

# ZOO-102 Current papers fall 2020-2021

## Q1: Reproductive Patterns

- The pattern of egg laying and development of young ones.
- In all invertebrates and vertebrates one of the three patterns.
- Oviparity • Ovoviviparity • Viviparity

## Q2: Define oviparous animals? 2marks

**Oviparous** • Which lay eggs and development outside the body of animals • Fertilization may be internal or external • Majority of invertebrates and many vertebrates are oviparous • Parental care may be or may not

## Q3: Define ovoviviparous animals? 2marks

**Ovoviviparous** • Which eggs are retained into the body but the young one gets all its food from yolk of egg • Fertilization is internal • Development also internal • Invertebrates: Annelids, brachiopods, gastropods • Vertebrates: Fishes and reptiles

## Q4: Define viviparous animals? 2marks

**Viviparous** • Which eggs develops into the body and the young one gets its nourishment from mother • Fertilization is internal • Development also internal • Invertebrates: Scorpions • Vertebrates: most mammals and elasmobranch fishes, few amphibians and reptiles

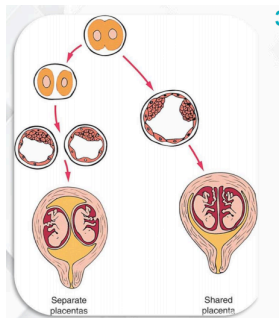
## Q5: Difference between holometabolous Metamorphosis AND Hemimetabolous Metamorphosis)

| Holometabolous Metamorphosis                                                                                                                                                                                                                                                                                                          | Hemimetabolous Metamorphosis                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>This is also called complete metamorphosis</p> <ul style="list-style-type: none"> <li>• In about 88% insects</li> <li>• It is the type of metamorphosis which separates the physiological process of growth from differentiation and sexual stages</li> </ul> <p>Each process is completed without intervention of other stage</p> | <ul style="list-style-type: none"> <li>• It is also called gradual incomplete metamorphosis</li> </ul>                                                                                                                                 |
| <p>Four stages</p> <ul style="list-style-type: none"> <li>• Egg</li> <li>• Larva</li> <li>• Pupa</li> <li>• Adult</li> <li>• <b>E.g., Insects</b></li> </ul>                                                                                                                                                                          | <ul style="list-style-type: none"> <li>• It is the mode of development of certain insects with three distinct stages</li> <li>• Egg</li> <li>• Nymph</li> <li>• Adult</li> <li>• <b>E.g., Aphid, grasshopper, cockroach</b></li> </ul> |
| <p><b>Egg Stage</b></p> <ul style="list-style-type: none"> <li>• First stage of insect life cycle • Development starts after fertilization or sometime without fertilization • Early embryonic development</li> </ul>                                                                                                                 | <p><b>Egg Stage</b></p> <ul style="list-style-type: none"> <li>• First stage of development • Initial stages of development are completed at egg stage • Egg stage varies in different groups but in some</li> </ul>                   |

|                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| completed at this stage • Egg stage is very short but in some cases undergo diapause                                                                                                                                                                                                                                                                                                                                                   | cases undergo diapause • Eggs of aphids are hatched before they are laid                                                                                                                                                                                                                     |
| <b><u>Larval Stage</u></b> <ul style="list-style-type: none"> <li>• Second stage of holometabolous life cycle • Larvae are hatched out from eggs • Motile and worm like form • Actively feed and grow in size • Never possess wings • Simple eyes • There are several larval stages or instars • Larva molts for passing from one instar to the next one</li> </ul>                                                                    | <b><u>Nymph Stage</u></b> <ul style="list-style-type: none"> <li>• Nymph is an immature form hatched out from the eggs • Nymph lacks wings • They have underdeveloped reproductive organs • Nymph undergo gradual changes called instars • Aquatic insect may have tracheal gills</li> </ul> |
| <b><u>Pupa Stage</u></b> <ul style="list-style-type: none"> <li>• Third stage of holometabolous metamorphosis • Larva undergo metamorphosis to become pupa • Larva form a case or cocoon around itself • It is quiescent, non feeding developmental stage • Mostly pupa move very little, however some are mobile • Some insects undergo diapause as pupa • It is the stage of drastic changes in morphology and physiology</li> </ul> |                                                                                                                                                                                                                                                                                              |
| <b><u>Adult Stage</u></b> <ul style="list-style-type: none"> <li>• Final stage of metamorphosis • Adults have wings and reproductive organs • Most insects adult grow very little • Some do not feed and entirely focus on mating and reproduction</li> </ul>                                                                                                                                                                          | <b><u>Adult Stage</u></b> <ul style="list-style-type: none"> <li>• The apparent difference from nymph is presence of wings • They are also reproductively mature</li> </ul>                                                                                                                  |

