

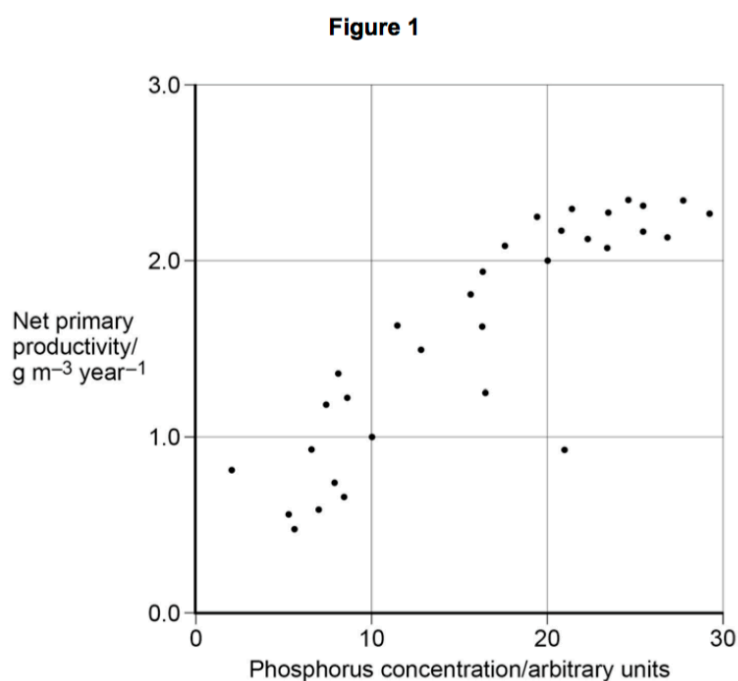
Paper 3 Data Analysis/Mathematical Skills/Practical

AQA International Biology 2018 9610 Paper 3

Question:

Phytoplankton are small photosynthetic organisms that float in the surface layers of open water.

Figure 1 shows the relationship between the concentration of phosphorus and the net productivity of phytoplankton in a number of different lakes.



The samples of plankton were all collected from the same depth below the surface. Explain why.

Answer:

Light will vary with depth;
Rate of photosynthesis will affect productivity of phytoplankton

Question:

A log scale has been used on the y-axis to plot the data on **Figure 1**. Give **one** advantage of using a log scale to plot these data.

Answer:

Allows quantities that range over several orders of magnitude/allows large range of data to be plotted;

Question:

By how many times greater is the net primary productivity at a phosphorus concentration of 20 than at a phosphorus concentration of 10 arbitrary units?

Answer:

10 (In base ten, $\log_{10} = 1$, $\log_{100} = 2$, so an increase in one on the log scale is equal to an increase in one order of magnitude on the actual scale, ie 10x)

Question:

Name **two** substances found in phytoplankton that contain the element phosphorus.

Question:

Any two from, one mark each:

Phospholipid; RNA; DNA; ATP; chlorophyll;

Question:

Use your knowledge of limiting factors to explain **Figure 1**

Answer:

Phosphorus is limiting up to a level of 20 arbitrary units;

Because an increase in concentration increases productivity;

Above 20 arbitrary units, something else is limiting;

INTERNATIONAL PAPER 2 Q8.2 APHIDS!

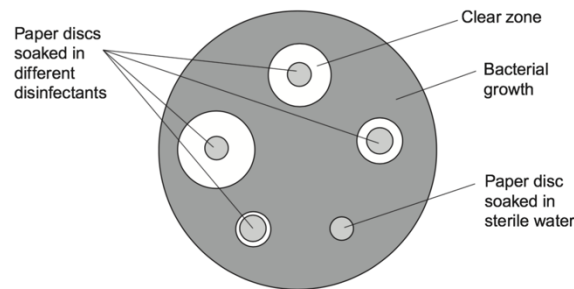
AQA June 2013 Unit 2 Q5b

Pseudomonas aeruginosa is a bacterium that can cause infections in hospital patients suffering from burns. Disinfectants are substances used to kill bacteria on non-living objects, such as medical equipment. Doctors in one hospital investigated how effective four disinfectants were at killing *P. aeruginosa*.

The doctors:

- Took samples from many patients in the hospital
- Isolated *p. Aeruginosa* from those samples
- Suspended the *p. Aeruginosa* in a solution
- Spread many samples of this solution on nutrient jelly in many petri dishes.

The doctors then placed five small paper discs on the jelly in each dish. Each disc had been soaked in a different disinfectant or sterile water. The doctors left the plates for 24 hours to allow bacteria to grow and divide. The diagram shows a typical Petri dish after 24 hours.



Question:

The doctors used samples of this bacterium taken from many patients in the hospital. Explain why this was important.

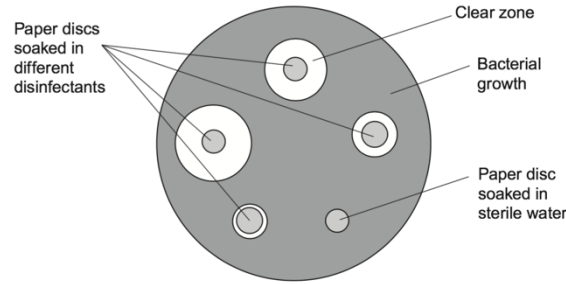
Answer:

Representative/typical/reliable / different types of bacteria;

Ignore reference to anomalies/accuracy

Question:

After 24 hours, the doctors measured the diameter of any clear zones around each paper disc. They then calculated the mean diameter of the clear zone for each disinfectant. The table shows their results



Do these data support the conclusion that hypochlorite was the most effective at killing this bacterium? Explain your answer.

Answer:

(Yes)

1. Largest clear zone/diameter/mean (so more bacteria killed);

(No)

2. Standard deviations of chlorhexidine overlap/share values;
3. (Overlap means difference) is not significant / is due to chance

Question:

Doctors in a different hospital repeated this investigation. They found that hypochlorite had little effect on samples of *P. aeruginosa* they obtained. Suggest how this different result may have arisen.

Answer:

1. Mutation (in bacterium);
2. Gene/allele for resistance;

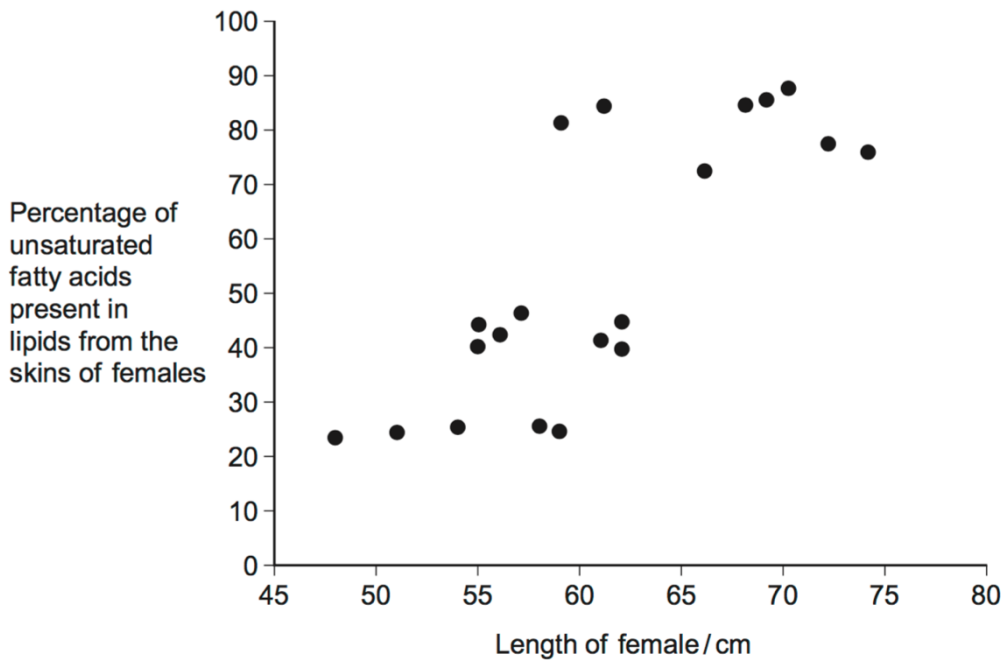
KEY THING TO TAKE HERE – STANDARD DEVIATIONS OVERLAPPING, SO DIFFERENCES ARE NOT SIGNIFICANT (DUE TO CHANCE)

ALSO REPRESENTATIVE SAMPLES – THINK ABOUT SAMPLE SIZES AND ITS RELATION TO RELIABILITY, REPEATABILITY, ANOMALIES AND ACCURACY

AQA June 2013 Unit 2 Q9i

The scientists analysed the lipids produced on the skins of females of different lengths. They found the percentage of unsaturated fatty acids present in the lipids. Their results are shown in **Figure 4**.

