

Respiratory quotient and respiration practicals: practice questions

7 questions · 21 marks · mark scheme at the back

For Pearson Edexcel International AS Biology XBI11 and International A Level Biology YBI11. **A Level only** is IA2 content (Units 4 to 6), not needed for the International AS.

Name

Total / 21

1 UNIT 5 STYLE [1 mark]

Which RQ would you expect from an organism respiring only glucose aerobically?

- A. ☐ 0.5
B. ☐ 0.7
C. ☐ 0.9
D. ☐ 1.0

2 UNIT 5 STYLE [2 marks]

A student measured the gas exchange of germinating sunflower seeds. In 20 minutes the seeds used 52 cm³ of oxygen and produced 38 cm³ of carbon dioxide. Calculate the respiratory quotient.

Answer = ...

3 UNIT 5 STYLE [3 marks]

Explain why the RQ for the respiration of lipid is lower than the RQ for the respiration of carbohydrate.

4

UNIT 5 STYLE

[4 marks]

Describe how a redox indicator can be used to compare the rate of respiration of yeast at different temperatures.

5

UNIT 6 STYLE

[3 marks]

In a yeast and methylene blue experiment, a student added a layer of oil to the surface of each tube. Explain why this improves the results, and suggest a suitable control.

6

UNIT 5 STYLE

[5 marks]

A respirometer containing germinating peas has a capillary tube of internal radius 0.4 mm. With potassium hydroxide in the apparatus, the fluid moved 30 mm in 10 minutes. Without potassium hydroxide, it moved 10 mm in 10 minutes. Calculate (a) the rate of oxygen uptake in $\text{mm}^3 \text{min}^{-1}$ and (b) the RQ.

Answer = ...

In a respirometer experiment using woodlice, a control tube containing glass beads of the same volume was used. Explain the purpose of the control tube and give one safety precaution.

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Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1]

D D: 6CO_2 are produced for 6O_2 consumed, so $\text{RQ} = 1.0$.

2. [2]

- $\text{RQ} = \text{CO}_2 \text{ produced} \div \text{O}_2 \text{ consumed} = 38 \div 52$
- 0.73 (accept 0.7); no units

3. [3]

- lipids contain less oxygen (proportionally) than carbohydrates
- more oxygen is needed from outside to oxidise the lipid
- so volume of CO_2 produced is less than the volume of O_2 consumed / RQ is below 1

4. [4]

- yeast suspension and glucose in tubes at set temperatures in water baths
- add equal volume / concentration of redox indicator (methylene blue / DCPIP)
- measure time for colour to disappear
- $\text{rate} = 1 \div \text{time}$; repeat and calculate means
- control variables: volume and concentration of yeast, glucose, indicator, pH
- Max 4

5. [3]

- oil prevents oxygen from dissolving / entering the suspension
- oxygen would re-oxidise the methylene blue / restore the colour
- control: boiled (and cooled) yeast, which should not decolourise the indicator

6. [5]

- $\text{volume O}_2 = \pi r^2 \times \text{distance} = \pi \times 0.4^2 \times 30 = 15.08 \text{ mm}^3$
- $\text{rate} = 15.08 \div 10 = 1.5 \text{ mm}^3 \text{ min}^{-1}$ (1.51)
- $\text{net change} = \pi \times 0.4^2 \times 10 = 5.03 \text{ mm}^3$
- $\text{CO}_2 \text{ produced} = 15.08 - 5.03 = 10.05 \text{ mm}^3$ (or ratio 20 : 30)
- $\text{RQ} = 10.05 \div 15.08 = 0.67$ (accept 0.7)

7. [3]

- to allow for changes in temperature / atmospheric pressure
- so that fluid movement can be attributed to gas exchange by the woodlice
- KOH is corrosive: wear eye protection / keep it from touching the woodlice, or handle woodlice gently and return them to their habitat