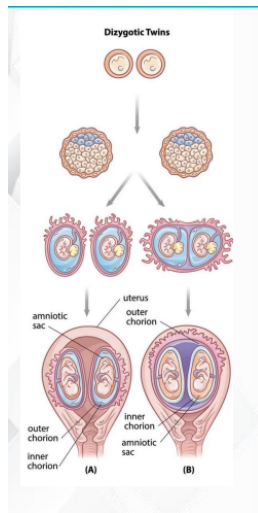
#### Q6: Define Monozygotic Twins

- Produced from one zygote (identical twins) • They are strikingly alike and of same sex • About 33% have separate placenta • Majority have separate amniotic sac
- Small proportion have one placenta and one amniotic sac • Indicate separation occur after 9 day of pregnancy • Conjoining risk, condition is Siamese twinning



#### Q7: Dizygotic Twins.3

- Produced from two zygote (Fraternal twins) • Do not have striking similarities • May be of same or different sex • They have separate placenta and separate amniotic sac



### Q8: Three Functions Of Epididymis Of Human Male Reproductive organ.3

- Sperms from seminiferous tubules comes into a network of called rete testis
- Then into epididymis where:
- Sperms are store
- Muscular contraction propel sperm forward

### Q9: Difference b/w synchrony and Asynchrony?

- 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

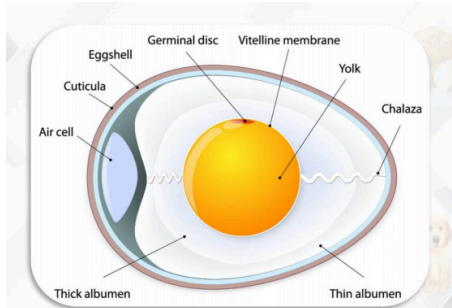
Define human population growth 5 marks

1. Population Growth • It is the increase in number of individuals in a population • Expanding population is the root cause of most environmental problems. • More population means more need for resource: food, urbanization, industrialization
2. Earth's Carrying Capacity • How many human can be supported by earth? • Virtually all scientists agree that even 5 billion is more for earth to support with all facilities • Maximum carrying capacity of earth is may be 9 to 10 billion people
3. Age Structure • Age structure shows the proportion of individuals at prereproductive, reproductive and postreproductive stage • Developing countries have more infants means high birthrates • In contrast to human, in natural population high birthrate is accompanied with high mortality

### Q10: What is avigan egg 3 or 5 marks

Structure of Avian Egg

1. Egg Formation • In ovaries • Large amount of yolk • Mature egg released from ovaries • Comes into oviduct • Fertilization takes place in upper portion of oviduct
2. Egg White • Membranes and fluid collected around the egg while moving through oviduct • Water and albumin is deposited around the egg • This protect from desiccation and mechanical damage • Albumin is used for protection and source of nutrition • Two denser strands of albumin attached to the egg shell
3. Egg Shell • Shell gland secrete  $\text{CaCO}_3$  which deposit around the egg • It is also impregnated with proteins • Thousands of tiny pores (40-50 $\mu\text{m}$ ) are for exchange of gases • Inside shell two membranes • Air pocke



4.