Figure 4



Question:

Using **Figure 4** to predict the percentage of unsaturated fatty acids produced by female garter snakes of body length greater than 75 cm might not give a true value. Suggest why.

Answer:

Results vary for a particular body size/% / values overlap / **small sample size** / idea of reaching maximum/100%/ a plateau

KEY THING TO TAKE HERE - THINK ABOUT SAMPLES IN THESE TYPES OF QUESTIONS, ARE THEY REPRESENTATIVE IE ARE THEY TOO SMALL?

AQA Jan 2013 Q7de

Question:

The portable heart rate monitor recorded the men's heart rates continuously. This gave more reliable mean heart rates than those obtained by recording the pulse in the wrist for 1 minute.

Suggest why it is more reliable.

Answer:

1. Monitor records heart rate over long period of time/all the time/more data collected;
2. Anomalies in recording have less effect;
3. Recording pulse rate for one minute only may give an anomalous/atypical result;
4. Errors when trying to count pulse for one minute/ human error;
5. Monitor records HR over a range of activities during the day/pulse rate only records for a single set of conditions

Question:

The table shows the doctors' results

Where and how heart rate was measured	Mean heart rate / beats per minute	
	Men with white-coat hypertension	Men without white-coat hypertension
Doctor's surgery, recording pulse when lying down	67	63
At home, walking around, using heart monitor	76	73
At home, sleeping, using heart monitor	63	60

A journalist, who saw these results, stated that they showed there is no such thing as *white-coat hypertension*.

Do these data support this statement? Give reasons for your answer.

Answer:

1. Men with condition always have higher heart rates;
2. But no direct measurements of blood pressure;
3. Only one investigation/test/need more studies;
4. Using different recording methods/conditions (in each case so cannot compare results);
5. Men without condition also have increased/higher heart rate in doctor's surgery;

KEY THING TO TAKE HERE IS MENTION OF ANOMALOUS RESULTS

ALSO MENTION OF ONLY ONE STUDY, WOULD NEED MORE INVESTIGATIONS DONE TO MAKE IT CONCLUSIVE

AQA Jan 2013 Unit 2

Schizophrenia is a mental illness. Doctors investigated the relative effects of genetic and environmental factors on the development of schizophrenia. They used sets of identical twins and non-identical twins in their investigation. At least one twin in each set had developed schizophrenia.

- Identical twins are genetically identical.
- Non-identical twins are not genetically identical.
- The members of each twin pair were raised together.

The table shows the percentage of cases where both twins had developed schizophrenia

Type of twin	Percentage of cases where both twins had developed schizophrenia
Identical	50
Non-identical	15

Question:

Explain why both types of twin were used in this investigation.

Answer:

1. Identical twins show genetic influence / differences between them show environmental influence;
2. Non-identical twins (also) show an environmental/non-genetic influence;

EXAM TIP:

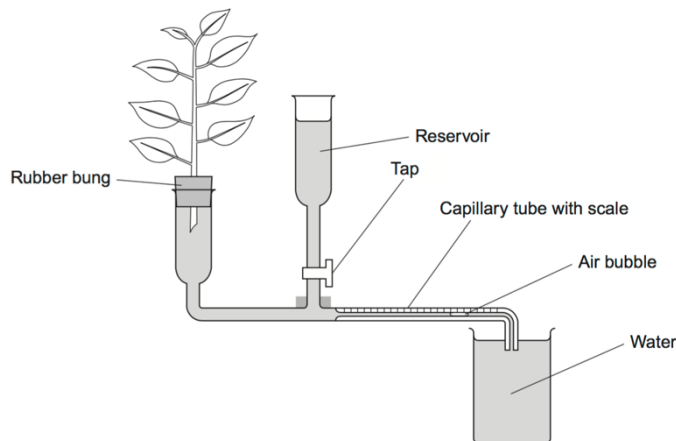
DON'T JUST SAY 'SO THAT THEY CAN SEE GENETIC AND ENVIRONMENTAL EFFECTS, STATE WHAT SPECIFICALLY IS GOING TO ENABLE THEM TO SEE THOSE EFFECTS, ie THE FACT THAT IDENTICAL TWINS WILL SHOW THE GENETIC ASPECT.

BASICALLY, RELATE TO CONTEXT!

AQA Jan 2013 Unit 2 Q5

Question:

Students investigated the effect of removing leaves from a plant shoot on the rate of water uptake. Each student set up a potometer with a shoot that had eight leaves. All the shoots came from the same plant. The potometer they used is shown in the diagram.



Describe how the students would have returned the air bubble to the start of the capillary tube in this investigation.

Answer:

Open/use tap / add water from reservoir;

Question:

Give **two** precautions the students should have taken when setting up the potometer to obtain reliable measurements of water uptake by the plant shoot.

Answer:

1. Seal joints / ensure airtight / ensure watertight;
2. Cut shoot under water;
3. Cut shoot at a slant;
4. Dry off leaves;
5. Insert into apparatus under water;
6. Ensure no air bubbles are present;
7. Shut tap;
8. Note where bubble is at start / move bubble to the start position;

Question:

A potometer measures the rate of water uptake rather than the rate of transpiration. Give **two** reasons why the potometer does **not** truly measure the rate of transpiration.

Answer:

1. Water used for support/turgidity;
2. Water used in photosynthesis;
3. Water produced in respiration;
4. Apparatus not sealed/'leaks'

The students' results are shown in the table.

Number of leaves removed from the plant shoot	Mean rate of water uptake / cm ³ per minute
0	0.10
2	0.08
4	0.04
6	0.02
8	0.01

Question:

Explain the relationship between the number of leaves removed from the plant shoot and the mean rate of water uptake.

Answer:

As number of leaves are reduced (no mark),

1. Less surface area;
2. Fewer stomata;
3. Less evaporation/transpiration;
4. Less cohesion/tension/pulling (force)

EXAM TIP:

KEY THING TO TAKE IS THAT IN ANY EXPERIMENT INVOLVING PLANTS, ALWAYS CONSIDER RESPIRATION, PHOTOSYNTHESIS.

IF TEMPERATURE IS INVOLVED, CONSIDER THE ENZYMES INVOLVED.

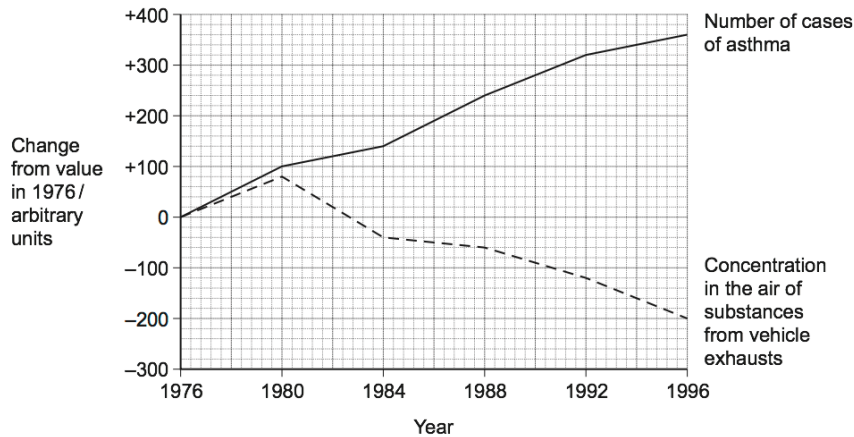
IF IT TALKS ABOUT WATER LIKE THIS QUESTION, THINK ABOUT COHESION/TENSION (IN THE XYLEM), EVAPORATION/TRANSPIRATION, STOMATA AND SURFACE AREA.

