

Z00514 – PRINCIPLES OF ANIMAL LIFE I

FINAL TERM MOST IMPORTANT QUESTIONS

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Q-1 Write difference between synchrony and asynchrony.

Cleavage refers to cell divisions that occur during embryonic development. Initially all the cells of embryo divide at the same time this is called **synchrony**. As development proceeds, all cells don't divide simultaneously. This is called **asynchrony**.

Q-2 Explain isomerism in carbohydrates with example.

Isomerism is the phenomenon in which more than one compounds have the same chemical formula but different structural formula. Such compounds are called isomers. All disaccharides are isomers of each other. For example, glucose, galactose and fructose all have the same molecular formula $C_6H_{12}O_6$.

Q-3 Define loose and fibrous connective tissues.

Loose connective tissues are strong flexible fibers of collagen which are interwoven with elastic fibers. They are located in epithelia of skin and throughout body. They wrap and cushion organs. In **fibrous connective tissues** collagen fibers densely packed, parallel. They are located in dermis of skin; submucosa of digestive tract; fibrous capsule of organ and joints. Their major function is to provide structural strength.

Q-4 Define mineralization and oxidation in sulfur cycle.

Mineralization:

Mineralization in the sulfur cycle involves the conversion of organic sulfur compounds into inorganic forms like sulfate through microbial processes. This makes sulfur available for plants and other organisms. Organic matter is decomposed, sulfur compounds are broken down by bacteria, and hydrogen sulfide or sulfuric acid can be produced. These compounds contribute to soil fertility, plant nutrition, and overall ecosystem balance.

Oxidation:

Oxidation in the sulfur cycle refers to the conversion of sulfur compounds, such as hydrogen sulfide (H_2S) or elemental sulfur (S^0), into sulfate (SO_4^{2-}) through microbial and chemical processes. This step releases energy for some microorganisms and contributes to the availability of sulfate for plants and other organisms. Sulfur-oxidizing bacteria play a key role in this conversion.

Q-5 How coexistence occurs?

Coexistence can occur when species utilize resources in slightly different way. MacArthur studied 5 species of warblers that use same caterpillar from different region of trees.

Q-6 Differentiate between renewable and non-renewable resources.

Natural resource can be divided into two main types: Renewable resources and Non-renewable resources. **Renewable resources** are those resources which are constantly available. After using they are reasonably replaced or recovered e.g., water, sunlight, air and biomass. **Non-Renewable Resources** are those which once exhausted are no more available. They are not replaced or recovered e.g., oil, gas and minerals.

Q-7 Difference between hypertonic and hypotonic solution.

Hypertonic Solution: When solute concentration is higher outside the cells than inside. Water molecules move out and the cell shrinks. This condition is called crenation.

Hypotonic Solution: When solute concentration is lower outside the cell than inside. Water molecules move into the cell which causes the cell to swell and burst.

Q-8 Write a detailed note on importance of Phosphorus.

Certainly, here are the key points about the importance of phosphorus:

- **Essential Nutrient:** Phosphorus is a vital nutrient for all living organisms.
- **DNA and RNA:** It is a building block of DNA and RNA, the genetic material of cells.
- **Energy Transfer:** Phosphorus is a component of ATP, the energy currency of cells.
- **Cell Membranes:** It contributes to the structure of cell membranes.
- **Limiting Nutrient:** Phosphorus often limits plant growth in ecosystems.
- **Agricultural Productivity:** Adding phosphorus through fertilizers enhances crop yield.
- **Ecosystem Health:** It influences the health of terrestrial and aquatic ecosystems.
- **Biogeochemical Cycle:** Phosphorus is part of the global phosphorus cycle.
- **Eutrophication:** Excess phosphorus runoff can cause water body pollution and eutrophication.
- **Sustainability:** Proper phosphorus management is vital for food security and ecosystem balance.

Q-9 Write disadvantages of sexual reproduction.

Sexual reproduction has certain disadvantages, some of which are as follows:

- 1) **Asexual animals:** sexual reproduction is not feasible for animal which rely on asexual means only, especially population with one sex only.
- 2) **Adaptive genes combination dismantles:** In sexual reproduction new genetic combinations arise. This will upset the already established adaptive gene combination.
- 3) **Wastage of energy:** in sexual reproduction a large number of gametes are formed. Many of which are not fertilized. This will cause a significant loss of energy.

