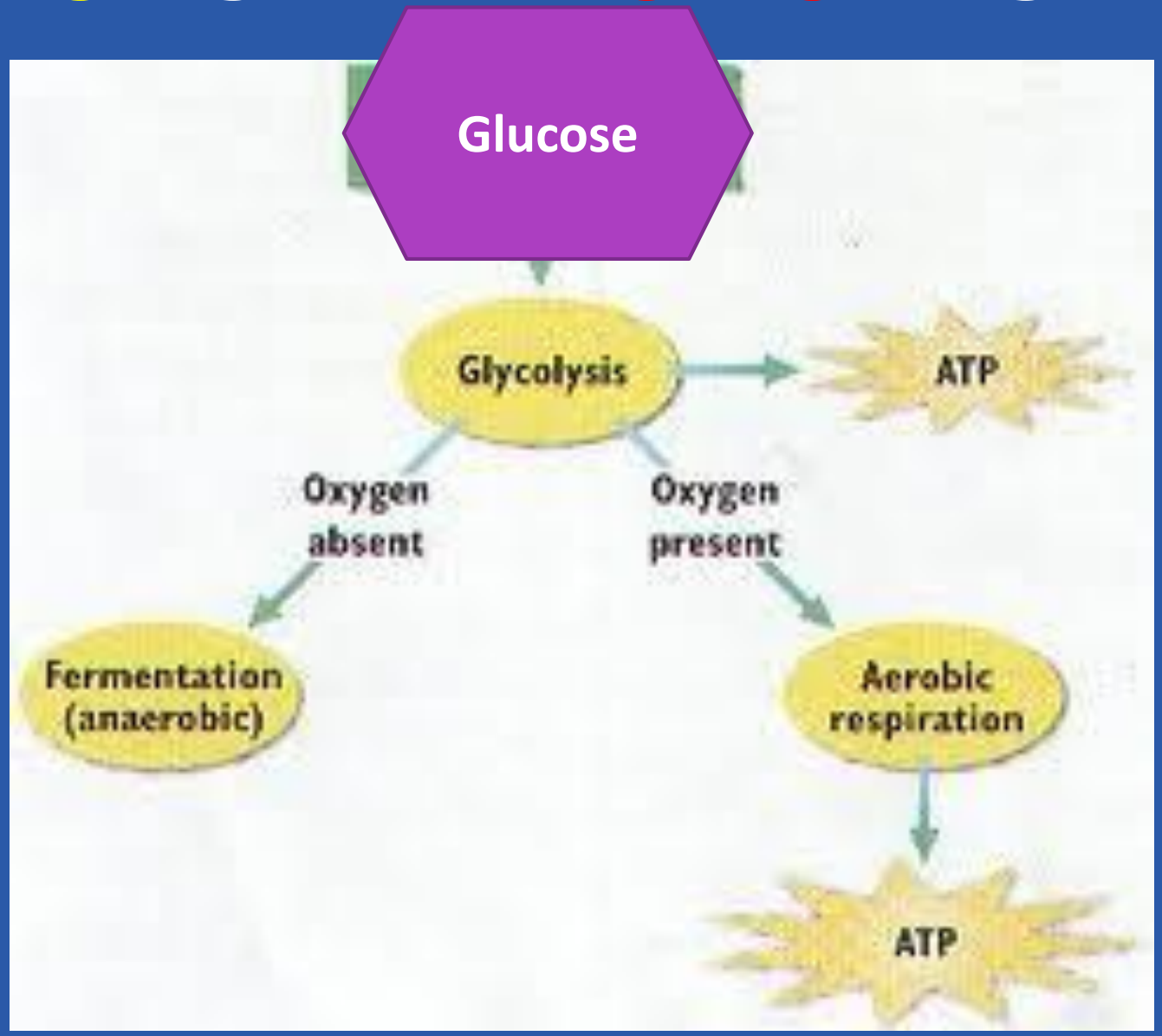
AEROBIC VS ANAEROBIC RESPIRATION

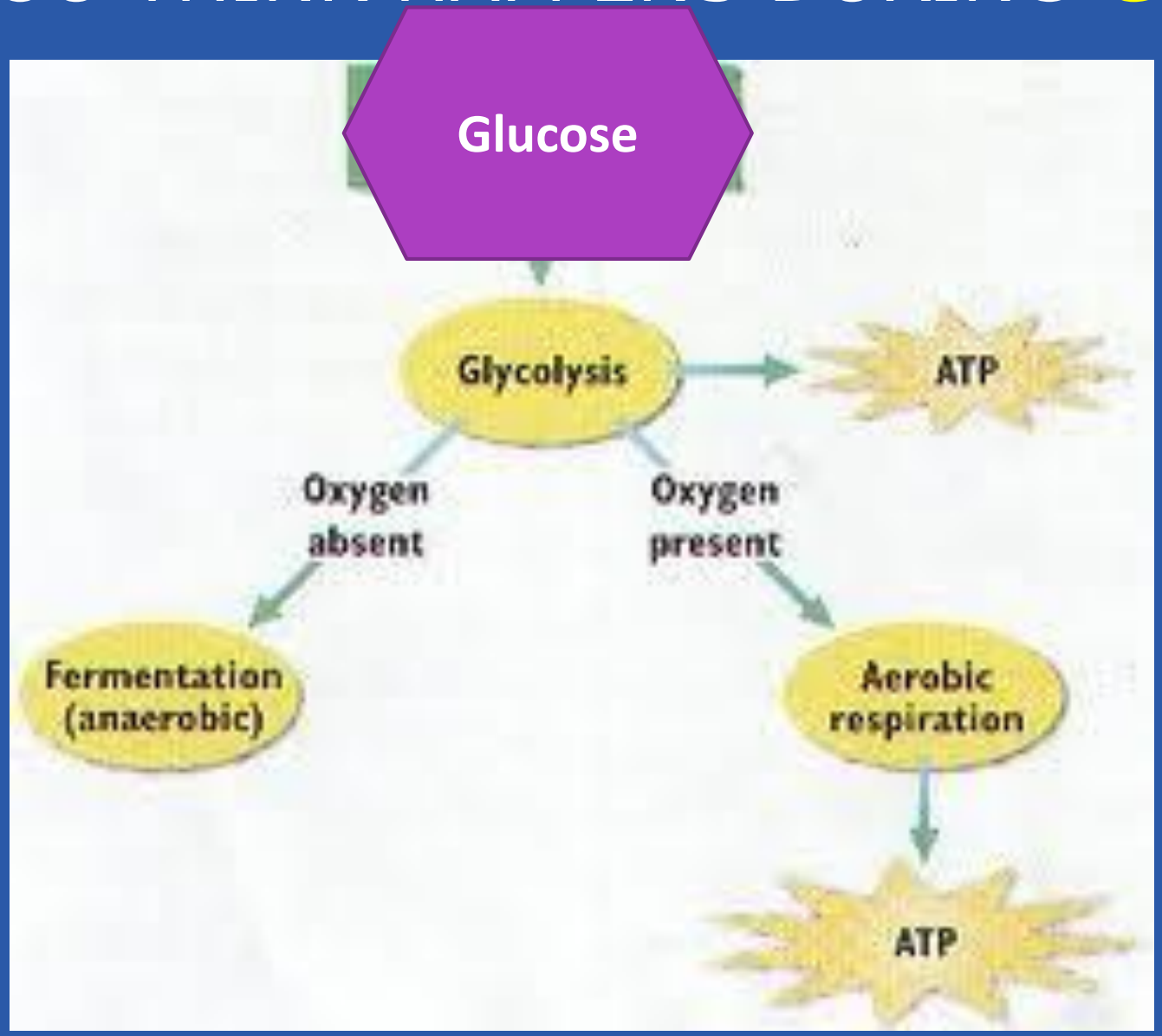


WHAT DO YOU THINK HAPPENS DURING **GLYCOLYSIS?**