AQA Jan 2012 Unit 1 Q4c

Scientists investigated the link between pollution from vehicle exhausts and the number of cases of asthma. Between 1976 and 1996, the scientists recorded changes in the following

- the concentration in the air of substances from vehicle exhausts
- the number of cases of asthma.

The graph shows their results



Question:

The scientists concluded that substances in the air from vehicle exhausts did **not** cause the increase in asthma between 1976 and 1980. Explain why.

Answer:

1. Correlation does not mean that there is a causal relationship; (CORRELATION DOES NOT MEAN CAUSALITY)
2. May be some other factor/named factor;
3. Associated with vehicles and asthma / producing rise in both;
4. (After 1980) asthma continues to rise but exhaust concentration falls / negative correlation (after 1980)

EXAM TIP:

**REFERENCE CAUSALITY WHEN TALKING ABOUT CORRELATION!
(ARE THERE ANY OTHER FACTORS INVOLVED THAT HAVE NOT BEEN INCLUDED IN THE STUDY, THAT COULD HAVE AN EFFECT?)**

AQA Jan 2012 Unit 1 Q7b

Read the following passage.

Aspirin is a very useful drug. One of its uses is to reduce fever and inflammation. Aspirin does this by preventing cells from producing substances called prostaglandins. Prostaglandins are produced by an enzyme-controlled pathway. Aspirin works by inhibiting one of the enzymes in this pathway. Aspirin attaches permanently to a 5 chemical group on one of the monomers that make up the active site of this enzyme.

The enzyme that is involved in the pathway leading to the production of prostaglandins is also involved in the pathway leading to the production of thromboxane. This is a substance that promotes blood clotting. A small daily dose of aspirin may reduce the risk of myocardial infarction (heart attack).

Use information from the passage and your own knowledge to answer the following questions.

Question:

Aspirin only affects one of the enzymes in this pathway. Use information in lines 5 – 7 to explain why aspirin does **not** affect the other enzymes.

Answer:

1. Affects one monomer/amino acid;
2. Not found in all active sites

EXAM TIP:

ALWAYS GIVE CONTEXTUAL LINKS TO THE QUESTION

AQA Jan 2012 Unit 2 Q10ai)ii)c)d)ei)ii)iii)

Question:

Scientists investigated the effect of drinking tea and coffee on reducing the risk of developing one type of brain cancer. The investigation involved 410 000 volunteers and was conducted in 10 European countries over a period of 8.5 years.

Apart from age, suggest **two** factors that the scientists should have considered when selecting volunteers for this trial.

Answer:

1. Sex;
2. Lifestyle;
3. Body mass;
4. Health;
5. Ethnicity;
6. Genetic factors / family history;

EXAM TIP:

FACTORS TO CONSIDER WHEN COMPLETEING STUDIES (NOT ALL WILL ALWAYS APPLY).

SEX, AGE, LIFESTYLE, BODY MASS, HEALTH, ETHNICITY, GENETIC FACTORS (FAMILY HISTORY)

Question:

Give **two** features of the design of this investigation that would ensure the reliability of the results obtained.

Answer:

1. Large sample/number / 410 000;
2. Long time period / 8.5/many years;
3. Different countries / more than one country;

Question:

In analysing the results of this investigation, the scientists took into account the age of the volunteers. Suggest why.

Answer:

Age affects risk of cancer;

Question:

During the investigation, the volunteers were asked to estimate the volume of tea and/or coffee that they drank each day. The types of tea and coffee consumed in different countries varied. When the data from all the countries were collected there was a correlation between drinking more than 100 cm³ of tea or coffee each day and a reduced risk of developing this type of brain cancer.

Tea and coffee contain caffeine. A newspaper reported the results of this investigation under the headline 'Caffeine helps cut cancer risk'. Explain why scientists could **not** support this view solely on the basis of this investigation.

Answer:

1. Correlation does not mean causal relationship;
2. Tea/coffee contains other substances;
3. Contain different amounts of caffeine;
4. Estimated intake (of tea/coffee);
5. No control group;
6. Only one type of cancer studied;
7. Further studies required / only one investigation/study/group;

THIS IS A GOOD QUESTION THAT INCORPORATES A LOT OF KEY CONCEPTS WHEN EVALUATING STUDIES AND CLAIMS!

Question:

Another group of scientists investigated the effect of caffeine on blood flow to certain parts of the brain. Volunteers were given different concentrations of caffeine solution to drink. A control group was also set up.

Describe how the control group should have been treated.

Answer:

- Treated the same
- No caffeine

Question:

Volunteers who drank the same concentration of caffeine solution often had different concentrations of caffeine in their blood. Suggest **one** reason for the difference in concentration of caffeine in the blood of volunteers

Answer:

1. Absorb different amounts;

2. Broken down by enzymes/digested;
3. Different blood volumes;
4. Differences in metabolism;
5. Caffeine from a different source

Question:

The investigation showed that caffeine reduces the blood flow to certain parts of the brain. Suggest **one** way in which this could lead to a reduced risk of brain cancers.

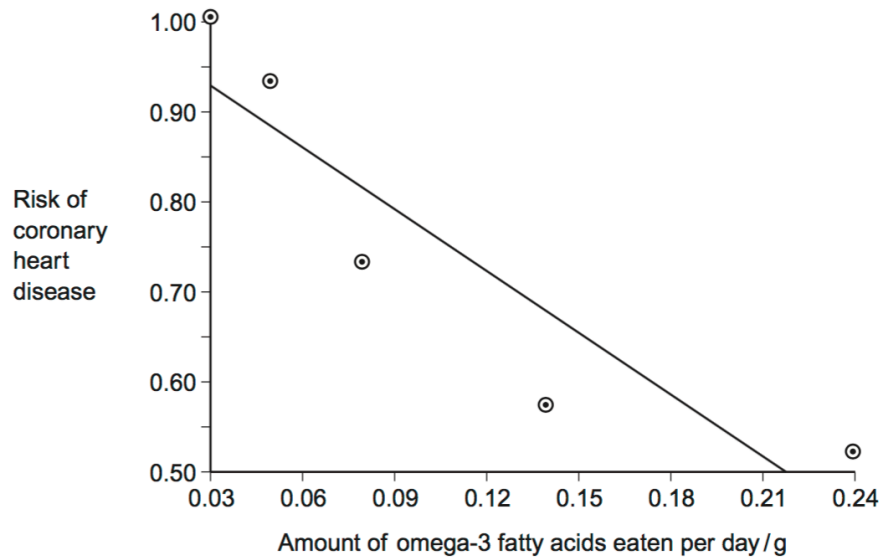
Answer:

1. Less oxygen/glucose to (cancer) cells;
2. Less carcinogens;
3. Reduces spread of cancer (cells)

AQA Jan 2011 Unit 1 Q4a

Question:

Scientists investigated the relationship between the amount of omega-3 fatty acids eaten per day and the risk of coronary heart disease. The graph shows their results.



Do the data show that eating omega-3 fatty acids prevents coronary heart disease? Explain your answer.

Answer:

Graph shows negative correlation / description given;

Correlation does not mean causation / prevention / shows lower risk not prevention;

May be due to another factor / example given;

EXAM TIP:

CORRELATION DOES NOT ALWAYS MEAN CAUSATION!!!

AQA Jan 2011 Unit 1 Q5

A student investigated the effect of putting cylinders cut from a potato into sodium chloride solutions of different concentration. He cut cylinders from a potato and weighed each cylinder. He then placed each cylinder in a test tube. Each test tube contained a different concentration of sodium chloride solution. The tubes were left overnight. He then removed the cylinders from the solutions and reweighed them.

