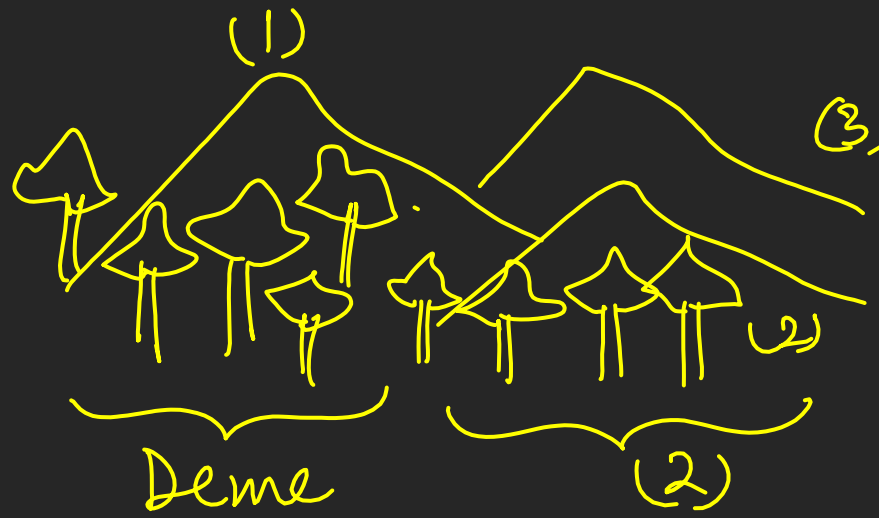


Population

↓

may be divided into

ALL

{ Asiatic Lion Landscape } → Based on Geographic subdivision

Sub-populations = Deme

POPULATION ECOLOGY

a) present in the same habitat

b) at the same time

① members of the same sp.

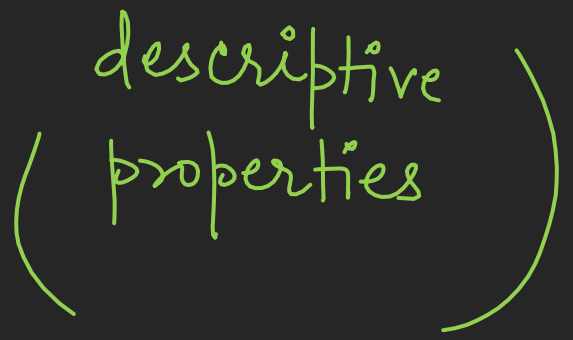
② Part of the same community

Definition

part of the same community

- A group of individuals of the same species living in a defined area at a particular time.
- Individuals in a population share (1) or compete (2) for resources and interbreed (3).
- **Examples** include all the cormorants in a wetland, rats in an abandoned dwelling, teakwood trees in a forest tract, bacteria in a culture plate, and lotus plants in a pond.

Attributes



Population Size

- **Significance of Population Size**
- Population size is a key indicator of a species' status in its habitat.
- Ecological processes such as competition with other species, predator impact, or pesticide application effects are evaluated in terms of changes in population size.
- **Range of Population Size**
- Population sizes in nature can vary greatly, from less than 10 (e.g., **Siberian cranes** at Bharatpur wetlands in any year) to millions (e.g., **Chlamydomonas** in a pond).

Measurement

- **Measurement of Population Size**
- **Direct measurement = Census**
- **Indirect:** Technically done as **population density** (designated as **N**), population size is not always measured in numbers.
- Other measures
  - In cases where there are many small plants (e.g., 200 carrot grass plants) and a single large tree (e.g., a banyan tree with a large canopy), stating that the population density of the banyan is low relative to the carrot grass underestimates the banyan's significant role in the community.
  - In such cases, the percent cover or biomass is a more meaningful measure of population size.

