

# Biodiversity

Define 'biodiversity'

What is species richness?

What is species evenness?

What is diversity index used to measure?

Heterozygosity index  
What is it used to measure?

## Simpson's Diversity Index

Biologists use a more complicated formula called Simpson's Diversity Index which calculates biodiversity rather than simply population size:

$$D = \frac{N(N-1)}{\sum n(n-1)}$$

Where:

D = diversity index (simply a number with no units)

N = total number of organisms of all species found

n = total number of individuals found of the species you are interested in

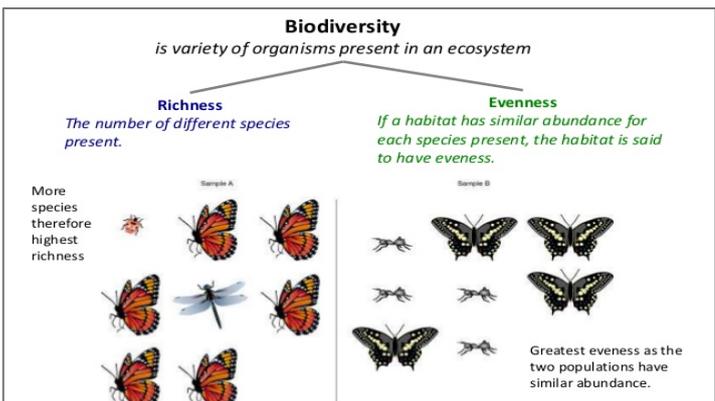
Use the calculation to calculate the diversity index for daisies and clover, by throwing 10 quadrats in total

Equation:

Calculation example:

What is the importance of biodiversity?

Types of sampling methods:



# Niches

What is a 'niche'?

Define natural selection

What is species competition?

Types of adaptation:

Behavioural:

Physiological:

Anatomical:

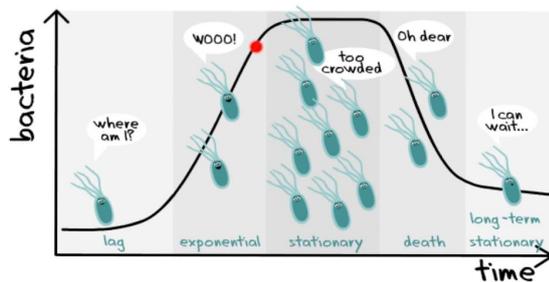
Types of competition:

Interspecific:

Intraspecific:

Why can't two species occupy same niche?

Bacterial Growth Phase



During the lag phase the bacteria adapt themselves to growing conditions and synthesize RNA, enzymes as well as other molecules  
The log phase is when the bacteria grow very rapidly  
The stationary phase occurs when a nutrient is depleted in the environment so death and growth is equal  
The death phase is when the bacteria die due to lack of nutrients

Why do organisms adapt?

# Evolution/natural selection

Define 'evolution'

What is reproductive isolation?

What is a selection pressure?

What are pre-zygotic barriers?

Define:

Examples:

What are post-zygotic barriers?

Define:

Examples:

## Hardy-Weinberg Principle

### Parent generation

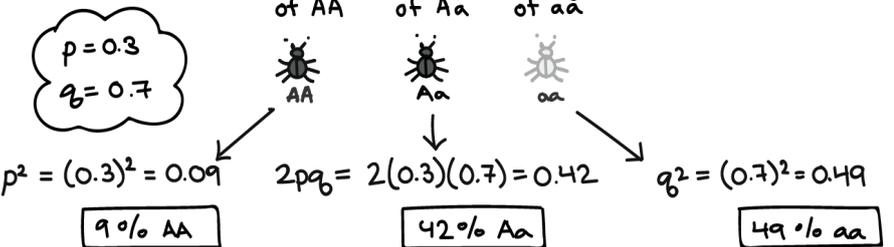
Phenotype	YY	Yy	yy
Genotypic frequency	.49	.42	.09
Number of individuals (total = 500)	245	210	45
Number of alleles in gene pool (total = 1000)	Y: 490 + 210 = 700		y: 210 + 90 = 300
Allelic frequency	$\frac{700 \text{ Y}}{1000 \text{ total}} = .7 = p$		$\frac{300 \text{ y}}{1000 \text{ total}} = .3 = q$

### Hardy-Weinberg analysis

	p (.7)	q (.3)	
p (.7)	YY $p^2 = .49$	Yy $pq = .21$	
q (.3)	Yy $pq = .21$	yy $q^2 = .09$	
	$p^2$	$2pq$	$q^2$
	.49	2(.7)(.3)	.09
	.49	.42	.09
	$.49 + .42 + .09 = 1$		
	Predicted frequency of YY offspring	Predicted frequency of Yy offspring	Predicted frequency of yy offspring

$p = \text{freq. of A}$   
 $q = \text{freq. of a}$

$p^2 + 2pq + q^2 = 1$  ] HARDY-WEINBERG EQUATION



What does hardy-weinberg show?

