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A2 Biology

LATEST SYLLABUS

Unit 6
2019 – 2025
Classified
Questions

SCAN ME

1 Seeds contain a plant embryo and a food supply. Cell growth in the seeds will begin when the temperature and moisture conditions are favourable. During cell growth, enzymes break down the stored food supply and ATP is generated by respiration.

(a) Describe an experiment to investigate the effect of temperature (the independent variable) on the rate of respiration in seeds.

(5)

Obtain 50 seeds from the same plant that were stored in the same conditions

Place 10 seeds on a wet cotton in a respirometer

Also put 10 g of soda lime in the bottom of the test tube to absorb CO2

Use an identical tube that contains boiled seeds as a control

Place the apparatus in a thermostatically controlled water bath set at 20 oC

Allow the apparatus for 10 min to equilibrate

Measure the distance travelled by the coloured liquid in the respirometer in 5 min

Using the syringe in the respirometer, repeat the measurement for 5 time and calculate the average respiration rate (vol of oxygen consumed per min)

Repeat the entire experiment at temperatures 10, 30, 40 and 50 oC

(b) (i) State **two** variables, other than temperature, which could affect the investigation.

(2)

Age of seeds pH volume of water mass of soda lime

1 Lemurs are primates found on the island of Madagascar. At least 33 different species of lemur are living on the island today. Scientists would like to know how closely related the different species of lemur are.

In one study, the scientists collected tissue samples from several individuals of each species. For each sample, they examined the DNA sequences of five different genes.

The polymerase chain reaction (PCR) was used to amplify the DNA in the samples.

(a) Describe how to amplify a strand of DNA using the polymerase chain reaction (PCR).

(5)

A blood sample is first collected from the animal

DNA is then extracted from the white blood cells

DNA polymerase, deoxynucleotides, primers are mixed in a buffer solution and then loaded in the PCR machine

High temperature (about 90 oC) breaks the H-bonds in DNA for about 1 min

The temperature then drops to about 40 oC which allows primers to bind

The temperature is then risen to 70 oC which allows DNA replication to take place

The cycle is then repeated for about 25 times to allow the production of enough number of DNA molecules

1 The photograph below shows an adult male frilled lizard *(Chlamydosaurus kingii)*.

Magnification ×0.1

Male frilled lizards display their frill to attract females. A successful male may mate with many females.

The female lays fertilised eggs in a nest on the ground and lightly covers them with soil.

Young lizards hatch from the eggs after an incubation period of approximately two months.

The temperature of the nest is usually between 20 °C and 40 °C.

(a) In many species of lizard, the gender (sex) of the offspring is influenced by the temperature at which the eggs are incubated.

Describe an experiment that could be carried out to investigate the effect of temperature on the gender of the frilled lizard offspring.

You should include details of how **two** relevant variables are controlled.

(5)