### Q11: Write notes on energy flow? 5marks

#### 1. Energy Budget

• It is the balance sheet of energy gained and energy expenditure of an organism • An organism is an open thermodynamic system which exchange energy with its surrounding in three ways i.e., heat, work and potential energy of biomolecules • Energy budget allocation varies for ectotherms and endotherms. • Ectotherms rely on environment as heat source • Endotherms rely on metabolic heat to maintain body temperature

#### 2. Gross Productivity

• Total amount of energy assimilated by an organism when an animal eats food • When an animal eats, food passes through its gut and nutrients are absorbed

#### 3. Net Productivity

• Most of the energy assimilated is used in metabolic demands which include cellular metabolism and regulation of body temperature • So, net productivity is the amount of energy store in the form of biomass

#### 4. Energy Flow

• Organisms require energy in one form or the other • Energy flow in an ecosystem is major factor for survival for great number of organisms • Source of energy is sunlight • Energy flows via food chain and food web • Flow is by 10% law • Energy flow is unidirectional

#### 5. Flow of material

- All elements essential for life are derived from environment • They make all form of molecules for life. • When animals die and their dead bodies are decomposed, these materials are recycled in the ecosystem • Nutrient flow in ecosystem in a cyclic way

### **Q12: Explain Coelom Formation**

- **Protostomes**: Coelom is formed by splitting of mesoderm. This pattern is called schizocoelous.
- **Deuterostome**: Coelom is formed by out pouching of primitive gut (archenteron). This pattern is called enterocoelous.

### **Q13: Consumer**

- Organisms which can not synthesize their food from inorganic compounds • They eat other organisms to get nutrition • All animals are consumers

### **Q14: Primary Consumers**

- They are also called herbivores • These are the animals which feed on plants • E.g., • insects • grain eating birds • reptiles, birds and mammals which feed on leaves and other vegetation

### **Q15: Secondary Consumers**

- Also called carnivores • These are the animals which feed on herbivores • E.g., lion, tiger, frog

### **Q16: Tertiary consumers**

- These are the animals which feed on secondary consumers • E.g., a snake when eating a frog, a jaguar when hunting for a crocodile

### **Q17: Difference between Density independent factors and Density dependent factors**

#### **Population Density**

- It is the number of individuals living per unit area. • Population density impact populations in predictable ways

#### **Density-independent Factors**

- These factors affect population regardless of their number • Weather conditions • Earth quake • Pollutants • Deforestation • Hurricane • Fire

#### **Density-dependent Factors**

These are the factors which are more severe when population density is high • Competition for resources • Disease • Predation • Parasitism

### **Q18:Spermatogenesis**

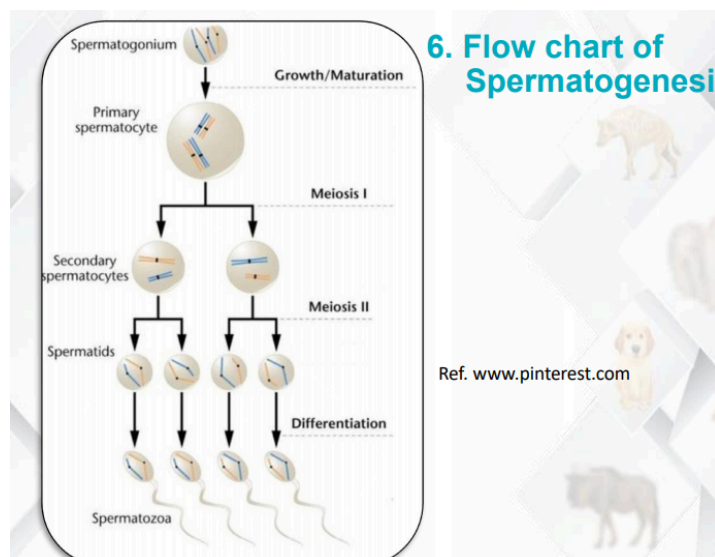
- The process of sperms production in male gonads through meiosis is called spermatogenesis

**2. Location and duration** • Spermatogenesis takes place in testes • In human the entire process of spermatogenesis and its transportation takes about 3 months • However, it is different in different animals

**3. Spermatogonium and Primary Spermatocytes** • Testes contain diploid stem cells • Sperm mother cell is called spermatogonium • It enlarges in its size and become primary spermatocyte