# Speciation

What is speciation?

Stages of speciation:

What is allopatric speciation?

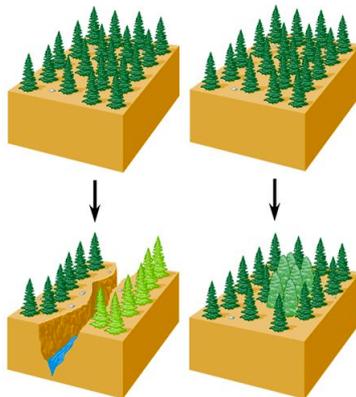
What is sympatric speciation?

Factors causing speciation:

## Allopatric vs. Sympatric Speciation

### **Allopatric speciation-**

Speciation occurs because a given group has been separated from the parent group, usually because of a geographic separation as time goes by.



### **Sympatric speciation-**

speciation occurs even though the two groups are still living in the same area.



# Classification + validation of evidence

What is a classification system?

Define species:

Hierarchy of life:

D -  
K -  
P -  
C -  
O -  
F -  
G -  
S -

The 5 kingdom system:

Animalia:

Plantae:

Fungi:

Protoctista:

Prokaryotes:

Why do scientists classify organisms?

- ◆
- ◆
- ◆

What is binomial nomenclature?

Ways evidence is critically evaluated:

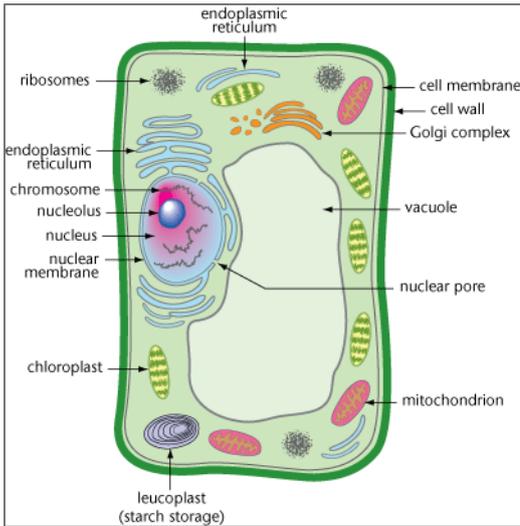
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Define 'phylogeny'

Why may evolution be controversial?

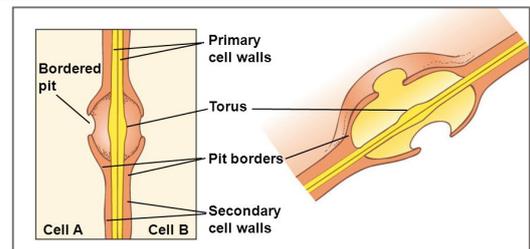
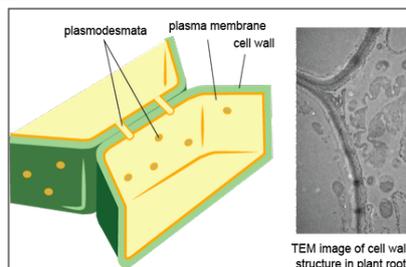
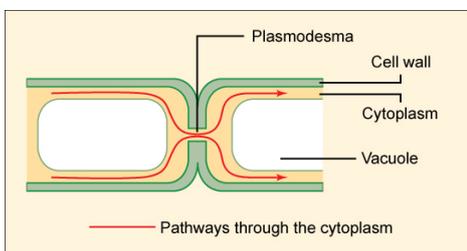
What is a peer review?