Question

Before reweighing, the student blotted dry the outside of each cylinder. Explain why

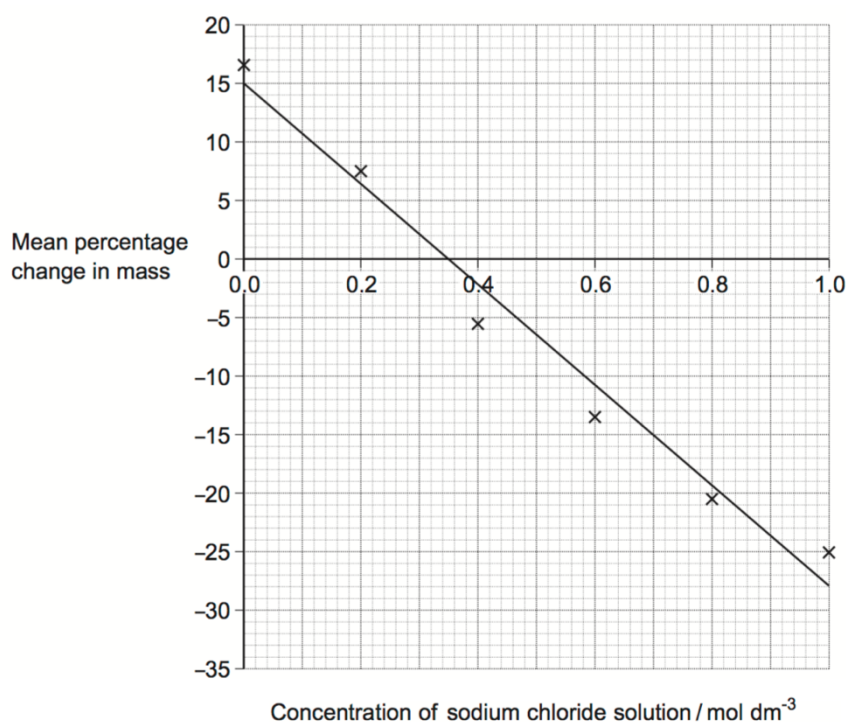
Answer:

Water will affect the mass / only want to measure water taken up or lost;

Amount of water on cylinders varies / ensures same amount of water on outside;

Question:

The student repeated the experiment several times at each concentration of sodium chloride solution. His results are shown in the graph.



Question:

The student made up all the sodium chloride solutions using a 1.0 mol dm⁻³ sodium chloride solution and distilled water.

Complete the table to show how he made 20cm^3 of a 0.2 mol dm^{-3} sodium chloride solution.

Volume of 1.0 mol dm^{-3} sodium chloride solution	Volume of distilled water

Answer:

4cm^3 (of 1.0 mol dm^{-3} sodium chloride solution) and 16cm^3 (of distilled water);

Question:

The student calculated the *percentage* change in mass rather than the change in mass.

Explain the advantage of this

Answer:

Allows comparison / shows proportional change;

Idea that cylinders have different starting masses / weights;

Question:

The student carried out several repeats at each concentration of sodium chloride solution. Explain why the repeats were important.

Answer:

(Allows) anomalies to be identified / ignored / effect of anomalies to be reduced / effect of variation in data to be minimised;

Makes the average / mean / line of best fit more reliable / allows concordant results;

Question:

Use the graph to find the concentration of sodium chloride solution that has the same water potential as the potato cylinders.

Answer:

0.35 mol dm^{-3}

EXAM TIPS

- **If in your answer you write about movement of substances, tell the examiner HOW they are moving ie diffusion, osmosis etc.**
- **Correlation does not always show causal relationship, and does not always show CAUSATION**
- **ALWAYS GIVE CONTEXTUAL LINKS TO THE QUESTION, ESPECIALLY WHEN ASKED!**

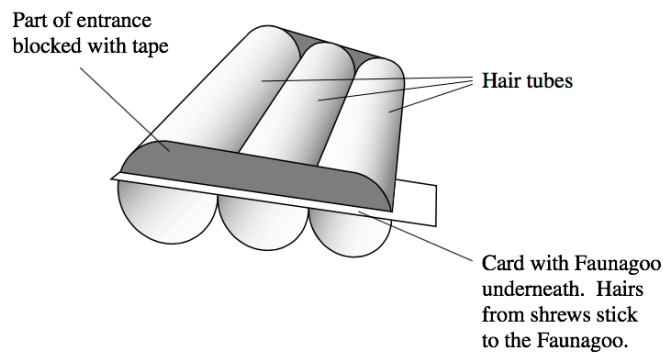
AQA Jan 2010 Unit 4 Q7

Shrews are small mammals. Three species of shrew live in mainland Britain. The table shows some

Species	Mean body mass / g	Mean length of head and body / mm	Food
Common shrew	10	79	Mainly insects and other small invertebrates
Pygmy shrew	5	58	
Water shrew	13	85	

features of these shrews.

A team of biologists investigated a method of estimating the abundance of shrews. They used plastic tubes, called hair tubes. Some of the hairs from a shrew that enters one of these tubes stick to glue in the tube. These hairs can be used to identify the species of shrew. The diagram shows a set of these hair tubes.



Question:

Faunagoo is a glue that remains sticky after wetting and drying. Explain the advantage of using Faunagoo in these hair tubes.

Answer:

Will work in all weather conditions/hairs will stick to it even if 1 shrew/animal is wet/ withstand rain;

Question:

The diagram shows that the biologists partly blocked the entrances to the tubes with tape. Suggest why they partly blocked the entrances.

Answer:

So shrews come into contact with glue;

Question:

The biologists needed to find a way of distinguishing between the hairs of the three species of shrew. They collected hairs from shrews of each species. For each species, they selected hairs at random and made different measurements.

Explain why the biologists selected the hairs at random.

Answer:

Avoids bias/allows statistical tests to be carried out;

Question:

Repeatable measurements are measurements of the same feature that are very similar. In this investigation, each measurement was made by two observers. This helped the team to check the repeatability of these measurements.

Explain why it was important to check the repeatability of the measurements.

Answer:

Increases the reliability of the measurements;

If measurements are repeatable, differences less likely to be due to measurement/personal error/anomalies unlikely

Question:

You could use a scatter diagram to check the repeatability of measurements made by two observers. Describe how.

Answer:

- Plot graph/scatter diagram of one set of results against the other;
- Expect to see points lying close to line / Line should slope upwards/show positive correlation;

OR

- Plot measurement against hair number;
- Look for overlying / corresponding points;

Question:

The biologists used hair tubes to find the abundance of shrews along the edges of some fields. They also used traps that caught shrews without harming them. They selected areas where all three species of shrew were present.

- They put sets of hair tubes at 5 m intervals along the edges of the fields. They inspected the tubes one week later and recorded the number of sets of tubes that contained shrew hairs. They called this the hair tube index.
- At each site where they used hair tubes, they set traps immediately after using the hair tubes. They recorded the number of different shrews caught in these traps.

The research team found the hair tube index. Explain why they could not use the hair tubes to find the total number of shrews present.

Answer:

Individual shrews 1 entering more than one hair tube / many hairs from same shrew/ shrews enter without leaving hair;

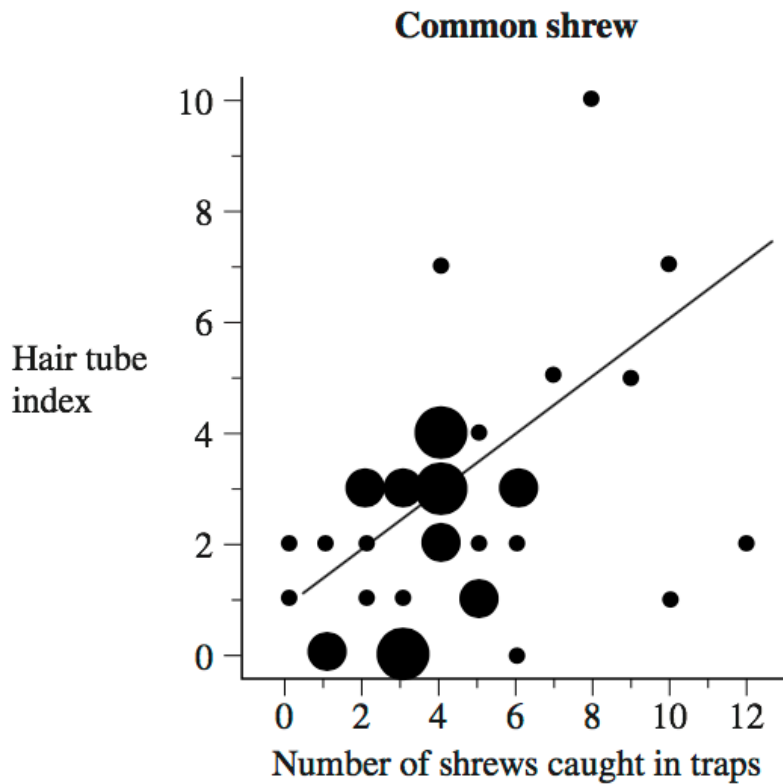
Question:

The research team set the traps immediately after using the hair tubes. Explain why setting the traps immediately after using the hair tubes would make comparisons between the two methods more reliable.

