

## Multiple Choice Questions (MCQ) topic quiz

### Respiration

#### ***Instructions and answers for teachers***

These instructions cover the learner activity section which can be found on [page 17](#).

This Lesson Element supports OCR A Level Biology A (H420) and Biology B (Advancing Biology) (H422).

**When distributing the activity section to the learners either as a printed copy or as a Word file you will need to remove the teacher instructions section.**

#### **The Activity**

This Lesson Element is a teaching and learning resource containing 20 multiple choice questions (MCQs) on the theme of photosynthesis. Some questions might require synoptic thinking, using knowledge and ideas from various topics across the full A Level content.

This resource can be used to test and consolidate understanding at the end of a topic or to revisit and refresh knowledge at a later point in the course.

#### **Introduction**

Multiple choice questions allow rapid coverage of a wide range of sub-topics.

Contrary to a widespread belief among students, multiple choice questions are not necessarily easy – they can be easy, moderate or difficult.

The questions are written so that the incorrect answers are plausible distractors based on common errors or misconceptions.

The questions in this quiz cover topics mainly from specification section:

##### Biology A

5.2.2 Respiration

##### Biology B (Advancing Biology)

4.1.1 Cellular Respiration.

### Multiple Choice Questions (MCQ) topic quiz - answers

- 1 Aerobic respiration has three stages where reactions occur between free-moving enzymes and substrates.

Which line of the table shows the correct location of each stage?

	<b>glycolysis</b>	<b>link reaction</b>	<b>Krebs cycle</b>
<b>A</b>	cytoplasm	cytoplasm	cytoplasm
<b>B</b>	cytoplasm	mitochondrial matrix	mitochondrial matrix
<b>C</b>	mitochondrial matrix	cytoplasm	cytoplasm
<b>D</b>	mitochondrial matrix	mitochondrial matrix	mitochondrial matrix

Your answer

**B**

- 2 Aerobic respiration is a pathway involving a series of reactions.

What is the final reaction in the pathway?

- A** the formation of carbon dioxide
- B** the oxidation of cytochrome
- C** the reduction of oxygen to water
- D** the synthesis of ATP

Your answer

**C**

**AS and A LEVEL**  
**BIOLOGY A**  
**BIOLOGY B (ADVANCING BIOLOGY)**  
**Teacher Instructions**

- 3** Reactions and processes in cells can be endothermic, requiring an energy supply in the form of ATP, or exothermic, releasing energy.

Which reaction is endothermic?

- A** the conversion of pyruvate to acetyl CoA
- B** the conversion of pyruvate to lactate
- C** the oxidation of triose phosphate to pyruvate
- D** the polymerisation of lactic acid

Your answer

**D**

- 4** Decarboxylase (**X**) and dehydrogenase (**Y**) enzymes are important in aerobic respiration.

Which line of the table shows when each type of enzyme is used?

	glycolysis		link reaction		Krebs cycle	
	X	Y	X	Y	X	Y
<b>A</b>	✓	✓	x	✓	✓	✓
<b>B</b>	✓	x	✓	x	x	✓
<b>C</b>	x	✓	✓	✓	✓	✓
<b>D</b>	x	✓	✓	x	x	✓

Your answer

**C**

**AS and A LEVEL**  
**BIOLOGY A**  
**BIOLOGY B (ADVANCING BIOLOGY)**  
**Teacher Instructions**

- 5 Striated muscle contains two types of muscle fibre, red and white fibres. Typical percentages of red fibres in different athletes are shown.

type of athlete	percentage of red fibres
short-distance runners	15-35
middle-distance runners	30-60
long-distance runners	65-95

What can be deduced about the properties of red fibres?

	tendency to fatigue	respiratory waste products
<b>A</b>	do not fatigue easily	carbon dioxide and water
<b>B</b>	do not fatigue easily	lactic acid
<b>C</b>	fatigue easily	carbon dioxide and water
<b>D</b>	fatigue easily	lactic acid

Your answer

A

- 6 Oxygen is required to oxidise food molecules in aerobic respiration.

Which food will require the largest volume of oxygen for it to be oxidised completely?