# Plant cell structure



List of plant cell organelles:

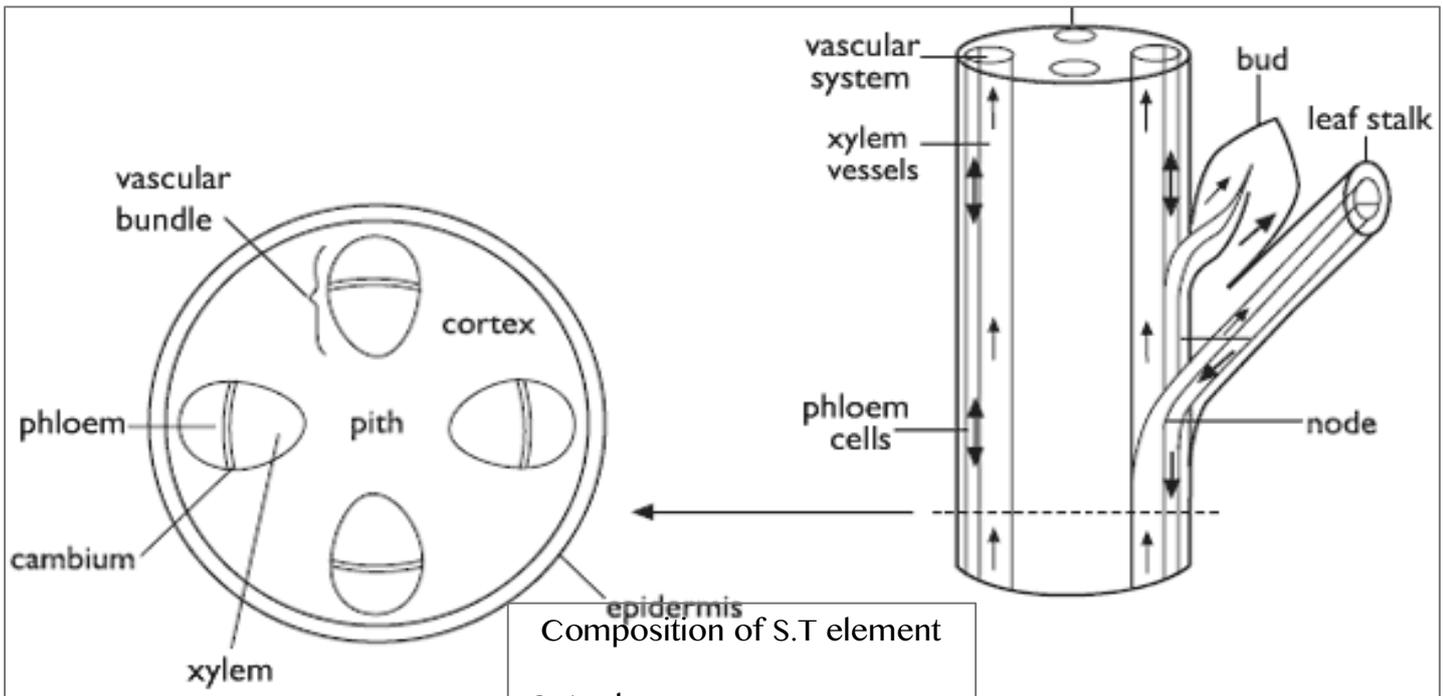
<i>Organelle</i>	<i>Structure</i>	<i>Function</i>
Cell wall		
Middle lamella		
Plasmodesmata		
Pits		
Chloroplast		
Amyloplast		
Vacuole/tonoplast		
Rough ER		
Smooth ER		
Golgi apparatus		



# Phloem tissue

What is the phloem?

What is translocation?



Composition of S.T element

Cytoplasm:

Sieve pore:

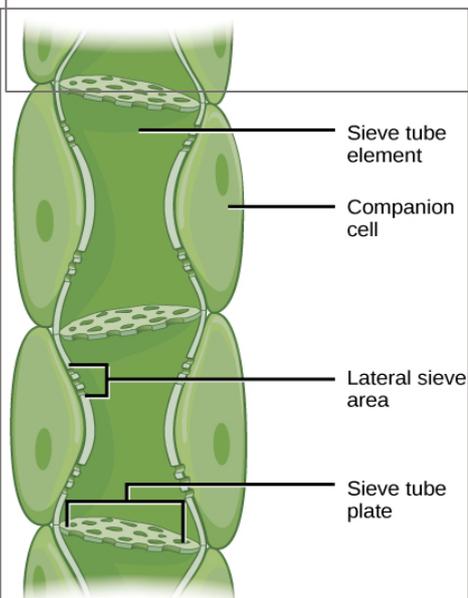
Companion cell:

Lateral sieve area:

What is the sieve tube element?