Q-10 Define budding.

Asexual reproduction in which an outgrowth appears on the body of animal which grows into complete organism. e.g. hydra, obelia and sponges. In budding, a group of cells rapidly divides and form a small outgrowth called bud. This bud increases rapidly and forms a complete organism. The bud may get detach from the parent or sometimes it may remain attached with the parental organism and form a closely associated group of individuals called a colony. Members of a colony belong to same species. In sponges internal buds are produced which are called as gemmules. Gemmule is a collection of cells surrounded by body wall. When parent dies, each gemmule gives rise to a new individual.

Q-11 Differentiate between inductive and deductive reasoning.

Inductive reasoning moves from specific instances to a generalized conclusion, while deductive reasoning moves from general principles to specific conclusions. Inductive reasoning is probabilistic, while deductive reasoning is based on logical rules and guarantees certainty if the premises are true.

Q-12 Difference between oviparous and viviparous.

Oviparous: These are the animals which lay eggs and development takes place outside the body of animals. Fertilization may be internal or external. Majority of invertebrates and many vertebrates are oviparous.

Viviparous: These are the animals in which eggs develop into the body and the young one gets its nourishment from mother. Both fertilization and development is internal. Scorpions, most mammals, elasmobranch fishes, few amphibians and reptiles are viviparous.

Q-13 Differentiate between evolutionary science and experimental science.**Experimental Science**

Biological science that addresses the questions of proximate causes is called experimental science. It proceeds through experiments. E.g., process of maintaining body temperature, process of cell division.

Evolutionary Science

Biological science that addresses the questions of ultimate causes is called evolutionary science. It proceeds through comparative methods E.g., comparison of hemoglobin structure of human and fish.

Q-14 Define reproduction and its importance.**REPRODUCTION AND ITS IMPORTANCE**

With the passage of time animals get aged, new animals should take their place. Reproduction is the process of producing new individuals. It is the basic feature of all forms of life. It is essential for existence of species and also for continuity of life on earth. Capability to reproduce is called reproductive potential. All the animals have great reproductive potential. If resources are unlimited a single species of fishes may fill the all oceans. Animals reproduce by two basic means: Asexual reproduction and sexual reproduction

Q-15 Write a note on oceanic layer.

The oceanic layer comprises stratified zones within the Earth's oceans, defined by variations in physical and chemical properties like temperature, salinity, and density. The surface mixed zone is influenced by wind and waves, exhibiting relatively uniform temperature and mixing. Below lies the thermocline, where temperature drops rapidly with depth. The halocline follows, marked by a sharp change in salinity. Deeper still is the deep ocean zone, with low temperatures, high pressure, and minimal light penetration. These layers play critical roles in oceanic circulation, heat distribution, and marine life habitats. Understanding oceanic layers is vital for comprehending climate patterns, ecosystem dynamics, and the intricate mechanisms that regulate our planet's overall health.

Q-16 What do you study in zoology?

Animal life is very fascinating to human being. It includes a great variety of animals ranging from microscopic invertebrates to very large size vertebrates. Beautiful domestic pets, gorgeous wildlife and stunning aquatic animals are all studied under the heading of zoology. When we see living organisms different questions rise in our mind like; how and where they live? What they eat? What they do? The answer to all questions is given by observing the animals living in natural environment, studying their activities (feeding, growth and reproduction) structure and function of different body parts up to molecular level.

Q-18 Explain RER and SER.

The endoplasmic reticulum (ER) is a complex organelle within eukaryotic cells responsible for various cellular functions. It exists in two distinct forms: smooth endoplasmic reticulum (SER) and rough endoplasmic reticulum (RER).

1. Smooth Endoplasmic Reticulum (SER):

- **Structure:** SER lacks ribosomes on its surface, giving it a smooth appearance under a microscope.
- **Functions:** SER is primarily involved in lipid metabolism, including synthesis of lipids (such as phospholipids and steroids), detoxification of drugs and toxins, and storage of calcium ions. It also plays a role in carbohydrate metabolism.
- **Examples:** SER is abundant in cells that are involved in lipid metabolism, such as liver cells and cells of the endocrine system.