- A** 1 g lipid
- B** 1 g monosaccharide
- C** 1 g polysaccharide
- D** 1 g protein

Your answer

A

- 7 The respiratory quotient, RQ, was calculated at intervals for a flask of germinating seeds. The RQ decreased over time from 1.0 to 0.7.

What caused the decrease in RQ?

- A Aerobic respiration was replaced by anaerobic respiration.
- B Anaerobic respiration was replaced by aerobic respiration.
- C The respiratory substrate changed from carbohydrate to lipid.
- D The respiratory substrate changed from lipid to carbohydrate.

Your answer

C

- 8 A student calculated the volume of oxygen used by a locust as  $1.7 \text{ cm}^3$  in 1 hour. The same locust produced  $1.3 \text{ cm}^3$  of carbon dioxide in the same time period.

What is the RQ of this locust?

- A 0.7
- B 0.8
- C 1.3
- D 2.2

Your answer

B

*Correct answer is 1.3 divided by 1.7 = 0.76, rounded to 1 decimal place this is 0.8. Distractor A rounds the answer down instead of up. Distractor C divides 1.7 by 1.3. Distractor D multiplies the two figures.*

**AS and A LEVEL**  
**BIOLOGY A**  
**BIOLOGY B (ADVANCING BIOLOGY)**  
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- 9 Rotenone is an insecticide that inhibits the electron transport chain.

Which line of the table shows the expected changes caused by rotenone?

	<b>oxygen consumption</b>	<b>lactate concentration</b>	<b>Krebs cycle activity</b>
<b>A</b>	decreased	decreased	increased
<b>B</b>	decreased	increased	decreased
<b>C</b>	increased	decreased	increased
<b>D</b>	increased	increased	decreased