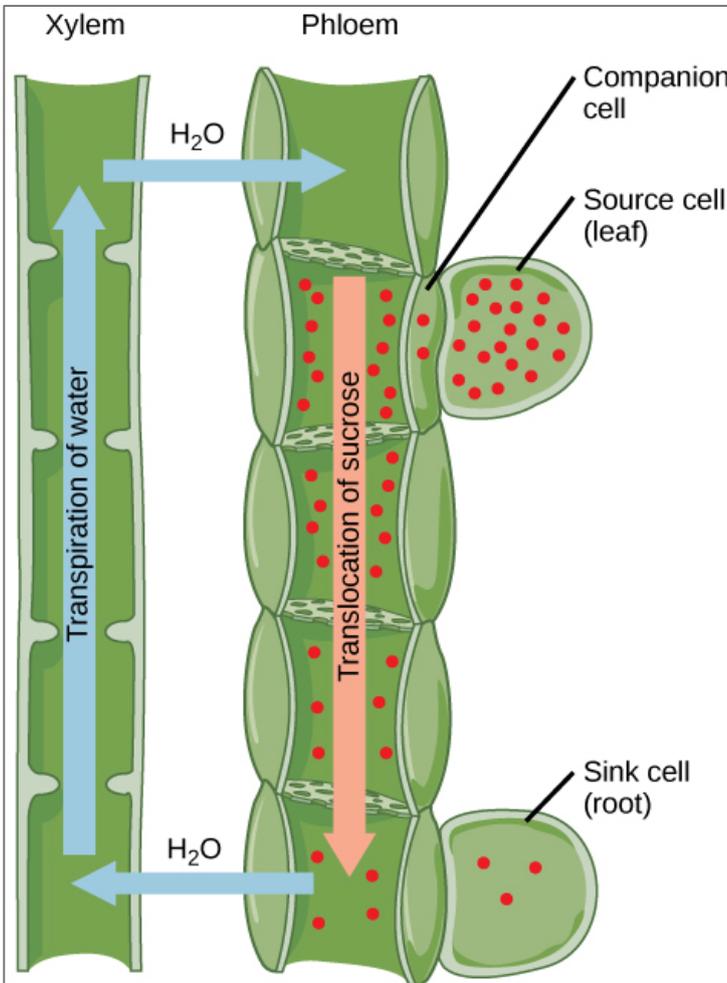
Why is sucrose transported and **not** glucose?

What does phloem transport?



# Transport in phloem

What is the mass flow hypothesis?



## Stages of transport in phloem

- 1.
- 2.
- 3.
- 4.
- 5.

Evidence supporting mass flow hypothesis

Evidence against mass flow hypothesis

How is phloem adapted for transport?

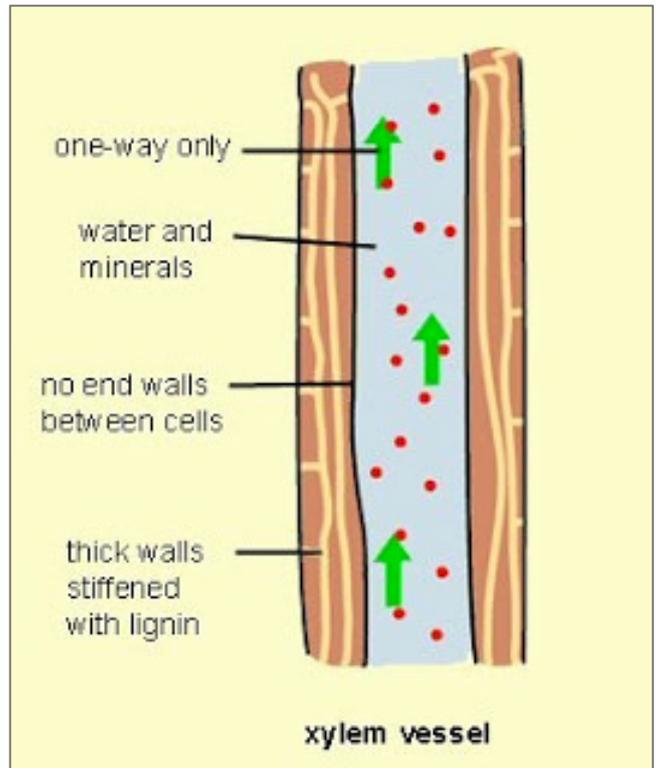
What are 'sources' and 'sinks'?

