Points to Remember

Origin of Life

Special creation	Life on Earth is a divine creation - Attributes to supernatural event in the past.
Spontaneous generation (Abiogenesis)	Life originated spontaneously from lifeless matter. ***Ex :*** Fishes from mud; frogs from moist soil; insects from decaying matter.
Biogenesis	Life originates from pre-existing life.
Extraterresterial or Cosmic origin	Life came from outer space. Units of life called spores (Panspermia) were transferred to different planets including earth.
Chemical evolution of Life	Life arose by a series of sequential chemical reactions. Non-living inorganic molecule→ Diverse organic molecules→Colloidal system→ Life

Evidences of Evolution

Morphology and Anatomy	***i) Homologous organs:*** Looks dissimilar, perform similar function, similar origin. ***Ex :*** A human hand, a front leg of a cat ***ii) Analogous organs:*** Looks similar, perform similar functions but have different origin. ***Ex :*** wings of a bat, a bird and an insect ***iii) Vestigial organs:*** They are degenerated and non-functional organs of animals. ***Ex :*** appendix, nictitating membrane, caudal vertebra, coccyx etc. ***iv) Atavism:*** The reappearance of ancestral characters in some individuals. ***Ex :*** Presence of rudimentary tail in new born babies.
Embryology	The embryos from fish to mammals are similar in early stages of development. The differentiation of their special characters appear in later stages of development.
Palaeontology	Study of fossils. Helps us understand the line of evolution of invertebrates & vertebrates. ***Archaeopteryx:*** Oldest known fossil bird. Connecting link between reptiles and birds.

Theories of Evolution

Lamarckism (or) Theory of inheritance of acquired characters (or) Use & Disuse theory	***i) Internal vital force :*** Living organisms tend to increase in size continuously. ***ii) Environment & new needs:*** Changing environment develops certain adaptive characters. ***iii) Use & disuse theory :*** Used organs develops strongly. Unused organs degenerates. ***iv) Theory of Inheritance of acquired characters :*** Acquired characters that are inherited.
Darwinism (or) Theory of Natural Selection	***i) Overproduction :*** Ability of organisms to reproduce individuals geometrically. ***ii) Struggle for existence :*** ***a) Intraspecific struggle:*** Competition among the individuals of same species. ***b) Interspecific struggle***: Competition b/w organisms of different species living together. ***c)Environmental struggle:*** Natural conditions that affect its existence. ***Ex :*** flood. ***iii) Variations :*** Favourable(useful) & Unfavourable (useless) variations ***iv) Survival of the fittest /Natural selection*** - Organism has to survive in its environment. ***v) Origin of species*** – Favourable variations gradually accumulates over generations.
Variations	It is the difference among individuals of same species and offspring of the same parent. **Types of variations** **1) Somatic variation:** They affect the body (somatic) cells. Non-heritable. **2) Germinal variation:** They are produced in germ cells. Heritable. ***a) Continuous (or) fluctuating variation :*** Gradual accumulation. ***Ex :*** skin colour, height and weight color of eye etc., ***b) Discontinuous variation:*** Sudden changes, which occur due to mutations. ***Ex :*** six fingers in human, short legged Ancon sheep, etc.,

Paleobotany	Deals with recovery and identification of plant remains of geological past.
Fossilization	It is the process of formation of fossils in the rocks. ***Methods:*** Petrifaction, Mold & Cast, Preservation, Compression, Infiltration / Replacement. **Determination of age fossils :** It is determined by radioactive elements present in it. ***Radioactive carbon(C^{14}) dating method :***The time passed since the death of plant or animal can be calculated by measuring the amount of C^{14} present in their body.
Ethnobotany	Study of region's plants and its uses through the traditional knowledge.
Astrobiology / Exobiology	It deals with the origin, evolution and distribution of life in the universe and to investigate the possibility of life in other world. ***Extremophiles :*** The organisms which live in extreme environmental conditions on earth**.**

Important Terms

★ **Palaeontology**	Study of fossils.
★ **Paleobotany**	Deals with recovery and identification of plant remains of geological past.
★ **Ethnobotany**	Study of region's plants and its uses through the traditional knowledge.
★ **Astrobiology / Exobiology**	Study of evolution of life in the universe.
★ **Abiogenesis**	Life originated spontaneously from lifeless matter.
★ **Biogenesis**	Life originates from pre-existing life.
★ **Phylogeny**	Evolutionary history of an organism.
★ **Ontogeny**	Origination and development of an organism.
★ **Vestigial organs**	Degenerated non functional organs of animals.
★ **Atavism**	Reappearance of ancestral characters.
★ **Extremophiles**	The organisms which live in extreme environmental conditions on earth.
★ **Archaeopteryx**	Oldest known fossil bird connecting link between reptiles and birds.

- ❋ **Leonardo da Vinci** – Father of Paleontology
- ❋ **Kaspar Maria Von Sternberg** - Father of Paleobotany (1761– 1838)
- ❋ **Birbal Sahani** - Father of Indian Paleobotany (1891–1949)
- ❋ **J.W.Harshberger** - Coined the term Ethnobotany
- ❋ **Jean Baptiste Lamarck** – Theory of inheritance of Acquired characters (or) Disuse theory
- ❋ **Charles Darwin** – Theory of Natural selection
- ❋ **Louis Pasteur** – Speculated biogenesis
- ❋ **Oparin & Haldane** – Chemical evolution of life
- ❋ **Ernst Haeckel** – Biogenetic law / Recapitulation theory
- ❋ **W.F. Libby** - Discovered radioactive carbon dating method