Obtain 50 eggs from the same female

Place 5 eggs in soil inside an incubator at 20 oC for two months

And then then determine the gender of the offspring

Repeat the experiment temperature of 10, 30, 40 and 50 oC

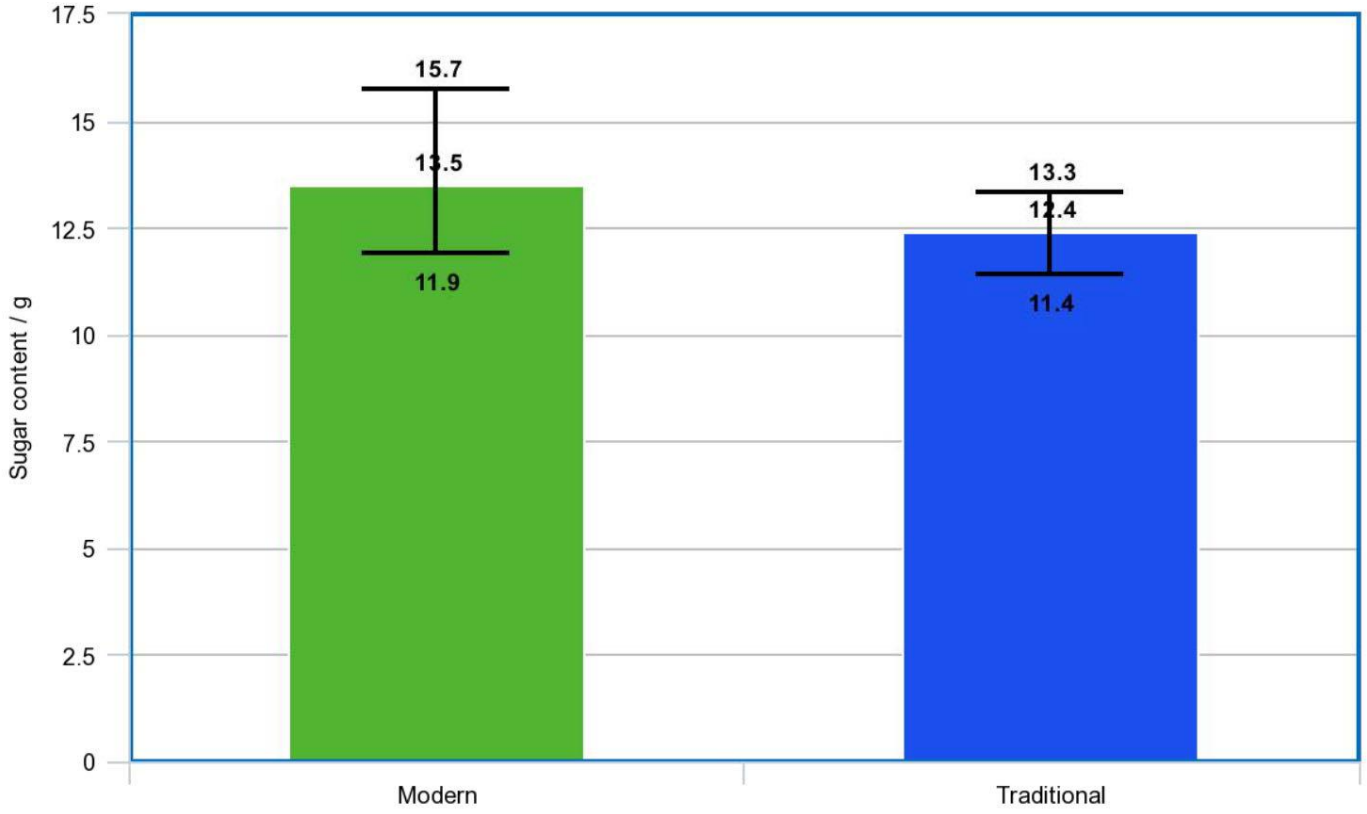
Ensure that the oxygen and humidity levels in the incubator are identical in each case

Also make sure that the mass and pH of the soil is the same at every temperature

Repeat the experiment at each temperature and calculate the mean

(c) On the graph paper below, draw a suitable graph to show the mean sugar content of modern apples and traditional apples. Include an indication of the variability of the data.