(2) Indirect → Estimation

(1) Size of the population

Birth rate

(2) Per unit area / volume ✓ aquatic habitat

(Density approach)

land area $1m^2$ / $1km^2$

$1m^3$

(How many individuals

3 approches

(1) Direct counting of all members

(Census / जनगणना)

↳ • Tigers, Lions,
• Elephant; Rhino,
• Snow Leopards; Leopards

- **Birth rate** is the number of individuals born in a population per unit time (usually per year). It is calculated by dividing the number of births by the number of individuals in the population at the start of the time period.

Birth : 10

Starting Popu/n = 100

- **Example:** If in a pond there were 20 lotus plants last year and through reproduction 8 new plants are added, taking the current population to 28, we calculate the birth rate as 8/20 = 0.4 = 40%, offspring per lotus per year.

Death rate

Deaths : 10

Popn : 200

$\frac{10}{200} \times 100 = 5\%$ Death rate

- **Death rate** is the number of individuals that die in a population per unit time. It is calculated by dividing the number of deaths by the number of individuals in the population at the start of the time period.
- **Example:** If 4 individuals in a laboratory population of 40 fruitflies died during a specified time interval, say a week, the death rate in the population during that period is 4/40 = 0.1 individuals per fruitfly per week.

$= 10\%$

Sex Ratio

- **Sex ratio** is the proportion of males to females in a population.
- **Example:** A population may have a sex ratio of 60% females and 40% males.

Ecological Age Groups

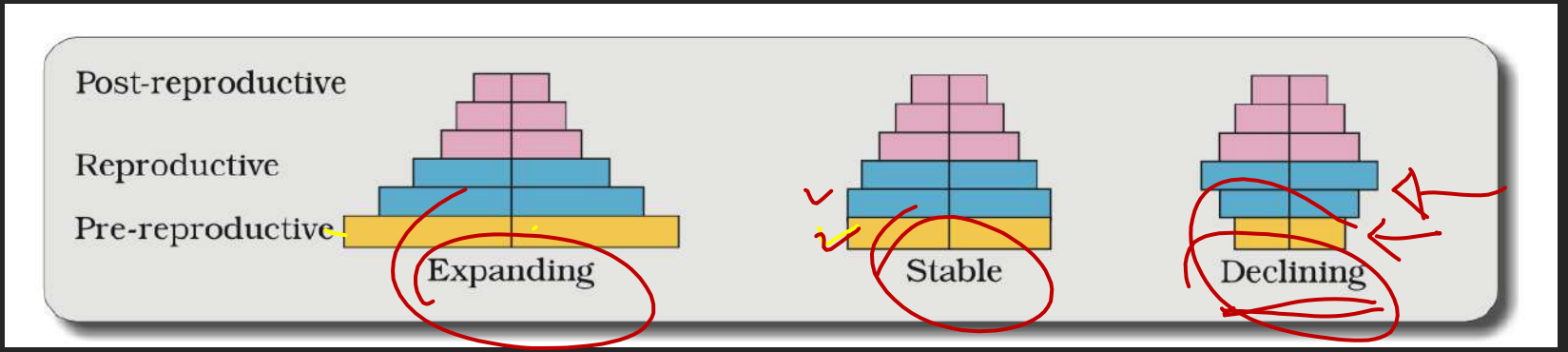
(1) Pre-reproductive

(2) Reproductive

(3) Post-reproductive

Age Structure

- **Age structure** is the distribution of individuals of different ages in a population. It is often represented by an age pyramid.
  - **Example:** The shape of an age pyramid can reflect the growth status of a population (growing, stable, or declining).