# Xylem tissue

What is the xylem?

What does the xylem transport?

Xylem vs phloem



Structure of xylem tissue

What is lignin?

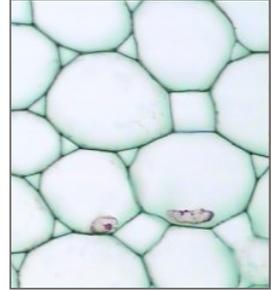
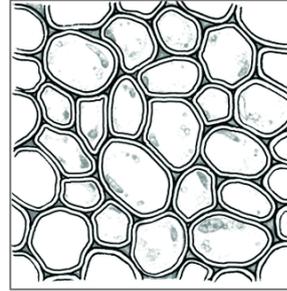
xylem adaptation to function

What are tracheids?

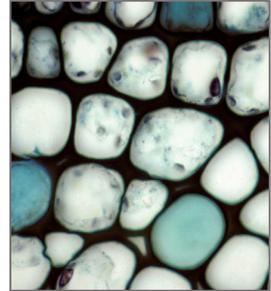
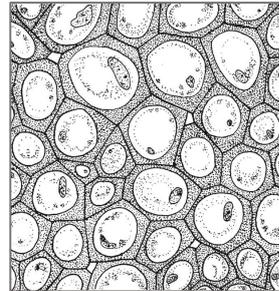
What does water potential mean?

# Further plant tissues

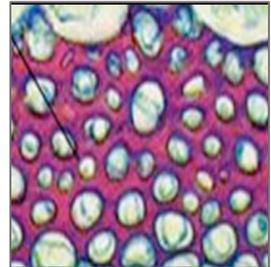
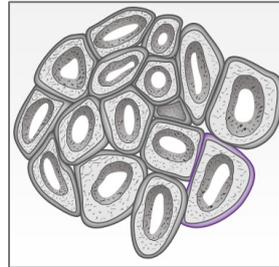
Parenchyma



Collenchyma



Sclerenchyma



<i>Feature</i>	<i>Parenchyma</i>	<i>Collenchyma</i>	<i>Sclerenchyma</i>
Cell shape			
Cell wall			
Cytoplasm			
Nucleus			
Intracellular spaces			
Lignin			
Location			
Functions			

