplasma
- Virulent in immunosuppressed individuals as in AIDS
- major cause of stillbirths and spontaneous abortions.
- Fetuses that survive frequently show signs of mental retardation and epileptic seizures

207. Write a note on phylum porifera? 10 marks

- Sponges
- Marine animals
- Loose organized cells
- Colonies of individual cells
- Asymmetrical or radially symmetrical

Three cell types:

1. **Pinacocytes**
2. **Mesenchyme cells**
3. **Choanocytes**
    - Central cavity, or a series of branching chambers

- No tissues or organs

Skeleton

- Microscopic needlelike spikes called spicules.
- Formed by amoeboid cells
- Made of calcium carbonate or silica
- May be made of spongin

Maintenance

- Feed on particles that range in size from 0.1 to 50 μm.
- Nitrogenous waste removal and gas exchange occur by diffusion
- No nerve cells

Reproduction

1. **Asexual**

- Budding
- Regeneration

2. **Sexual**

- Monoecious
- Choanocytes undergo meiosis to form flagellated sperm
- Other choanocytes form eggs by meiosis

Reproduction

- Cleavage of a zygote results in the formation of flagellated larva
- Larva is released and develops into adult.

208. Metamerism and tagmatization? 10 Marks

Metamerism

Segmented arrangement of body parts in an animal is called **Metamerism**. Each segment having its own excretory, nervous and circulatory system.

Tagmatization

- Organization of segments into functional units (e.g. head, thorax and abdomen)

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Segmentation, also called **metamerism**, or **metameric** segmentation, in **zoology**, the condition of being constructed of a linear series of repeating parts, each being a metamere (body segment, or somite) and each being formed in sequence in the embryo, from anterior to posterior.

Another worm, the earthworm in phylum **Annelida**, can exemplify true metamerism. In each segment of the worm, a repetition of organs and muscle tissue can be found. ... The process that results in the grouping of metameres is called "**tagmatization**", and each grouping is called a tagma (plural: tagmata).

Metamerism is a body type exhibited by members of the phylum **Annelida**. It means that the body is composed of repeating segments attached to make a whole. These segments are known as metameres, and the lines we see externally separating each segment are called annuli. **Metamerism** is easily visible in earthworms.

209. Effects of acid rain? 10 Marks

- Not many things can grow in acidic conditions
- Low pH and high aluminum concentrations can damage or kill fish and aquatic populations
- At pH lower than 5 most fish eggs will not hatch and lower pH can kill adult fish.
- Soils can be damaged by the hydronium ion, which mobilizes aluminum and encourages leaching of minerals such as magnesium essential for plant life.
- Forests suffer from soil damage, however most food crops are unharmed because the nutrients lost are replaced in fertilizer.
- Monuments made of Calcium Carbonate (limestone and marble) will react with acid rain to form Gypsum
- Increases the oxidation rate of metals such as copper and bronze

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Effects of Acid Rain

Acid rain has significant effects on the world environment and public health.

1. Effect on Aquatic Environment

Acid rain either falls directly on aquatic bodies or gets run off the forests, roads and fields to flow into streams, rivers and lakes. Over a period of time, acids get accumulated in the water and lower the overall pH of the water body.

The aquatic plants and animals need a particular pH level of about 4.8 to survive. If the pH level falls below that the conditions become hostile for the survival of aquatic life.

Acid rain tendency of altering pH and aluminum concentrations greatly affects pH concentration levels in surface water, thereby affecting fish as well as other aquatic life-forms. At pH levels below 5, most fish eggs cannot hatch. Lower pHs can also kill adult fish.

Acid rain runoff from catchment areas into rivers and lakes has also reduced biodiversity as rivers and lakes become more acidic. Species including fish, plant

and insect types in some lakes, rivers and brooks have been reduced and some even completely eliminated owing to excess acid rain flowing into the waters.

2. Effect on Forests

It makes trees vulnerable to disease, extreme weather, and insects by destroying their leaves, damaging the bark and arresting their growth. Forest damage due to acid rain is most evident in Eastern Europe – especially Germany, Poland and Switzerland.

3. Effect on Soil

Acid rain highly impacts on soil chemistry and biology. It means soil microbes and biological activity as well as soil chemical compositions such as soil pH are damaged or reversed due to the effects of acid rain.

