**IDX G9 BIOLOGY S STUDY GUIDE**

**By Isabella**

**3.1 What is Ecology?**

A. Biosphere

- Consists of all life on earth and all parts of the earth in which life exists

- Atmosphere (gas), lithosphere (solid), hydrosphere (liquid)

- 11 km below sea level ~ 8km above sea level

B. Ecology

Ecology: The scientific study of interactions between organisms & environment

C. Levels of Organisation

1) Individual organism

- A species is a group of similar organisms that can breed and produce fertile offspring

2) Population

- Group of individuals that belong to the same species, area, and time

3) Community

- The assemblage of different populations that live together in the same area

4) Ecosystem

- Organisms in the same community involving the physical environment

5) Biome

- a group of ecosystems that share similar climates and typical organisms

6) Biosphere

- entire planet’s organism + physical environment.

- Biotic: living things

- Abiotic: non-living things

- the activities of organisms can influence abiotic factors

D. Ecological method

- Observation: to use observations of natural phenomena to answer questions

- Experimentation: to test a hypothesis using designated processes

- Modelling: to design a model based on real situations to observe and answer questions

**3.2 Energy, Producers, and Consumers**

A. Producers

- Autotrophs: organisms that use solar /chemical energy to assemble inorganic compounds into complex (energy-rich) organic compounds

B. Energy from the sun

- Photosynthesis: produce carbon hydrates such as sugars and starches with light energy

Formula: CO2 + H2O + Light energy → Carbohydrates + O2

C. Life without light

- Chemosynthetic bacteria in the deep sea, volcanic vents, hot springs, etc.

- Formula: Co2 + Hydrogen sulfide + 02 → Carbohydrates + sulfur compounds

D. Consumers

- Heterotrophs: acquire energy from other organisms

- Carnivore: eat animals

- Herbivore: eat plants

- Omnivore: eat both plants and animals

- Scavenger: consumes the remains.

- Detritivores: ingest detritus particles

- Decomposers: release digestive enzymes

- Saprotrophs: Living or non-living organic matter, secreting digestive enzymes into it and absorbing digestive product

**3.3 Energy Flow in Ecosystem**

A. Food chains & Fool webs

- One way

- Sun → Producer → Consumer

- Food chains: A series of steps in which organisms transfer energy by feeding

- Vary in length

- Phytoplankton: primary producers that are a mixture of floating algae.

- Zooplankton: small swimming animals that feed on marine algae

- Food web: Model representing interconnected fool chains in which energy flows

- Food chains show how energy moves through an ecosystem

- A food web shows how food chains interact

- Decomposers convert dead material to detritus

- releases nutrients

- recycles nutrients

B. Balance of food webs

- Changes in the population size of one organisation can disturb other organisms in the food web

C. Trophic Level

- Trophic Level: the position of an organism in a food chain

- Producer → primary consumer → secondary consumer → tertiary consumer

D. Ecological Pyramids

- Ecological pyramids. A diagram that shows the relative amounts of energy/biomass / # of organisms at each trophic level in an ecosystem

- Pyramid of energy: show the relative amount of energy available at each trophic level

- Measured in units of energy per unit area/ unit time: kJ m^-2 y^-1

- Transfer of energy is never 100% efficient.

- Around 90% of energy is lost through the process

- not eaten

- not digested/absorbed

- excreted

- lost as heat from respiration

- Pyramid of Biomass: the relative amount of living tissue at each trophic level

- Pyramid of numbers: the relative number of individual organisms at each level in an ecosystem

**2.2 Properties of Water**

A. Polarity

- The greater probability of finding the shared electrons in the water close to its oxygen atom than near its hydrogen atoms

- The oxygen end has a slight negative charge and the hydrogen end has a slightly positive charge

- Polar molecule: charges unevenly distributed.

B) Hydrogen Bonding

- Polar molecules such as water can attract each other.

- Hydrogen bond: the weak attraction between a hydrogen atom on one water molecule and the oxygen atom on another

C) Cohesion

- Attraction between molecules of the same substance

- Surface tension

D) Adhesion

- Attraction between molecules of different substances

- Example:

-Meniscus: adhesion between water and glass molecules is stronger than the cohesion

between water molecules



- Capillary Action: adhesion. between water and glass cause water to rise in a narrow tube against the force of gravity

E) Heat Capacity

- Amount of heat energy required to increase its temperature

F) Solutions

- water polarity allows it to dissolve both ionic compounds and other polar molecules

- Solute: the substance that is dissolved

- Solvent: the substance in which the solute dissolves

6) The pH Scale

- PH Scale: Measurement system to indicate the concentration of H+ ions in solution

- From 0 to 14

- Basic: OH->H+

- Neutral: OH- =H+

- Acidic: OH-<H+

- Lower PH, greater acidity, and less basic

**3.4 Cycles of Matter**

A. Recycling in the Biosphere

- Energy enters as light (trapped by photosynthesis) and usually loss as heat

- Matters/nutrients are recycled

- Matter: anything that takes up space and has mass

- Matter is never created/destroyed

- Matter only change

B) Energy flows and Nutrient Cycles

- Energy enters from sunlight

- Producers capture sunlight

- Energy flows through the trophic levels in the food chain

- Energy transfer is approximately 10% from one level to the next

- Energy transfers to detritivores or decomposers in dead organic matter

- Heat energy is lost through cell respiration

- Energy loss due to material not consumed

- Nutrients absorbed by a producer from the ecosystem

- Nutrients move through the food chain by digestion of other organisms

C) The water cycle

1) Evaporation: Water→ vapour

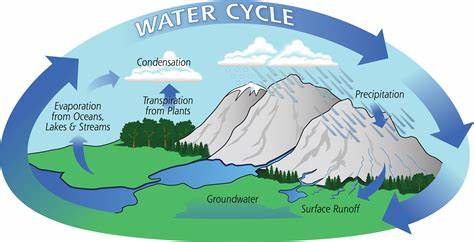
- Transpiration: water loss from plant leaves

2) Condensation: cooling water vapour condenses into droplets around dust particles

3) Precipitation: Rain, sleet, snow, hail

4) Runoff: the flow of water occurring on the ground/underground

5) Percolation: gradual filtering through porous surfaces = infiltration



D) Nutrient Cycles

- Nutrient: a chemical substance that an organism must obtain from its environment to sustain life

- Oxygen combines with these elements

E) The Carbon Cycle

