1. In organic matter, macromolecules containing nitrogen are broken down by decomposers. The decomposers are also respiring aerobically.

Which of the following will be released?

1: carbon dioxide
2: ammonium ions
3: nitrate ions

A 1, 2 and 3
B Only 1 and 2
C Only 2 and 3
D Only 1

Your answer ☐

[1]

2. The light independent reaction of photosynthesis needs products from the light dependent reaction.

What are the correct products of the light dependent reaction which are needed for the light independent reaction?

A reduced NAD, ADP
B reduced NADP, ATP, carbon dioxide
C reduced NADP, ATP
D reduced NAD, ADP, oxygen

Your answer ☐

[1]

3. A student carried out an investigation into the effect of light intensity on photosynthesis.

Several groups of spinach leaf discs were placed in test tubes of water. The discs all sank to the bottoms of the tubes. Each tube was placed at a measured distance from a lamp, as shown below in **Fig. 15.1**.

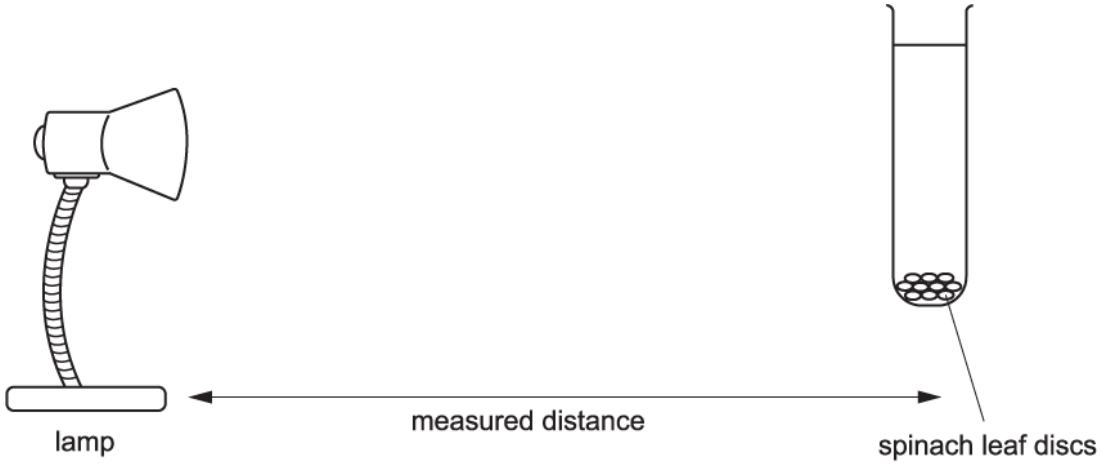


Fig. 15.1

As photosynthesis occurs, the build-up of oxygen gas in the leaf discs causes them to rise from the bottom of the tube upwards.

Table 15.1 shows the results:

Tube number	Distance from lamp (mm)	Time taken for five discs to float (s)
1	50	125
2	100	210
3	150	360
4	200	600
5	250	None floated in the time available

Table 15.1

Which of the following statements is / are true?

Statement 1: The compensation point occurs between 200 and 250 mm.
Statement 2: A variable which is controlled is the distance of the tube from the light source.
Statement 3: The time taken for the discs to rise is directly proportional to the distance from the lamp.

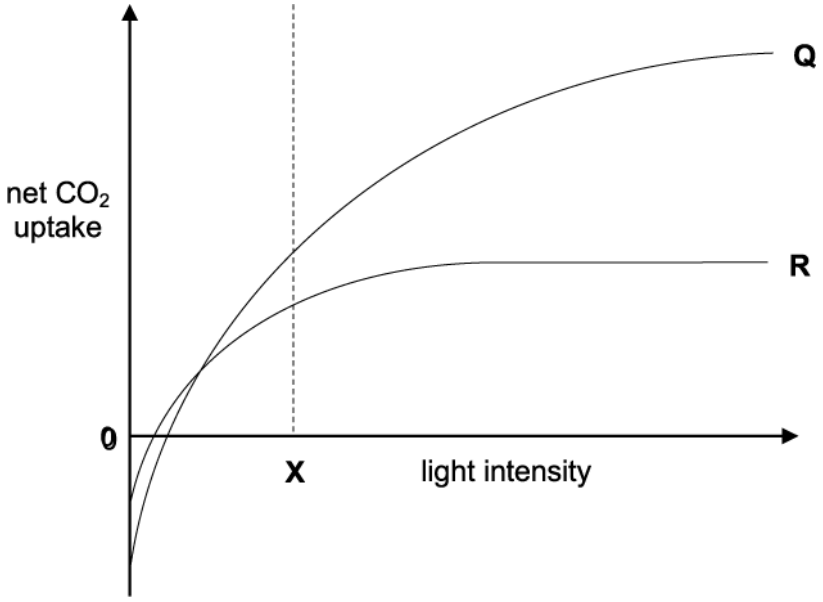
A 1, 2 and 3
B Only 1 and 2
C Only 2 and 3

D Only 1

Your answer

[1]

4. The graph below shows the effect of light intensity on the net CO_2 uptake of two vegetable crops, **Q** and **R**.



Which of the following statements is / are correct?