2. Rough Endoplasmic Reticulum (RER):

- **Structure:** RER is studded with ribosomes on its cytoplasmic surface, giving it a rough appearance under a microscope.
- **Functions:** RER is primarily involved in protein synthesis and folding. Ribosomes attached to the RER synthesize proteins that are either destined for secretion, incorporation into the cell membrane, or targeted to specific organelles.
- **Examples:** Cells that actively produce proteins for secretion, such as pancreatic cells producing digestive enzymes or cells of the immune system producing antibodies have abundant RER.

Q-19 Write benefits of asexual reproduction.

Advantages of Asexual Reproduction

- 1) Species survival:** Asexual reproduction is specially the beneficial to those species have one sex only.
- 2) Minimal energy requirements:** Only one sex is involved so less amount of energy is required.
- 3) Positive genetic combinations passed on to next generation:** Because there is no genetic recombination, the good traits acquired of an organism are transmitted to next generation. Fragmentation in planaria Fig. New Mexico Whiptail lizard population has only females.
- 4) Rapid Increase in Population:** Under stable conditions animals reproduce asexually causing a rapid increase in population.

Q-20 Define kingdom.

In the Linnaean system of biological classification, the kingdom is the second-highest taxonomic rank, just below domain. It is used to categorize and classify living organisms based on shared characteristics and evolutionary relationships. The Linnaean system typically includes five or six kingdoms, depending on the classification scheme being used.

Q-21 What are monozygotic twins?

Monozygotic Twins are from single zygote and are identical twins. They are strikingly alike and of same sex. About 33% have separate placenta. Majority have separate amniotic sac. Small proportions have one placenta and one amniotic sac which indicates separation occurs after 9 day of pregnancy. There is conjoining risk, the condition is Siamese twinning.

Q-22 Write a note on importance of nucleotides.

Nucleotides are important because they:

1. Form the building blocks of DNA and RNA, the genetic material of organisms.
2. Carry the genetic code that determines an organism's traits.
3. Serve as the primary energy currency in cells (ATP).
4. Act as signaling molecules in cell communication pathways.
5. Participate in enzymatic reactions and metabolic pathways.
6. Regulate gene expression and protein production.
7. Contribute to cell structure and membrane integrity.

Q-23 Explain intertidal zone.

The Intertidal Zone extends from splash Zone Ocean to low tide marks. This region is subjected to the action of both tides and waves. It is the harshest and the richest of all marine environments. Here is pounding surf, sun, wind, rain, erosion, and sedimentation and temperature fluctuation. This zone has bounty of habitat and plenty of nutrients.

Here, plants are larger. They include seagrass, red algae and mangroves. Motile animals like fishes and crabs move with tides. Other such as amphipods, isopods, ghost crabs and polychaetes burrow in the sand and mud. Water trapped in tidal pools support a rich animal life such as echinoderms, barnacles, limpets and chitons. Attached animals close shells to avoid drought during low tides.

Q-24 Define Coriolis Effect.

The Coriolis Effect is the apparent deflection or curvature of moving objects (such as air or water) caused by the rotation of the Earth. It influences the direction of motion, causing objects to deviate to the right in the Northern Hemisphere and to the left in the Southern Hemisphere.

Q-25 Differentiate between dependent and independent variables.**1. Independent Variable:**

The independent variable is the factor that is deliberately manipulated or changed by the researcher in an experiment. It is the variable that is under the researcher's control and is intentionally altered to observe its effect on the dependent variable. In other words, the independent variable is the presumed cause or influencer in an experiment. It is often placed on the x-axis of a graph and is denoted by "X." For example, in a study examining the effect of different doses of a drug on blood pressure, the independent variable would be the different doses of the drug.

2. Dependent Variable:

The dependent variable is the factor that is observed, measured, or recorded in response to changes in the independent variable. It is the outcome or result that researchers are interested in studying and understanding. The changes in the dependent variable are expected to be influenced by the changes in the independent variable. The dependent variable is often placed on the y-axis of a graph and is denoted by "Y." Following the previous example, in the study of the effect of different doses of a drug on blood pressure, the dependent variable would be the participants' blood pressure readings.

Q-26 Explain theory of chemical evolution.