Answer:

- Rules out differences due to changes in population / changes in 2 environmental conditions;
- That could be produced by births/deaths/migration/specific example of environmental conditions affects results

The graphs are types of scatter diagram called bubble plots. They show hair tube index plotted against the number of shrews caught in traps. The area of the bubble is proportional to the number of records plotted.



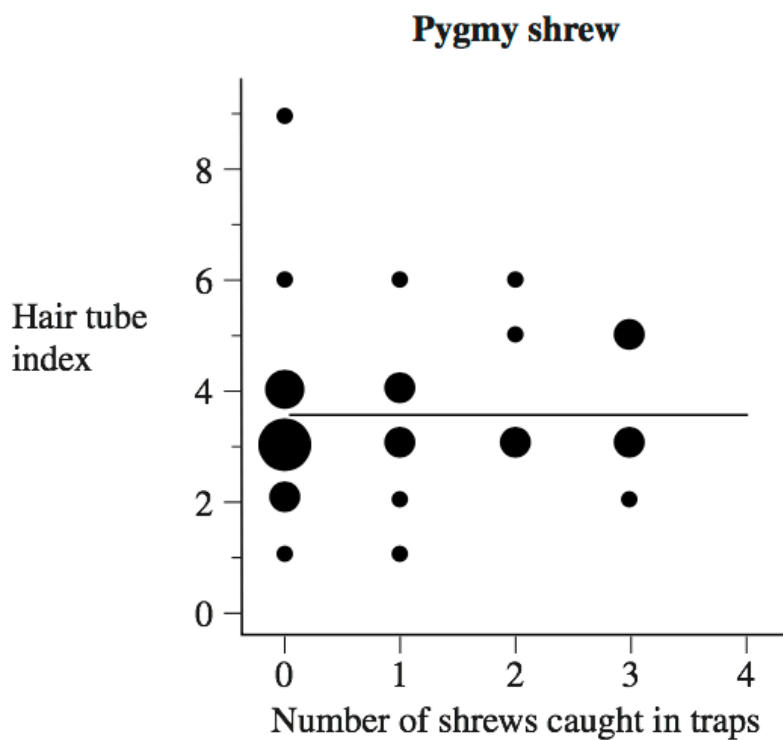
Question:

Explain test was analysing common terms probability

Answer:

(A determines results chance;

Enables



why a statistical necessary in the results for the shrew. Use the chance and in your answer.

statistical test) the probability of being due to

null

hypothesis/description of null hypothesis to be accepted/rejected

Determines whether correlation/result is significant;

Question:

The biologists concluded that hair tubes were a reliable way of measuring the abundance of common shrews. Give evidence from the graph to support this conclusion.

Answer:

Curve/line of best fit shows) positive correlation/ description of positive correlation;

Question:

Use information in this question to evaluate the use of hair tubes as a way of measuring the abundance of pygmy shrews

Answer:

Curve/line of best fit (almost) parallel to x-axis/horizontal / level/ no correlation / index is independent of number of shrews;

Hair tubes with positive results when no shrews trapped; Small size of shrews means shrews may not trigger traps

AQA June 2014 Q5abc

Malaria is a disease that destroys red blood cells. Scientists investigated whether certain red blood cell phenotypes were associated with developing severe or mild malaria. They compared the red blood cell phenotypes of hospital patients suffering from severe malaria with the red blood cell phenotypes of patients suffering from mild malaria. The results are shown in **Table 2**.

Table 2

Red blood cell phenotype	Ratio of patients with severe malaria : patients with mild malaria
Sickle cell trait	0.48 : 1
Blood group A	2.45 : 1
Blood group O	0.96 : 1

Question:

Explain the advantage of presenting the results as a ratio:

Answer:

- Allows valid comparisons
- As sample sizes from the study may vary

Question:

What do these data show about the effect of red blood cell phenotypes on the chance of developing severe malaria rather than mild malaria?

Answer:

1. Increased chance of (severe malaria) with blood group A / decreased chance of (severe malaria) with sickle cell;
2. Almost equal chance with blood group O /slightly greater chance of mild malaria with O /slightly lower chance of severe malaria with O /2.5 x/2.48 x/more than twice the chance of severe with blood group A
/(almost) 50%/half the chance of severe malaria with sickle cell
/twice the chance of mild malaria with sickle cell

AQA June 2014 Unit 4 Q7cii

Scientists investigated the effect of the chemical fluridone as a method of controlling Hydrilla. The study was carried out using samples of Hydrilla grown under controlled laboratory conditions. Several samples of the plant were grown at different concentrations of fluridone. The results are shown in **Table 4**.

Table 4

	Days of treatment			
	0	20	40	60
Concentration of fluridone / $\mu\text{g dm}^{-3}$	Mean biomass of Hydrilla/g			
0.0	5.0	16.4	20.9	33.4
0.5	5.0	14.1	18.2	31.3
1.0	5.0	9.7	8.9	7.4
5.0	5.0	4.6	2.8	1.3
25.0	5.0	3.2	1.6	0.4

Question:

A scientist reviewed the results of this investigation. He suggested that fluridone should be used in the habitat at a concentration of $5.0 \mu\text{g dm}^{-3}$ rather than at the other concentrations tested. Use the information provided and your knowledge of chemical control to explain why he made this suggestion.

Answer:

1. '0.5 is not effective, 1.0 is less effective (than 5.0) so concentrations below 5.0 less effective;
2. At 5.0 biomass/growth is reduced;
3. Small difference between using 5.0 and 25.0;
4. Using 5.0 is cost effective / using 25.0 is expensive;
5. 25.0/high concentrations may affect the environment / other organisms / chemical may remain in habitat / bioaccumulation

AQA June 2014 Q8c

Question:

The bluebell is a flowering plant found in woodlands. Global warming has been associated with a change in the population of bluebells. Describe how you could estimate the number of bluebells in a small woodland.

Answer:

1. Use a grid / split area into squares/sections;
2. Method of obtaining random coordinates / numbers, e.g. calculator/computer/random numbers table/random number generator;
3. Count number/frequency of plants in a quadrat;
4. Calculate mean/average number (per quadrat/section);
5. Valid method of calculating total number of bluebells/plants. e.g. mean number of plants per quadrat/section/ m^2 multiplied by number of quadrats/sections/ m^2 in wood;

AQA June 2014 Unit 5 Q9bc

Scientists measured the rate of respiration in **three** parts of an ecosystem.

They did this by measuring carbon dioxide released into the air by:

- leaves of plants
- stems and roots of plants
- non-photosynthetic soil organisms.

Table 2 shows the scientists' results for these three parts of the ecosystem.

Table 2

Part of ecosystem	Mean rate of carbon dioxide production/ $\text{cm}^3 \text{ m}^{-2} \text{ s}^{-1}$	Percentage of total carbon dioxide production measured by the scientists
Leaves of plants	0.032	25.0
Stems and roots of plants	0.051	
Non-photosynthetic soil organisms	0.045	

Question:

A student who looked at the data in **Table 2** concluded that plants carry out more respiration than non-photosynthetic organisms in the ecosystem.

Use the information provided to suggest why these data may **not** support the student's conclusion.