Glycolysis Song

CR video intro

CR video1



2 ATP

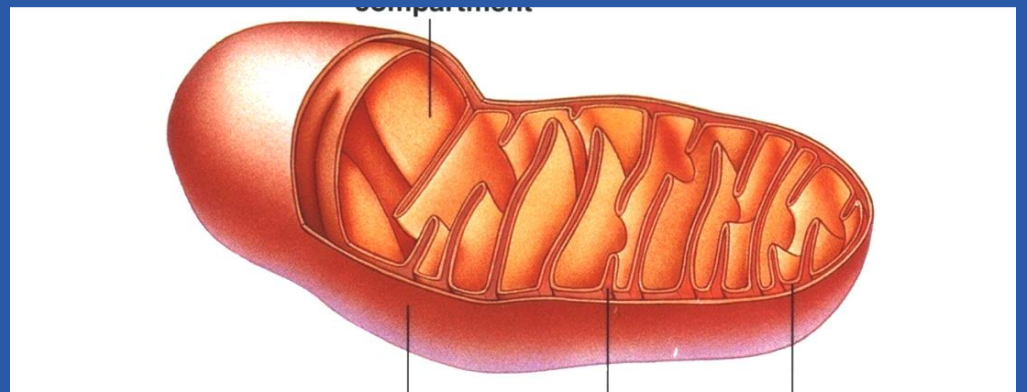
36 ATP

HOW IS A MARATHON RUNNER DIFFERENT FROM A SPRINTER?

