

**NEXT IAS**

# GENERAL SCIENCE



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**General Science**

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# Contents

## General Science

### UNIT – I: BIOLOGY

#### Chapter - 1

<b>Diversity World .....</b>	<b>2</b>
1.1 Classification .....	2
1.2 Kingdom Classification .....	3
1.3 Kingdom Plantae .....	3
Algae .....	4
Bryophytes .....	4
Pteridophytes.....	4
Gymnosperms .....	4
Angiosperms .....	4

#### Chapter - 2

<b>Cell, Building Block, Genetics.....</b>	<b>5</b>
2.1 Cell .....	5
2.2 Cell Theory.....	5
2.3 Types of Cells .....	5
2.4 Structure of Cell .....	6
2.5 Various Cell Organelles .....	6
Cell Organelles .....	6
Plasma Membrane or Cell Membrane.....	6
Cell Wall.....	6
Cytoplasm.....	6
Nucleus.....	7
Chromosomes.....	7
Vacuoles .....	7
Endoplasmic Reticulum (ER) .....	8
Golgi Apparatus or Golgi Complex.....	8
Lysosomes.....	8
Mitochondria.....	8
Plastids .....	9
2.6 Differences between Plant Cell and Animal Cell .....	10

#### Chapter - 3

<b>Biomolecules .....</b>	<b>11</b>
3.1 Biomolecule .....	11

3.2 Carbohydrates .....	11
Monosaccharides .....	11
Oligosaccharides.....	12
Polysaccharides .....	12
3.3 Proteins, Amino Acids, Enzymes .....	12
Proteins.....	12
3.4 Fats, Healthy Fats and Unhealthy Fats .....	13
Fats/Triglycerides.....	13
Lipid.....	13
Fatty Acid.....	13
Saturated Fat .....	13
Unsaturated Fat .....	13
Healthy Fats.....	14
Unhealthy Fats – Saturated Fat and Trans Fat .....	14
Adipose Tissue .....	15
3.5 Nucleic Acids, DNA and RNA.....	15
3.6 Micronutrients – Vitamins and Minerals.....	16
3.7 Vitamins .....	16
Fat Soluble Vitamins .....	17
Water Soluble Vitamins .....	17
3.8 Minerals .....	17
Five Important Micronutrients .....	17
3.9 Dietary Fibers .....	18

#### Chapter - 4

<b>Cell Cycle and Cell Division .....</b>	<b>19</b>
4.1 Cell Cycle and Cell Division.....	19
4.2 Cell Cycle in Prokaryotes.....	19
4.3 Cell Cycle in Eukaryotes .....	19
Significance of Mitosis .....	20
4.4 Meiosis.....	20
Significance of Meiosis .....	21
Difference between Mitosis and Meiosis.....	21

#### Chapter - 5

<b>Genetics .....</b>	<b>23</b>
5.1 Genetics .....	23

5.2	Inheritance – Mendel's Laws of Inheritance.....	23
	Mendel's Experiments on Inheritance .....	23
	Factors – Genes.....	23
	Pair of Alleles – Homozygous and Heterozygous .....	24
	Dominant and Recessive Factor .....	24
	Mendel Conducted Monohybrid and Dihybrid Cross Between Plants to Give Mendel's Laws of Inheritance.....	25
5.3	Mendel's Laws of Inheritance .....	25
	First Law or Law of Dominance.....	26
	Second Law or Law of Segregation .....	26
5.4.	Inheritance of Two Genes – Dihybrid Cross.....	27
	Law of Independent Assortment.....	27
5.5	Chromosomal Theory of Inheritance .....	27
5.6	Sex Determination, Genetic Disorders.....	27
	Sex Determination.....	27
	Sex Determination in Humans.....	28
5.7	Genetic Disorders.....	28
	Pedigree Analysis .....	28
	Genetic Disorders.....	29
	Mendelian Disorders.....	29
	Sickle-Cell Anaemia.....	29
	Thalassemia .....	29
	Chromosomal Disorders .....	29

## Chapter - 6

	<b>Origin and Evolution of Life on Earth.....</b>	<b>32</b>
6.1	Origin of Life on Earth.....	32
6.2	Evolution of Life on Earth .....	32
	Biological Evolution.....	33
	A Brief Account of Evolution .....	33
	Origin and Evolution of Man.....	34
	Important Tissues .....	37