The soil needs to maintain an optimum pH level for the continuity of biological activity. When acid rains seep into the soil, it means higher soil pH, which damages or reverses soil biological and chemical activities. Hence, sensitive soil microorganisms that cannot adapt to changes in pH are killed.

High soil acidity also denatures enzymes for the soil microbes. On the same breadth, hydrogen ions of acid rain leach away vital minerals and nutrients such as calcium and magnesium.

4. Vegetation Cover and Plantations

The damaging effects of acid rain on soil and high levels of dry depositions have endlessly damaged high altitude forests and vegetation cover since they are mostly encircled by acidic fogs and clouds. Besides, the widespread effects of acid rain on ecological harmony have lead to stunted growth and even death of some forests and vegetation cover.

5. Effect on Architecture and Buildings

Acid rain on buildings, especially those constructed with limestone, reacts with the minerals and corrode them away. This leaves the building weak and susceptible to decay. Modern buildings, cars, airplanes, steel bridges and pipes are all affected by acid rain. Irreplaceable damage can be caused to the old heritage buildings.

6. Effect on Public Health

When in the atmosphere, sulfur dioxide and nitrogen oxide gases and their particulate matter derivatives like sulfates and nitrates, degrades visibility and can cause accidents, leading to injuries and deaths. Human health is not directly affected by acid rain because acid rainwater is too dilute to cause serious health problems.

However, the dry depositions also known as gaseous particulates in the air which in this case are nitrogen oxides and sulfur dioxide can cause serious health problems when inhaled. Intensified levels of acid depositions in dry form in the air can cause lung and heart problems such as bronchitis and asthma.

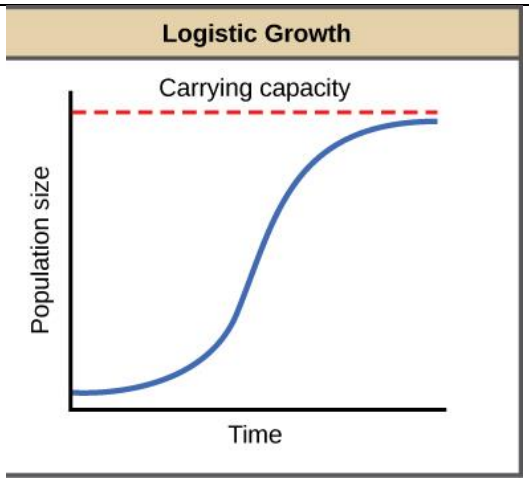
7. Other Effects

Acid rain leads to weathering of buildings, corrosion of metals, and peeling of paints on surfaces. Buildings and structures made of marble and limestone are the ones especially damaged by acid rain due to the reactivity of the acids in the rain and the calcium compounds in the structures.

The effects are commonly seen on statues, old gravestones, historic monuments, and damaged buildings. Acid rain also corrodes metals like steel, bronze, copper, and iron.

210. Differentiate between Exponential or logistic growth? 10Marks

		exponential growth	logistic growth
1.	Definition	It is Involves the growth of population over time, but taking carrying capacity into account.	It is Involves the growth of population over time,but not taking carrying capacity into account.
2.	shape	It shows a characteristic curve which is J-shaped	It shows a characteristic curve which is S-shaped
3.	Application of model	It is applicable to any population which doesn't have a limit for growth	It is applicable to any population which comes to a carrying capacity
4.	Result	It is typically results in an explosion of the population	It is results in a relatively constant rate of population growth
5.	Limitations	doesn't have any upper limit	It has and upper limit, which is the carrying capacity
6.	Number and kinds of phases	It has Only have two phases 1. lag 2. log	It has Has four phases 1. lag 2. log 3. deceleration 4. stationary
7.	Stationary phase	It is not frequently reached	Stationary phase is reached
8.	restriction	un-restricted growth	restricted growth.
9.	Occurrence	It mostly occurs in bacteria	occurs in many organisms.
10	Factors that effect growth rate	1. Food 2. Shelter 3. Space 4. Diseases	1. climate 2. predators 3. food
11	formula	**Dp/dt=kp**	**dp/dt=kp(1-P/L)**

12	graph		

EXPONENTIAL GROWTH	LOGISTIC GROWTH
It occurs when resources are abundant.	It occurs when resources are limited.
Population passes well beyond the carrying capacity of the ecosystem.	Population doesn't grow beyond the carrying capacity of the ecosystem.
It produce J shaped curve.	It produce S shaped curve.
A stationary or stable phase is seldom achieved.	A stationary or stable phase is achieved.
It has two phases lag and log.	It has four phases lag, log, deceleration & steady .
It occurs in fewer organisms like lemmings, algal blooms, etc.	It is more common, example members of wildlife, yeast (a microscopic fungus), etc.