Answer:

1. Data only include (heterotrophic) soil organisms;
2. Doesn't include animals (above ground)/other (non-soil) organisms;
3. Doesn't take into account anaerobic respiration;

Question:

What measurements would the scientists have made in order to calculate the rate of carbon dioxide production?

Answer:

- **VOLUME** of carbon dioxide given off
- **Per unit area**
- Per unit time

AQA June 2013 Unit 5 Q5a)c)

Question:

Hyperthermia is a condition in which a person's body temperature is above 37.5 °C. This happens when a person's body produces or absorbs more heat than it loses to the environment.

Doctors recruited healthy volunteers. At a room temperature of 20 °C, the doctors measured each volunteer's:

- body temperature
- rate of oxygen consumption
- rate of carbon dioxide production.

Each volunteer then put on a suit that covered the whole body. Water at 38 °C was circulated through pipes in the suit. This caused the volunteer to develop hyperthermia.

The doctors' results are shown in the table.

	At 20 °C	In suit at 38 °C	P value
Mean body temperature / °C	36.82	38.62	< 0.001
Mean rate of oxygen consumption / $\text{cm}^3 \text{kg}^{-1} \text{minute}^{-1}$	3.31	4.16	< 0.05
Mean rate of carbon dioxide production / $\text{cm}^3 \text{kg}^{-1} \text{minute}^{-1}$	2.68	3.03	> 0.05

The doctors carried out statistical tests to see whether or not the differences in the results were significant. The P values from these tests are shown in the table.

Calculate the percentage increase in mean body temperature. Show your working.

Answer:

$$(38.62-36.82/36.82) \times 100 = 4.9\%$$

Question:

Were the changes produced by hyperthermia significant? Give reasons for your answer. You should use the P values in your answer.

Answer:

1. Yes, for temperature and oxygen consumption/no for carbon dioxide;
2. Because P value (equal to, or) less than 0.05 (other than carbon dioxide)/ P value greater than 0.05 (for carbon dioxide)

AQA June 2014 Unit 5 Q6c

Question:

Use your knowledge of fast muscle fibres to explain the data in Figure 5

COMMAND WORDS – ‘USE YOUR KNOWLEDGE’

THIS IS DIRECTING YOU TO GIVE ALL KNOWLEDGE REGARDING FAST MUSCLE FIBRES (OR WHICHEVER TOPIC IS BEING ASKED), AS WELL AS THEN LINKING THAT TO THE GRAPH. (SO BASICALLY, FACTUAL RECALL WITH CONTEXT)

Answer:

- (From graph, phosphocreatine) takes longer to remake as people get older;
- Fast muscle fibres used for rapid/brief/powerful/strong contractions;
- Phosphocreatine used up rapidly during contraction/to make ATP;
- Anaerobic respiration involved;
- (As people get older) slower metabolic rate/slower ATP production/slower respiration;
- ATP used to reform phosphocreatine;
- Lots of phosphocreatine in fast fibres;

AQA June 2013 Unit 5 Q9ab

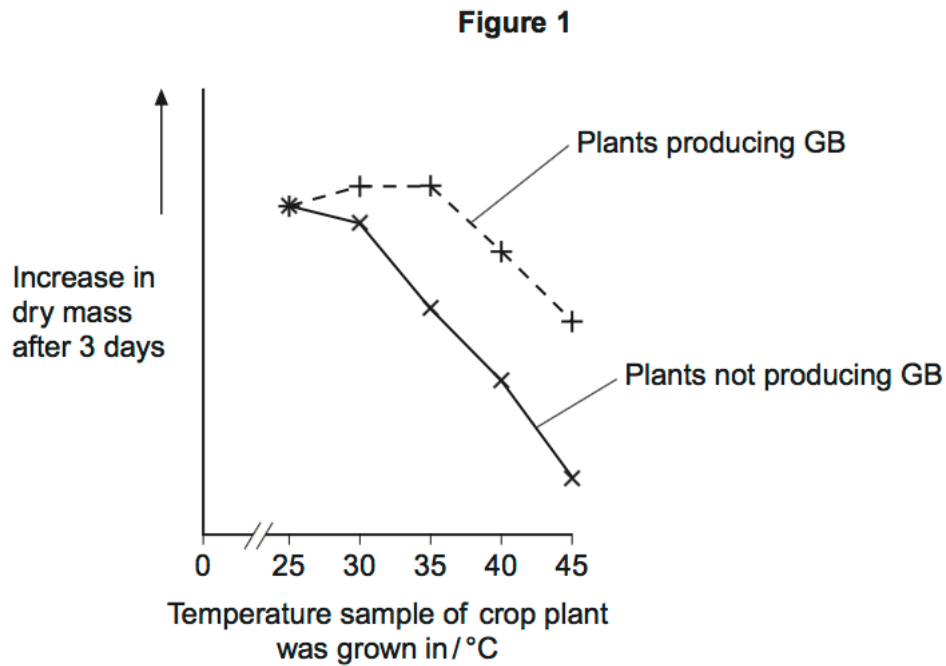
Some species of crop plant produce a substance called glycinebetaine (GB).

Scientists transferred the gene for GB into a species of crop plant that does not normally produce GB. These genetically modified plants then produced GB.

The scientists grew large numbers of the same crop plant with and without the gene at different temperatures. After 3 days, they found the increase in dry mass of the plants.

Figure 1 shows their results.

Figure 1 shows their results.



Question:

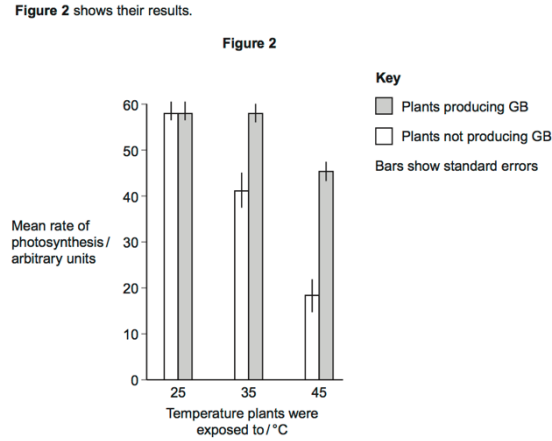
Describe the effect on growth of transferring the gene for GB into this plant.

Answer:

1. No effect at 25°C;
2. Keeps growing at 35°C and 35°C/up to 35°C (more than without GB);
3. Above 35°C, falls but grows more than plant without GB;

The scientists measured the rate of photosynthesis in plants that produce GB and plants that do not produce GB at 25°C, 35°C and 45°C.

Figure 2 shows their results.



Question:

The scientists concluded that the production of GB protects photosynthesis from damage by high temperatures.

Use these data to support this conclusion.

Answer:

Significantly different (because SEs do not overlap)

KEY WORD WHEN TALKING ABOUT STANDARD ERRORS, DEVIATIONS, P VALUES ETC, IS **SIGNIFICANCE**

Question:

Use the data from figure 2 for plants that do not produce GB to explain the effect of temperature on changes in dry mass of the plants shown in figure 1

Answer:

Enzyme activity reduced/(some) enzymes denatured;

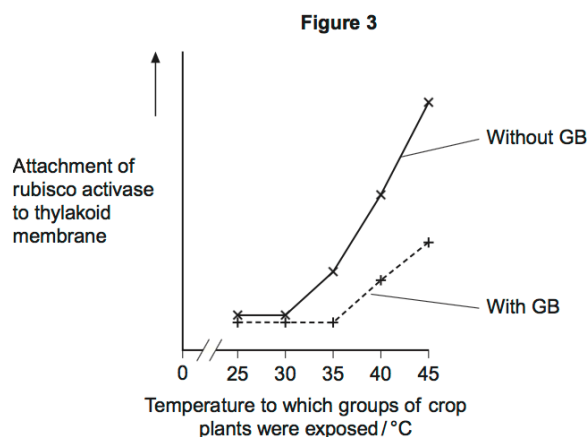
1. Less photosynthesis, so fewer sugars formed;
2. Less (complex) biological molecules/organic substances made (that add to mass);
3. Less respiration;
4. Less energy/ATP for growth;
5. Less energy for named function associated with growth

Question:

The scientists investigated the effect of GB on attachment of rubisco activase to thylakoid membranes at different temperatures.