## Chapter - 7

	<b>Human Physiology .....</b>	<b>37</b>
7.1	Human Digestive System.....	37
	Alimentary Canal .....	37
	Buccal Cavity or Oral Cavity – Teeth, Tongue, Saliva...37	
	Teeth .....	37
	Saliva .....	38
	Tongue .....	38
	Foodpipe/Oesophagus.....	38

	Stomach.....	38
	Small Intestine .....	39
	Large Intestine.....	39
	Digestive Glands .....	39
	Salivary Glands.....	39
	Liver.....	39
	Pancreas.....	40
7.2	Respiratory System.....	41
	Human Respiratory System .....	41
7.3	Body Fluids and Circulation .....	42
	Formed Elements.....	42
	Lymph (Tissue Fluid).....	42
	Blood Groups.....	43
	Circulatory System.....	43
	Human Circulatory System .....	43
	Cardiac Cycle .....	43
7.4	Excretory System, Kidney, Urine Formation .....	44
	Excretory Products and Their Elimination .....	44
	Human Excretory System.....	44
	Role of other Organs in Excretion .....	45
7.5	Locomotion and Movement .....	45
	Muscular and Skeletal System.....	45
	Muscular System – Muscle Types .....	46
	Skeletal System .....	46
7.6	Human Neural System, Human Brain .....	47
	Neural Control and Coordination .....	47
	Human Neural System .....	47
	Human Brain.....	48
	Human Eye (sensory organ which helps in coordination).....	49
7.7	Chemical Coordination and Integration .....	50
	Endocrine Glands and Hormones.....	50
	Pituitary Gland .....	50
	Hypothalamus.....	50
	Pineal Gland .....	51
	Thyroid Gland .....	51
	Parathyroid Gland.....	52
	Thymus .....	52
	Adrenal Gland.....	52
	Pancreas.....	53
	Testis.....	53
	Ovary .....	53
	Hormones of Heart, Kidney and Gastrointestinal Tract .....	53
7.8	Human Reproductive System .....	54
	Male Reproductive System .....	54
	Female Reproductive System .....	55

Pregnancy and Embryonic Development .....	56
Parturition and Lactation .....	56

### Chapter - 8

<b>Health and Disease.....</b>	<b>57</b>
8.1 Classification of Disease causing organisms.....	57
8.2 Diseases Caused by Microorganisms .....	57
Types of Acquired Immune Response .....	63

### Chapter - 9

<b>Plant Morphology .....</b>	<b>65</b>
9.1 Morphology of Flowering Plants.....	65
The Root System.....	65
The Stem System .....	67
The Leaf System .....	67
The Flower System.....	68
9.2 Anatomy of Flowering Plants.....	68
Epidermal Tissue System .....	69
The Ground Tissue System.....	69
The Vascular Tissue System .....	70
Monocotyledons (Monocots) and Dicotyledons (Dicots) .....	70

### Chapter - 10

<b>Plant Physiology.....</b>	<b>72</b>
10.1 Transport in Plants .....	72
10.2 Mineral Nutrition.....	74
Essential Mineral Elements .....	74
10.3 Photosynthesis In Higher Plants .....	75
Location of Photosynthesis .....	75
Types of Pigments Involved in Photosynthesis .....	75
Light and Dark Reactions .....	76
C3 Pathway and C4 Pathway.....	77
Photorespiration.....	78
Factors Affecting Photosynthesis.....	78
10.4 Plant Growth Regulators/Plant Hormones.....	79
Plant Hormones .....	79

## UNIT – II: PHYSICS

### Chapter - 11

<b>Units and Measurements .....</b>	<b>83</b>
11.1 Physical Quantities .....	83
11.2 Units .....	83

Fundamental or Base Units.....	83
Supplementary Units .....	83

### Chapter - 12

<b>Force and Laws of Motion .....</b>	<b>86</b>
12.1 Force.....	86
12.2 Fundamental or Basic Forces in Nature.....	86
12.3 Motion .....	87
12.3 Force and Motion Relation .....	88
12.4 Newton's Laws of Motion .....	88
Newton's First Law of Motion .....	88
Newton's Third Law of Motion .....	89
12.5 Common Forces in Mechanics .....	89
12.6 Circular Motion Forces.....	90
Centripetal Force .....	90
Centrifugal Force .....	90
Coriolis Force.....	90