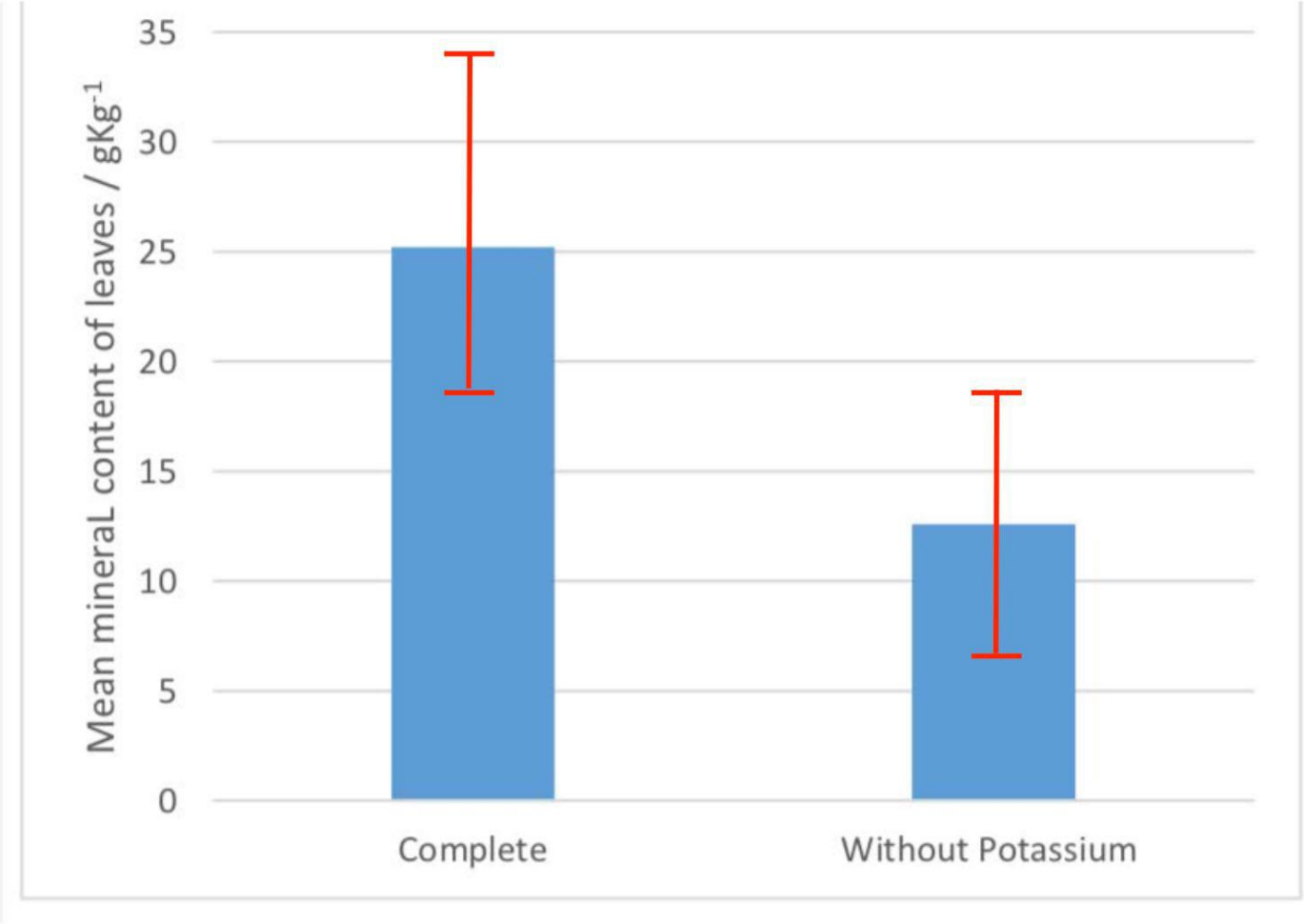
(3)



(c) On the graph paper below, draw a graph to show the mean mineral content for each set of results.

Include an indication of the variability of the data.

(3)



(d) The student carried out a Mann-Whitney U test to analyse the data. This statistical test determines if the data obtained for insecticide **A** and for insecticide **B** are significantly different.

The calculation for this test produced a result of U = 21.

For the difference between the two insecticides to be significant, this U value has to be equal to, or smaller than, the critical value (U ⩽ critical value).

The table shows the critical values for the Mann–Whitney U test at p = 0.05, for four different sample sizes of insecticide **A** and insecticide **B**.

Sample size for insecticide A	Sample size for insecticide B			
	9	**11**	**13**	**15**
9	17	23	28	34
11	23	30	37	44
13	20	28	37	45
15	24	34	44	54

What conclusions can be drawn from this investigation?

Use information from the table and your graph to explain your answer.

(4)

The calculated value 21 is less than the critical value 37

therefore we'll have to reject the null hypothesis

So there is a significant difference between insecticide A and insecticide B

and this difference is not due to chance

(e) Suggest why the conclusions from this investigation may not be valid.

(3)

Other factors such as the concentration of the insecticide might not have been considered

In addition, the sample size being too small might reduce the validity of this investigation

Lastly, error bars from both insecticides are overalpping

(Total for Question 2 = 16 marks)

(d) A Mann-Whitney U test was used to analyse the data. This statistical test determines if the difference between the two sets of data is significant.

The calculations produced a U value of 44.

For the difference to be significant, the U value has to be equal to, or less than, the critical value shown in the table below.

The table shows the critical values for the Mann-Whitney U test at p = 0.05.

N_1 and N_2 are the number of samples in each set of data.

N_1 / N_2	10	11	12	13	14	15
10	23	26	29	33	36	39
11	26	30	33	37	40	44
12	29	33	37	41	45	49
13	33	37	41	45	50	54
14	36	40	45	50	55	59
15	39	44	49	54	59	64

Using your graph and the table of critical values, explain the conclusion that can be drawn from this investigation.