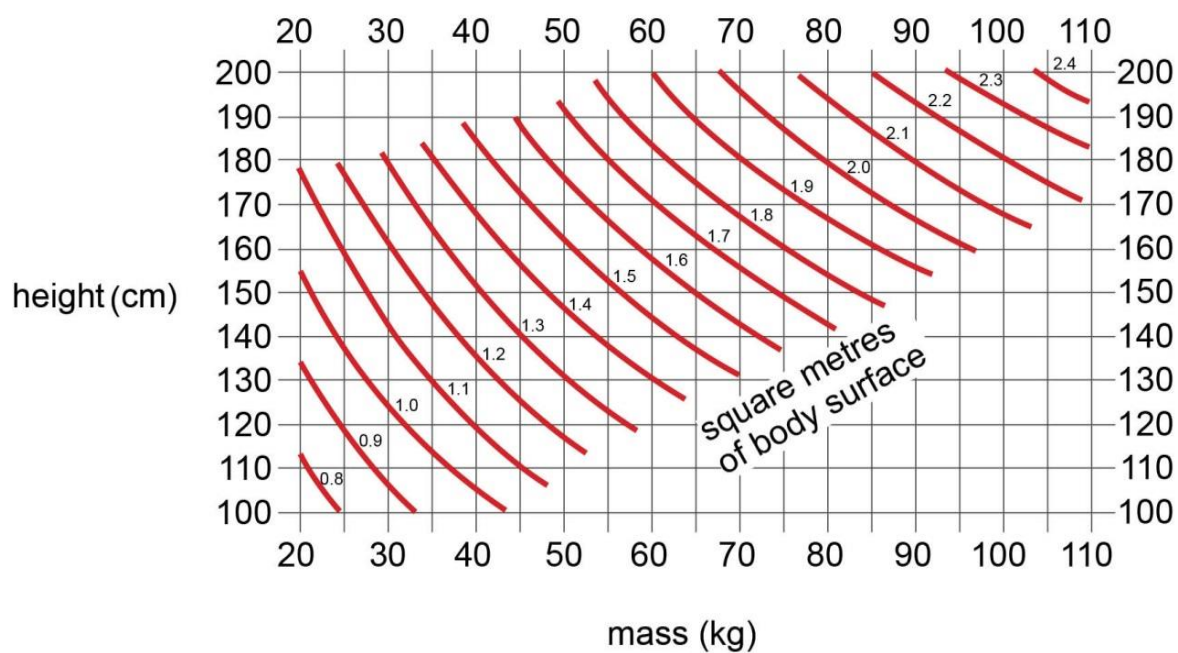
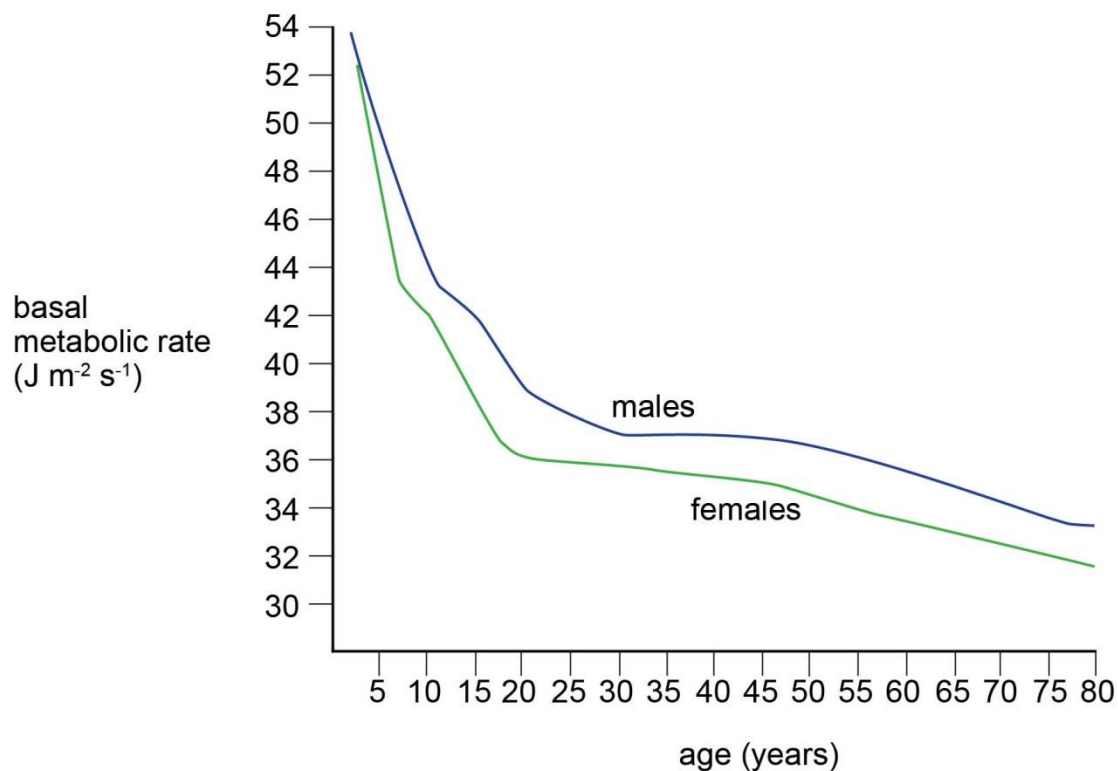
Your answer

**B**

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- 10 The top figure shows the basal metabolic rate as Joules of energy used per square metre of body surface per second for people of different ages.

The second figure shows how the height and mass of an individual relate to the person's surface area.



How much energy is used in five minutes by a 20 year old female of height 170 cm and mass 60 kg?