### Chapter - 13

<b>Gravitation.....</b>	<b>92</b>
13.1 Gravitation .....	92
13.2 Universal Law of Gravitation (Newton's Law) .....	92
Acceleration Due to Gravity (g) .....	92
Relation Between 'G' and 'g' (Acceleration Due to Gravity) .....	92
Variations of g .....	92
Some Major Applications of Gravitational Force and Gravity .....	94
Kepler's Laws of Planetary Motion .....	94
Orbital Velocity.....	94
Escape Velocity / Escape Speed / second cosmic velocity .....	95

### Chapter - 14

<b>Work, Energy and Power .....</b>	<b>96</b>
14.1 Work.....	96
14.2 Energy .....	96
14.3 States of Energy .....	96
14.4 Kinetic Energy .....	96
14.5 Potential Energy .....	97
Mechanical Energy .....	97
14.6 Work-Energy Theorem .....	97
14.7 Transformation of Energy .....	97

14.8	Law of Conservation of Energy .....	97
14.9	Einstein's Mass-Energy Equivalence .....	98
14.10	Power.....	98

## Chapter - 15

### Mechanical Properties of Fluids ..... 99

15.1	Thrust and Pressure.....	99
15.2	Density.....	99
15.3	Relative Density .....	99
15.4	Fluid Properties and Laws Associated with them .....	99
	Pressure of Fluid .....	99
	Pascal's Law .....	100
	Buoyancy and Buoyant Force.....	100
	Archimedes Principle (Physical Law of Buoyancy).....	101
	Surface Tension .....	101
	Surface Energy .....	103
	Angle of Contact.....	103
	Capillary Rise.....	103

## Chapter - 16

### Heat, Temperature and Thermodynamics..... 106

16.1	Heat.....	106
16.2	Temperature.....	106
16.3	Humidity.....	106
	Absolute Humidity.....	106
	Relative Humidity .....	106
16.4	Specific Heat Capacity .....	106
16.5	Latent Heat .....	107
16.6	Heat Transfer .....	107
	Conduction .....	107
	Convection.....	108
	Radiation.....	108
16.7	Thermodynamics .....	109
	Laws of Thermodynamics .....	109

## Chapter - 17

### Wave Motion and Sound..... 111

17.1	Types of Waves.....	111
17.2	Types of Mechanical Waves .....	111
	Longitudinal Waves.....	111
	Transverse Waves.....	111

Electromagnetic waves or Non-mechanical waves.....	112
--	-----

17.3	Terms Related to Waves .....	112
	Sound Waves.....	112
	Characteristics of Sound .....	113
	Speed of Sound in Different Media.....	113
	Reflection of Sound.....	114
	Range of Hearing and Types of Sounds .....	114
17.4	Applications of Ultrasound.....	115
17.5	Beats .....	116
17.6	Doppler Effect in Sound.....	116
17.7	Electromagnetic Waves (EM Waves) .....	116
17.8	Electromagnetic Spectrum .....	117

## Chapter - 18

### Optics ..... 119

18.1	Properties of Light .....	119
18.2	Reflection of Light.....	119
	Laws of reflection.....	119
	Mirror .....	119
	Plane Mirror .....	119
	Spherical Mirrors.....	120
	Uses of Mirrors.....	120
18.3	Scattering of Light .....	121
18.4	Refraction .....	121
	Total Internal Reflection.....	122
	Refraction by Spherical Lenses .....	123
	Convex or Converging Lens .....	123
	Image Formation by Lenses .....	124
	Uses of Lens.....	124
18.5	Dispersion of Light.....	125
18.6	Diffraction of Light.....	126
18.7	Doppler Effect in Light .....	127

## Chapter - 19

### Electrostatics and Current Electricity ..... 128

19.1	Electric Charge.....	128
	Types of Charges.....	128
	Properties of Electric Charges .....	128
19.2	Coulomb's Law .....	129
19.3	Electric Field .....	129
	Electric Field of hollow conductor .....	129
19.4	Different Types of Conductivity .....	129
	Conductors .....	129

Insulators .....	130
Semiconductors.....	130
Superconductors .....	130
19.5 Electric Current.....	131
Types of Electric Current.....	131
Ohm's Law .....	131
Resistance .....	132
Heating Effects of Electric Current.....	133
19.6 Electric Cell.....	133

## Chapter - 20

<b>Magnetism.....</b>	<b>135</b>
20.1 Magnet.....	135
20.2 Magnetic Field .....	135
Magnetic Properties of Materials .....	136
Permanent Magnets and Electromagnets.....	136
Earth's Magnetism .....	137

