ANSWER KEY.

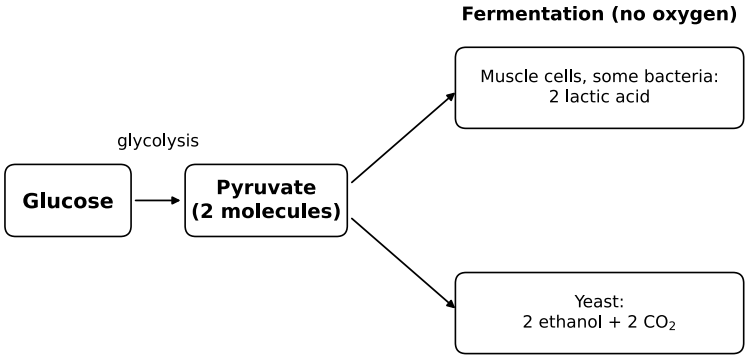
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Fermentation

Biology | ANSWER KEY

Answer in complete sentences. Show your work for calculations.

1. The model shows what cells can do with pyruvate when there is no oxygen. Name the products in boxes 1 and 2.



(a) Box 1: _____

(b) Box 2: _____

(a) **Lactic acid (2 lactic acid)**, in muscle cells and some bacteria

(b) **Ethanol and CO_2 (2 ethanol + 2 CO_2)**, in yeast

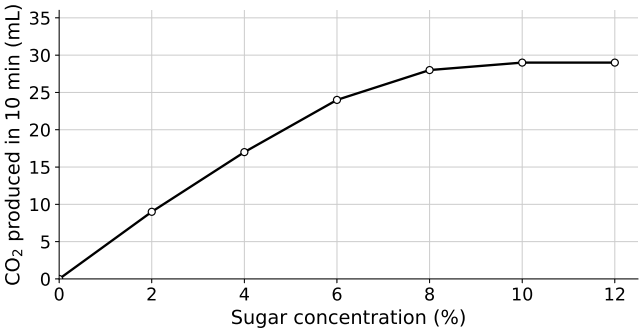
2. Complete the table to compare aerobic respiration with fermentation.

	Aerobic respiration	**Fermentation**
Needs oxygen?	**Yes**	**No**
ATP per glucose	**About 30**	**2**
Where it starts	**Glycolysis in the cytoplasm**	**Glycolysis in the cytoplasm**

Fermentation recycles NADH to NAD^+ so glycolysis can continue, but it makes no ATP itself.

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3. Yeast were given different amounts of sugar, and the CO_2 produced in 10 minutes was measured (sample data).



(a) How much CO_2 was produced with 6% sugar?

(b) What happens above 10% sugar? Explain using the term limiting factor.

(a) **24 mL**

(b) **The rate levels off at 29 mL.** Sugar is no longer the limiting factor, so another factor, such as the number of yeast cells or the temperature, limits the rate.

4. A cell needs to make 60 ATP.

(a) How many glucose must it ferment, at 2 ATP per glucose?

(b) How many glucose does it need using aerobic respiration, at about 30 ATP per glucose?

(a) 60 ÷ 2 = **30 glucose**

(b) 60 ÷ 30 = **2 glucose**. Fermentation needs 15 times as much glucose.

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