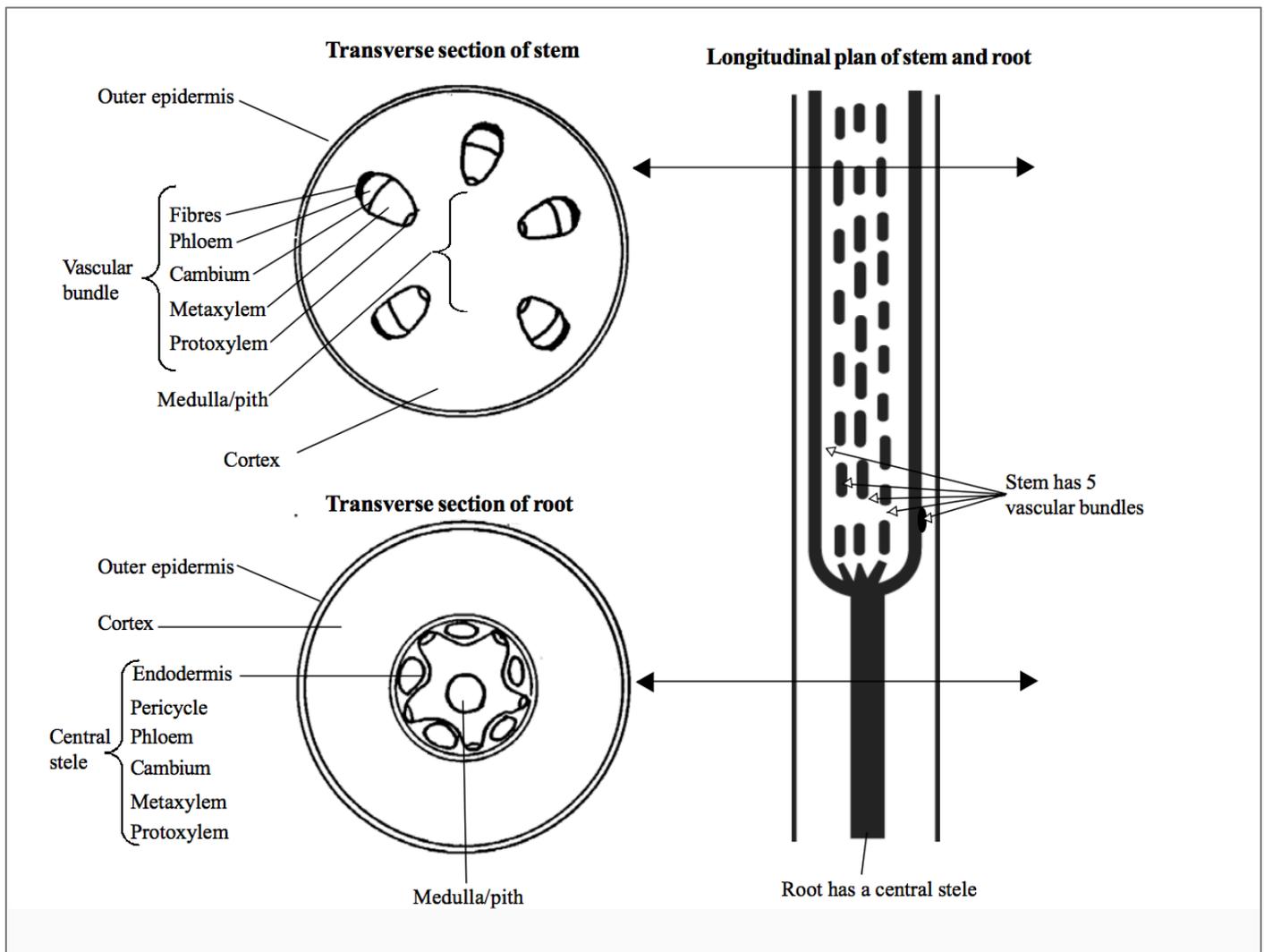
# Stems & Roots

What is a vascular bundle?

What is the plasmodesmata?

How do hollow transport tubes form?

What is the cambium?



## Stems vs Roots

# Cellulose & Cell Wall

What is cellulose?

Structure of cellulose

Function of cellulose

Starch vs. cellulose

Joining of 2 beta-glucose units

Primary cell wall

Secondary cell wall

What are cellulose microfibrils?

Difference between primary + secondary

# Strength of plant fibres - core prac

What does the term 'tensile strength' mean?

Hypothesis:

Dependent:

Independent:

## Control Variables

- Length of fibre
- Time before addition of mass
- Mass hook
- Size/width of fibre

## Risk assessment

## Conclusion/evaluation

## Equipment

## Method

# Plant products sustainability

Uses of plant products:

Future of plastics

What are bioplastics?

Positives of bioplastics:

Negatives of bioplastics:

Natural fibres advantages:

Natural fibres disadvantages:

Man-made fibres advantages:

Man-made fibres disadvantages:

Sustainability of Plant fibers and starch

Properties of water importance to plants

High specific heat capacity:

Coherence:

Maximum density at 4°

Mineral requirements in plants

Magnesium ions:

Nitrate ions:

Calcium ions:

Mineral deficiencies

Lack magnesium:

Lack Nitrate:

Lack Calcium:

# Developing Drugs

What is a double blind trial?

What is a placebo?

Historical vs contemporary - similarities

Historical vs contemporary - differences

1. Research stage

5. Phase 2 - clinical trial

2. Drug discovery

6. Phase 3 - clinical trial

3. Preclinical trials

7. FDA approval

4. Phase 1 - clinical trial

8. Post approval monitoring

# Conservation - zoos

Zoos for education:

Zoos for science research

Zoos for captive breeding:

Disadvantages of zoos

- \*
- \*
- \*
- \*
- \*
- \*

Methods to prevent inbreeding:

In-situ conservation:

Reasons for In-situ conservation:

- 
- 
- 
- 

Ex-situ conservation:

Reasons for Ex-situ conservation:

- 
- 
- 
- 

What is genetic drift?

Why don't animals breed successfully in captivity?

Benefits of zoos:

# Conservation - seed banks

Why conserve wild plants?

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- 
- 

Why are seeds conserved rather than plants?

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- 
- 
- 

How are seeds collected & stored?

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

Issues with seed banks:

- 
- 
- 
- 

Conditions used for storage of seeds:

Benefits of storing seeds in seed banks

- ✓
- ✓
- ✓
- ✓

Reasons for cool + dry conditions:

- 
- 
- 
- 
- 