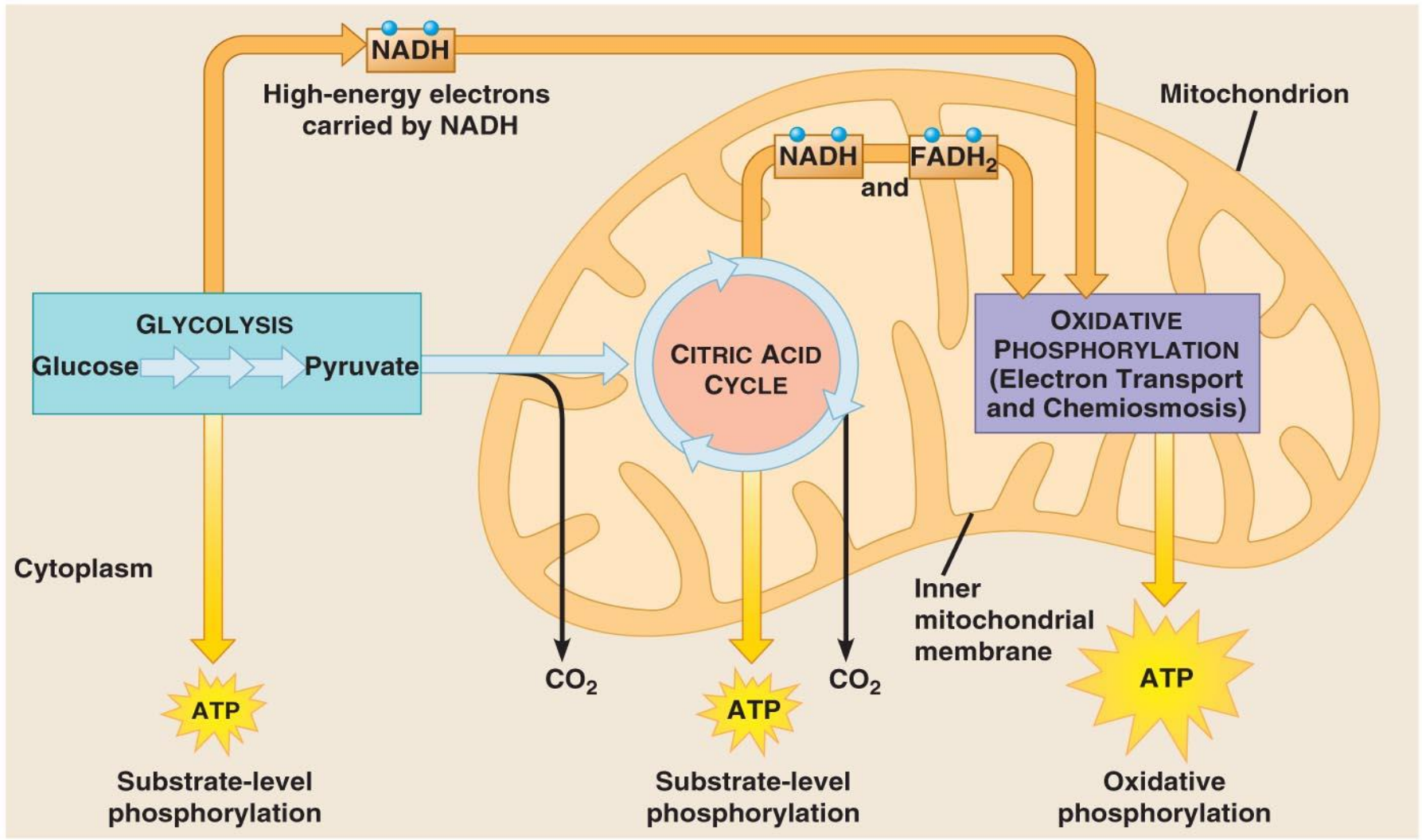
CELLS CAN GENERATE **ATP ENERGY** FROM GLUCOSE IN **2** DIFFERENT WAYS:

1. **Aerobic** Respiration mixes glucose with **oxygen** inside a **mitochondria** to release **38** ATP per glucose

- Results in a **slow**, steady supply of energy
- Glucose is completely broken down into **CO_2** and **H_2O**.



