Insect Biology

THE YOUNG SCIENTIST PROGRAM
HTTP://YSP.WUSTL.EDU
WASHINGTON UNIVERSITY SCHOOL OF MEDICINE
ECOLOGY/EVOLUTION TEACHING TEAM

Make a dichotomous key

Dichotomous key

- A dichotomous key is a tool that scientists can use to help identify a particular specimen.
- In science we use many helping aids to organize and easily retrieve information.
- The specimen could be a chemical that is identified by its physical properties, an insect identified by its markings and traits, or even a rock sample based on its different properties. The term dichotomous begins with the prefix of "di" which means two.
- The dichotomous key allows for the scientist to ask a series of questions with yes or no answers. Each question should be phrased so that the answer will either be **yes** or **no**.

The first step in the key will be organized the following way:

1. a. wings covered by an exoskeleton
   b. wings not covered by an exoskeleton

Next, the statements need to lead the observer to the next step to narrow the identification further:

1. a. wings covered by an exoskeleton .... go to step 2
   b. wings not covered by an exoskeleton .... go to step 3

Step 2 needs to consist of a pair of statements that will allow for the identification of the ladybug and the grasshopper:

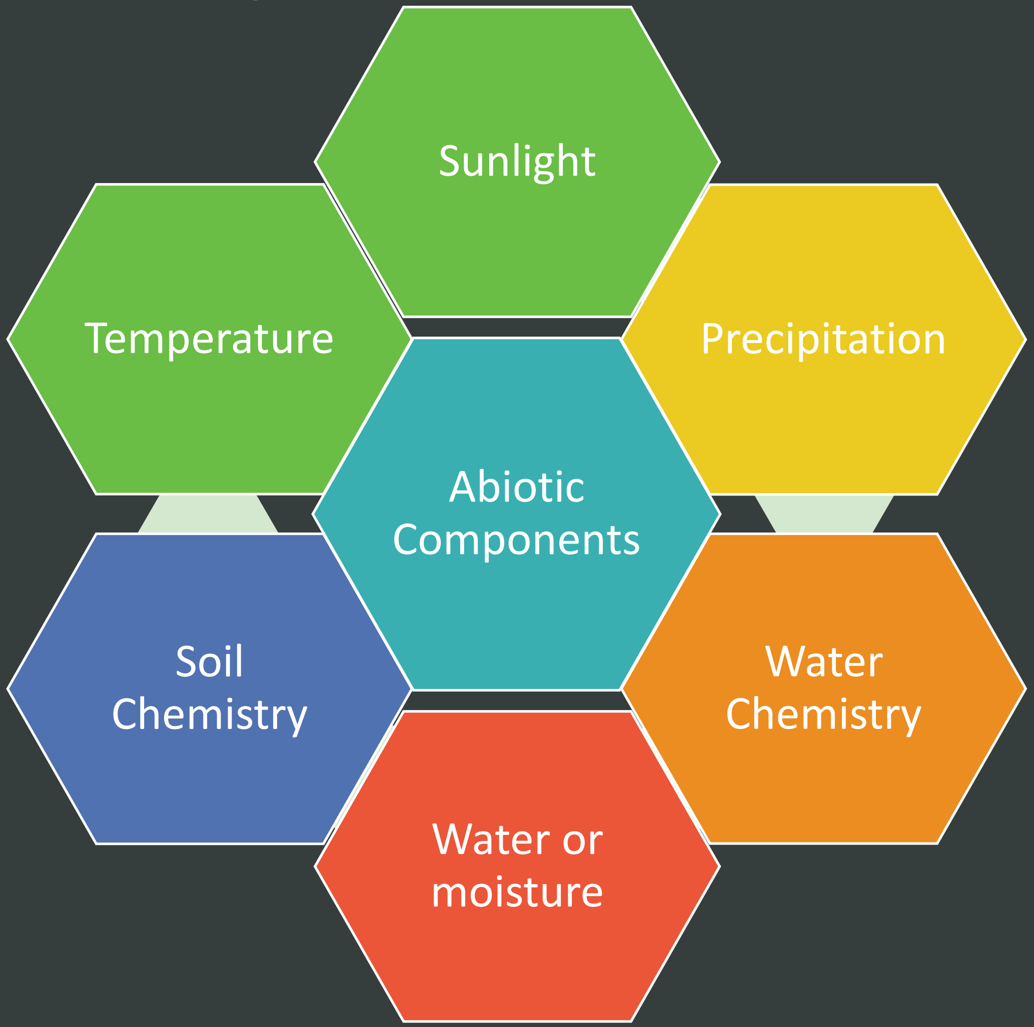
2. a. body has a round shape .... **ladybug**
   b. wings not covered by an exoskeleton .... **grasshopper**

