1. Which is a use of energy in a cell?

   ☐ removing all the water from the cytoplasm

   ☐ lowering the cell's temperature on hot days

   ☐ stopping all reactions while the cell rests

   ☐ active transport, movement, and building large molecules

2. The respiratory quotient (RQ) is the ratio of CO_2 produced to:

   ☐ ATP made

   ☐ glucose used

   ☐ oxygen used

   ☐ water made

3. Glycolysis takes place in the mitochondria and needs oxygen.

   ☐ True ☐ False

4. During the Krebs cycle, what is removed?

   ☐ whole glucose molecules

   ☐ water only

   ☐ carbon dioxide and hydrogen

   ☐ oxygen only

5. Why does fermentation matter when there is no oxygen?

   ☐ it makes the Krebs cycle run faster

   ☐ it produces oxygen

   ☐ it stops glycolysis

   ☐ it regenerates NAD so glycolysis can keep producing some ATP

6. ATP is re-made from ADP and a _____ group.

   _____

7. Which respiratory substrate releases the most energy per gram?

   ☐ carbohydrates

   ☐ lipids

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   ☐ proteins

8. Glycolysis gives a net gain of _____ ATP per glucose molecule.

   _____

9. Each turn of the Krebs cycle removes carbon dioxide and hydrogen, reducing NAD and FAD.

   ☐ True ☐ False

10. In mammals anaerobic respiration produces ethanol and carbon dioxide, while yeast produces lactate.

    ☐ True ☐ False

1. **active transport, movement, and building large molecules**

   Energy from respiration drives active transport, movement (e.g. muscle), and anabolic (building) reactions.

2. **oxygen used**

   RQ = CO_2 produced ÷ O_2 used.

3. **False**

   False. Glycolysis happens in the cytoplasm and is anaerobic. The later stages (link reaction, Krebs cycle, oxidative phosphorylation) are in the mitochondria.

4. **carbon dioxide and hydrogen**

   Each turn removes CO_2 (decarboxylation) and hydrogen (dehydrogenation), reducing the coenzymes NAD and FAD.

5. **it regenerates NAD so glycolysis can keep producing some ATP**

   Without oxygen, NAD must be regenerated by fermentation so glycolysis can continue making ATP.

6. **phosphate**

   Respiration provides the energy to re-attach the phosphate to ADP.

7. **lipids**

   Lipids release the most energy per gram (most hydrogen); then proteins, then carbohydrates.

8. **2**

   2 ATP are used and 4 are made – a net gain of 2 ATP (plus 2 reduced NAD).

9. **True**

   The reduced NAD and FAD then carry the hydrogen to oxidative phosphorylation, where most ATP is made.

10. **False**

    False. It is the other way round: mammals produce lactate, while yeast produces ethanol and carbon dioxide.

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