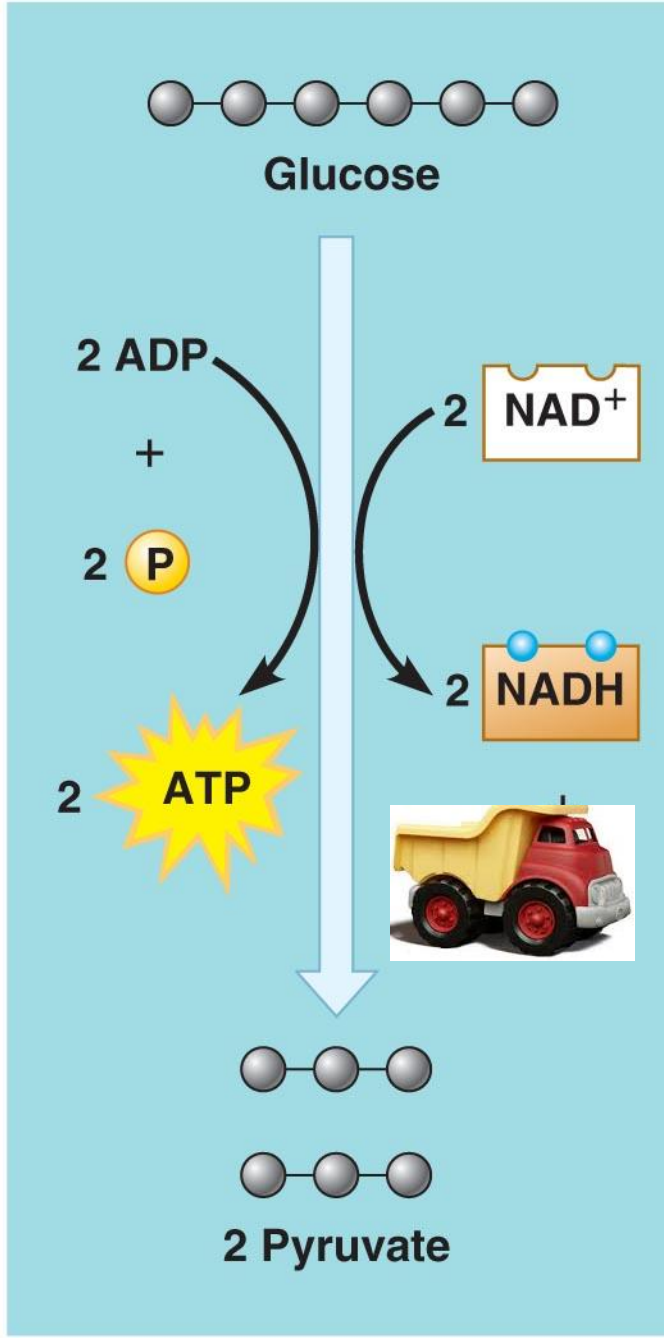
AEROBIC RESPIRATION IN A MUSCLE CELL



Glycolysis Song

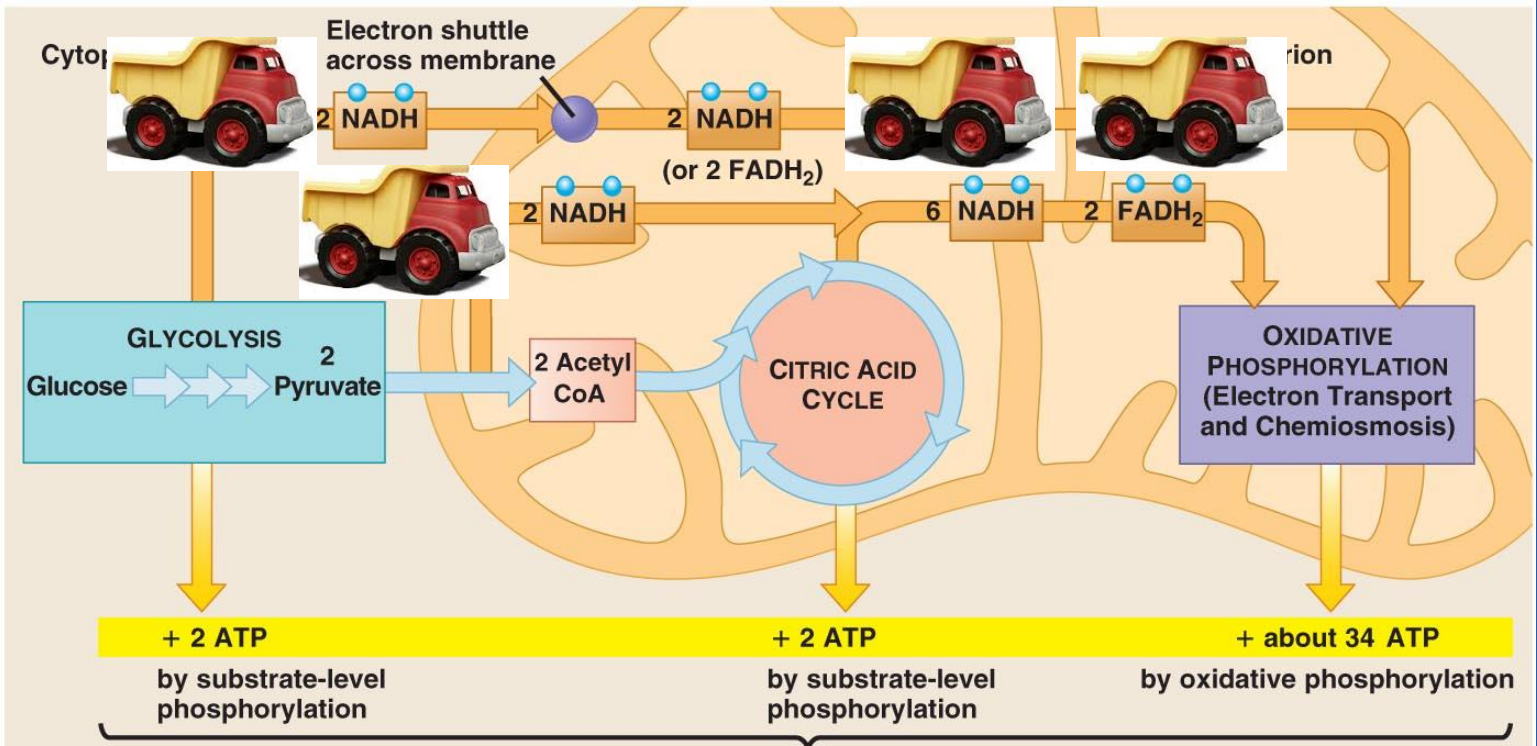
GLYCOLYSIS :

1) happens in the __cytoplasm__
2) "__cracks__" a glucose in half
3) Forms __2__ 3-C Pyruvate molecules
4) Recharges __2__ ATP
5) Loads __2__ NADH energized electron "dumptrucks" that carry the energy to the __mitochondria__