- A 36 J
- B 61 J
- C 306 J
- D 18 360 J

Your answer

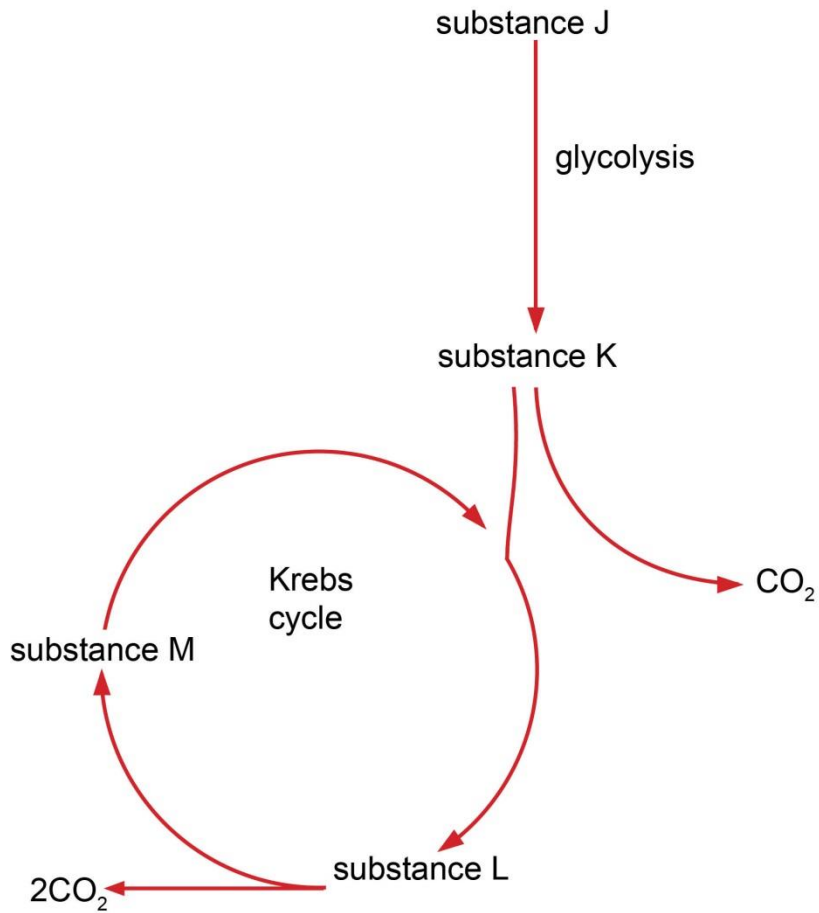
D

*Correct working is to read off 36  $J m^{-2} s^{-1}$  (which is distractor A) and to multiply it by 1.7 read off the second graph (the product is distractor B). This should then be multiplied by 5 minutes (giving distractor C) and then by 60 seconds, giving the correct value of 18360 J.*



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**BIOLOGY A**  
**BIOLOGY B (ADVANCING BIOLOGY)**  
**Teacher Instructions**

11 Part of the respiration pathway is shown.



Which line of the table shows the substances that ionise to release a hydrogen ion into solution?

substances that ionise to release H <sup>+</sup>				
	J	K	L	M
A	✓	✓	✓	✗
B	✓	✗	✗	✗
C	✗	✓	✓	✓
D	✗	✗	✗	✓

Your answer

C

**AS and A LEVEL**  
**BIOLOGY A**  
**BIOLOGY B (ADVANCING BIOLOGY)**  
**Teacher Instructions**

**12** How does chemiosmosis lead to ATP synthesis?

- A** Hydrogens diffuse from the intermembrane space to the stroma through ATPase.
- B** Hydrogens jump from the inner membrane to the outer membrane and out through ATP synthase.
- C** Hydrogen ions diffuse from the intermembrane space to the matrix through ATP synthase.
- D** Protons are pumped from the matrix to the intermembrane space through ATP synthase.

Your answer

**C**

**13** Cells in culture were supplied with radioactively-labelled oxygen gas.

Which cell metabolite will show most radioactivity after a few minutes?

- A** ATP
- B** carbon dioxide
- C** reduced NAD
- D** water

Your answer

**D**

- 14 The table compares the oxygen consumption and body mass of two animals. These figures can be used to calculate the metabolic rate of each animal in  $\text{cm}^3\text{g}^{-1}\text{h}^{-1}$

	oxygen consumption ( $\text{cm}^3\text{h}^{-1}$ )	body mass (g)
elephant	52 500	5 000 000
shrew	20	10

How many times greater is the shrew's metabolic rate compared to that of the elephant?

