

CONSOLIDATION TASK

Topics: The Scientific Method
Total: 35



QUESTION 1

Life Sciences learners read the extract below in a scientific magazine.

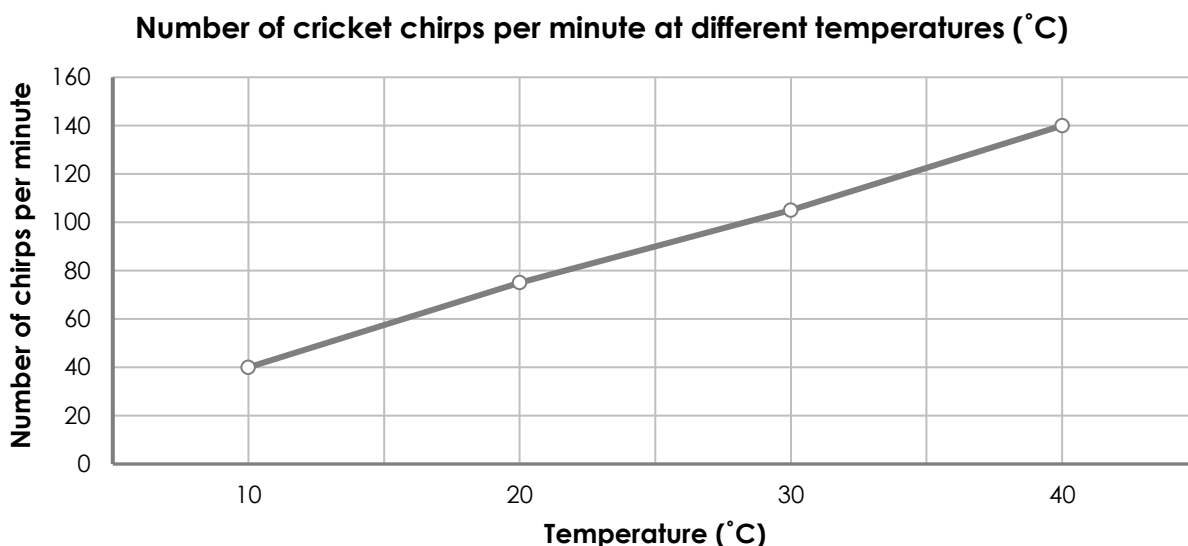
HOW IS A CRICKET'S CHIRP RELATED TO TEMPERATURE?

Crickets are insects. Like all living things, they have many chemical reactions, e.g. reactions that allow muscles to contract to produce the chirping sound. All insects are ectothermic ('cold-blooded') and take on the temperature of their surroundings. Changes in temperature affect how quickly these chemical reactions occur.

They decided to conduct an experiment to determine the relationship between the temperature and the number of chirps per minute. The procedure was done as follows:

- They collected four crickets of the same species.
- They took four wooden boxes of the same size and placed one cricket in each box.
- Each box was also fitted with a temperature-controlled heater.
- The boxes were labelled A, B, C and D.
- The heater in box A was set at 10°C, box B was set at 20°C, box C at 30°C and box D at 40°C.
- Each box was left for 10 minutes so that the crickets could get used to the temperature.
- They then recorded the number of chirps per minute.

The results are shown in the line graph below.



- 1.1 Write a suitable hypothesis for this investigation. (2)
- 1.2 Give the:
- (a) independent variable (1)
 - (b) dependent variable (1)
- 1.3 State **THREE** factors that were kept constant during the investigation. (3)

- 1.4 Explain **ONE** way in which the learners could have improved the reliability of their investigation. (2)
- 1.5 In which season would you expect to hear more crickets chirping? Give a reason for your answer. (2)
- 1.6 Use the graph and determine:
 (a) the number of times the crickets chirp per minute in 15°C. (1)
 (b) in which temperature the crickets will chirp 100 times per minute. (1)
- 1.7 Organise the information in the graph into a table with a heading and columns. (5)
- (18)**

QUESTION 2

Scientists performed an investigation regarding the following scientific question:
Will learners' test scores be affected by distracting sounds in the testing environment?

The scientists followed the procedure below:

- 20 learners were randomly selected and divided into two groups of 10 each.
- All the learners were the same age, in the same grade and studying the same Mathematics course.
- Both groups were given the same subject content material to prepare for a test.
- After some time, both groups sat to write a test, but in different rooms.
 - The test for group 1 was administered in a quiet, soundproof exam room.
 - The test for group 2 was administered in the music room during band practice.
- The scientists recorded the test scores for the learners in each group.

- 2.1 State the aim for this investigation. (2)
- 2.2 What was the sample size for this investigation? (1)
- 2.3 What was the independent variable in this investigation? (1)
- 2.4 State **THREE** other factors that the scientists should have kept constant. (3)
- 2.5 Why is it important that the learners were randomly selected and divided into groups? (1)
- 2.6 Which group (1 or 2) served as the control? Explain the importance of the control group in this investigation. (3)
- (11)**

QUESTION 3

Draw a pie chart using the information provided in the table.

