A. ORGANIC v INORGANIC

ORGANIC compounds contain C-H (CARBON-HYDROGEN) BONDS

- **CH_4** (methane) is classed as **organic** as it contains **C-H bonds**.
- **CO_2** (carbon dioxide) is classed as **inorganic**, as it has **no C-H bonds**.
- To be classed as **organic,** it is **not enough** to just simply **contain carbon**.

B. VOCABULARY

ORGANIC	Compounds that contain **carbon-hydrogen (C-H) bonds**.
ABIOTIC	The **non-living** factors that can affect the population of organisms e.g. water, light, humidity, temperature.
BIOTIC	The **living** factors that can affect the population of organisms e.g. prey and predators.
SPECIES	Organisms that can **breed together** to produce **fertile offspring**.
AUTOTROPH	Makes its **own food** by obtaining **inorganic nutrients** from the **abiotic environment** e.g. light, water, CO_2.
HETEROTROPH	Makes food by **digesting organic compounds** from **other organisms**.
CONSUMERS	These are **heterotrophs** that **feed on** and **ingest living organisms**.
DETRITIVORES	These are **heterotrophs** that obtain **organic nutrients** from **detritus** (dead leaves or roots; parts of decomposing animals and faeces) by **internal digestion**. Examples include worms.
SAPROTROPHS	These are **heterotrophs** that obtain **organic nutrients** from **dead organisms** by **external digestion**. Examples include bacteria and fungi.
POPULATION	The **number of individuals** of the **same species** in a **given area.**
COMMUNITY	**Populations** of **different species living together** and **interacting** with each other.
ECOSYSTEM	Formed when a **community interacts** with its **abiotic environment.**
BIOMASS	The **mass** of **living organisms** in a **given area** or **ecosystem,** at a **given time**
PRODUCERS	**Plants** found at the **start** of **food chains,** which make their **own organic compounds** by **photosynthesis.**
PRIMARY CONSUMERS	**Animals** that obtain their **energy** from **producers** in a food web**.** They are **herbivores.**
SECONDARY CONSUMERS	**Animals** that obtain their **energy** from **primary producers** in a food web. They are **carnivores.**
TERTIARY CONSUMERS	**Animals that obtain their energy from secondary consumers in a food web.**
TROPHIC LEVEL	The **position** of an **organism** in a **food chain.**
ENERGY PYRAMID	Shows how much **energy flows through** each **trophic level** of a **food chain.**