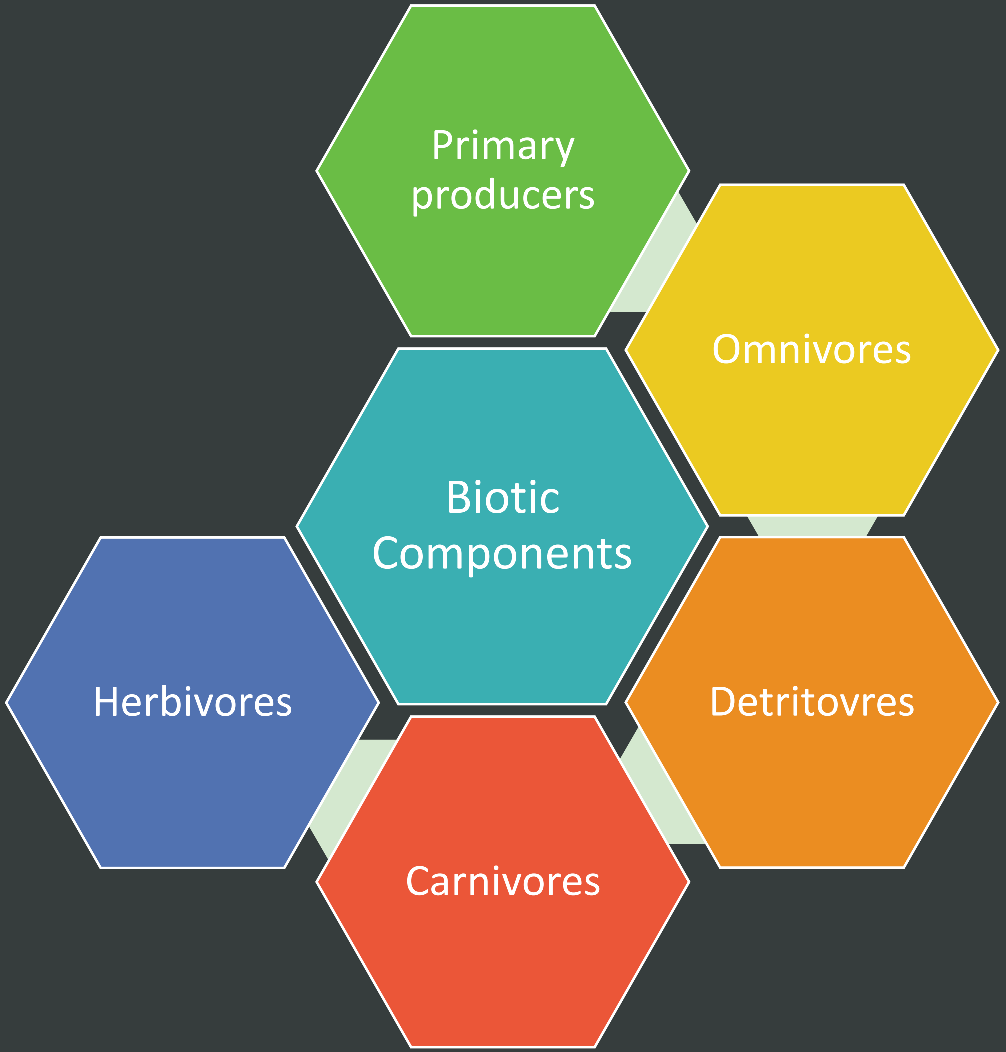
Step 3 needs to consist of a pair of statements that will allow for the identification of the housefly and dragonfly:

3. a. wings point out from the side of the body .... **dragonfly**
   b. wings point to the posterior of the body .... **housefly**

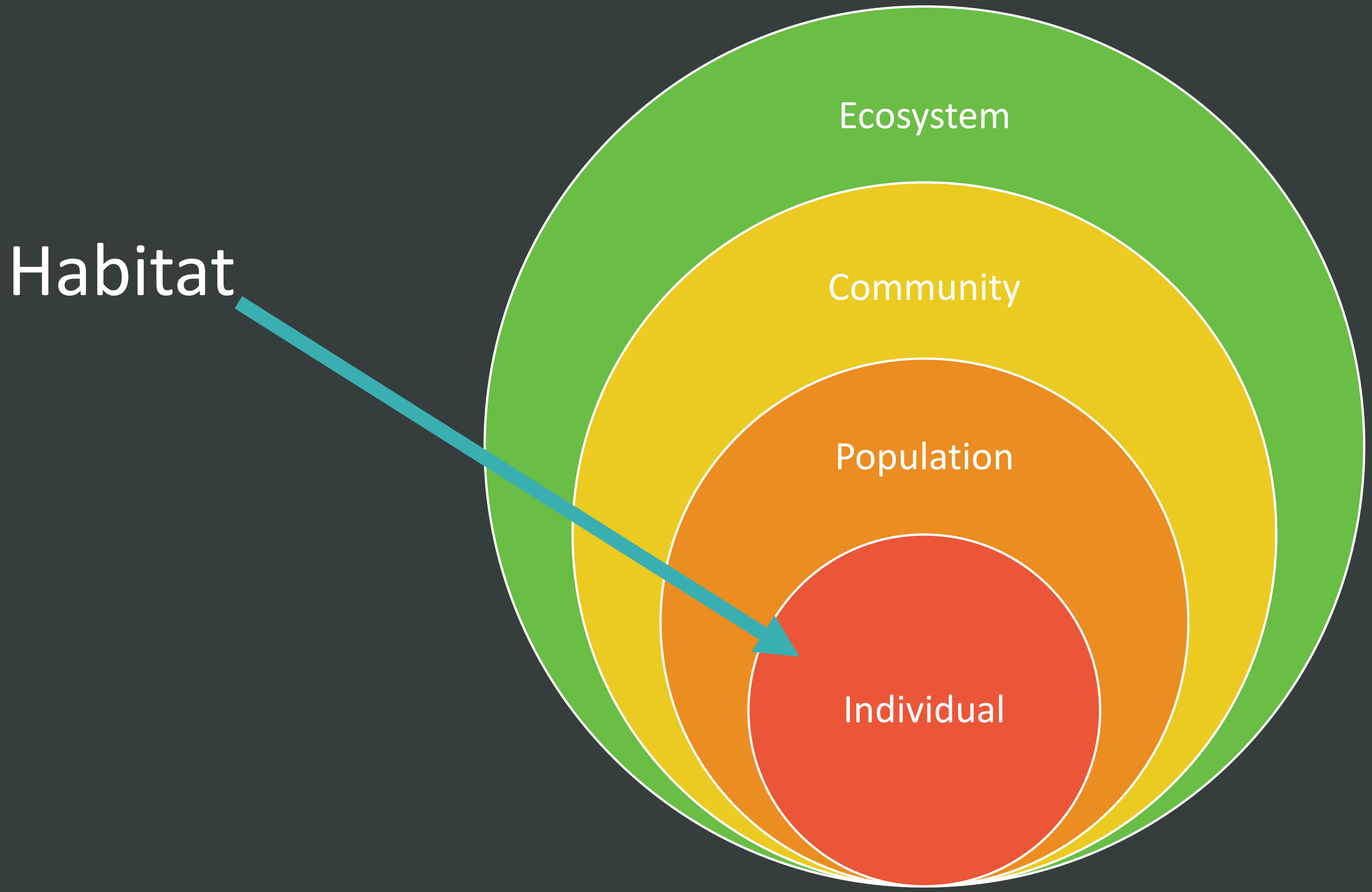
Population Biology

Ecosystems made of both abiotic and biotic components





The characterization of an ecosystem



Why can’t one species dominate the planet?

- Nutrients are limited
- Environments are limited