Percentage of high school learners in South Africa that participate in sports	
Grade	Percentage learners (%)
8	70
9	62
10	58
11	59
12	51

(6)

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**QUESTION 1**

- 1.1. The higher the temperature the higher the number of chirps per minute ✓✓ **OR**
 The lower the temperature the lower the number of chirps per minute ✓✓ **OR**
 The higher the temperature the lower the number of chirps per minute ✓✓ **OR**
 The lower the temperature the higher the number of chirps per minute ✓✓ (2)
- 1.2 (a) temperature ✓ (1)
 (b) number of chirps per minute ✓ (1)
- 1.3 Crickets were all the same species ✓
 Wooden boxes were the same size ✓
 The same number of crickets per wooden box ✓
 The boxes were left for the same amount of time ✓
 Method of recording the numbers of chirps is the same ✓ first 3 only (3)
- 1.4 They could increase the sample size ✓/number of crickets to obtain more generalisable results ✓/to calculate and average.
OR
 They could have repeated the investigation ✓ to confirm the consistency and trustworthiness of their results ✓.
OR
 They could have calculated an average ✓ to provide more generalisable results ✓ for the larger group / species of cricket. first only 1 x 2 marks (2)
- 1.5 Summer ✓ since crickets chirp more in warmer temperatures ✓. (2)
- 1.6 (a) 57/58 ✓ chirps (1)
 (b) 27/28°C ✓ (1)
- 1.7

✓V

The effect of temperature on the number of chirps per minute in crickets ✓H	
Temperature (°C)	Chirps per minute ✓C
10	40
20 ✓I	78 (accept any value between 75 – 78) ✓D
30	105 (accept any value between 104 – 107)
40	140

H Heading with both variables = 1**C** Column headings = 1**V** Independent and dependent variables in correct columns = 1**I** Information in temperature column correct = 1**D** Information in chirps column correct = 1

(5)

(18)**QUESTION 2**

- 2.1 To determine if learners test scores are affected by distracting sounds in the testing environment ✓✓. (2)
- 2.2 20 ✓ learners (1)
- 2.3 Distracting sounds ✓ (1)

- 2.4 The same time to prepare for the test ✓
 The same test must be written ✓
 The same marking guideline ✓
 The learners must all be from the same school ✓
 The same time to complete the test ✓
 The learners must have the same IQ composition in the two groups ✓
 The same gender / or the same gendered combination in each group ✓
 The same type of room setting ✓ first 3 only (3)
- 2.5 It ensures the reliability of the experiment. ✓ (1)
- 2.6 Test group 1 (quiet room) ✓ – to be able to compare the results ✓ (their test scores) with the experimental group (learners that received distracting sounds). This allows us to see the effect of distracting sounds ✓ on their test scores. (3)
- (11)**

QUESTION 3

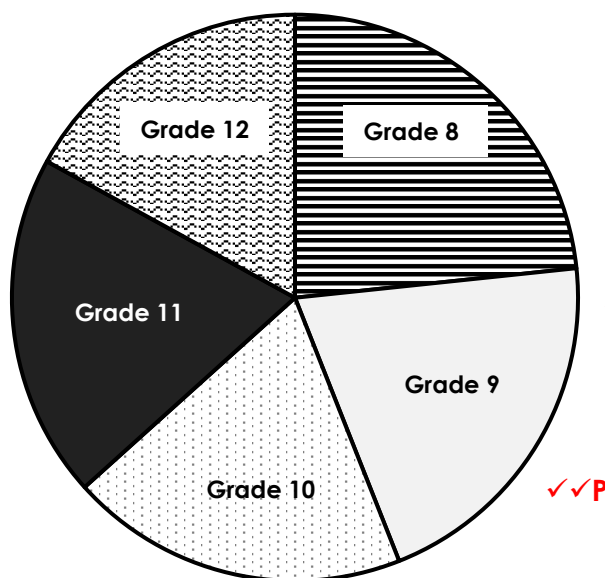
Total: $70 + 62 + 58 + 59 + 51 = 300$
 Grade 8: $70/300 \times 360 = 84^\circ$
 Grade 9: $62/300 \times 360 = 74,4 = 74^\circ$
 Grade 10: $58/300 \times 360 = 69,6 = 70^\circ$
 Grade 11: $59/300 \times 360 = 70,8 = 71^\circ$
 Grade 12: $51/300 \times 360 = 61,2 = 61^\circ$

✓✓C

TEACHER TIP

Print the pie chart onto a transparency that can be placed over a learner's pie chart. The size of the pie chart does not matter as the proportions of the sectors remain the same. Place the transparency with the mid-point of the pie chart on top of the mid-point of the learner's pie chart. Rotate the transparency to see if the sectors line up. You may have to flip the transparency over if the learner used a different sequence for the sectors.

Percentage of high school learners in South Africa that participate in sports ✓H



Pie chart drawn (T)	1
Title of the graph shows the relationship between two variables (H)	1
Correct calculations to determine proportions (C)	2: All 4 correct 1: 1-3 correct
Correct proportions for the labelled sectors (P) <i>To be checked by using a transparency</i>	2: All 4 sectors correct 1: 1-2 sectors correct

(6)