

3 Energy from respiration

1 Select the most appropriate word from the list below to complete the following paragraph:

Respiration is the release of fromand takes place in all of the body..... In the course of respiration, is broken down toand If oxygen is used for this process, the respiration is called If oxygen is not used in the process, the respiration is called
Each stage of respiration is speeded up by a particular

cells, food, carbon dioxide, enzyme, muscles, aerobic, oxygen, water, vitamin, protein, energy, anaerobic.

2 Complete the following equation which summarises aerobic respiration of glucose:



3 What are the products of alcoholic fermentation?

4 In which cell structures does respiration mainly occur?

5 If a person is lying quite still, what does he or she need energy for?

6 Which of the two forms of respiration (aerobic and anaerobic) provides more energy from a given quantity of food?

7 (a) What are the intermediate products of anaerobic respiration in an active muscle?

(b) Which of them is associated with oxygen debt?

(c) In what way is this product associated with the 'oxygen debt'?

8 Which two of the following statements are **incorrect**?

(a) Anaerobic respiration uses oxygen to release energy from food.

(b) Aerobic respiration releases oxygen from food during oxidation.

(c) Aerobic respiration converts food to carbon dioxide and water.

(d) Anaerobic respiration releases energy from food without using oxygen.

9 (a) Which one of the following would be acceptable evidence that some form of respiration was taking place in a living tissue

(i) oxygen being taken up

(ii) oxygen being given out

(iii) water vapour being produced

(iv) food being used up

(b) Why are the others unacceptable?

10 If a tissue was heated to 65°C for 10 minutes, respiration would cease even if oxygen and food were supplied. Why is this?

11 What name is given to the whole range of chemical changes which are needed just to keep an organism alive ?

(a) basal metabolism (c) catabolism

(b) anabolism (d) metabolism

12 (a) What chemical is normally used to test for the presence of carbon dioxide?

(b) What is the result of the test if carbon dioxide is present?

13 Blood from a donor is sterile and stored in a sealed bag, but it is still kept at 4°C. What is the advantage of keeping it at this low temperature?

3 Energy from respiration - answers

1 Respiration is the release of *energy* from *food* and takes place in all *cells* of the body. In the course of respiration, *food* is broken down to *carbon dioxide* and *water*. If oxygen is used for this process, the respiration is called *aerobic*. If oxygen is not used in the process, the respiration is called *anaerobic*. Each stage of respiration is speeded up by a particular *enzyme*.



3 The products of alcoholic fermentation are alcohol and carbon dioxide.

4 Respiration in cells takes place mainly in the mitochondria.

5 A person lying quite still needs energy for breathing movements (rib muscles and diaphragm), circulation of blood (heart contraction), temperature maintenance, nerve impulses in the brain and nervous system.

6 Aerobic respiration provides more energy than anaerobic respiration given the same quantity of food.

7 (a) In an active muscle, the intermediate products of anaerobic respiration are pyruvic acid and lactic acid.

(b) lactic acid is associated with oxygen debt.

(c) lactic acid which accumulates in the muscles has to be taken to the liver and oxidised even after the exercise has finished.

8 Statements (a) and (b) are incorrect.

(a) Anaerobic respiration does not use oxygen.

(b) Neither form of respiration produces oxygen.

9 (a) (i) Oxygen being taken up is acceptable evidence of respiration.

(b) (ii) Oxygen is not given out during respiration.

(iii) Water vapour is given off by non-living systems, e.g. wet washing.

(iv) Using up food could be evidence for respiration but the food could be used for growth rather than for energy. Nevertheless, any growth process will almost certainly need energy from respiration, so (iv) is acceptable evidence in most cases.

10 A temperature of 65°C for 10 minutes would denature the enzymes in most tissues, so respiration would cease. Structural proteins in the cell membranes would also be denatured. In short, the tissue would be killed by this temperature.

11 (a) Basal metabolism refers to the range of chemical activities needed to maintain basic body functions, e.g. during sleep.

12 (a) Lime water is used to test for carbon dioxide.

(b) If carbon dioxide is present, the lime water goes 'milky'.

Note: pH indicators, such as hydrogencarbonate indicator are sometimes used to detect carbon dioxide, but they are not specific for this gas. Anything which increased the acidity of the indicator would produce a colour change.

13 At 4 °C, enzyme activity is slowed down, so the rate of respiration (and hence usage of food and oxygen) in the blood cells is slowed down. This increases the possible storage time.