Equation for population growth

$$\frac{dN}{dT} = rN$$

Equation for population growth

$$N$$

Population size

Equation for population growth

$$T$$

Time

Equation for population growth

$$\frac{dN}{dT}$$

The growth rate of the population at a given instant

Equation for population growth

$$r$$

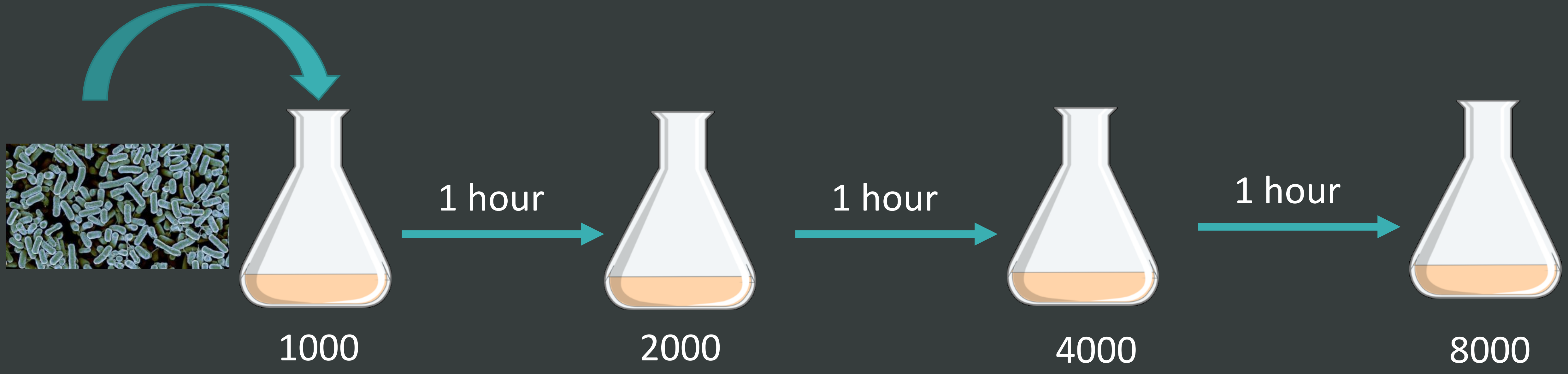
Per capita rate of increase/how quick the population grows