Statement 1: At light intensity **X**, crop **Q** must use stored carbohydrate as a respiratory substrate.

Statement 2: For both crops, when net CO_2 uptake is zero, the rate of respiration equals the rate of photosynthesis.

Statement 3: Crop **R** is better adapted to shaded conditions than crop **Q**.

A 1, 2 and 3 are correct
B Only 1 and 2 are correct
C Only 2 and 3 are correct
D Only 1 is correct

Your answer ☐

[1]

5. A food chain consisting of five organisms is shown below, along with the energy available at each trophic stage.

Organism:	maize	→	locust	→	lizard	→	snake	→	hawk
Energy ($kJ\,m^{-2}\,year^{-1}$):	74 011		8075		753		79		8

Which of the options, **A** to **D**, is the percentage energy transfer between the primary consumer and secondary consumer?

A 9.3
B 10.3
C 10.9
D 12.2

Your answer ☐

[1]

6. The stomach of a ruminant animal has four highly-specialised chambers.

Which of the options, **A** to **D**, is a function of the rumen?

A absorption of essential amino acids
B digestion of insoluble plant material
C killing microorganisms
D passing food to the small intestine

Your answer ☐

[1]

7. Which of the options, **A** to **D**, is oxidised by the bacterium *Nitrosomonas* in the nitrogen cycle?

A ammonium ion (NH_4^+)
B atmospheric nitrogen (N_2)
C nitrate ion (NO_3^-)
D nitrite ion (NO_2^-)

Your answer ☐

[1]

8. Photolysis is the process of splitting water using light energy.

Which of the options, **A** to **D**, is the region of the chloroplast in which this process takes place?

A outer membrane
B stroma
C thylakoid lumen
D thylakoid membrane

Your answer ☐ **[1]**

9. The statements below relate to the Calvin cycle.

Which of the following statements is / are correct?

1 Molecules of triose phosphate are required for the synthesis of nucleic acids.
2 The production of triose phosphate from glycerate-3-phosphate requires ATP and reduced NAD.
3 Reactions of the Calvin cycle occur at a faster rate when stomata are closed.
A 1, 2 and 3 are correct
B Only 1 and 2 are correct
C Only 2 and 3 are correct
D Only 1 is correct

Your answer ☐ **[1]**

10. Which of the molecules, **A** to **D**, is the source of electrons in photosynthesis?

A ATP

B CO_2

C H_2O

D NADPH

Your answer [ ] **[1]**

11. DCPIP is a molecule that is used to measure the rate of the Hill reaction in isolated chloroplasts.

Which of the options, **A** to **D**, correctly describes DCPIP during the Hill reaction?

A it becomes oxidised

B it loses electrons

C it mimics NADP

D it turns from colourless to blue

Your answer [ ] **[1]**

12. Proton pumps establish electrochemical gradients, which are required for ATP production.

Which of the options, **A** to **D**, are regions of a plant cell **into** which protons are pumped?

A chloroplast stroma and mitochondrial intermembrane space

B chloroplast stroma and mitochondrial matrix

C thylakoid space and mitochondrial intermembrane space

D thylakoid space and mitochondrial matrix

Your answer [ ] **[1]**

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1			B	1	
			Total	**1**	
2			C	1	
			Total	**1**	
3			D	1	
			Total	**1**	
4			C	1	
			Total	**1**	
5			A ✓	1	
			Total	**1**	
6			B ✓	1	
			Total	**1**	
7			A ✓	1	
			Total	**1**	
8			D ✓	1	**Examiner's Comments** This was a straightforward question about the location of photolysis.
			Total	**1**	
9			D ✓	1	**Examiner's Comments** Candidates did not perform well on this question. The most common incorrect answer was option **B** suggesting that candidates had not read the options carefully and failed to spot the reference to reduced NAD in statement 2.
			Total	**1**	
10			C	1	
			Total	**1**	

Question			Answer/Indicative content	Marks	Guidance
11			C	1	Examiner's Comments This question tests knowledge of the practical demonstration of the Hill reaction during which DCPIP is reduced, turning from blue to colourless. DCPIP therefore mimics NADP.
			Total	1	
12			C	1	
			Total	1	