- A 2
- B 95
- C 190
- D 200

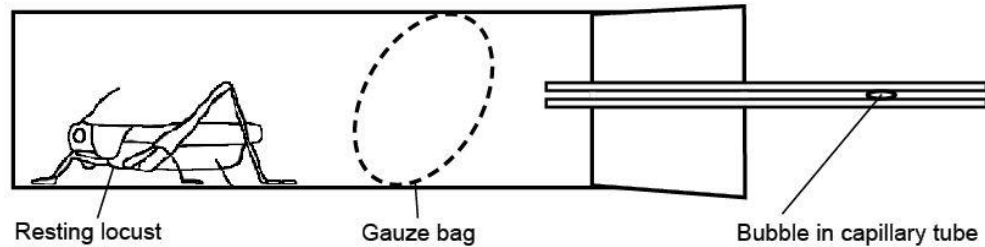
Your answer

C

*Correct working is to find metabolic rate of shrew =  $20 \div 10 = 2 \text{ cm}^3\text{g}^{-1}\text{h}^{-1}$  while that of elephant is  $52\,500 \div 5\,000\,000 = 0.0105$  and then to divide 2 by 0.0105  $\text{cm}^3\text{g}^{-1}\text{h}^{-1}$  to give an answer of 190 times (option C). Distractor A is the rate for shrew, B is the rate for elephant based on dividing body mass by oxygen consumption (i.e. wrong way round) and D is the result of rounding the elephant rate to 0.01 rather than completing the calculation using 0.0105.*

**AS and A LEVEL**  
**BIOLOGY A**  
**BIOLOGY B (ADVANCING BIOLOGY)**  
**Teacher Instructions**

- 15 The diagram shows respirometer apparatus. The gauze bag can be filled either with soda lime pellets or with glass beads.



Which of the following statements describe(s) what this apparatus can be used for?

**Statement 1:** It can be used to measure the rate of oxygen uptake.

**Statement 2:** It can be used to measure the difference between oxygen uptake and carbon dioxide production.

**Statement 3:** It can be used to measure the difference between carbon dioxide uptake and oxygen production.

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

Your answer

B

**AS and A LEVEL**  
**BIOLOGY A**  
**BIOLOGY B (ADVANCING BIOLOGY)**  
**Teacher Instructions**

- 16 Which of the following statements is/are true of respiration under anaerobic conditions in both yeast and animal cells?

**Statement 1:** Carbon dioxide is produced.

**Statement 2:** Glycolysis occurs.

**Statement 3:** Reduced NAD is oxidised to NAD.

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

Your answer

C

- 17 Which of the following reactions form(s) part of glycolysis?

**Statement 1:** ATP donates a phosphate group to glucose.

**Statement 2:** Triose phosphate is oxidised to pyruvate.

**Statement 3:** A six-carbon sugar bisphosphate splits into two three-carbon sugar phosphates.

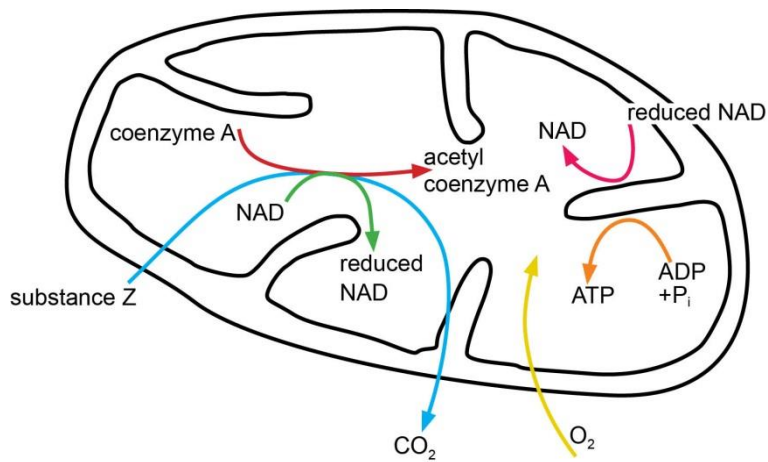
- A** 1, 2 and 3  
**B** Only 1 and 2  
**C** Only 2 and 3  
**D** Only 1

Your answer

A

**AS and A LEVEL**  
**BIOLOGY A**  
**BIOLOGY B (ADVANCING BIOLOGY)**  
**Teacher Instructions**

18 The diagram shows some of the reactions occurring in a mitochondrion.



Which statements concerning the diagram are true?

**Statement 1:** The acetyl group from acetyl coenzyme A will join with oxaloacetate.

**Statement 2:** The reduction of NAD occurs at the cristae.

**Statement 3:** Substance Z is glucose.

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

Your answer

D

- 19 Live yeast is used in making bread. The yeast is mixed with flour, sugar and water to make dough. This is left in a covered bowl for one to two hours. During this time the yeast cells respire and produce bubbles of gas that make the dough rise.