(4)

The calculated value is greater than the critical value 37 so the null hypothesis can be accepted

There is no significant difference between variety of wheat and the number of infected shoots

This is further supported by the overlapping in the error bars of the two samples

(e) Suggest why it may **not** be reasonable to draw valid conclusions from the results of this investigation.

(3)

Abiotic factors such as temperature, soil type and mineral content may not have been taken into consideration

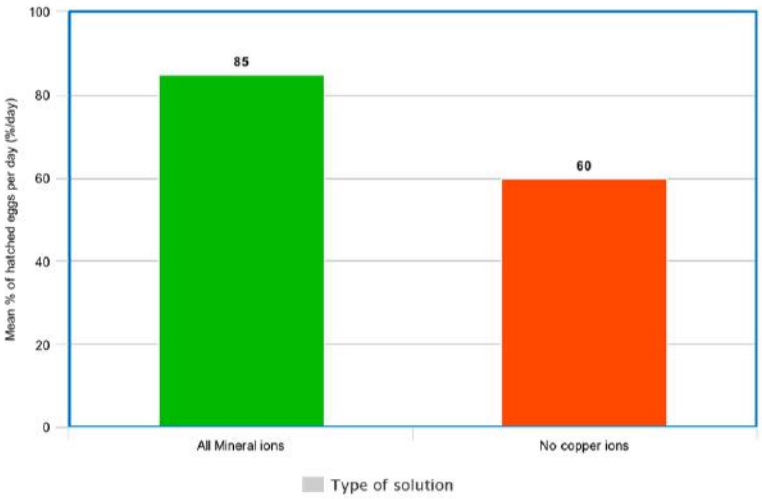
The samples could have been taken at different times of the year which would make a big difference

The sample size is small (only 12 samples)

(Total for Question 2 = 15 marks)

(iii) A clear explanation of how your data are to be recorded, presented and analysed in order to draw conclusions from your investigation.

(4)



Rate of hatched eggs (%/day)	Solution	
	All mineral ions	No copper ions
Day 1		
Day 2		
Day 3		
Day 4		
Day 5		
Day 6		
Day 7		
Mean		

The t-test can be done here to see if there is a significant results between the two between the rate of egg hatching results at each solution

(iv) The limitations of your proposed method.

(3)

It is difficult to control all other factors affecting brine shrimp hatching

Mineral concentration and oxygen levels would decrease during the time of investigation

The small size of eggs would make it difficult to count their number

It is difficult to determine viability of eggs and their genetic diversity

(Total for Question 2 = 23 marks)

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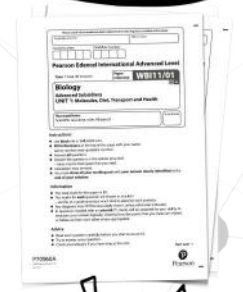

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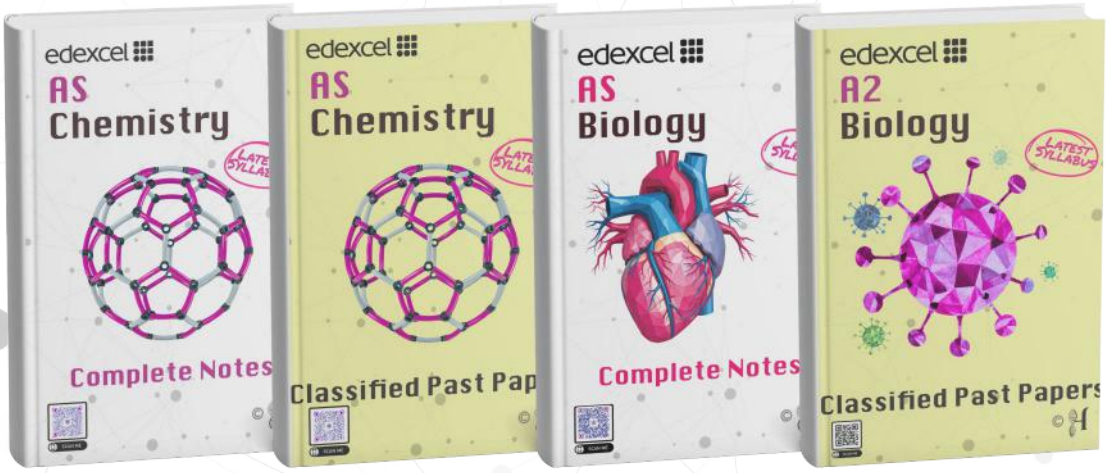

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