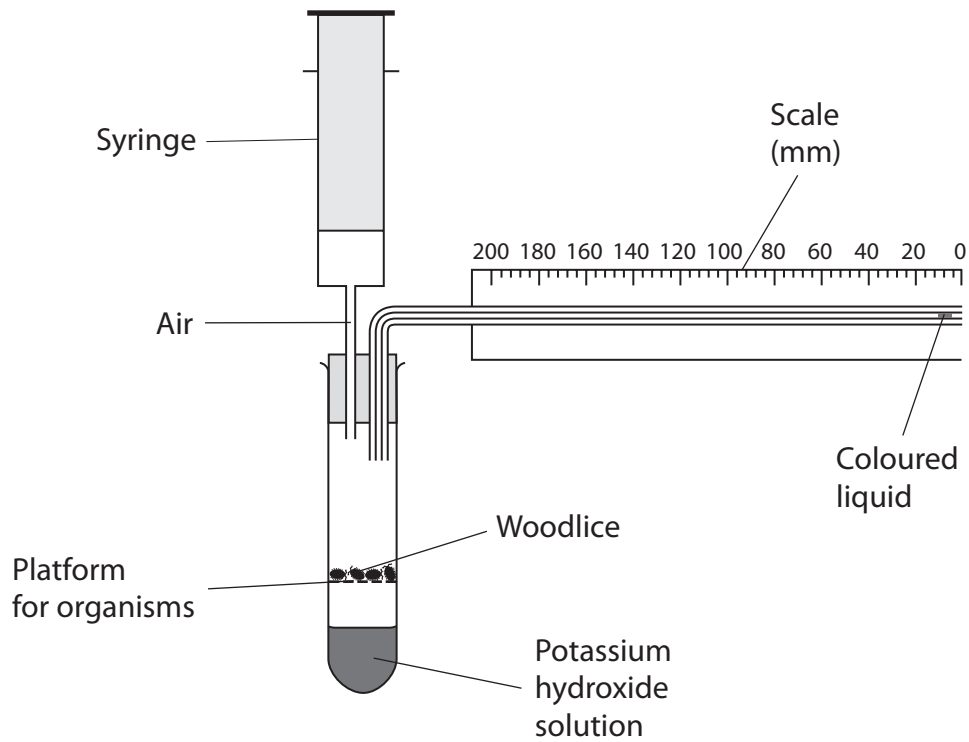1 The apparatus shown in the diagram below can be used to measure the rate of respiration of small animals such as woodlice.

(a) (i) Potassium hydroxide solution absorbs carbon dioxide.
Suggest a reason for absorbing carbon dioxide in this apparatus.

(1)

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(ii) Suggest what the syringe is used for in this apparatus.

(2)

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*(b) Describe how this apparatus could be used to find the mean rate of respiration of woodlice.

(6)

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(Total for Question 1 = 9 marks)