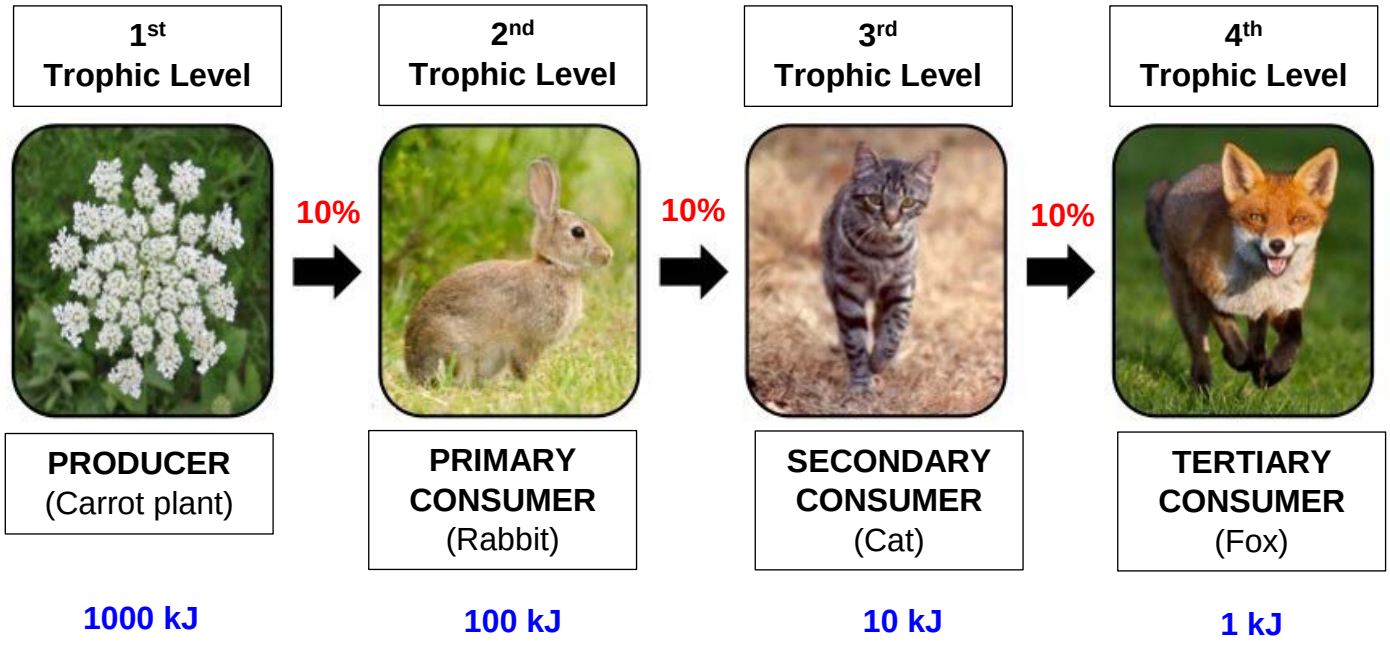
C. ENERGY & FOOD CHAINS

Entering food chains

- **Light energy** is the **energy source** for **all organisms**.
- **Producers** convert **light energy** into **chemical energy**.
- **Producing glucose**.
- **Organic compounds** used for **energy/growth/repair/storage**.

Passing along food chains

- **Energy** is **passed along** a food chain by **feeding.**
- Only **10%** of the **energy** is passed from **one trophic level** to the **next**.



- **Glucose** is used in **respiration** to release **ATP**.
- Energy is lost as **heat** during **respiration**.
- Energy is lost in **faeces/urine** during **excretion**.
- Energy is lost as **bones/teeth/hair** are **not fully eaten**.
- Eventually, energy passes to **saprotrophs** as they **remove energy** from **waste/dead organisms**.
- Energy is **not recycled**.

D. WHY DO FOOD CHAINS USUALLY CONTAIN NO MORE THAN FIVE ORGANISMS?

Higher trophic levels receive less energy from feeding.

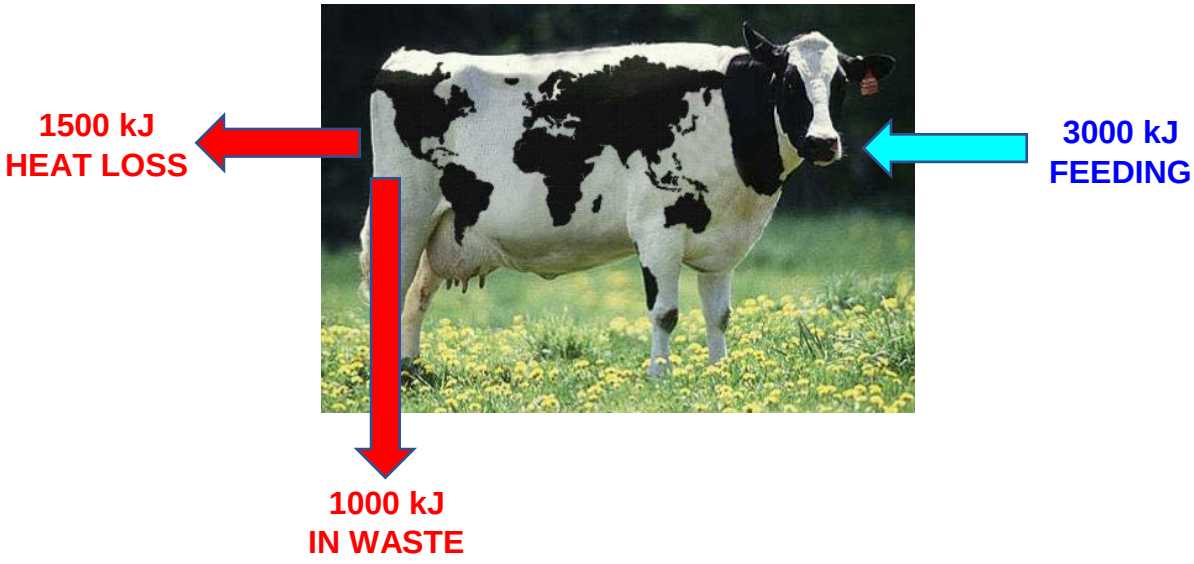
(So) they need to eat more prey to obtain enough energy.

They expend more energy hunting for food.

If the energy required to hunt food exceeds the energy available from the food eaten, the trophic level cannot be sustained.

(Also) there may not be many organisms to hunt, so it will starve to death.