Types of Population growth

1. Exponential
2. Logistic

When resources are unlimited, populations exhibit exponential growth, resulting in a J-shaped curve. In logistic growth, population expansion decreases as resources become scarce. It levels off when the carrying

capacity of the environment is reached, resulting in an S-shaped curve. The potential for a population to increase in numbers of individuals is remarkable. Rather than increasing by adding a constant number of individuals to the population in every generation, the population increases by the same ratio per unit time. In other words, populations experience exponential growth.

The best example of exponential growth is seen in bacteria. Bacteria are prokaryotes that reproduce by prokaryotic fission. This division takes about an hour for many bacterial species. If 1000 bacteria are placed in a large flask with an unlimited supply of nutrients (so the nutrients will not become depleted), after an hour there will be one round of division (with each organism dividing once), resulting in 2000 organisms. In another hour, each of the 2000 organisms will double, producing 4000; after the third hour, there should be 8000 bacteria in the flask; and so on. The important concept of exponential growth is that the population growth rate, the number of organisms added in each reproductive generation, is accelerating; that is, it is increasing at a greater and greater rate. After 1 day and 24 of these cycles, the population would have increased from 1000 to more than 16 billion. When the population size, N, is plotted over time, a J-shaped growth curve is produced.

Logistic Population Growth

Logistic growth curves reflect limited resources placing an upper limit on population size. A logistic growth curve is an S-shaped (sigmoid) curve that can be used to model functions that increase gradually at first, more rapidly in the middle growth period, and slowly at the end, leveling off at a maximum value after some period of time.

3. A group of individuals of the same species living in the same area is called a population. The measurement of how the size of a population changes over time is called the population growth rate and it depends upon the population size, birth rate and death rate. As long as there are enough resources available, there will be an increase in the number of individuals in a population over time, or a positive growth rate. However, most populations cannot continue to grow forever because they will eventually run out of water, food, sunlight, space or other resources. As these resources begin to run out, population growth will start to slow down. When the growth rate of a population decreases as the number of individuals increases, this is called logistic population growth.

4. **Graphing Logistic Population Growth**

5. If we look at a graph of a population undergoing logistic population growth, it will have a characteristic S-shaped curve. The population grows in size slowly when there are only a few individuals. Then the population grows faster when there are more individuals. Finally, having lots of individuals in the

population causes growth to slow because resources are limited. In logistic growth, a population will continue to grow until it reaches carrying capacity, which is

201. Prevention/Adaptation of animals to prevent from dehydration? 10 marks

Adaptations To avoid dehydration:

Behavioral

Nocturnal mode, burrows/hides

Physiological

Osmoregulation

Water Currents

- Affect animal distribution in water body.
- Generated by wind
- Convection currents
- Determine biodiversity and niche
- Movement of minerals and rocks

212. How can food web provide balance in consumption and it resources. 10 marks.

Consumer-Resource system

Direct or indirect balance between resources and consumption. Predators indirectly increase plant growth. They prevent overgrazing by suppressing herbivores. The net effect of direct and indirect relations is called trophic cascades.

Trophic Cascade

Powerful indirect interactions that can control entire ecosystems. Occurs when a trophic level in a food web is suppressed.

Example: Removal of the top predator can alter the food web dynamics

Impacts of climate and human activity on ecosystem

3. **Top-Down Effect**

Effect flows down through a trophic chain. From apex predator to lower trophic levels

4. **Bottom-Up Effect**

Effect flows up through a trophic chain. From primary producers to higher trophic levels

5. **Species Level Cascade**

Subset of the food-web dynamic is impacted by a change in population numbers

6. Community Level Cascades

Change in population numbers has a dramatic effect on the entire food-web

Example: Distribution of plant biomass