If no movement, r = births - deaths

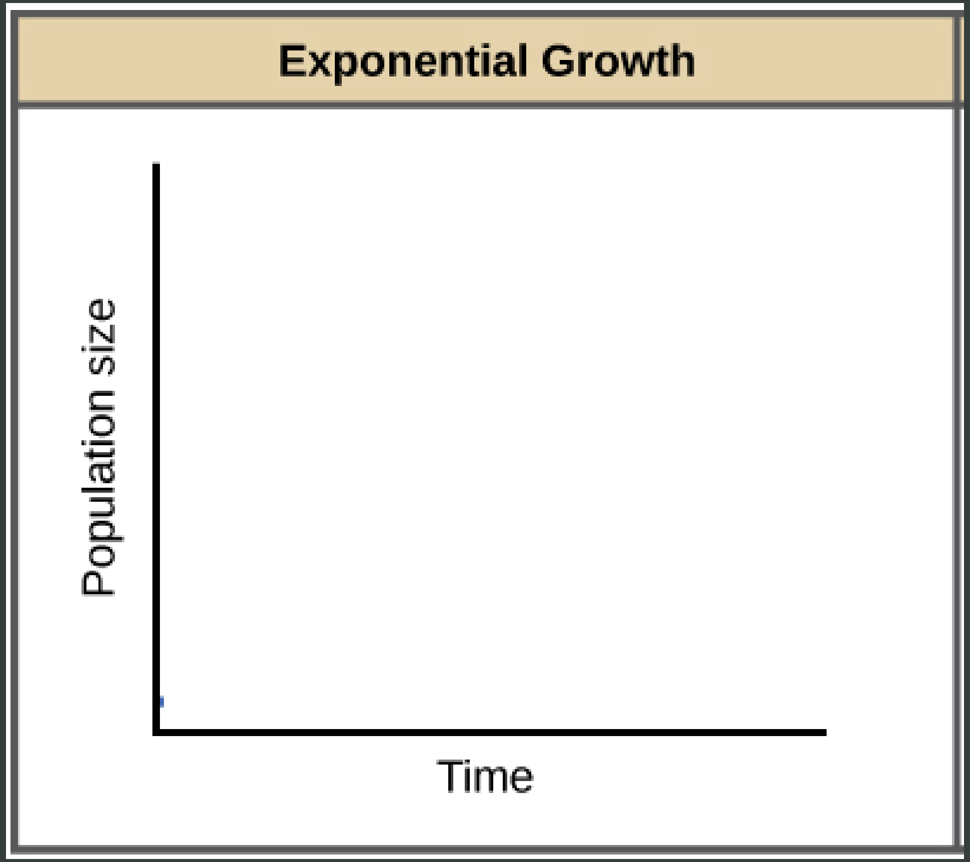
Different Growth Rates

Exponential Growth Rate

When r (per capita rate of increase) never changes



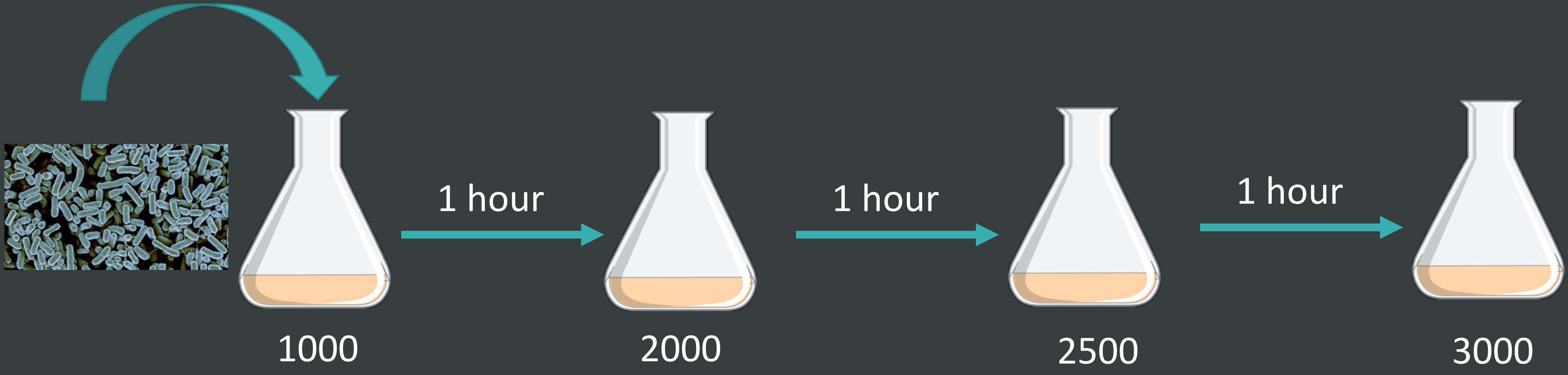
Exponential Growth Rate



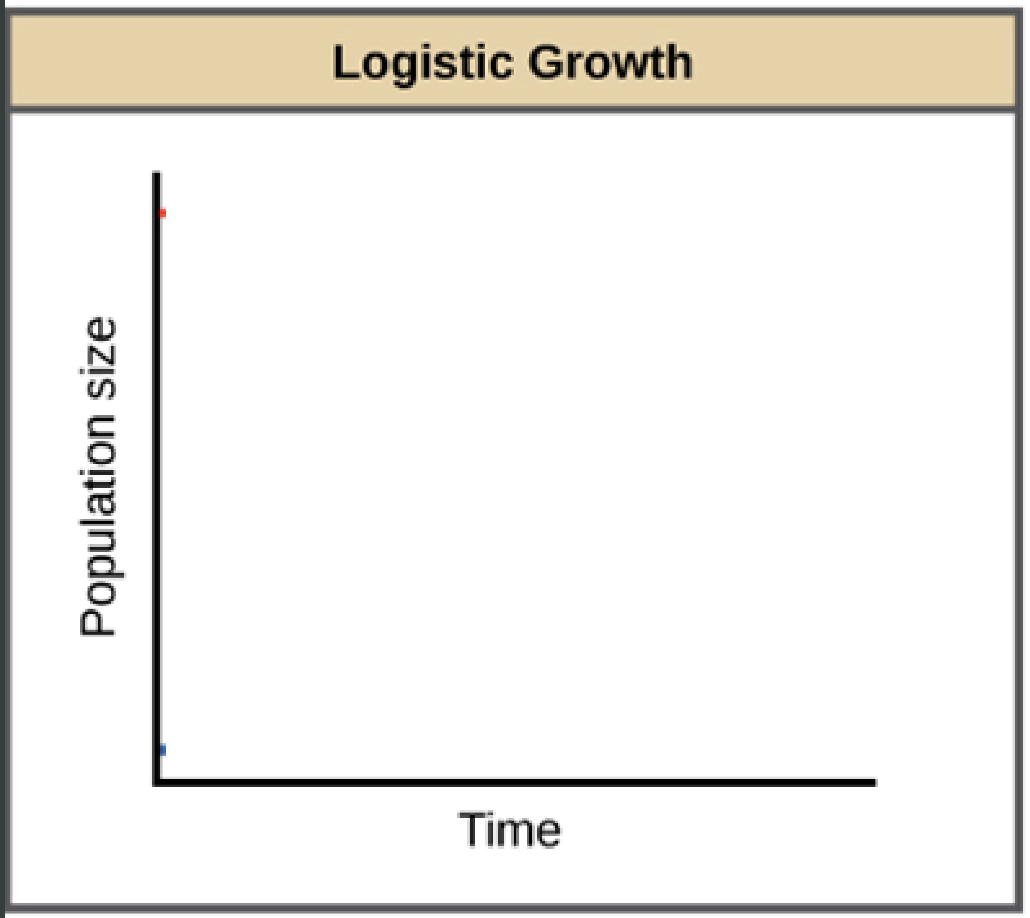
J Shaped Curve

Logistic Growth Rate

When r increases until the population reaches a maximum limit.



Logistic Growth Rate



S Shaped Curve

$$\frac{dN}{dT} = r_{max} \boxed{\frac{(K - N)}{K}} N$$

Logistic Growth Rate

$$(K - N)$$

Tells us how many more individuals can be added to the population before it hits carrying capacity

Logistic Growth Rate

$$\frac{(K - N)}{K}$$

The fraction of the carrying capacity that has not yet been "used up"

How to determine carrying capacity

- Food
- Habitat
- Water
- Other abiotic factors

Intraspecific competition