In this experiment we are going to measure metabolic rate using a carbon dioxide probe.

We will need:

Three beakers.

One beaker will contain 20 germinating peas at room temperature.

A second beaker will contain 20 non-germinating peas, which have been boiled and then cooled to room temperature.

And the third beaker will contain 20 germinating peas which have been stored with ice.

We'll also need a CO2 probe.

And a computer with logging software.

The CO2 probe is connected to the computer, which displays and records both the oxygen and the carbon dioxide levels.

We can see it in action by simply exhaling on to it.

Breathing out on to the probe increases the carbon dioxide level recorded.

Before the experiment we need to draw up a table for our results.

First, we take an initial reading of the CO2 level.

Now, cover the beakers containing the germinating peas at room temperature, the nongerminating boiled and cooled peas, and the germinating peas on ice in clingfilm.

These will be left for around three hours.

After three hours it is time to test for CO2 levels in each of the three covered jars.

Using the tip of the probe to pierce the clingfilm we can insert the probe into each jar.

First, we test the germinating peas on ice.

These show a slight increase in carbon dioxide levels.

Although the ice has slowed the metabolic rate, it is to be expected that germinating peas will still produce some CO2 even at a lower temperature.

Next, we test the peas that have been boiled.

These show no increase in carbon dioxide.

These peas are dead so will not show any metabolic rate or produce CO2.

Finally, we test the germinating peas.

These show the largest increase in CO2.

They are germinating as normal and so have the highest metabolic rate.

We can now record our results on our table.

The changes in carbon dioxide production in different conditions are directly related to the metabolic rate of an organism when in those conditions.

Our experiment shows that germinating peas at room temperature had a higher metabolic rate than germinating peas at a cool temperature.

As expected in our control experiment; the non-germinating peas at room temperature had a metabolic rate of zero.

In conclusion, living organisms use up energy constantly to survive, and the rate at which this is used up is the metabolic rate.

The energy to drive metabolism comes from the breakdown of glucose during cell respiration.

It is possible to measure metabolic rate by measuring:

Carbon dioxide produced over a given time.

Oxygen used up over a given time.

And heat energy produced.