Figure 3 shows their results.

Figure 3 shows their results.



Use information from Figure 2 and Figure 3 to suggest how GB protects the crop plant from high temperatures.

Answer:

1. GB prevents/reduces binding of rubiscoactivase to (thylakoid membrane);
2. (Prevents it) up to 35°C;
3. (So) rubiscoactivase/enzyme remains active;
4. (So) photosynthesis/light- independent stage still happens;
5. Above 35°C, some binding still occurs but less than without GB, so less reduction in growth

Question:

The scientists' hypothesis at the start of the investigation was that crop plants genetically engineered to produce GB would become more resistant to high environmental temperatures.

The scientists developed this hypothesis on the basis of previous research on crops that are grown in hot climates.

Suggest how the scientists arrived at their hypothesis.

Answer:

1. Looked for information/journals, on crop plants that grow at high temperatures;
2. (Crop plants cited in this research) contain/make GB;
3. So assumed making plants produce GB makes them resistant to high temperatures;

AQA June 2013 Unit 4 Q7b

Question:

The scientists investigated the percentage of lizards of both species that were infected with malaria at different sites on the island. They collected samples of both lizards at intervals of 3 months for 1 year. They also recorded the elevation (height above sea level) of each site. Some of their results are shown in the table.

Site	Elevation of collection site / metres	Total number of <i>A. gingivinus</i> collected in one year	Percentage of <i>A. gingivinus</i> infected with malaria	Total number of <i>A. wattsi</i> collected in one year	Percentage of <i>A. wattsi</i> infected with malaria
1	10	13	0	0	0
2	80	30	0	0	0
3	120	35	23	3	0
4	200	40	30	7	0
5	300	52	46	12	0
6	315	35	31	13	1
7	370	155	37	79	2
8	414	124	44	68	4

Answer:

1. Number in sample varies;
2. Allow a (valid) comparison;

EXAM TIP:

WHEN DISCUSSING WHY PERCENTAGES ARE BETTER, REFER TO COMPARISONS AS ACTUAL NUMBERS IN SAMPLES VARY!

Question:

A preliminary study suggested that malarial infections were more common at higher elevations. Use the information provided to evaluate this suggestion.

Answer:

1. (Overall) positive correlation (for either/both species);
2. Reference to (site) 5 / 300 metres;
3. Limited results for *A. wattsi* / small sample/number/percentage infected for *A. wattsi*;

EXAM TIP:

WHEN TALKING ABOUT RELATIONSHIPS, REFER TO CORRELATION! ALSO TAKE INTO ACCOUNT SAMPLE SIZES

Question:

As a result of this investigation, the scientists concluded that the presence of malaria provided a competitive advantage to *A. wattsi*. Use the information provided to explain how they reached this conclusion.

Answer:

Fewer *A. wattsi* infected / more *A. gingivinus* infected;

2. Higher number of *A. wattsi* present when higher percentage/number of *A. gingivinus* infected;
3. No *A. wattsi* present when *A. gingivinus* has zero infection

Question:

The malarial parasite of *Anolis* lizards destroys both red and white blood cells. Suggest how an increase in the percentage of *A. gingivinus* infected with malaria could result in *A. wattsi* having a competitive advantage.

Answer:

1. Reduced immunity / increased susceptibility to disease;
2. Reduced oxygen transport/uptake/respiration / reduced activity/movement;

Question:

The scientists carried out a statistical test to determine whether the correlation between the number of *A. wattsi* collected and the percentage of *A. gingivinus* infected was significant. They obtained a value for P of < 0.01 .

Use the terms **probability** and **chance** to help explain what this means

Answer:

1. There is a probability of less than 1% / 0.01;
2. That result(s)/correlation/it is due to chance;

EXAM TIPS PROBABILITY AND CHANCE – P VALUES

AQA Jan 2013 Unit 4

Scientists investigated the effect of a pesticide called malathion on the survival of tadpoles of species of toads found in the USA. The scientists determined the LC50 for the tadpoles of each species over a 16-day period in an aquarium. The LC50 is the concentration of malathion that killed 50 percent of a population of tadpoles. The scientists also investigated whether the presence of a predator of tadpoles changed the effect of malathion.

Question:

Suggest **two** advantages of using the LC50 to determine the effect of a pesticide.

Answer:

1. Provides a standard/benchmark;
2. Can compare (different pesticides/chemicals);
3. Does not kill all the tadpoles/organisms/population;

Question:

The scientists looked at previous studies on the effects of various pesticides on tadpoles.

They found that most of these studies:

- Were carried out on tadpoles of the African clawed toad
- Measured the LC50 of each pesticide over 1 to 4 days in the absence of any biotic factor.

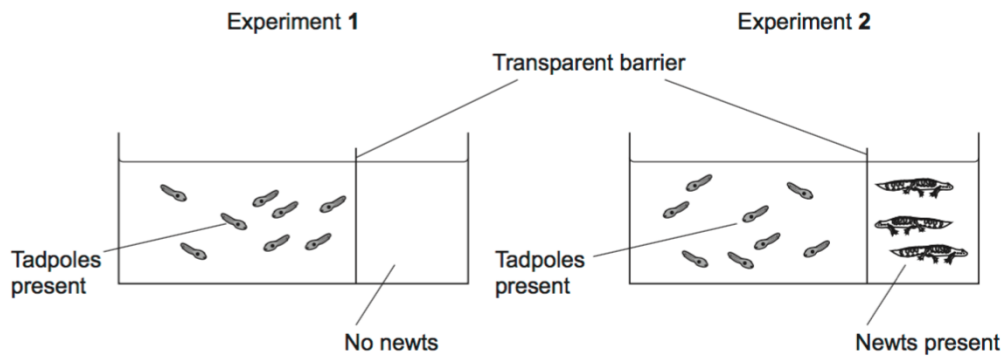
The scientists concluded that these previous studies were of limited use when trying to assess the effects of malathion on the tadpoles of toads found in the USA. Suggest why the scientists reached this conclusion.

Answer:

1. Only carried out on one species of toad/African toad / not carried out on USA toads/tadpoles/species;
2. Only tested for 1-4 days/short term / not 16 days/long term;
3. Did not look at effect of predator/predation;
4. Used various pesticides / may not have used malathion;

Question:

Malathion affects the nervous system of tadpoles. The scientists investigated whether the stress caused by the presence of a predator changed the effect of malathion on the tadpoles. The scientists used newts which are predators of tadpoles. They carried out two experiments, as shown in the diagram.



Explain why the scientists carried out experiment 1.

Answer:

1. (See) effect of pesticide/malathion;
2. Without predator/newts/stress / to compare/see effect with predator/newts/stress present (in experiment 2);

Question:

Explain why the scientists used a transparent barrier in experiment 2

Answer:

1. Tadpoles not killed/eaten;
2. Newts are seen/detected;

Question:

Adult toads spend most of their time on land but lay their eggs in water. These eggs hatch into tadpoles, which live in water and develop into adults. The tadpoles are much smaller than adult toads. Use this information to explain why the tadpoles are affected more rapidly by pesticides in water than adult toads.

Answer:

1. Large surface area to volume ratio;
2. Rapid/more diffusion / shorter diffusion pathway;
3. Longer time exposure to pesticide / adults/toads live in and out of water / tadpoles remain/stay in water;

Question:

When malathion is used as a pesticide, it is often sprayed onto aquatic habitats at concentrations of 0.1 to 1.6 mg dm^{-3} . The scientists tested the effect of malathion at concentrations of 0.001 to 10 mg dm^{-3} .

Suggest why.