**4. Secondary Spermatocytes and Spermatids** • Primary spermatocyte undergo meiotic cell division. • After meiosis-I two secondary spermatocytes are formed • Meiosis-II results in four haploid spermatids

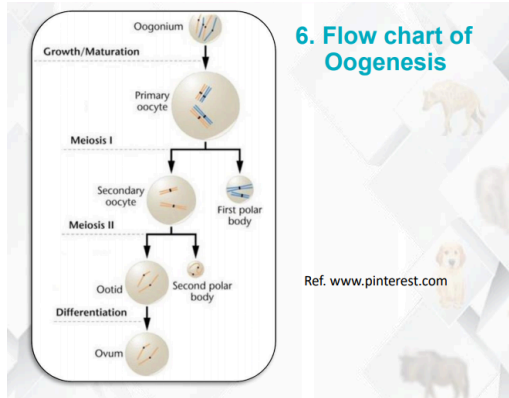
**5. From spermatids to sperms** • Spermatids do not undergo any further cell division • They undergo morphological changes to produce sperms



### Q19: Gametogenesis OR Oogenesis

1. Oogenesis • The process of egg production in female gonads through meiosis is called oogenesis
2. Location of Oogenesis • Oogenesis takes place in ovaries • Follicles are specific structures in which egg formation and maturation takes place
3. Oogonium and Primary Oocytes • Ovaries contain oogonia. • Oogonium increase its size ....primary oocyte • Primary oocyte is diploid cell with duplicated chromosome • Each primary oocyte will form 1 ovum and polar bodies after reductive division
4. Secondary Oocytes and Ovum • Primary oocyte undergo meiotic cell division. • After meiosis-I one secondary oocyte and one polar body is formed • Meiosis-II results in a haploid ootid and another polar body
5. Secondary Oocytes and Ovum • Ootid undergo differentiation process to form ovum

6.



### Q20: Differentiate between the Sprouter AND Seeders:

Types of Plants • Two types of plants

- Sprouters: dormant meristem, storage and intact root help to regenerate quickly
- Seeders: long lived seeds, germination induced by fire • Plants include toyon, chamise, poison oak, scrub oak, Yucca, Sumac

### Q21: factores effecting on reproductive potential(5marks long)

Number of offspring produced

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

### Q22: plasmodstomes(not confirm)

### Q23: Niche Diversification

- Competition between species may be reduced if resources are divided • One part of resources by one species and second part by other species • This mechanism is called niche diversification

### Q24: Epigenesis Theory

- This theory gained popularity in mid 18th century • This theory says that embryo contain material from which embryo is gradually build • Much like a carpenter builds a building from nails, lumber and bricks

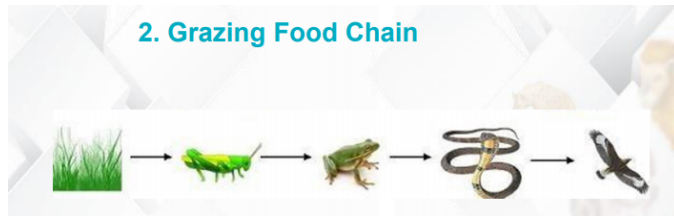
### Q25: Food chain and its importance?

#### 1. Food Chain

- It is the sequence of organisms in an ecosystem where energy moves from one organism to the next organism • It tells us the sequence to eat and being eaten

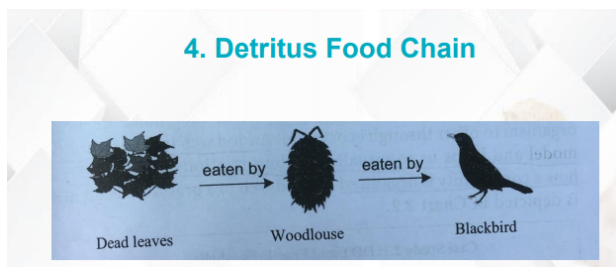
## 2. Grazing Food Chain

- It is the food chain that starts from the living green plants.
- Green plants are eaten by herbivores which are eaten by carnivores
- Such food chains are directly dependent on sunlight