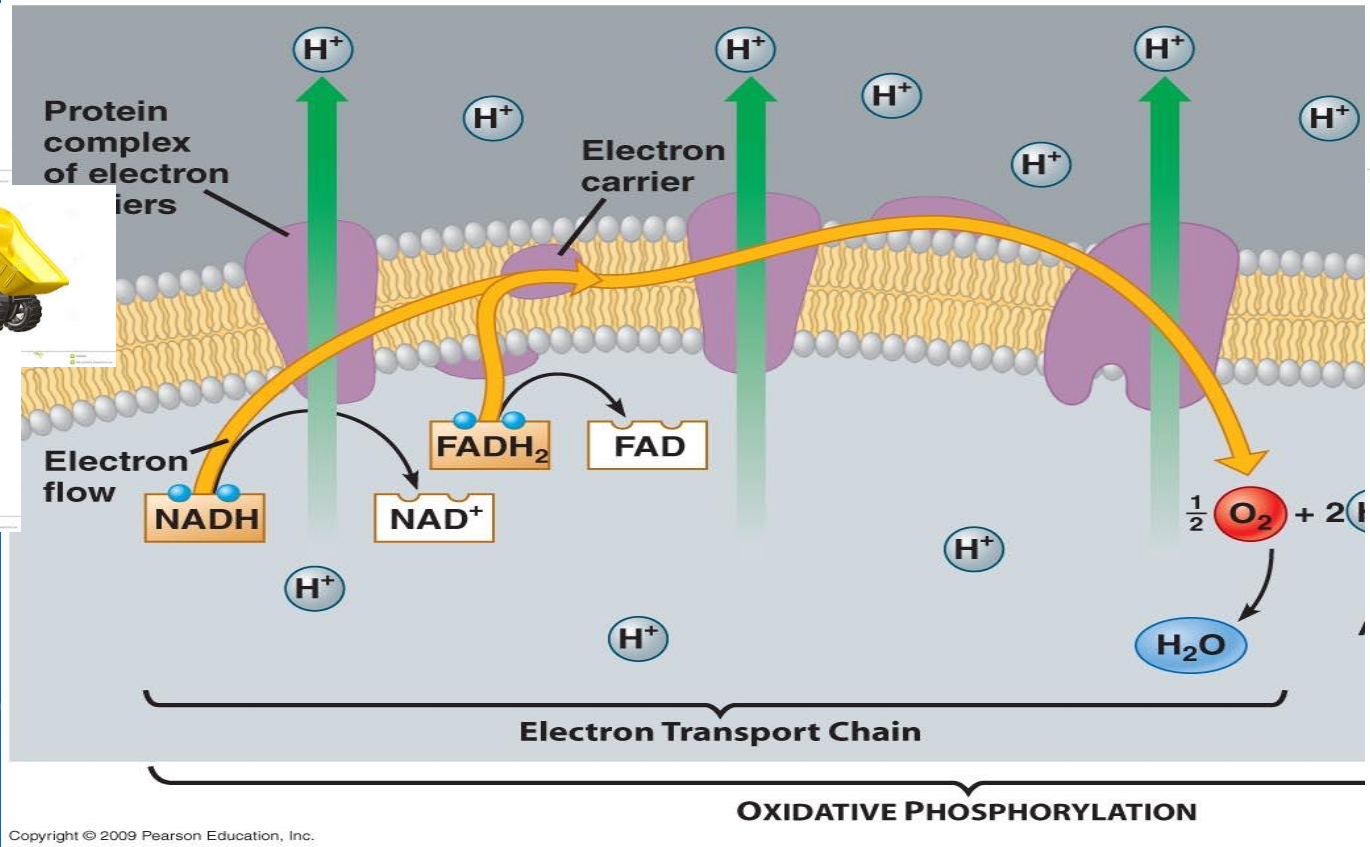
AEROBIC Respiration :

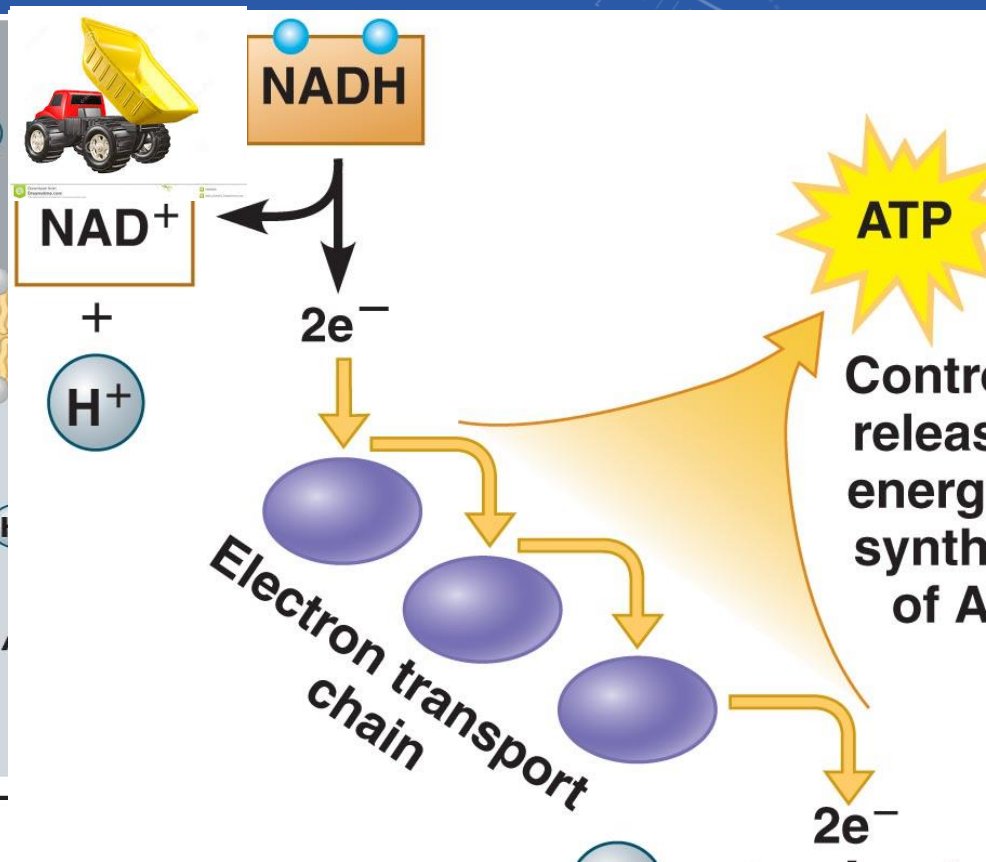
1) happens in the mitochondria
2) Loads many more energized electron "dumptrucks" (NADH, $FADH_2$) with energy released from the 2 pyruvate molecules during the Citric Acid cycle