E. CALCULATING % EFFICIENCY OF ENERGY TRANSFER

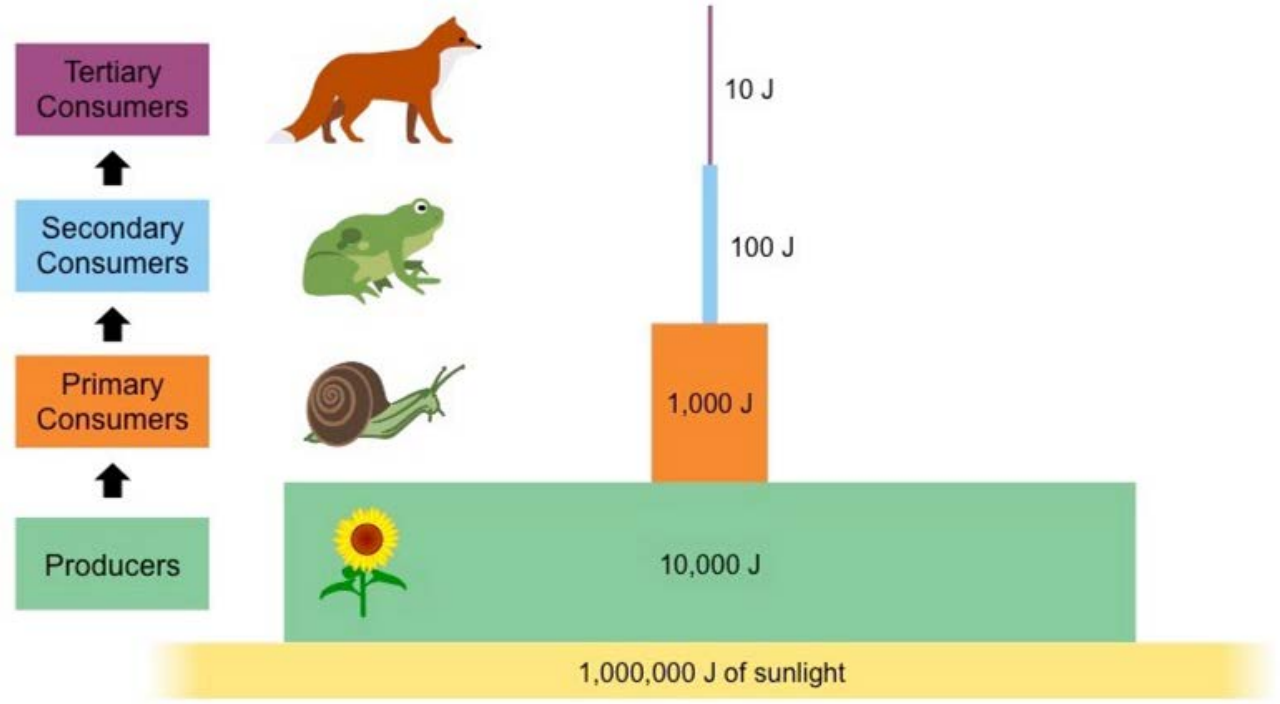


- Energy available for growth = 3000 - 1500 - 1000 = **500 kJ**

- % efficiency of energy transfer = $\frac{500 \text{ (energy for growth)}}{3000 \text{ (energy supplied)}} \times 100 =$ **16.7%**

F. PYRAMID OF ENERGY

- Shows how much **energy** flows through each **trophic level** of a **food chain**.
- They are expressed in units of energy per area per time (e.g. **kJ m^{-2} year^{-1}**)
- Pyramids of energy are **always this shape** as **90% of the energy is always lost between each trophic level**.



- **Draw** this in **exams** and make sure that it is **fully labelled**.
- **If you are asked to explain its shape**, you will need information from earlier:

Only **10%** of the **energy** is passed from **one trophic level** to the **next**.

Energy is **lost** as **heat** during **respiration**.

Energy is **lost** in **faeces/urine** during **excretion**.

