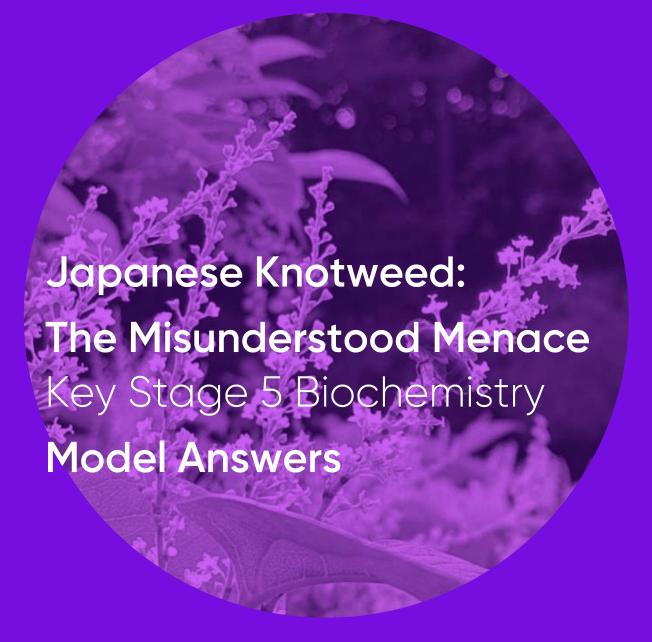
Research Based Curricula





Resource One Model Answers



Answers

Question 1

A species that can colonise an inhospitable environment.

Question 2

Mosses and lichens

Herbaceous plants (e.g. Japanese knotweed)

Shrubs

Mature trees

Question 3

Ecological succession allows the colonisation of a harsh environment by a variety of different species. Hardy pioneer species can survive on the bare rock, and make the abiotic conditions more favourable for other species. This leads to a change in the community over time, due to the species present. Allowing the eventual transformation of the area into a mature forest.

Question 4

The abiotic environment becomes less hostile, e.g. soil forms with plentiful nutrients;

This leads to a greater number of habitats;

This leads to increased biodiversity as different species occupy these habitats

Question 5

Biodiversity is very important to an ecosystem because each species plays a different role in the maintenance of the ecosystem. A low biodiversity area is more likely to have a food chain rather than a food web. A food web provides more options than a food chain if the population of a particular organism in the food web decreases. Some animals can just eat more of another organism if food is in short supply. However, this in turn can affect the populations of other organisms in the food web.

Question 6

A. Japanese knotweed uses allelopathy to change the soil conditions to allow for succession. It possesses an extensive rhizome system to cling onto steep volcanic slopes.

B. Japanese knotweed grows in densely packed stands, early in the season, with large leaves to shade out competitors.

Resource One Model Answers



Answers

Question 7

The following methods are given in the AQA syllabus:

- "The size of a population can be estimated using:
- randomly placed quadrats, or quadrats along a belt transect, for slow-moving or non-motile organisms
- the mark-release-recapture method for motile organisms. The assumptions made when using the mark-release-recapture method."

These can be applied to a Japanese knotweed stand vs a nearby patch of native vegetation, to quantify the biodiversity within the stand. Japanese knotweed is very dense and previous studies using these methods have found a reduced biodiversity.

Question 8

Answer:

- Species diversity is zero following the eruption
- Succession occurs
- A pioneer species makes conditions more favourable for other species
- The species richness/ number of species increases over time

Resource Two Model Answers



Answers

Question 1

- · Public fear
- Reduction of house prices

Question 2

- A. £32,000
- B. £469,000
- C. £963,000
- D. £165, 609, 000

Question 3

Japanese knotweed in the UK is a female clone. Therefore, it cannot spread by seed. It spreads by vegetative reproduction. Fragments of rhizome or stem can regenerate to form a new plant.

Question 4

Liability means being responsible for something or obligated by law to do something. In this context, land owners are responsible for preventing the spread of Japanese knotweed to other people's property.

Question 5

Answers should include reference to recent study by Dr Mark Fennell and Professor Max Wade of AECOM, which found that it cannot cause significant damage to building foundations. However, this study also confirmed lesser damages to patios, paths and garden walls, which are a legitimate concern to homeowners.

Question 6

- Laws and punishments need to be appropriate for the level of damage caused. Therefore, information about damage must be known.
- Public deserve to know accurately the consequences of Japanese knotweed on their property.
- Public need to know about available treatments

Resource Three Model Answers



Answers Question 1

Biological Control or biocontrol is a method of controlling pests such as insects, mites, weeds and plant diseases using other organisms. It relies on predation, parasitism, herbivory, or other natural mechanisms, but typically also involves an active human management role

Question 2

- Quick growth
- Dominates habitats
- Excludes plants

Question 3

- Chemical control can be detrimental to sensitive, nontarget plants,
- For complete control, herbicides need to be sprayed repeatedly over a period of years
- Expensive

Question 4

Japanese knotweed is not a problem in Japan because native natural enemies control it.

Question 5

Answer: A) Biological control reduces the population of the pest without completely removing it, and D) the control species may not behave as expected and may become a pest itself.

Question 6

It was important for the scientists to test the biological control agents on closely related species native to the UK, because the insect might damage native species and become a problem itself.

Resource Three Model Answers



Answers Question 7

A: The prey population decreases because it is eaten by the predator. When there are fewer insects available to eat, the frog population also decreases due to a lack of resources. The reduced frog population means that the insects can flourish because they are not being predated as heavily. The increased insect population provides enough food for the number of frogs to multiply again. This cycle means that neither the insect nor the frog population is able to grow out of control, and both stay in balance.