## UNIT – III: CHEMISTRY

## Chapter - 21

<b>Matter and Its States .....</b>	<b>140</b>
21.1 Physical Nature of Matter.....	140
21.2 States of Matter.....	140
Two More States of Matter .....	140

## Chapter - 22

<b>Structure of Atom .....</b>	<b>143</b>
22.1 Dalton's Atomic Theory .....	143
22.2 Sub-atomic Particles.....	143
Fundamental Particles .....	143
Non-Fundamental Particles.....	144
22.3 Atomic Models.....	144
Thomson Model of Atom.....	144
Rutherford's Model of Atom .....	145
Bohr's Model of an Atom.....	145
Bohr Bury Scheme.....	146
Valency .....	146

## Chapter - 23

<b>Classification of Elements.....</b>	<b>148</b>
23.1 Classification of Elements and Periodicity in Properties .....	148

23.2 Periodic Classification .....	148
23.3 Mendeleev's Periodic Table .....	148
23.4 Modern Periodic Table.....	149
Characteristics of Modern Periodic Table .....	149
23.5 Trends in the Modern Periodic Table .....	151

## Chapter - 24

<b>Bonding and Chemical Reactions .....</b>	<b>153</b>
24.1 Chemical Bond .....	153
24.2 Kossel-Lewis Approach to Chemical Bonding .....	153
24.3 Electronic Theory of Chemical Bonding (Octet Rule) .....	153
Types of Bonding.....	153
Ionic Bond .....	153
Covalent Bond .....	153
Coordinate Bond/Dative Bond .....	154
Hydrogen Bonding.....	154
Van der Waal's Forces.....	155
24.4 Chemical Reactions.....	155
Some Important Types of Chemical Reactions .....	155

## Chapter - 25

<b>Chemistry in Everyday Life .....</b>	<b>158</b>
25.1 Drugs.....	158
Classification of Drugs on the Basis of Therapeutic Action.....	158
25.2 Chemicals in Food .....	159
Artificial Sweetening Agents .....	159
Food Preservatives .....	159
Colloidal Solutions and Emulsions .....	159
Cleansing Agents .....	161
25.3 Polymers .....	163
Plastics .....	163
Polythene.....	164
Teflon .....	165
Polyvinyl Chloride (PVC).....	165
Bakelite.....	165
Melamine .....	165
Synthetic Fibres .....	165
Rubber.....	166
25.4 Acids, Bases, Salts and pH .....	166
Uses of Acids in Everyday Life .....	167
Uses of Bases in Everyday Life .....	167
Uses of Salts in Everyday Life .....	168
Importance of pH in Everyday Life .....	168

25.5	Some Important Fuels and their Uses.....	168
	Coal .....	169
	Petroleum.....	170
	Natural Gas.....	170
	Liquified Petroleum Gas (LPG) .....	171
	Bio gas or Gobar gas .....	171
	Water Gas or Syngas.....	171
	Petrol.....	171
	Diesel.....	172
	Brent Crude Oil.....	172

Cell and Battery .....	172
Different Types of Batteries .....	173
Sodium Ion Battery .....	175
Fuel Cell technology .....	175

## Chapter - 26

### Miscellaneous ..... 178

26.1	What Are Colligative Properties?.....	179
	Colligative Properties Examples .....	179
	Different Types of Colligative Properties of Solution...	179







# Unit

I

## Biology

1. Diversity World .....	2
2. Cell, Building Block, Genetics .....	5
3. Biomolecules .....	11
4. Cell Cycle and Cell Division .....	19
5. Genetics.....	23
6. Origin and Evolution of Life on Earth .....	32
7. Human Physiology .....	37
8. Health and Disease .....	57
9. Plant Morphology .....	65
10. Plant Physiology .....	72

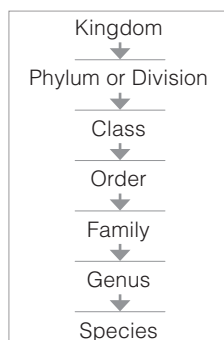
# CHAPTER 1

## DIVERSITY WORLD

### 1.1 Classification

Scientists have estimated that there are around 8.7 million species of plants and animals in existence out of which nearly 1.2 million species have already been identified and described so far.