Answer:

1. Link between using less (pesticide) and cost/less effect on environment/organisms;
2. Pesticide/malathion diluted (in water);
3. Concentrated due to evaporation;
4. Concentrated in food chains/webs/tadpoles/habitat;

Question:

As a result of this investigation, the scientists concluded that more studies on pesticides should be carried out in natural habitats rather than under laboratory conditions. Suggest **two** advantages of carrying out such investigations in natural habitats

Answer:

1. Can see effect of other biotic factors / effect on other organisms;
2. Can see effect of abiotic factors / named abiotic factor;

EXAM TIP:

**IF THE QUESTION IS REFERRING TO SIZE OF ORGANISMS,
THINK ABOUT WHETHER SURFACE AREA TO VOLUME
RATIO COULD BE A POSSIBLE ANSWER!**

AQA Jan 2012 Unit 4 Q3a

Question:

The photograph shows marram grass growing on a sand dune.

Describe how you would investigate the distribution of marram grass from one side of the dune to the other.

Answer:

1. Transect/lay line/tape measure (from one side of the dune to the other);
2. Place quadrats at regular intervals along the line;
3. Count plants/percentage cover/abundance scale (in quadrats)

AQA Jan 2012 Unit 4 Q7ai)ii)bii)ci)ii)d)

Question:

In some countries, pigs are reared in intensive units in which the temperature is controlled. Agricultural scientists investigated the effect of temperature on pig growth and on the efficiency with which the pigs converted food to biomass.

In the investigation, the scientists used pigs of the same breed, with similar genotypes. Explain why.

Answer:

1. Same breed so similar alleles;
2. Controls/removes variable/so genes not a factor / only temperature affects results / rate of growth affected by genes;

EXAM TIP:

**WHEN TALKING ABOUT GENETIC FACTORS, ALWAYS
MENTION ALLELES!!!!!!!!!!!!**

Question:

The pigs were allowed to eat as much food as they wanted.

How could this have decreased the reliability of any conclusions drawn from the investigation?

Answer:

1. Different growth rates / gained different biomass / grew different amount;
2. Not due to temperature / the **independent** variable;

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Temperature /°C	Mean growth rate/ kg per day	Efficiency of conversion of food to biomass /%
0	0.54	19
10	0.80	42
20	0.85	48
30	0.45	37
35	0.31	37

Question:
student
concluded from
data that the
growth rate of
pigs was fastest

as 20°C. Do you agree with this conclusion? Explain your answer.

Answer:

1. Temperature may be between 10 and 30/10 and 20/20 and 30;
2. Intervals are 10 C/large/not small/should be smaller/should be intermediates;

EXAM TIP:

WHEN EVALUATING A CLAIM ABOUT DATA, MORE SPECIFICALLY, ABOUT A CLAIM OF THE MOST EFFECTIVE TEMPERATURE, INTENSITY (NAMED VARIABLE), THINK ABOUT INTERVAL SIZE OF THE INDEPENDENT VARIABLE. FOR EXAMPLE, IN THE QUESTION ABOVE, COULD BETWEEN 20 AND 30 CELCIUS YIELD A BETTER MEAN GROWTH RATE?

Question:

Pigs can survive at temperatures above 35°C. Use the data to suggest why scientists did **not** carry out any investigations at temperatures higher than 35°C

Answer:

1. Growth rate decreasing / conversion staying same/ decreasing;
2. (Scientists would be) looking for high growth rate/ conversion / data shows unlikely to improve growth/yield;
3. Wastes time/resources/would not relate to farming conditions;

Question:

The efficiency of conversion of food to biomass is lower at 0°C than it is at 20°C. Suggest an explanation for the lower efficiency.

Answer:

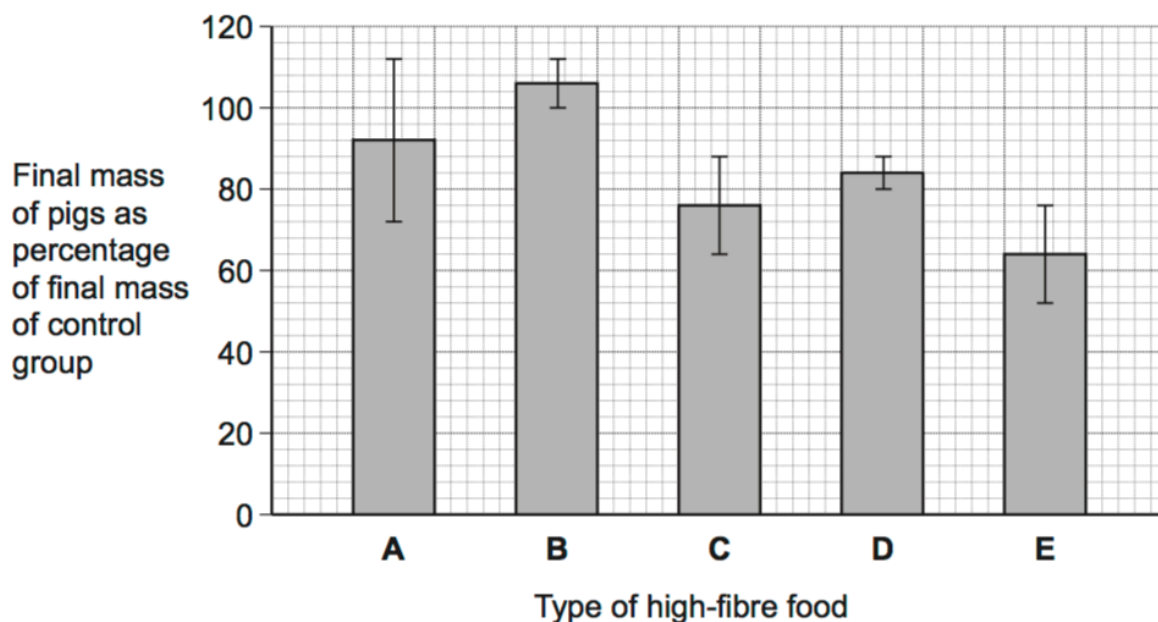
1. Will lose more heat / not as much energy used to maintain body temperature;
2. Heat resulting from respiration/more respiration;
3. More food used in respiration

Question:

Pigs require a mixture of fibre and protein in their food. The greater the ratio of fibre to protein, the less the food costs.

Scientists took five large groups of pigs. They fed each group a different high-fibre food. Each of the foods contained fibre from different plant species, but they all had the same energy content. The scientists fed a control group of pigs a low-fibre food with the same energy content. After 10 days, the scientists compared the masses of the pigs fed on high-fibre food to those fed on low-fibre food.

The graph shows the results of the investigation. The bars represent ± 2 standard errors of the mean.



A farmer saw these results and concluded that he should replace his pigs' usual food with food **B**. Evaluate this conclusion

Answer:

In support

1. Food B produces greater mass than control/greater than 100%;

But

2. Error bars for B mean B could be no better / not different from control;

3. Overlap of error bars for B and A;
4. A no better than/not different from B;

Experimental limitations

5. Experiment only ran for 10 days;
6. Experimental conditions /breed of pig may not be the same as on the farm;
7. No information about cost;

AQA Jan 2011 Unit 4 Q7c

Question:

(In a previous question we are told that...Residual food intake (RFI) is the difference between the amount of food an animal actually eats and its expected food intake based on its size and growth rate. Scientists have selectively bred cattle for low RFI.)

Bacteria in the digestive systems of cattle break down food and produce methane. Scientists investigated the relationship between RFI and methane production. They measured the rate of methane production of 76 cattle over a fifteen-day period. Some of the results are shown in **Figure 3**.

Figure 3

	Low RFI	High RFI
Mean rate of methane production /g day ⁻¹	142.3	190.2

Suggest a null hypothesis for this investigation.

Answer:

- RFI does not affect methane production
- There is no difference in the rate of methane production for low and high RFI values /
- The difference between the rates of methane production is due to chance /
- No correlation/relationship/link between RFI and methane production;

EXAM TIP:

WHEN TALKING ABOUT PHOTOSYNTHESIS REFER TO THE ACTUAL NAMES OF EACH STAGE IE LIGHT INDEPENDENT STAGE AND LD STAGE.

KEY TERM: ALLELE!!! (ALLELE FREQUENCIES) - IF TALKING ABOUT EVOLUTION)!!!

SELECTIVE REPRODUCTIVE SUCCESS