## 3. Detritus Food Chain

- It is the food chain that starts from dead organic matter to microorganisms and then to organisms
- They are little or not at all dependent on direct solar energy



## 4. Importance of Food Chain

- To understand the feeding relationships between organisms
- To explore the energy flow mechanisms and matter circulation
- To understand the problems of biomagnification

### Q26: Neritic Ecosystem.2

- Neritic ecosystem extend from littoral zone to the edge of continental shelf
- It is also called the shallow water

### Q27: Enlist 5 types of ecological hierarchy?5

2. Ecological Hierarchy • It is the way in which ecological components interact with each other • There are five levels • Organism • Population • Community • Ecosystem • Biosphere

#### 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

#### 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

## **Community**

• Groups of different species living together in a given area • The number of species represent the diversity of community • Community ecology include • Predation • Parasitism • Competition

## **Ecosystem**

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

## **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

### **Q28: Disadvantage of sexual reproduction (5)**

#### **1. Advantages**

##### **a) Genetic Variability**

• Genetic recombination • New combination of traits • This may help in changing environment or in case of disease

##### **b) Foundation for Evolution**

• Genetic variability is there • Variation is the foundation of evolution

##### **c) Elimination of Deleterious Traits**

• As there is genetic recombination • Deleterious mutation are eliminated

#### **2. Disadvantages**

##### **a) Asexual animals**

• Not feasible for animal which rely on asexual means only • Especially population with one sex only

##### **b) Adaptive Gene Combination Dismantle**

• In sexual reproduction new genetic combination arise • This will upset the already established adaptive gene combination

##### **c) Wastage of energy**

• Many of the gametes are not fertilized • This will cause a significant loss of energy

### **Q29: Difference in spiral and radial cleavage (3Mark's)**

. **Spiral Cleavage** • It is pattern in which cells of animal pole are not exactly laying above the vegetal pole cells • Cleavage takes place at oblique angle forming a spiral pattern • Example: protostomes

**Radial Cleavage** • It is pattern in which cells of animal pole are exactly laying above the vegetal pole cells • Upper tier of cells is exactly on the lower tier of cells • Example: deuterostomes

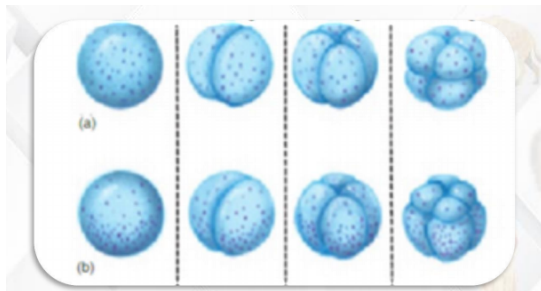
### Q30: Explain meroblastic cleavage and Holoblastic Cleavage? 3marks

#### Meroblastic Cleavage

• Cleavage type in which egg is not completely divided into two cells • This is due to large amount of yolk • These embryo develop around or on top of yolk • Eggs of birds and reptiles

#### Holoblastic cleavage

• Cleavage type in which egg is completely divided into two cells • Egg contain little or moderate amount of yolk • Eggs of Amphibians, mammals, echinoderms, flatworms, nematodes



### Q31: Difference between . Ectosymbiosis and Endosymbiosis?

. **Ectosymbiosis** • It is a symbiosis in which symbionts live on the body surface of the host or in the digestive tract • E.g., Lice, barnacles and cleaner fish

**Endosymbiosis** • It is the relationship in which one symbiont live within the tissue of other. • E.g., nitrogen fixing bacteria in root nodules, algae inside the corals

✨ Discuss coriolis effects? 3marks

### Q32: Coriolis Effect

• Biomes are distinct by climate, pattern of rainfall, temperature and solar radiations • Warm air at equator rises and move towards poles and cold air away from pole • The earth rotation deflect this air to right and left of the poles • The effect is called Coriolis effect

### Q33: Primary Succession

• The process of succession in an area that was not supporting any life previously is called primary succession. • Ecological succession in a lake formed by glacier or land exposed by land sliding