According to theory of chemical evolution simple molecules were first converted into monomers of carbohydrates, proteins, lipids and nucleic acids. These monomers later joined to form polymers. All these polymers were suspended in oceans giving up a soup like consistency. Polymers later arranged to form a primitive type of cell called Protocell. This was a simple self-replicating system. It was a simple bacterium like primary heterotroph organism. As food availability became limited, natural selection acted upon these simple cells and self-replicating systems were more successful. Cells began to evolve and genetic code was established and protein synthesis mechanism was developed. Fossil record shows that life existed about 3.8 billion years ago. Eukaryotes (membrane bounded nucleus and organelles) evolved about 1.5 billion years ago.

Q-27 Differentiate between sprouter and seeder.

Sprouters are dormant meristem; storage and intact root help to regenerate quickly while seeders are long lived seeds, germination induced by fire. Plants include toyon, chamise, poison oak, scrub oak, yucca and sumac.

Q-28 What is neritic ecosystem?

The Neritic Ecosystem extends from littoral zone to the edge of continental shelf. It is also called the shallow water. Nutrients are delivered by rivers and upwelling at the edge of continental shelf. This region is more productive than open sea. Planktonic and attached algae contribute to the primary productivity. Plants include kelps, algae, seaweeds, seagrasses and phytoplankton.

Invertebrate animals include crabs, sponges, echinoderms, corals, and polychaetes whereas, vertebrate fauna include different types of fishes such as cod, tuna, herring, capelin and many other species.

Q-29 What is holoblastic cleavage?

The pattern of cleavage in which egg is completely divided into two cells. Egg contains little or moderate amount of yolk. Cleavage in fertilized eggs of Amphibians, mammals, echinoderms, flatworms and nematodes.

Q-30 Enlist hierarchy of Ecology.

Contents

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|--------------|-------------------------|--------------|---------------|
| 1. Ecology | 2. Ecological Hierarchy | 3. Organism | 4. Population |
| 5. Community | 6. Ecosystem | 7. Biosphere | |

1. Ecology

- It is the branch of biology that deals with the relationship of organisms to one another and with their physical environment.

2. Ecological Hierarchy

- It is the way in which ecological components interact with each other
- There are five levels: Organism, Population, Community, Ecosystem, Biosphere.

3. Organism

- Organism is the first level in ecological hierarchy
- All the living things come at this level
- E.g., human, lion, tiger, cow, tree, shrub
- The way how organism interact with its environment is studied at this level

4. Population

- Group of organism of same species living at same geographical location at same time • At this level we study how the members of group live together and interact with each other.

5. Community

- Groups of different species living together in a given area
- The number of species represents the diversity of community
- Community ecology includes:
 - Predation
 - Parasitism
 - Competition

6. Ecosystem

- It is the study of all population in a community and their physical environment
- Biotic components and abiotic components
- How living organism makes the use of abiotic components
- How they get energy
- Effect of physical factors on organisms

7. Biosphere

- Biggest of all levels
- All the area of earth and atmosphere occupied by living organisms
- Main focus is on:
 - Geology
 - Climate
 - Water bodies
 - Latitude
 - Longitude

Q-31 Explain internal and external fertilization.

The process of fusion of gametes is called fertilization. The process in which fusion of gametes occurs outside the body of animals is called external fertilization. Normally, it occurs in water. Female releases many eggs in the water; the process is called broadcast spawning. Male sprays sperms on the released eggs. So, fertilization occurs in water and the development is also outside the body of female i.e., external. In case of Internal Fertilization, fusion of gametes occurs inside the body of animals. In mating process male introduces sperms into female body, sperms are motile they approach to female gametes within the body of female. Many sperms are packed into a ball like structure called spermatophore. Which is accepted by female. Sperms are protected in spermatophore and there is minimal loss of sperms. Species with external fertilization produced large number of gametes while few gametes are produced in case of internal fertilization.

Q-32 What are dizygotic twins?

Dizygotic Twins are produced from two zygotes. They are called as fraternal twins. They do not have striking similarities and may be of same or different sex. They have separate placenta and separate amniotic sac.

Q-33 Explain structure of avian egg.