This number is so huge that it is extremely difficult to study each and every single species separately. Thus, species were grouped into convenient categories based on some easily observable characters. This process is known as classification. Based on characteristics, all living organisms can be classified into different taxa. This process of classification is taxonomy



**Figure:** Taxonomic categories showing hierarchical arrangement in descending order

- **Genus:** Genus comprises a group of *related species* which has *more characters in common in comparison to species of other genera*
- **Family:** It has a group of related genera with still a *smaller number of similarities as compared to genus and species*
- **Order:** It is the assemblage of families which exhibit a few similar characters. The similar characters are less in number as compared to different genera included in a family
- **Class:** This category includes related orders. For example, order Primata comprising monkey, gorilla and gibbon is placed in class Mammalia along with order Carnivora that includes animals like tiger, cat and dog.
- **Phylum/Division:** Classes comprising animals like fishes, amphibians, reptiles, birds along with mammals constitute the next higher category called Phylum. In case of plants, classes with a few similar characters are assigned to a higher category called Division
- **Kingdom:** All animals belonging to various phyla are assigned to the highest category called Kingdom Animalia in the classification system of animals. The Kingdom Plantae, on the other hand, is distinct, and comprises all plants from various divisions.
- **Species:** It comprises *related organisms* that share *common characteristics* and are *capable of interbreeding*.

Common	Biological	Genus	Family	Order	Class	Phylum/ Division
Man	Homo sapiens	Homo	Hominidae	Primates	Mammalia	Chordata
Housefly	Musca domestica	Musca	Muscidae	Diptera	Insecta	Arthropoda
Mango	Mangifera indica	Mangifera	Anacardiaceae	Sapindales	Dicotyledonae	Angiospermae
Wheat	Triticum aestivum	Triticum	Poaceae	Poales	Monocotyledonae	Angiospermae

## 1.2 Kingdom Classification

- Initially **Linnaeus** proposed two kingdom classification i.e., *plantae* and *animaliae* in his book *systema naturae*.
- After various evolutions, **R.H. Whittaker** (1969) proposed a *Five Kingdom Classification*.
- The kingdoms defined by him were named Monera, Protista, Fungi, Plantae and Animalia.

- The main **criteria for classification** used by him included *cell structure, body organisation, mode of nutrition, reproduction and phylogenetic relationships*.
- In the five kingdom classification of Whittaker there is **no mention of lichens and some acellular organisms like viruses, viroids (infectious agent) and prions (infectious agent)**.

**Table:** Kingdom Classification and characteristics

Five Kingdoms					
Characters	Monera	Protista	Fungi	Plantae	Animalia
<b>Cell type</b>	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	<b>Eukaryotic</b>
<b>Cell wall</b>	Noncellulosic (Polysaccharide + amino acid)	Present in some	Present with chitin	Present (cellulose)	Absent
<b>Nuclear membrane</b>	Absent	Present	Present	Present	Present
<b>Body organisation</b>	Cellular	Cellular	Multicellular/ loose tissue	Tissue/organ	Tissue/organ/ organ system
<b>Mode of nutrition</b>	Autotrophic (chemosynthetic and photosynthetic) and Heterotrophic (saprophytic/parasitic)	Autotrophic (Photosynthetic) and Heterotrophic	Heterotrophic* (Saprophytic/ Parasitic)	Autotrophic** (Photosynthetic)	Heterotrophic (Holozoic/ Saprophytic etc.)
<b>Examples</b>	Bacteria are the sole members of the Kingdom Monera	Members of Protista are primarily aquatic. Dinoflagellates, Euglenoids, Slime moulds and Protozoans come under this	Mushroom, Mucor etc.	All plants except fungi and members of Monera and Protista having cell walls	Almost all animals except protozoan

\* **Heterotrophic:** Heterotrophic nutrition is a mode of nutrition in which organisms depend upon other organisms for food to survive. They can't make their own food like Green plants. Heterotrophic organisms have to take in all the organic substances they need to survive.

\*\* **Autotrophic:** Autotrophic nutrition is a process where an organism prepares its own food from a simple inorganic material like water, mineral salts and carbon dioxide in the presence of sunlight."

**Monera:** It includes all prokaryotic organism like bacteria, cyanobacteria and archaebacteria. Filamentous bacteria also come under this kingdom. All organism of this kingdom are microscopic.

**Protista:** This includes unicellular forms like Amoeba that are usually found in aquatic habitats. On the basis of mode of nutrition they are autotrophic, parasitic and saprophytic. Diatoms, flagellates and protozoa come under this kingdom.

\*Euglena have both *heterotrophic* and *autotrophic* mode of nutrition. So, it is placed between plant and animal.

**Fungi:** This kingdom includes non-green plants. It has saprophytic nutrition grow on dead and decaying organic matter. The cell wall is composed of chitin.