Which of the following statements describe(s) an effective way to shorten the time needed for yeast to make bread dough rise?

**Statement 1:** Leave the bowl adjacent to a warm radiator.

**Statement 2:** Make the dough with double the normal quantities of flour and water.

**Statement 3:** Use finely-powdered sugar instead of granulated sugar.

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

Your answer

D

- 20 Gardeners in the UK sometimes make a hot-bed to grow early crops. The hot-bed consists of a pit dug into the soil and filled with 50 cm depth of fresh animal manure and 10 cm of topsoil. It is covered with a glass cover supported on a wooden frame.

Which of the following statements explain(s) why a hot-bed is effective at increasing the rate of plant growth?

**Statement 1:** Decomposer respiration generates heat in the manure layer.

**Statement 2:** The soil around the pit and the wooden frame acts as heat insulation.

**Statement 3:** Temperature is a limiting factor for plant photosynthesis.

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

Your answer

A

**AS and A LEVEL**  
**BIOLOGY A**  
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**Teacher Instructions**

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## Multiple Choice Questions (MCQ) topic quiz

### Respiration

#### Learner Activity

- 1 Aerobic respiration has three stages where reactions occur between free-moving enzymes and substrates.

Which line of the table shows the correct location of each stage?

	glycolysis	link reaction	Krebs cycle
A	cytoplasm	cytoplasm	cytoplasm
B	cytoplasm	mitochondrial matrix	mitochondrial matrix
C	mitochondrial matrix	cytoplasm	cytoplasm
D	mitochondrial matrix	mitochondrial matrix	mitochondrial matrix

Your answer

- 2 Aerobic respiration is a pathway involving a series of reactions.

What is the final reaction in the pathway

- A the formation of carbon dioxide
- B the oxidation of cytochrome
- C the reduction of oxygen to water
- D the synthesis of ATP

Your answer

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- 3 Reactions and processes in cells can be endothermic, requiring an energy supply in the form of ATP, or exothermic, releasing energy.

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Your answer

- 4 Decarboxylase (X) and dehydrogenase (Y) enzymes are important in aerobic respiration.

Which line of the table shows when each type of enzyme is used?

	glycolysis		link reaction		Krebs cycle	
	X	Y	X	Y	X	Y
<b>A</b>	✓	✓	x	✓	✓	✓
<b>B</b>	✓	x	✓	x	x	✓
<b>C</b>	x	✓	✓	✓	✓	✓
<b>D</b>	x	✓	✓	x	x	✓

Your answer

**AS and A LEVEL**  
**BIOLOGY A**  
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**Learner Activity**

- 5 Striated muscle contains two types of muscle fibre, red and white fibres. Typical percentages of red fibres in different athletes are shown.

type of athlete	percentage of red fibres
short-distance runners	15-35
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What can be deduced about the properties of red fibres?

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Your answer

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Which food will require the largest volume of oxygen for it to be oxidised completely?

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Your answer

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**Learner Activity**

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What caused the decrease in RQ?

- A Aerobic respiration was replaced by anaerobic respiration.
- B Anaerobic respiration was replaced by aerobic respiration.
- C The respiratory substrate changed from carbohydrate to lipid.
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Your answer

- 8 A student calculated the volume of oxygen used by a locust as 1.7 cm<sup>3</sup> in 1 hour. The same locust produced 1.3 cm<sup>3</sup> of carbon dioxide in the same time period.