AEROBIC Respiration :

3) **Unload** many energized electron "dumptrucks" (NADH & $FADH_2$) releasing **electrons** that fall down the **ETC** "stairway" of the mitochondria's inner membrane

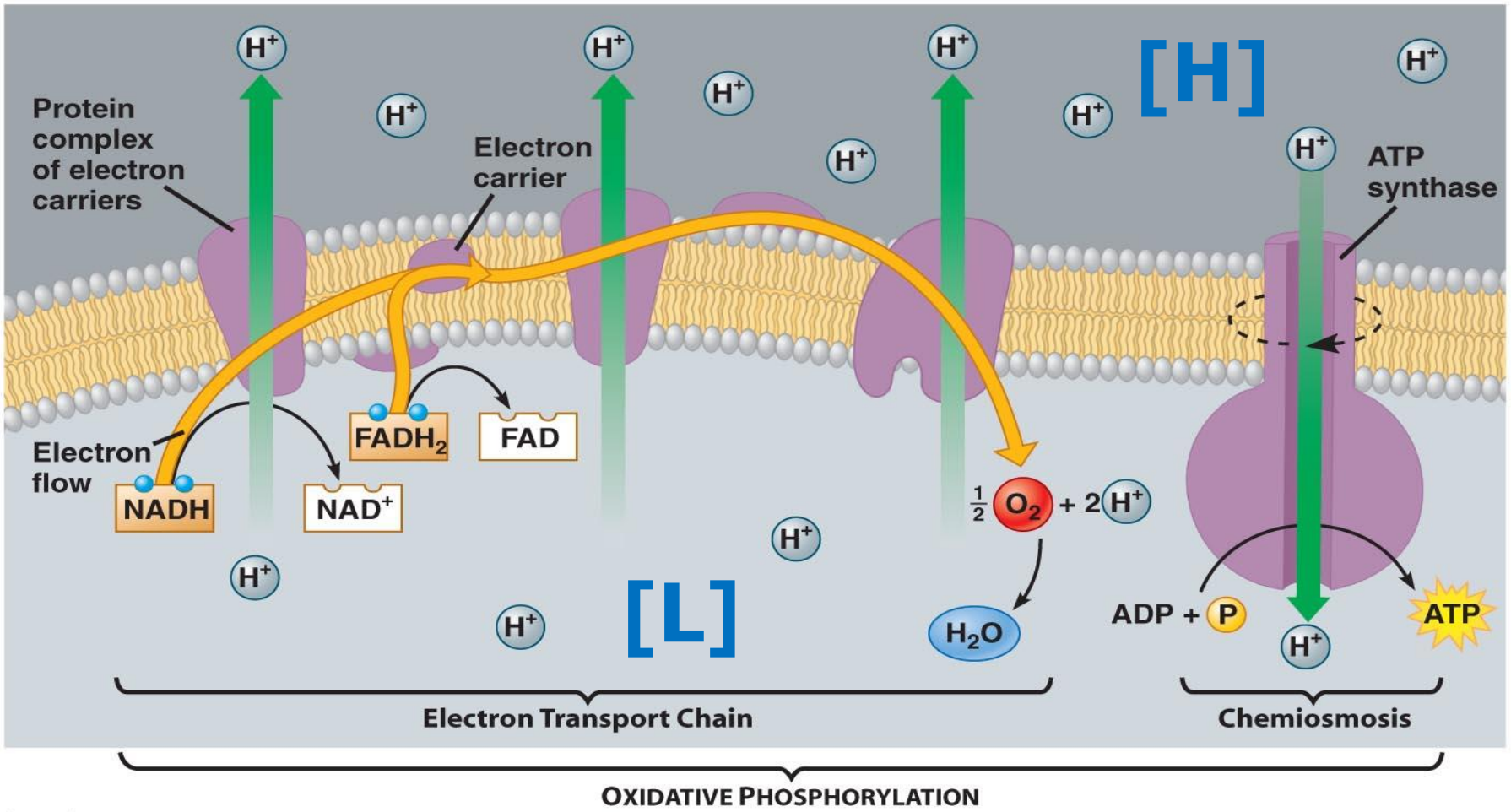




CAN YOU SEE WHAT O_2 IS DOING?