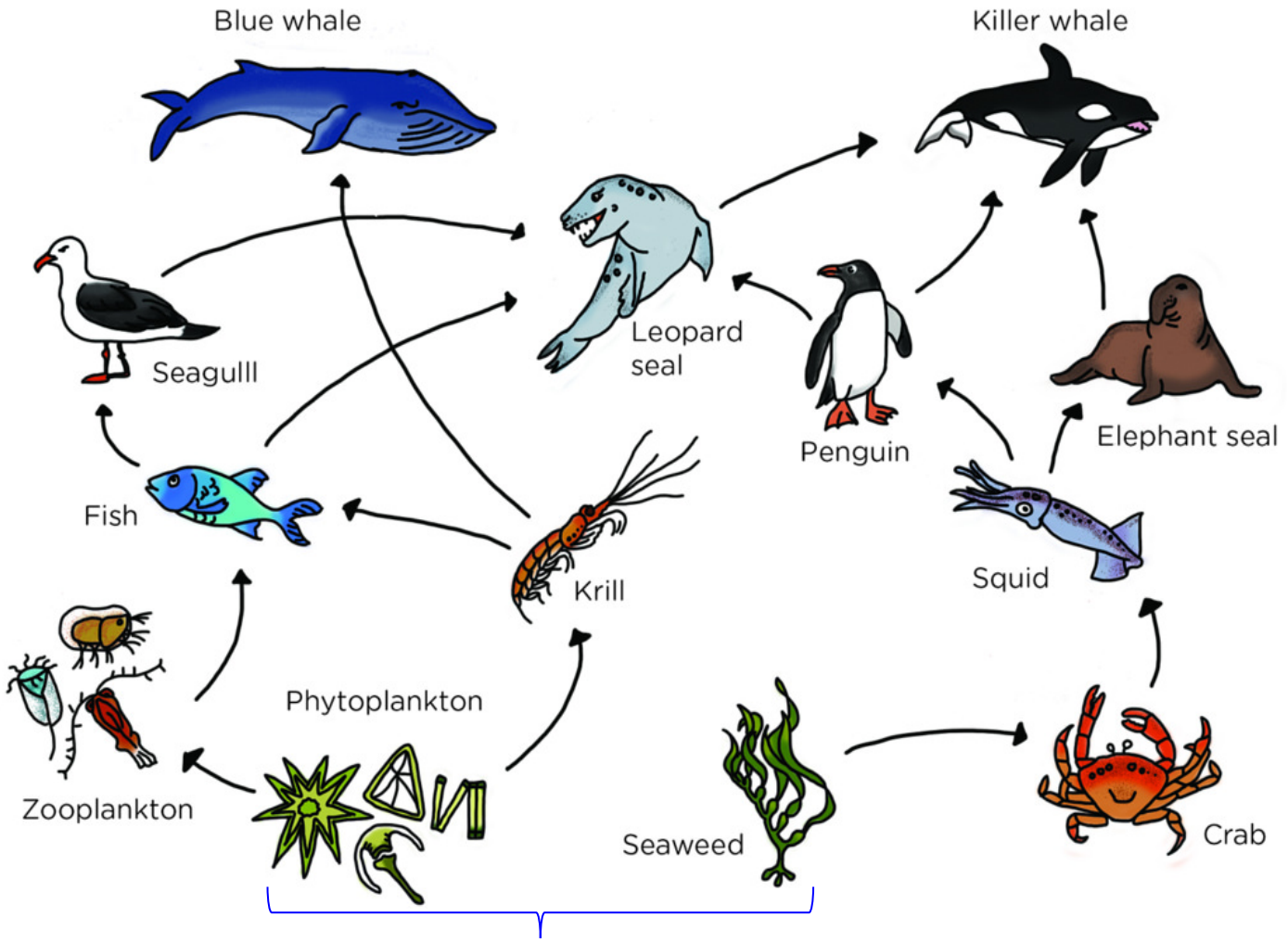
Energy is **lost** as **bones/teeth/hair** are **not fully eaten**.

Eventually, energy passes to **saprotrophs** as they **remove energy** from **waste/dead organisms**.

Energy is **not recycled**.

G. FOOD WEB

- Shows many **interconnected food chains.**



- **Count the arrows** from the **producers** to work out which **organisms** are **primary**, **secondary** and **tertiary consumers**.
- Some organisms can act as **more than one type of consumer** in the same food web,
- The **leopard seal** acts as both a **tertiary consumer** and a **quaternary consumer** above.
- A common **error** by students in exams:

If the zooplankton die, explain what will happen to the number of krill.

They will **decrease** as the **fish will eat more of them**.

They will **increase** as there will be **less fish** to eat them, as there is **less overall food** for **fish**

The fish **may not be able to find and eat more krill**.

Always **answer** these in terms of **what would happen to the number of the predator**, if its **prey given** in the **question** changes, rather than explaining it by **alternative food sources**.

H. HOW THE FLOW OF ENERGY IN A FOOD WEB DIFFERS FROM THE MOVEMENT OF NUTRIENTS

- nutrients are recycled in a food web and energy is not recycled (enters and leaves)
- nutrients are recycled by saprotrophs (returned to the environment and reused);
- while energy (enters as light and) is dispersed as heat;