Structure of Avian Egg:

Membranes and fluids are collected around the egg while moving through oviduct. Water and albumin is deposited around the egg. This protects from desiccation and mechanical damage. Albumin is used for protection and a source of nutrition. Two denser strands of albumin called chalaza are attached to the egg shell. They suspend egg in the center of albumen. Shell gland secretes CaCO_3 which deposits around the egg. It is also impregnated with proteins. Thousands of tiny pores (40-50 μm) are for exchange of gases. Inside the shell two membranes are present. At the round end of egg an air pocket is present between two membranes. Air pocket enlarges with time. Near the time of hatching the chick breaks air pocket, the air inflates its lungs and the chick starts breathing.

Q-34 What is fission?

Fission (Latin word fissio, the act of splitting) is a type of asexual reproduction in which one organism splits into two or more organisms. There are two basic types of fission: Binary fission and multiple fission. The process in which one organism divides into two organisms is called binary fission. Both are approximately equal size. Binary fission may be asymmetrical, transverse and longitudinal. Asymmetric organisms like amoeba may divide into two from any side; such fission is called asymmetric fission. When a line of cleavage transversely divides an organism into two is called transverse fission. e.g., binary fission in paramecium. When an organism is divided

longitudinally into two daughter organisms, this is called longitudinal fission. e.g., binary fission in planaria and euglena.

Multiple fission is a number of successive divisions of nucleus followed by cytoplasmic division in which one cell divides into many cells. e.g., amoeba, tapeworm. Amoeba form cyst under unfavorable conditions and form new amoebae by multiple fission.

Q-35 Differentiate between protandrous and protogynous.

Sequential hermaphrodites have one sex in first phase of life and opposite sex in other phase of life. Means if animal is male in first phase of life, it will be female in second half of life. Those sequential hermaphrodites which are female in first phase of life and male in second phase of life called **protogynous** (female first) e.g., wrasses. Those animals which are male in first phase of life and female in second phase of life are called **protandrous** e.g., clown fish.

Q-36 What are characteristics of having small packets?

Proteins are synthesized in the lumen of endoplasmic reticulum from where they are sealed off in small packets called transfer vesicles and send to Golgi apparatus. After modifications in Golgi apparatus proteins are packed into small sacs called secretory vesicles and move towards cell membranes for cells secretions

Q-37 What are microtubules?

Microtubules are hollow, slender, cylindrical structures. They are largest cytoskeletal elements. Each microtubule is about 25nm in diameter and made up of tubulin protein. Microtubules help in movement of organelles and chromosomes. They are part of transport system (e.g., secretory vesicle movement) in the cell and are involved in overall shape changes of cell during specialization. Microtubules make different structures like mitotic apparatus, cilia, flagella and centrioles.

Q-38 What is intermediate filament?

Intermediate filaments are heterogeneous group of cytoskeletal fibers. They are made up of more than 70 different types of proteins. They are of intermediate size (10nm diameter). Intermediate filaments help to maintain cell shape, maintain spatial arrangement of organelles and promote mechanical activities in cytoplasm.

Q-39 Write functions of epididymis?

The epididymis is a coiled tube located on the back of each testicle where sperm mature and are stored before being ejaculated. It plays several essential roles in the process of sperm development and transportation within the male reproductive system. Here are five functions of the epididymis:

1. Sperm Maturation:

Immature sperm produced in the testes enter the epididymis. During their passage through the epididymis, they undergo maturation processes, including changes in membrane proteins and acquiring the ability to swim (motility). This maturation process is crucial for sperm to become fully functional and capable of fertilizing an egg.

2. **Concentration:**

The epididymis aids in concentrating sperm by reabsorbing excess fluid that surrounds the developing sperm. This concentration increases the sperm's concentration and potency, making them more effective for fertilization.

3. **Storage:**

The epididymis acts as a storage reservoir for mature sperm. Sperm that are fully developed are stored within the epididymal ducts until they are needed for ejaculation. This storage capacity ensures that mature sperm are readily available for ejaculation during sexual activity.

4. **Sperm Transport:**

The epididymis plays a role in propelling sperm through its coiled structure via peristaltic contractions of its smooth muscle walls. These contractions assist in moving sperm from the head of the epididymis (where they enter) to the tail of the epididymis (where they are stored) and eventually to the vas deferens for ejaculation.

5. **Functional Assessment:**

As sperm mature within the epididymis, they are subjected to a process known as "capacitation." This process involves changes to the sperm membrane that enable them to become capable of fertilizing an egg. The epididymis provides an environment where sperm can undergo capacitation, ensuring that only functionally competent sperm are released during ejaculation.