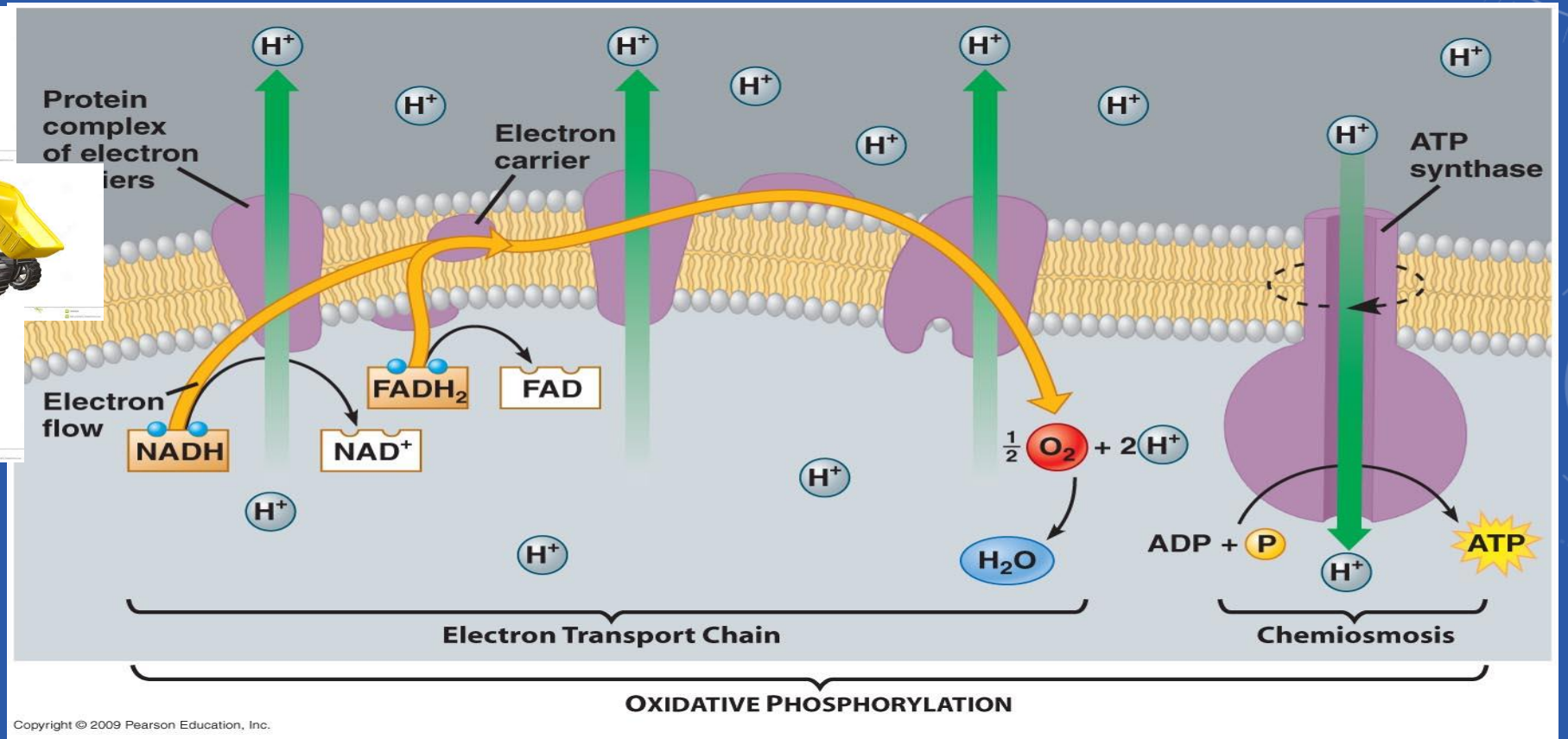
See any Active Transport?