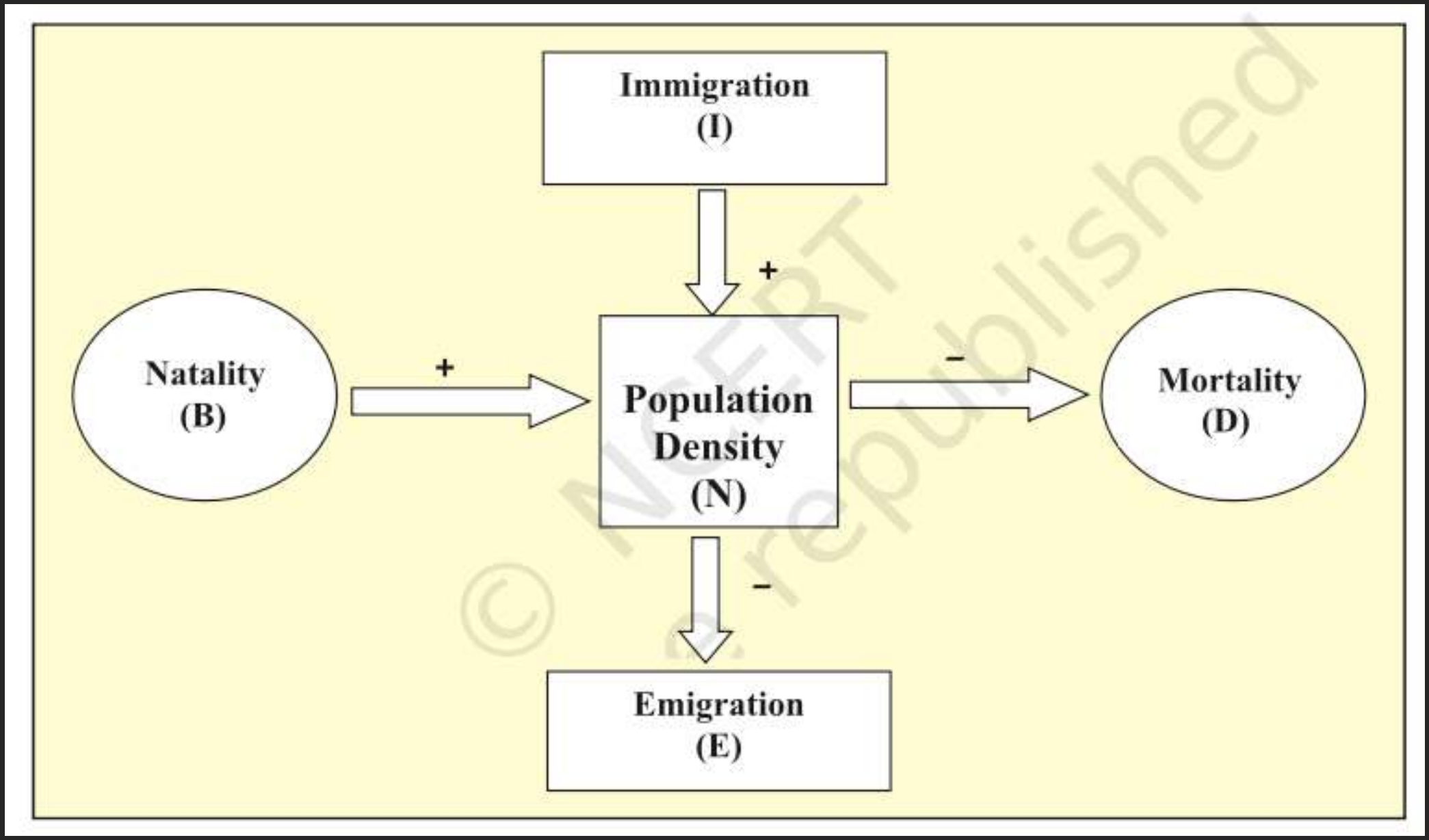


Population Growth

4 Factors

4 Key factors:

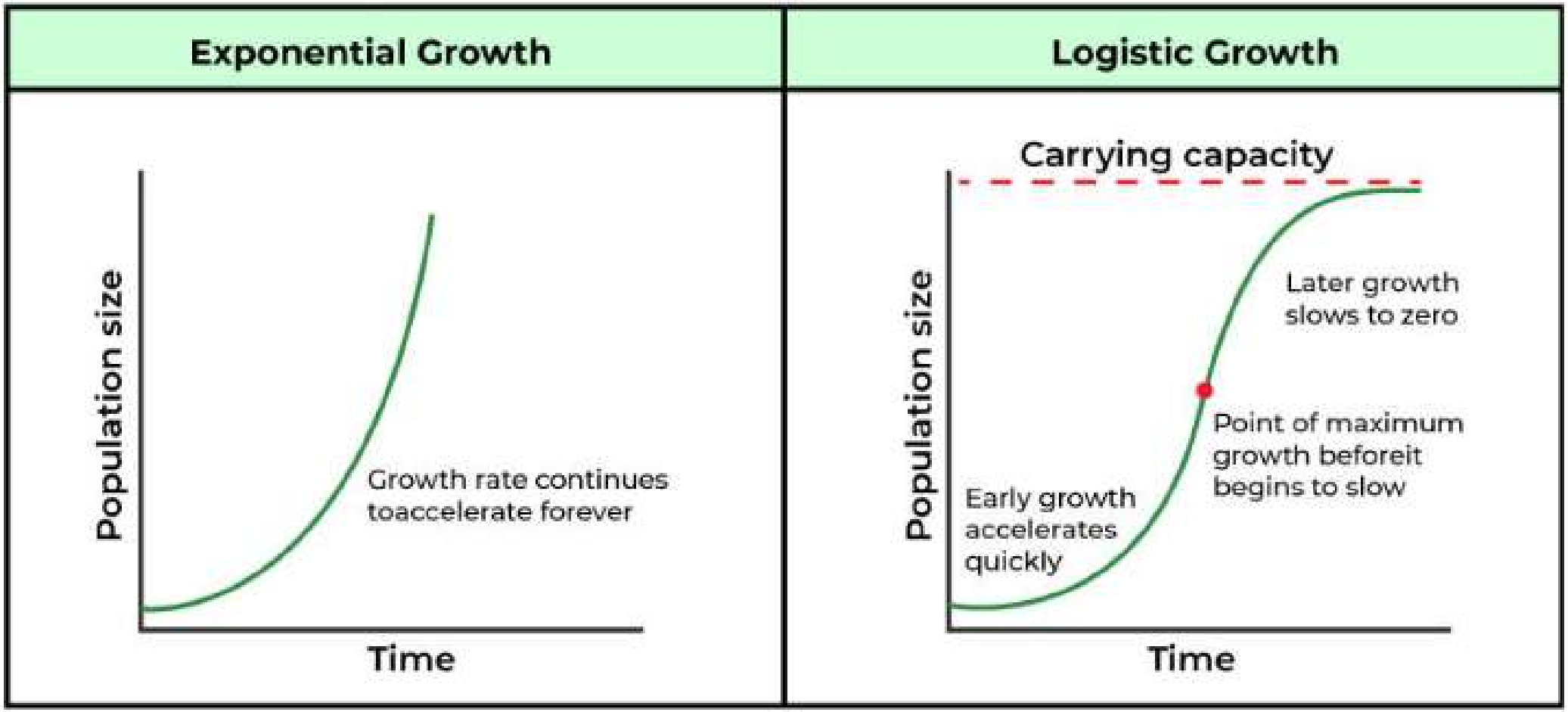
1. Natality: Number of births during a given period added to the initial density.
2. Mortality: Number of deaths in the population during a given period.
3. Immigration: Number of individuals of the same species that have come into the habitat from elsewhere during the time period.
4. Emigration: Number of individuals of the population who left the habitat and gone elsewhere during the time period.