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Your answer

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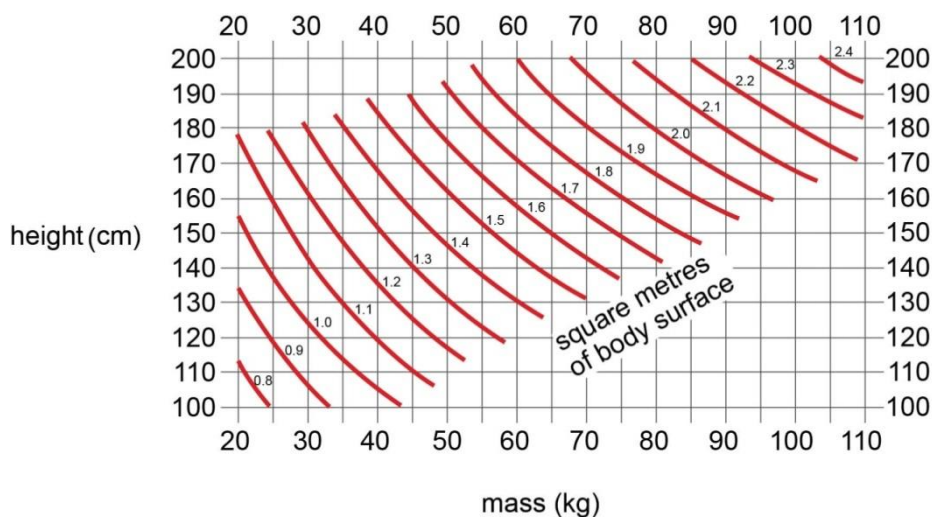
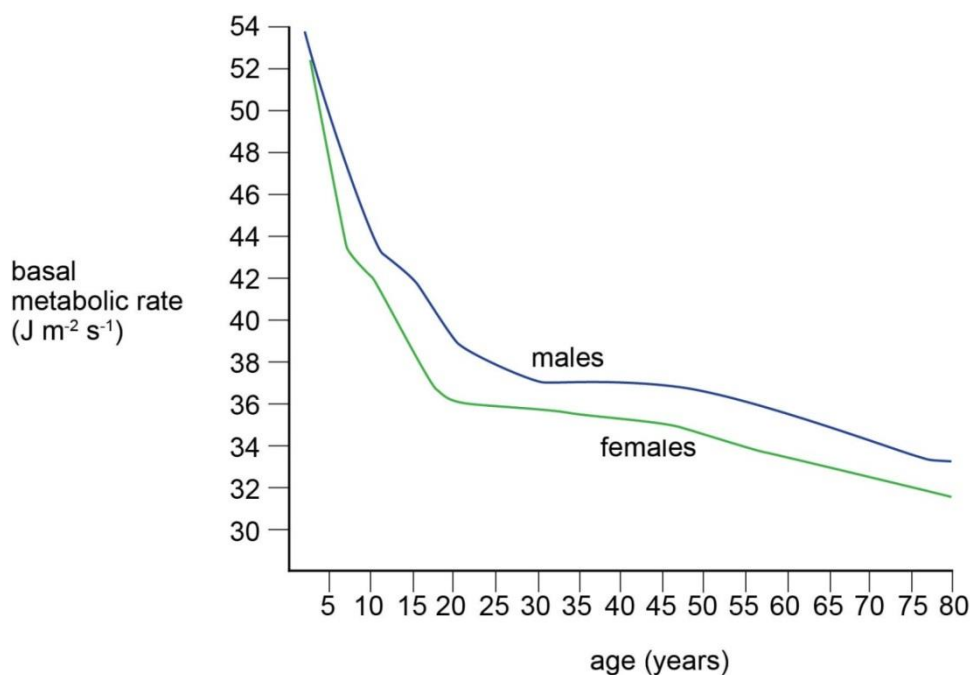
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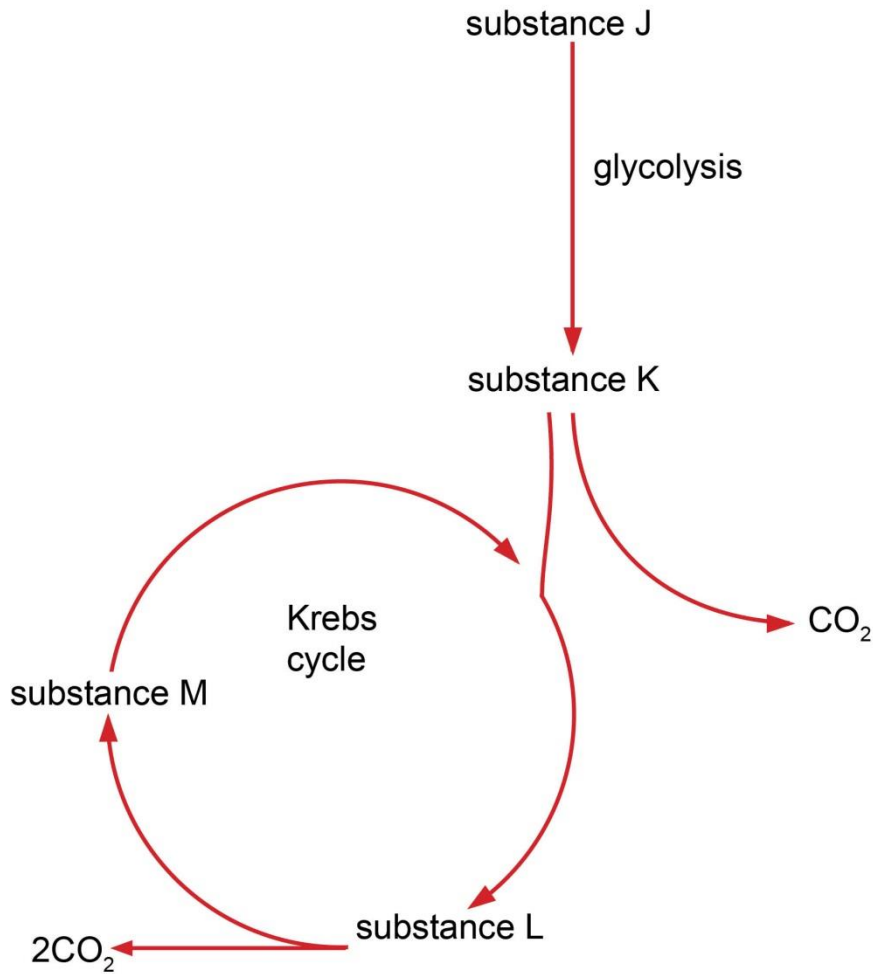