B: Decreasing numbers going up trophic levels

C: Frog numbers cannot increase until young are born, which requires energy from eating the increased number of insects.

Resource Four Model Answers



Answers Question 1

Phloem	The living tissue that transports the soluble organic compounds made during
	photosynthesis.
Xylem	The transport tissue that transports water and mineral ions in plants from the roots to
	the leaves.
Isotope	Variants of a particular chemical element that differ in neutron number, but not
	atomic number.
Herbicide	A substance that is toxic to plants, used to destroy unwanted vegetation.
Translocation	The movement of materials from leaves to other tissues throughout the plant
Sinks	The sites in a plant where photo-assimilates are stored or used.
Sources	The parts of a plant where net fixation of carbon dioxide occurs.
Mass	An analytical technique that ionizes chemical species and sorts the ions based on their
spectrometry	mass-to-charge ratio i.e. measures masses.

Question 2

Answer B.

Question 3

Answer B. The xylem transports water and minerals from the roots to the leaves.

Question 4

Answer B.

Question 5

Answer C. Phloem transports sugar up and down the plant.

Question 6

Answer B. Phloem transports sugar up and down the plant.

Question 7

Answer A. Water moves into a root hair cell by osmosis from high to low concentration.

Resource Four Model Answers



Answers Question 8

Answer: Movement of sucrose from mesophyll cells to phloem is active and requires energy from ATP. Metabolic inhibitors stop respiration and prevent ATP manufacture.

Question 9

Answer: for storage; to provide energy for fruit/tomato development; to make fruits attractive to animals; for animal dispersal.

Question 10

Answer: The isotopic carbon can be used to label carbon dioxide which is then utilized by the plant in photosynthesis. The movement of the labelled photosynthetic products, such as sucrose, can be traced through the stem.

Question 11

- A. Water and salts can still pass upwards past the ring because the xylem tissue is intact.
- B. Removal of the phloem impedes the downward flow of organic solutes.

Resource Five Model Answers



Answers

Question 1

Answer: Allelopathy is a biological phenomenon by which an organism produces one or more biochemicals that influence the germination, growth, survival, and reproduction of other organisms. These biochemicals are known as allelochemicals and can have beneficial or detrimental effects on the target organisms and the community.

Question 2

Answer: foliar leaching, root exudation, residue decomposition, volatilization and debris incorporation into soil

Question 3

- Change soil biochemistry
- Aid succession
- Inhibit growth of other plants
- · Promote the growth of Japanese knotweed

Question 4

- Bean plant redirects its energy use from growth to production of secondary metabolites/allelochemicals
- Bean plant would be smaller/stunted growth compared
- Aphid causes stress on the plant, sucks the sap, takes sugars from bean plant
- Bean plants, Vicia faba, release a volatile, methyl salicylate, which is repellent to aphids but attractive to aphid enemies such as parasitoids.
- Parasitoids eat the aphids, reduce the number of aphids and so relieve stress on the bean plant.

Question 5

Answer: Ethene promotes the ripening of fruit. Bananas are picked when green, ensuring that they do not over-ripen during transport/shipping. Ethene then rapidly induces ripening.

Resource Five Model Answers



Answers

Question 6

What is the name given to this process?

This is an example of kin-recognition, or allelopathy.

How do the rice plants respond differently when they recognise kin compared to a non-kin stranger?

Production of allantoin from roots is suppressed in the presence of kin, and increases in the presence of non kin.

What effect does all anton in have on the roots of the non-kin plant?

Allantonin increases root growth in the non-kin plant.

How might the above effect be detrimental to the non-kin plant?

The non-kin plant is wasting its energy on excess root production, and therefore has less energy to put into its above ground growth.

How might this benefit the kin-rice plants?

Plants of the same species do not have to compete with the non-kin plant for sunlight.

Resource Six Model Answers



Answers Question 1

Bonds in a molecule absorb infrared radiation at characteristic wavenumbers. This causes a change to their molecular vibrations. Strong bonds vibrate faster than weak bonds. Chemists use IR spectroscopy to identify the functional groups in a molecule. 'Fingerprinting' allows identification of a molecule by comparison of spectra.

Question 2

- Identification of pure chemicals in organic synthesis
- Disease diagnosis e.g. ovarian cancer
- Linkage mapping of plant species

Question 3

Answer: Bromine is heavier than Chlorine. Chlorine is more electronegative than bromine, so the Cl bond is stronger. Stronger bonds and lighter atoms vibrate faster.

Question 4

Answer: Broad strong absorption peak at 3230 - 3550 cm-1

Question 5

Answer: All three gases are greenhouse gases because all three contain bonds which can absorb infrared radiation.

Final Reflection Model Answers



Guidance

Logical Structure

 Layout is logical and it is easy to navigate through the content.

Use of suitable fonts and illustrations

- Headings and subheadings are large / bold.
- Symbols and captions are used appropriately.
- Diagrams, tables etc. are used as visual aids and are labelled

Use of grammar, spelling and language

• Correct grammar, tense and academic language is used to communicate effectively.

Effective communication of research

• Research objectives, motivations, outcomes and forecasts are clear to the reader and are presented at a standard expected at doctoral level.

Possible content to include:

- Ecosystem explanations
- Species control
- The effect of different species
- Control measures



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