

Activity 9

Carbon Dioxide

Rationale: The amount of carbon dioxide is related directly to the metabolic activity. Thus these measurements are a very good indication of the rate of metabolism; that is, growth and reproduction. The amount of carbon dioxide above ambient values (ca. 400ppm) will be a quantitative measurement of the amount of activity by the worms.

Objectives

- 1) Determine the amount of carbon dioxide produced by the worms.
- 2) Determine if the amount of carbon dioxide produced is related to any of the other measurements.

PDE Standards

Science and Technology

3.1.7. A,B,C

3.2.7. A,B,C,D,E,F

3.6.7. A,B

3.7.7. A,B,C,D

Environment and Ecology

4.1.7. A,B,C

4.2.7. A,C

4.6.7. A,B,C

Math

2.1.8. A,B,D,G

2.2.8. A,B,F

2.3.8. A,B,D

2.4.8. A,B,D,F

2.5.8. A,B,C,D

2.6.8. A,B,C,E,F

2.7.8. B,C,D

2.8.8. F,G,H,I,J

2.11.8. A,B

Materials

Carbon dioxide sensor

CBL2

TI 83/84

Computer

Graphical Analysis

Duct tape

Introduction

The amount of CO₂ produced diurnally will be a valuable indicator of worm growth. The worms carry on cellular respiration 24 hours a day. The nearer the physical conditions in the vermicompost are to the optimum, the greater the amount of cellular respiration. The amount of CO₂ produced above the ambient value under optimum conditions will be related to the mass of the worms. The CO₂ will be produced by the

worms in the vermicompost and it will diffuse rather rapidly to the surface and into the air space above.

Strategies

It would be ideal if the students could be guided into discovering/recalling the above information before this activity is designed. The carbon dioxide sensor uses a laser to excite a photo receptor (detector) – the frequency of the laser light is absorbed by carbon dioxide. Thus the more carbon dioxide in the air, the more the laser light is absorbed; the lower the amount of reference laser light reaching the detector, the greater the amount of CO₂. Once again, the students should determine the time schedule for the data collection.

Procedure

- 1) Press the APPS button and select DataMate.
- 2) Set up the CBL/TI 83/84 for the CO₂ sensor.
- 3) Duct tape the sensor to the bottom of the lid.
- 4) Start the data collection.
- 5) At the end of the collection period, download the data using Graphical Analysis.
- 6) Attach a copy of the data to this activity.
- 7) Enter the CO₂ data into List 1 and add other data sets that will help determine if the amount of CO₂ is related to worm growth.
- 8) Perform several linear regressions with CO₂ measurements and other variable measurements.

Expectations

The students should be able to:

- 1) determine a meaningful time schedule for data collection.
- 2) program the Datamate program with coaching.
- 3) decide how to compare CO₂ measurements to other variables.
- 4) design the Data Table(s), methods, and present/explain the ideas to the class.
(Groups)