Q-40 What is fragmentation?

Fragmentation is the process of asexual reproduction in which an animal breaks into two or more pieces and each piece is capable of growing into a new organism. Fragmentation is common in different groups of animals including cnidarians, Platyhelminthes and echinoderms.

Q-41 Write a note on Coral Reef.

Coral Reef is the underwater ecosystem. They are formed by colonies of stony corals. Coral are members of class Anthozoa. They grow in association of zooxanthellae. Polyps of corals are held together by calcium carbonate. Reefs are formed over thousands of years in warm, clear and relatively shallow waters. The greatest depth for their growth is 50-60 m. Below this light is insufficient to support zooxanthellae. Coral Reefs are the richest source of biodiversity in oceans. Coral reefs occupy less than 0.1% of oceans, yet they are home of more than 25% marine species. Residents include sponges, cnidarians, nematodes, crustaceans, mollusks, echinoderms, tunicates and fishes.

Q-42 Define photoautotrophs, chemoautotrophs and chemolithotrophs.

Photoautotrophs:

Photoautotrophs use sunlight as energy source for the synthesis of food from inorganic compounds. They include green plants, algae and photosynthetic bacteria. Photosynthesis transforms sunlight into chemical energy. Out of total sunlight reaching to earth 30% reflects back, 20% is absorbed by atmosphere, 50% absorbed by earth and less than 1% of sunlight is used by photosynthesis.

Chemoautotrophs:

Chemoautotrophs are microorganisms that obtain energy by oxidizing inorganic compounds, like hydrogen sulfide or ammonia, rather than relying on sunlight. They use this energy to synthesize organic molecules from carbon dioxide through a process called chemosynthesis, sustaining themselves without the need for external organic sources.

Chemolithotrophs:

Chemolithotrophs obtain energy by oxidizing inorganic compounds. They usually live in extreme environments. e.g., sulfur bacteria.

Q-43 How overpopulation effect the earth?

Human overpopulation is a major threat to natural resources. Although modern technology is helping to produce more and more food but extensive use of minerals and oil reserves will exhaust these resources. Although biodiversity is a renewable resource but different animals and plants living on this earth are at the risk of extinction because of overexploitation and destruction of their natural habitat. Different strategies can be used to protect the resources. Conservation is one of the important methods to save natural resources. Resources may be conserved by increasing efficiencies of resource utilization, using alternative resources and recycling of materials. A control on population will have direct impact on resource conservation.

Q-44 What factors affect reproductive potential?

There are 4 factors that affect reproductive potential. They are as follows:

- Number of offspring produced
- Survival to reproductive age
- Reproductive period duration
- Length of time taken to maturity

Q-45 Explain hierarchy classification of animals.

Animal hierarchy is the arrangement of animal into different groups and subgroups on the basis of their relatedness/similarities. The branch of science that deals with the naming and classification of organisms into different groups and subgroups on the basis of relatedness is called taxonomy. Each group of classification is called a taxon. Overall sequence of hierarchy of classification of animals is as follow:

- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- Species

The smallest group of classification system is species.

a. Species

Species is a group of animals which can interbreed and produce fertile offspring. It is the group of animals with maximum similarities. e.g., dogs, cats, horses and elephants.

b. Genus

Closely related species form a genus. Genus name starts with a capital letter and italicized e.g., *Panthera*. *Panthera* is genus of five living wild cats i.e., lion, tiger, jaguar, leopard and snow leopard

c. Family

Closely related genera form a family. e.g., Felidae and Hominidae.

d. Order

Closely related families form an order. e.g., Carnivora and Primates e.

e. Class

Similar orders are grouped together form a class. e.g., Amphibia, Reptilia, Aves and mammalia.

f. Phylum

It is the principal category of classification. Classes with some common features are grouped to form a phylum. e.g., echinodermata and chordata.

g. Kingdom

Kingdom is the highest rank of classification. All the living organisms are distributed into five kingdoms i.e., monera, protista, fungi, plantae and animalia. All the animals are included in kingdom animalia

h. Domain

In 1977 Carl Woese divided the cellular organisms in three domains. i.e., archaea, bacteria and eukarya.