2 The diagram below shows part of the carbon cycle. The processes A, B, C, D and E, transfer carbon.

forests

oceans

E

A

D

B

carbon dioxide in the air

C

fossil fuels
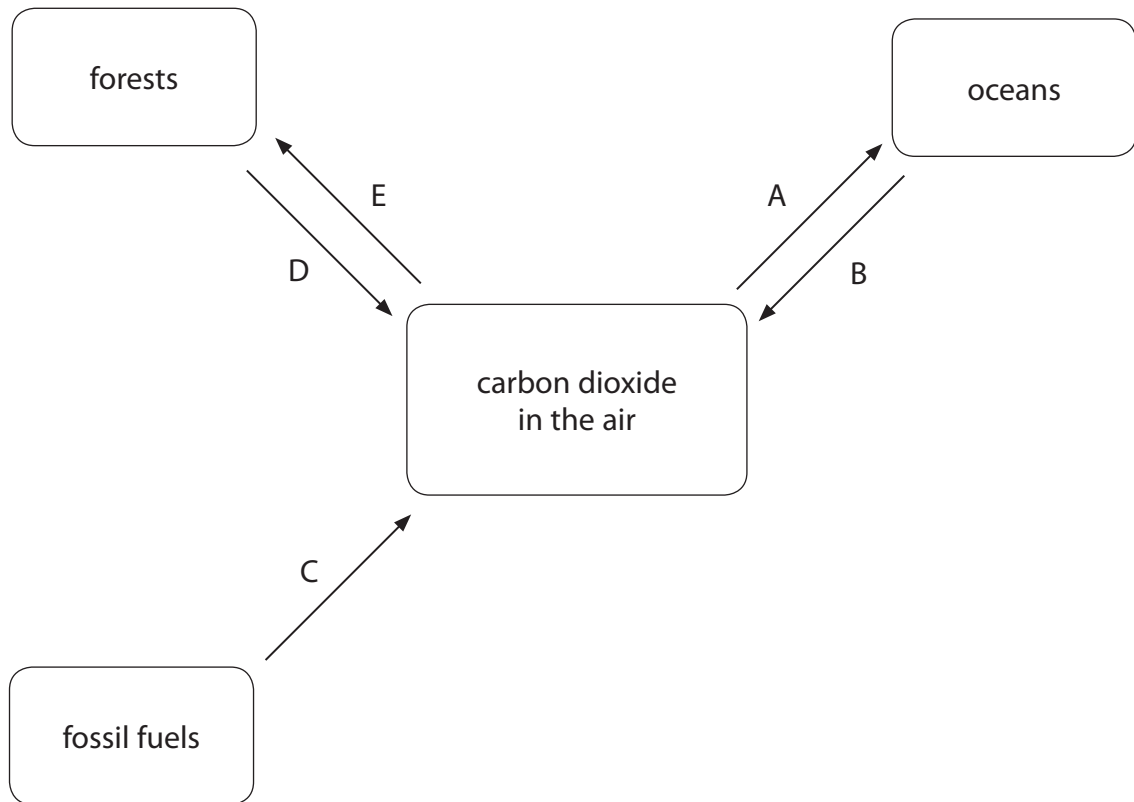
(a) Explain how carbon dioxide is removed from the air into the oceans by process A.

(2)

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(b) Suggest how carbon dioxide is returned to the air from the oceans by process B.

(1)

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(c) Place a cross ☒ in the box next to the gases produced by process C.

(1)

☒ **A** carbon dioxide and methane

☒ **B** carbon dioxide and water vapour

☒ **C** carbon dioxide, methane and water vapour

☒ **D** carbon dioxide, oxygen and water vapour

(d) Describe the role of bacteria in process D in the diagram.

(3)

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(e) Place a cross ☒ in the box next to the reaction in process E that uses carbon dioxide.

(1)

☒ **A** light-dependent reaction

☒ **B** light-independent reaction

☒ **C** photolysis

☒ **D** photophosphorylation

(f) The table below shows how much carbon is being transferred by each of the processes in the diagram.

Process	A	B	C	D	E
Mass of carbon transferred / au	338	332	23	444	450

(i) Calculate how much more carbon is entering the air than is leaving it.

Show your working.

(2)

Answer ....

(ii) Suggest why more carbon is entering the air than is leaving it.

(3)

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(Total for Question 2 = 13 marks)

3 The scientific article you have studied is adapted from articles in The Biologist. Use the information from the article and your own knowledge to answer the following questions.

(a) Explain why obesity is 'a big problem' for society (paragraph 2).

(2)

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(b) Describe the structure of triglyceride fat found in white adipose tissue (WAT).

(2)

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(c) Calculate the percentage increase in deaths for young girls with anorexia (paragraph 6).

(2)

Answer = ... %

(d) State the evidence supporting the idea that specific parts of the brain are responsible for the gender differences in the processing of information related to body image (paragraphs 8 to 14).

(4)

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(e) Explain why the raised cortisol levels due to dieting in females, may be a long term risk factor (paragraph 18).

(2)

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(f) Suggest why it may be an advantage to have lipids stored in 'many small droplets rather than in a large mass' in brown adipose tissue (BAT) (paragraph 28).

(2)

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(g) Suggest how the uncoupling agent UCP-1 might affect the production of ATP and heat (paragraph 28).

(3)

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(h) Suggest why 18F-fluorodeoxyglucose (18FFDG) becomes 'trapped' in the cells, unlike glucose which is rapidly metabolised (paragraph 32).

(3)

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(i) Explain why the seaweed pigment fucoxanthin caused a reduction in abdominal fat in rats (paragraph 38).

(3)

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*(j) Give the scientific evidence for the protein PRDM16 being responsible for potential weight loss (paragraphs 40 and 41).

(5)

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(k) Give **two** pieces of evidence showing that environmental factors can alter gene expression (paragraphs 45 to 47).

(2)

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(Total for Question 3 = 30 marks)