# OCR (A) Biology A-level

## 6.2.1 - Cloning and biotechnology

Flashcards

# How can we produce natural clones of plants?

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Vegetative propagation. Part of a plant is separated, then develops into a new plant genetically identical to the original. English Elm does not produce viable seed, so naturally self-propagates using its roots.

# How should a plant cutting be taken for cloning?

How should a plant cutting be taken for cloning?

Stem is cut between the leaf and nodes. Replanted and allowed to grow, sometimes with the use of plant hormones.

# How can we produce artificial clones of plants?

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- Tissue culture; sample placed on various nutrient-containing mediums to encourage cell division and shoot growth.
- Micropropagation; material produced from tissue culture is rapidly multiplied to produce large numbers of plants.

# Evaluate the use of artificial plant cloning in agriculture.

Evaluate the use of artificial plant cloning in agriculture.

+ Large number of plants can be produced regardless of weather conditions.
- Reduces genetic variation, making them susceptible to disease.

Give an example of natural cloning in animals.

Give an example of natural cloning in animals.

Monozygotic twins; embryo splits during development to produce two genetically identical individuals.

# How can we produce artificial clones of animals?

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- Somatic cell nuclear transfer; differentiated cell from parent fused with an enucleated egg cell. The cell develops into an embryo and can be implanted into a womb.
- Embryo splitting; same process by which twins form, performed artificially.

Give arguments surrounding cloning in animals.

Give arguments surrounding cloning in animals.

+ Quick process suited to the growing population of Earth.
+ Can preserve endangered species.
- Cloned animals often suffer from health problems.
- Low genetic diversity.

# Why are microorganisms suited for use in biotechnological processes?

# Why are microorganisms suited for use in biotechnological processes?

- Rapid growth in a variety of environmental conditions.
- Can be genetically engineered.
- Reduces use of chemicals, beneficial to the environment.

Give some ways microorganisms are used in biotechnological processes.

Give some ways microorganisms are used in biotechnological processes.

- Food; baking, brewing, yogurt, cheese
- Medicine; penicillin, insulin
- Environmental; removing pollution (bioremediation)

Give advantages of using microorganisms to produce food for human consumption.

Give advantages of using microorganisms to produce food for human consumption.

+ Production rate easily varied
+ Not dependent on climate
+ Long-lasting
+ Uses waste products

Give disadvantages of using microorganisms to produce food for human consumption.

Give disadvantages of using microorganisms to produce food for human consumption.

- Lack of flavour.
- Proteins must be isolated and purified.
- Contains different amino acids to animal proteins.

Describe the technique that should be used to culture microorganisms.

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Aseptic technique; everything must be kept completely sterile so that no unwanted microorganisms are present in the culture.

# Summarise the three steps of growing microorganisms.

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1. Sterilisation; part of the aseptic technique.
2. Inoculation; microorganism introduced to agar plate by streaking, seeding, or spreading.
3. Incubation; placed in warm environment for 24-48 hours to grow.

# Differentiate between batch and continuous fermentation.

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- Batch= closed environment, competition for resources, maintains culture in stationary phase, easy to set up, less efficient.
- Continuous= products continually removed, maintains culture in log phase, difficult to set up, more efficient.

# How are the growth conditions manipulated to maximise yield?

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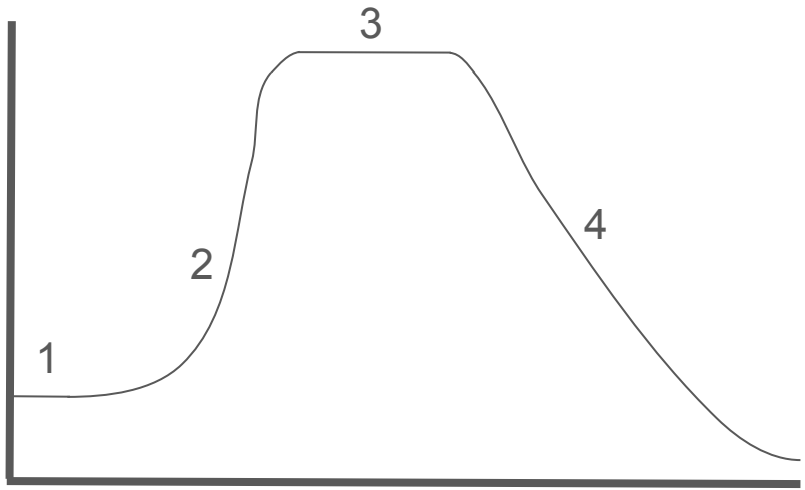
- Temperature maintained at optimum.
- Sufficient nutrient supply.
- Aerobic conditions to prevent products of anaerobic respiration.
- pH kept constant to maximise enzyme activity.