**Example:** Mushroom, mucor, etc.

**Plantae:** This kingdom includes all plants except algae, diatoms, fungi and member of monera and protista.

**Animalia:** Almost all animal comes under this kingdom except protozoans.

## 1.3 Kingdom Plantae

- Plantae includes algae, bryophytes, pteridophytes, gymnosperms and angiosperms



## Algae

- Algae are *chlorophyll-bearing*, simple, thalloid, autotrophic and *largely aquatic* (both fresh water and marine) organisms.

## Bryophytes

- The word bryophyte is the collective term for *mosses, hornworts and liverworts*.
- They are *spore-producing*, rather than seed-producing, plants and they *are all without flowers*.

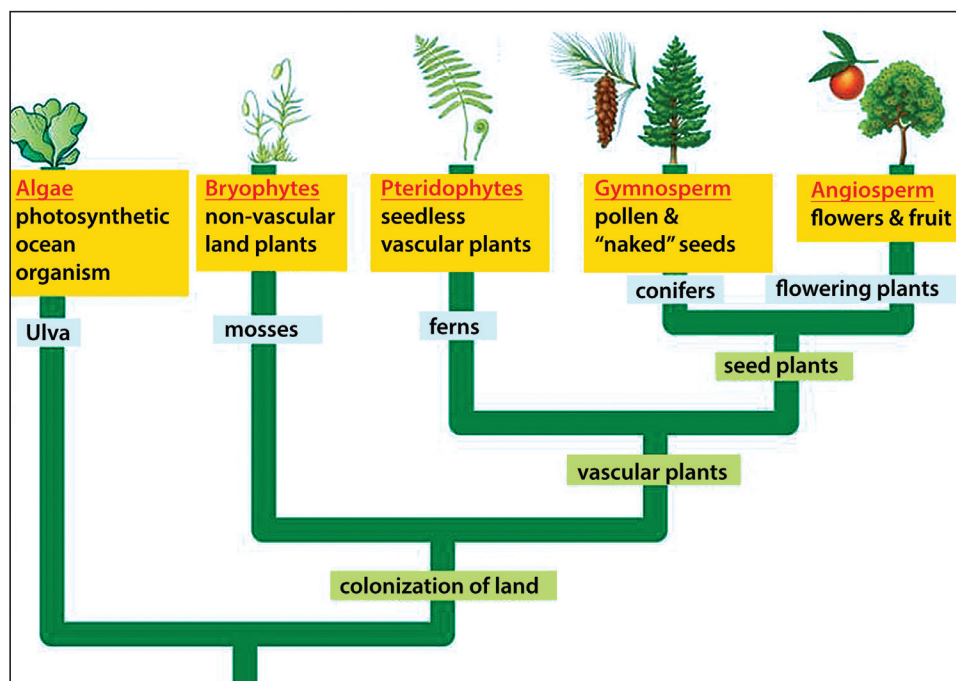


Figure: Evolution of plants from algae to angiosperms

- They are also called **amphibians of the plant kingdom** because these plants can *live in soil* but are dependent on *water for sexual reproduction*.

## Pteridophytes

- These include *horsetails* and *ferns*
- Evolutionarily, they are the **first terrestrial plants to possess vascular tissues** – xylem and phloem.

**Xylem** tissue transports water and nutrients from the roots to different parts of the plant, and also plays a role in structural support in the stem.

**Phloem** tissue transports organic compounds from the site of photosynthesis to other parts of the plant.

- They are also *spore-producing*, rather than seed-producing, plants and they are **all without flowers**.

## Gymnosperms

These include medium-sized trees or tall trees and shrubs

These are *vascular plants* in which the *ovules are not enclosed by any ovary wall* and remain exposed and thus have naked seeds.

**Examples:** conifers, pines, firs, cycads etc.

## Angiosperms

Angiosperms are plants that *produce flowers* and bear their *seeds in fruits*.

They are the largest and most diverse group within the kingdom Plantae.

**Examples:** lilies, orchids, grasses, peas, roses, sunflower, apple, mango etc.

■■■■



## TRY SOME QUESTIONS

- Which one of the following sets of elements was primarily responsible for the origin of life on the Earth ? [CSE Prelims : 2012]  
(a) Hydrogen, Oxygen, Sodium  
(b) Carbon, Hydrogen, Nitrogen

- (c) Oxygen, Calcium, Phosphorus  
(d) Carbon, Hydrogen, Potassium

Ans. (b)