### Q34: Birth of modern embryology (2)

- Modern embryology emerged with the proposed germ layer theory • Embryo form 2-3 layers from which different body parts are formed

### **Q35: Deffernece. b/w. phtoautotrophes and chemtrouphe**

**Photoautotrophs** • They use sunlight as energy source for the synthesis of food from inorganic compounds • Green plants, algae, and photosynthetic bacteria • Photosynthesis transform less than 1% of sunlight reaching to earth • 30% reflects back • 20% is absorbed by atmosphere • 50% absorbed by earth

**Chemolithotrophs** • They obtain energy by oxidizing inorganic compounds • Usually live in extreme environments • E.g., sulfur bacteria

### **Q36: Ecological Pyramids**

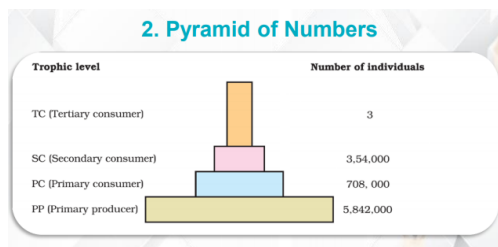
- It is the graphical representation of relationship between organisms at different trophic levels of an ecosystem • Three most common types of pyramids: • Pyramid of number • Pyramid of biomass • Pyramid of energy

#### **Pyramid of Numbers**

- It is the graphical representation of total number of different organisms present at each trophic level • This shows the population of organisms in a food chain

#### **Pyramid of Numbers Example**

- In a grass land the survey was conducted to check the trophic structure. • Following data was obtained • Producers:  $1.5 \times 10^6$  • Primary consumers:  $2 \times 10^5$  • Secondary consumers:  $9 \times 10^4$  • Tertiary consumers: 1



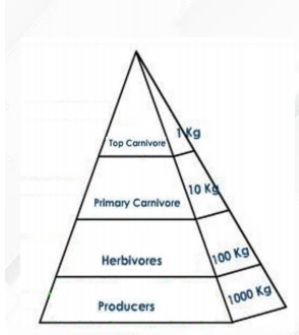
#### **Pyramid of Biomass**

- It is the representation of total mass of living matter present at each trophic level. • Biomass decrease at each ascending trophic level • Biomass is measured in grams of dry mass per square meter

#### **Pyramid of Biomass Example**

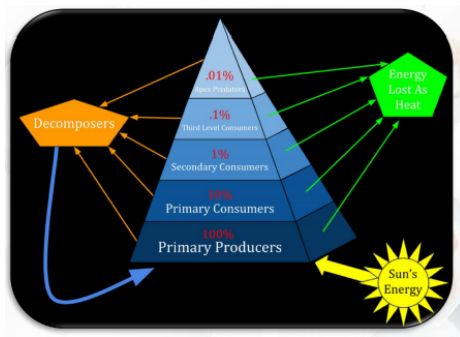
- In a pond the survey was conducted to check the trophic structure. • Following data was obtained • Producers: 809 g/m<sup>2</sup> • Primary consumers: 37 g/m<sup>2</sup> • Secondary consumers: 11 g/m<sup>2</sup> • Tertiary consumers: 1.5 g/m<sup>2</sup>

### 3. Pyramid of Biomass



### Pyramid of Energy

- It is the representation of total amount of energy present at each trophic level in an ecosystem • It is always upright • Energy pyramids help to compare the productivity of ecosystems.



### Q37: Biodiversity loss (5)...

#### Biodiversity of Earth

- More than 1.6 million • Estimate is 4 to 6 million • More accurate is between  $8.7 \pm 1.3$  million

#### Threats to Biodiversity

- Biodiversity of all natural areas is threatened • Acid rain • Pollution • Urbanization • Agriculture • Human is exploiting 40% of earth net primary production • Habitat loss

#### Solutions

- Realization about biodiversity • 22nd May is World Biodiversity Day • A system of international ethics that value natural diversity

### Q38: Define Decomposers

- These are the organisms which obtain energy by breaking down dead organic matter into simpler compounds • Also called saprotrophs