# Describe the growth curve of a microorganism in a closed culture.

# Describe the phases of a growth curve of a microorganism in a closed culture.

- Lag= cells increase in size and take in water. Population constant.
- Log= cells divide. Population increases exponentially.
- Stationary= nutrient levels decrease, slowing growth rate. Population stabilizes.
- Death= toxic metabolites increase to a point that kills cells. Population declines.

# Label the phases on this graph of population plotted against time.



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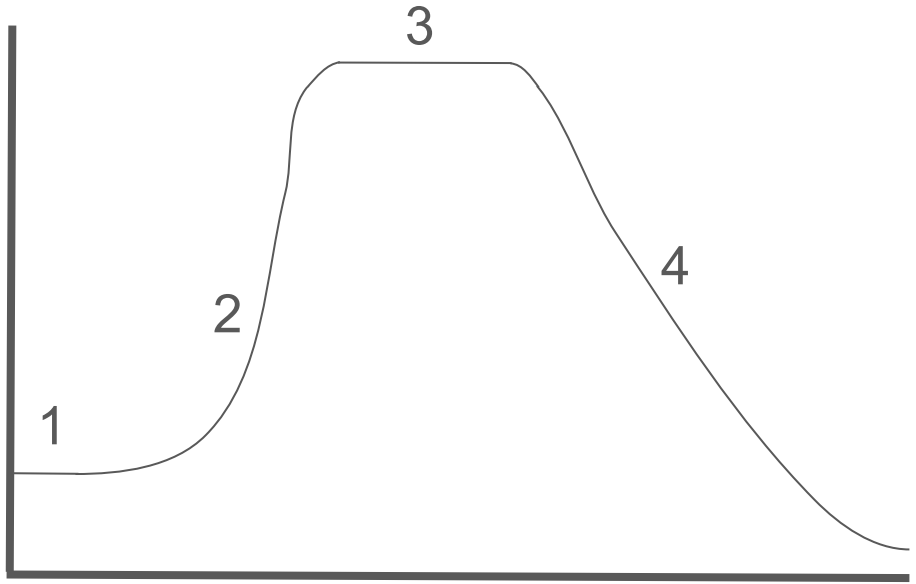


1 - Lag

2 - Log

3 - Stationary

4 - Death

Give the formula for bacterial growth.

# Give the formula for bacterial growth.

$$N = N_0 \times 2^n$$

- N = number of bacteria currently in the population
- $N_0$ = number of bacteria in the population at the beginning
- $^n$ = number of divisions

# What is an immobilised enzyme?

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An enzyme attached to an inert material in order to restrict its movement and hold it in place during a reaction so that it can be reused.

# Give methods of immobilising enzymes.

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1. Bonding= enzyme binds with support ionically (adsorption) or covalently.
2. Entrapment= enzyme placed in a semi-permeable material that allows diffusion of the substrate and product.
3. Membrane separation= a partially permeable membrane separates enzyme from substrate.

# Give uses of immobilised enzymes.

# Give uses of immobilised enzymes.

- Glucose to fructose conversion.
- Semi-synthetic penicillin production.
- Lactose to glucose/galactose conversion.
- Pure samples of amino acids.
- Dextrins to glucose conversion.

# Evaluate the use of immobilised enzymes.

# Evaluate the use of immobilised enzymes.

+ Product is not contaminated by enzyme, so does not need to be purified.
+ Enzymes can be reused.
+ Enzymes are protected from harsh environment.
- Expensive.
- Reaction rate is slower as enzymes cannot move.