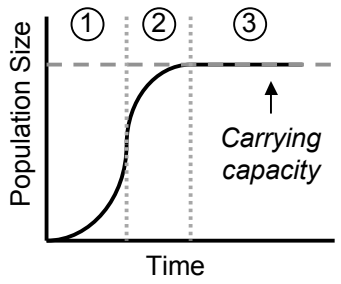
Populations (5.3) & Evolution (5.4)

The sigmoid (S-shaped) population growth curve (5.3.2 / 5.3.3)



1. Exponential Growth Phase
Maximal growth rates under optimal environmental conditions *(births > deaths)*

2. Transitional Phase
Environmental resistance begins to set in slowing population growth *(↓ births ; ↑ deaths)*

3. Plateau Phase
Carrying capacity is reached, resulting in equilibrium *(births = death)*

Factors affecting population growth (5.3.4)

Remember: **PANDA PAW**

Predation
Availability of shelter
Nutrient supply
Disease
Availiability of light, oxygen, water, etc.
Partner selection (mates)
Accumulation of wastes
Weather conditions

Key terms (5.3.1 / 5.4.1)

Population: $\Delta P = (N + I) - (D + E)$

- Population size is increased by natality (births) & immigration and is decreased by deaths & emigration

Evolution: The cumulative change in heritable characteristics of a population

Explain natural selection (5.4.3 - 5.4.5, 5.4.7)

- There is genetic variation within a population *(which can be inherited)*
- There is competition for survival *(species produce more offspring than the environment can support)*
- Selective pressures give rise to differential reproduction
- Organisms with beneficial adaptations are more likely to reproduce *('survival of the fittest')*
- Over generations there is a change in allele frequency within the population *(evolution)*

Reproduction & Variation (5.4.6)

Crossing Over

- In prophase I of meiosis homologous chromosomes pair up and genetic information can be exchanged via chiasma between non-homologous chromatids

Independent Assortment

- In metaphase I of meiosis homologous chromosomes randomly align at the equator
- Different chromosome combinations will ensue due to the random orientation of chromosomes

Random fertilisation

- Each person has 2^{23} different gamete combinations
- Each mating will result in unique gamete fusion

Evidence for evolution (5.4.2)

Fossil Record

- The fossil record shows that more simpler organisms appeared before more complex ones
- Transitional fossils demonstrate evolutionary change over time (e.g. archaeopteryx)

Homologous Structures

- Similar structures with different functions
- Indicative of common ancestry (e.g. pentadactyl limbs in vertebrates)

Selective Breeding

- Type of artificial selection (human intervention)
- Examples include horses (racing versus farming) and dogs (hunting, tracking, herding)

Examples of evolution (5.4.8)

Antibiotic resistance: *S. aureus* can be either resistant to methicillin (MRSA) or susceptible (MSSA)

Industrial melanism: Peppered moths can have a dark or light melanic form (potential camouflage)

In both examples, frequency of type will be altered by environmental conditions (antibiotics or predation)