**CC 5:MICROBIAL PHYSIOLOGY AND METABOLISM (THEORY)**

**Microbial growth in response to nutrition and energy**

**Nutritional types of microorganisms**

All microorganisms require **sources of energy, hydrogen and electron for growth.** Microorganisms can be grouped into nutritional classes based on their nutritional requirements.

**There are only two sources of energy available to microorganisms:**

1. **Light energy trapped during photosynthesis**
2. **The energy derived from oxidizing organic or inorganic molecules.**

**Phototrophs – use light as their energy source.**

**Chemotrophs- obtain energy form oxidation of chemical compounds (either organic or inorganic).**

Microorganisms also have two sources for hydrogen atoms or electrons. Lithotrophs use reduced inorganic substances as their electron source, whereas organotrophs extract electron or hydrogen from organic compounds.

**Microorganisms on the basis of primary sources of energy, hydrogen and/or electrons and carbon-**

1. **Photolithotrophic autotrophy (photolithoautotrophy)**
2. **Photoorganotrophic heterotrophy (photoorganoheterotrophy)**
3. **Chemolithotrophic autotrophy (chemolithoautotrophy)**
4. **Chemoorganotrophic heterotrophy (chemoorganotrophy)**
5. **Photolithotrophic autotrophs (often called photoautotrophs or photolithoautotrphs)-**

Often called Photolithotrophic autotrophs or photolithoautrophs

Use light energy and CO2 as a carbon source.

 inorganic hydrogen/electron (H/e-) donor

Eukaryotic algae and blue-green bacteria (cyanobacteria) employ water as the electron donor and release oxygen. Purple and green sulfur bacteria cannot oxidize water but extract electrons from inorganic donors like hydrogen, hydrogen sulfide and elemental sulfur.

1. **Photoorganotrophic heterotrophy (photoorganoheterotrophy)**

Use light energy

Organic H/e- donor

Use organic carbon source (CO2 may also be used)

Some purple and green bacteria are photosynthetic and use organic matter as their electron donor and carbon source.

1. **Chemolithotrophic autotrophy (chemolithoautotrophy)**

Chemical energy source (inorganic)

Inorganic H/e- donor

CO2 carbon source

Example- Sulfur-oxidizing bacteria, Hydrogen bacteria, Nitrifying bacteria, Iron bacteria.

1. **Chemoorganotrophic heterotrophy (chemoorganotrophy)**

Chemical energy source (organic)

Organic H/e- donor

Organic carbon source

Protozoa, Fungi, Most nonphotosynthetic bacteria.