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Which line of the table shows the substances that ionise to release a hydrogen ion into solution?

substances that ionise to release $\text{H}^+$				
	J	K	L	M
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B	✓	✗	✗	✗
C	✗	✓	✓	✓
D	✗	✗	✗	✓

Your answer

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**Learner Activity**

**12** Chemiosmosis produces ATP.

What explains ATP synthesis by chemiosmosis?

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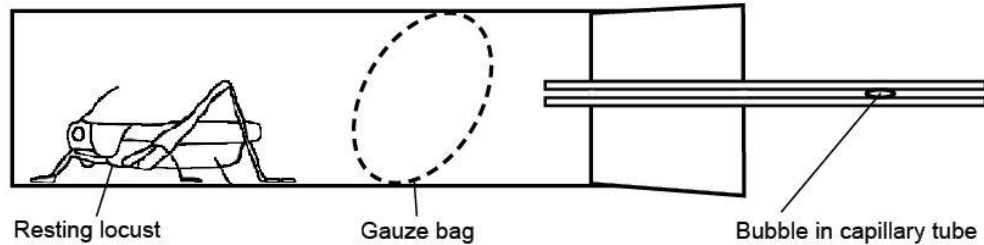
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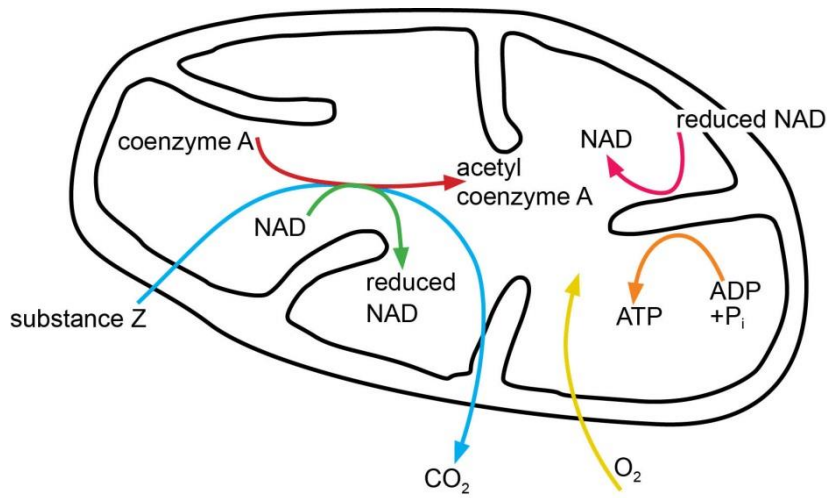
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Your answer