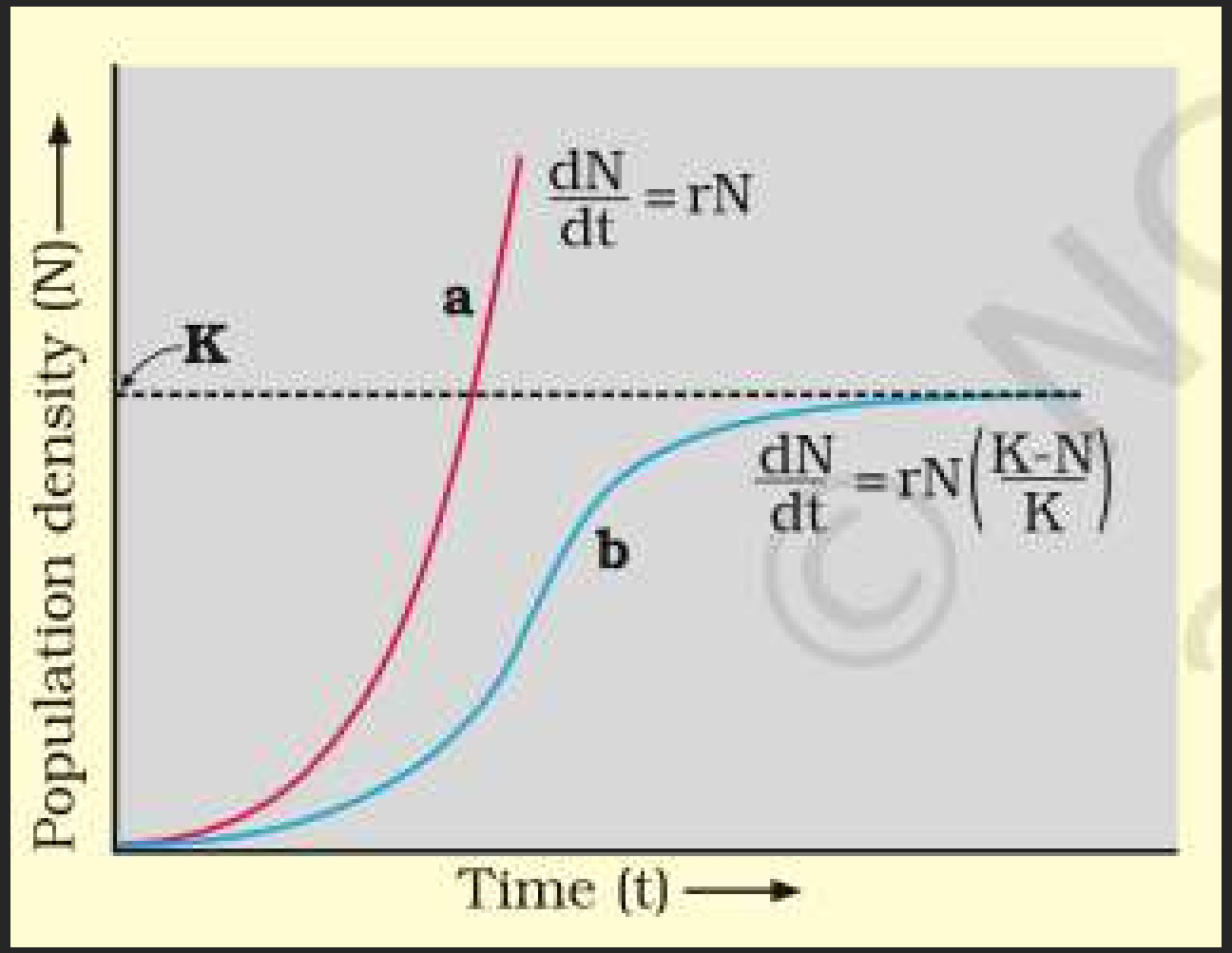


Formula

- if N is the population at time t, then its density at time t +1 is:
- $N_{t+1} = N_t + [(B+I)-(D+E)]$

Population Growth Models




Population density (N)
Time (t)
K
a
b
dN/dt = rN
dN/dt = rN(K-N/K)

Factors Controlling Population Growth

1. Density-Dependent Factors: Include disease, competition, and predation. Can have either a positive or a negative correlation to population size.
2. Density-Independent Factors: Include environmental stressors and catastrophe, not influenced by population density change. These factors include food or nutrient limitation, pollutants in the environment, and climate extremes

Thank You