

ACT Practice: Cell Respiration

PASSAGE III

A scientist wanted to observe the effects of altitude on the respiratory system of mammals. Four different species of mammals were placed in a chamber that underwent gradual changes in pressure (measured in atmospheres, or atm) to simulate the atmosphere at high altitudes. After 5 minutes at each atmospheric pressure tested, the average number of

breaths per minute (*respiratory rate*) was determined for each of the 4 mammals while they remained at rest. The data from the experiment are shown in the following graph. (Note: Larger animals typically have slower respiratory rates. Higher respiratory rates indicate rapid breathing, a sign of distress in some mammals.)

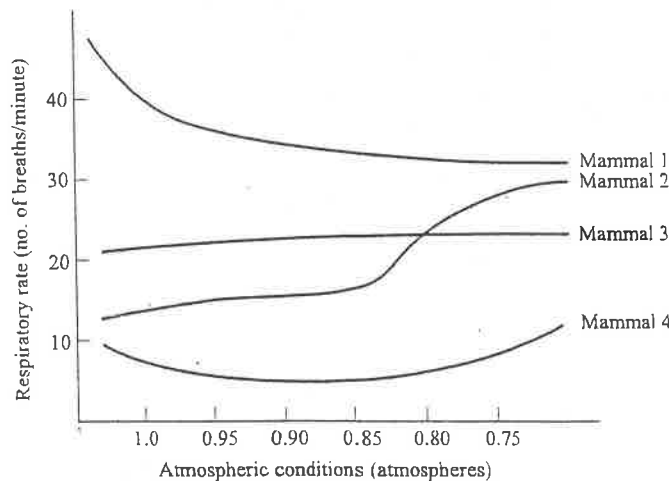


Figure 1

- What is the general relationship between respiratory rate and atmospheric pressure for Mammal 2?
 - Decreases in pressure decrease the respiratory rate.
 - Decreases in pressure increase the respiratory rate.
 - Pressure changes have no effect on the respiratory rate.
 - Increases in pressure increase the respiratory rate.
- At approximately which pressure, in atmospheres, did Mammals 2 and 3 have the same respiratory rate?
 - 1.0
 - 0.95
 - 0.80
 - 0.75
- Further measurements showed that Mammal 4 used significantly more oxygen per minute than Mammal 2. This would be consistent with the data from the graph if:
 - Mammal 4 was in a warmer environment than Mammal 2.
 - Mammal 4 was significantly larger than Mammal 2.
 - Mammal 2 was significantly larger than Mammal 4.
 - Mammals 2 and 4 were the same weight.
- A higher respiratory rate causes mammals to have a higher metabolic rate. Which of the mammals would have a higher metabolic rate at a pressure of 1.0 atm than at .80 atm?
 - 1 only
 - 2 only
 - 4 only
 - 1 and 4 only
- Based on the data in the graph, which of the mammals might be native to higher-altitude environments (meaning that they are more comfortable at higher altitudes than at lower altitudes)?
 - 1 only
 - 2 only
 - 3 only
 - 4 only

Respiration Diagram

4

Respiration Key Ideas:

- 1)
- 2)

Red Crab Seasonal Comparison		
Environmental Conditions	Dry	Wet
Crab genes	CATCAT	TAGTAG
mRNA		
Crab Muscle Protein		
Circle →	Aerobic or anaerobic	Aerobic or anaerobic
Circle →	"White meat" or "Dark Meat"	"White meat" or "Dark Meat"
Circle →	Sprinter or marathoner	Sprinter or marathoner

Circle which mRNA (above) the researchers found in the red crab muscle cells taken from crabs that were migrating to mate?