See any Passive Transport



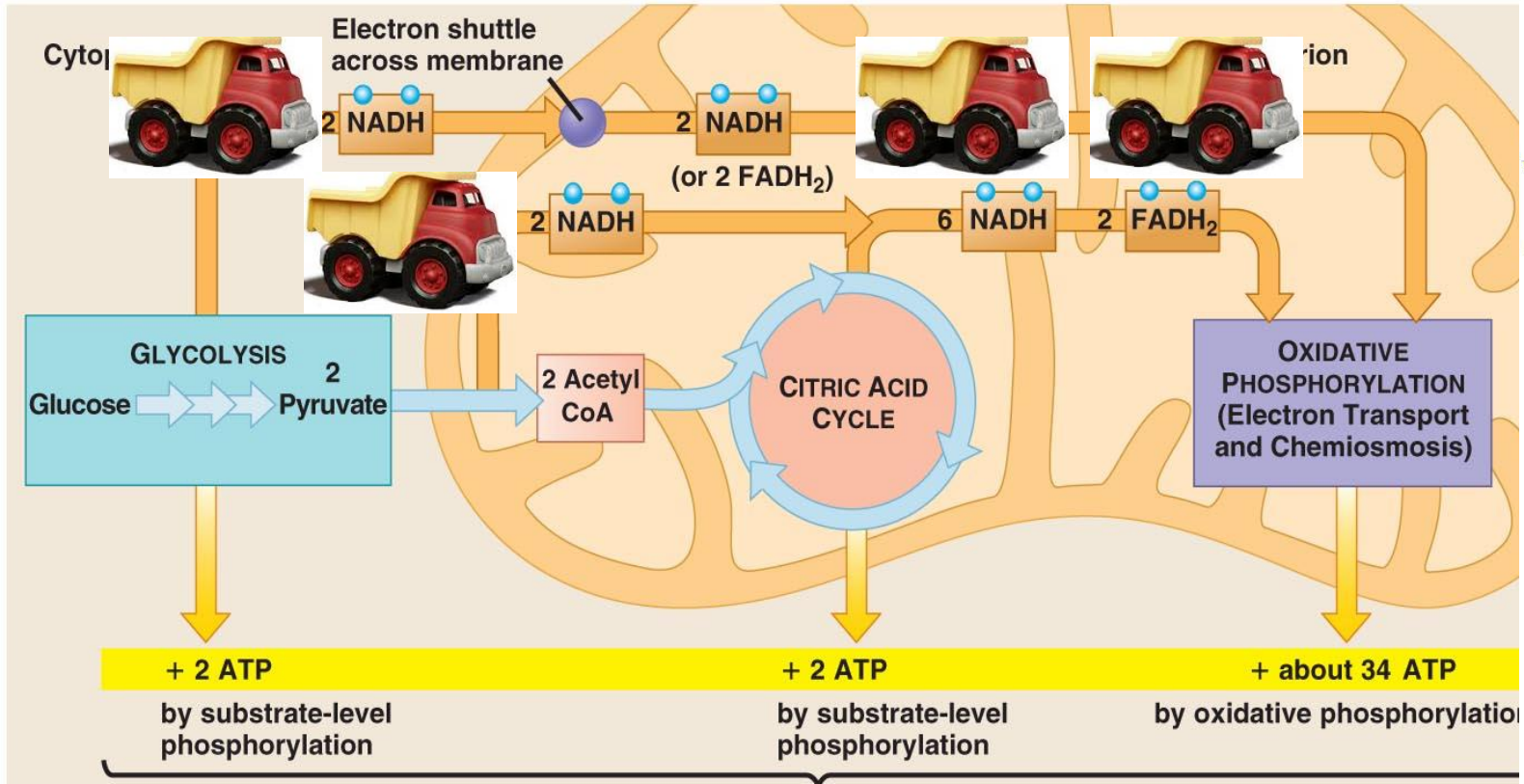
AEROBIC Respiration :

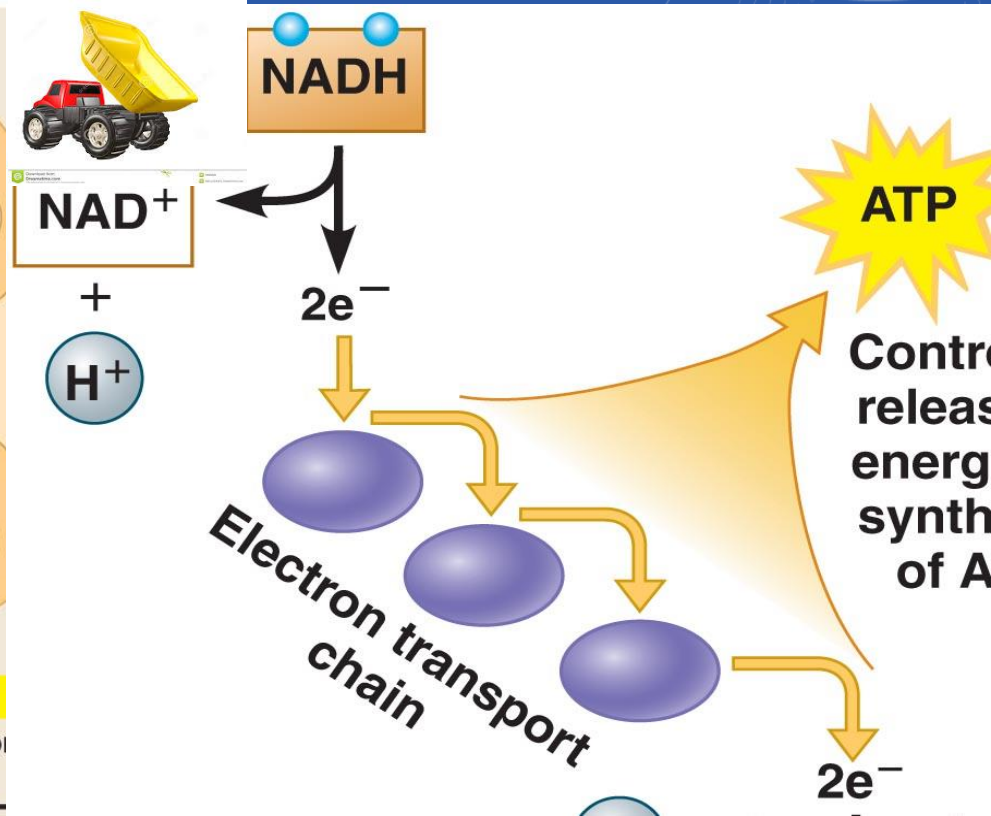
4) __Oxygen__ is needed to remove these electrons by forming __H_2O__ that can be used or removed from the cell. This keeps the ETC "stairway" __open__ for the next electron



AEROBIC Respiration :

5) Recharges __2__ ATP in the Citric Acid cycle
6) Recharges __34__ ATP as energized electrons play "__slinky__" down the **ETC** during the process of Oxidative Phosphorylation



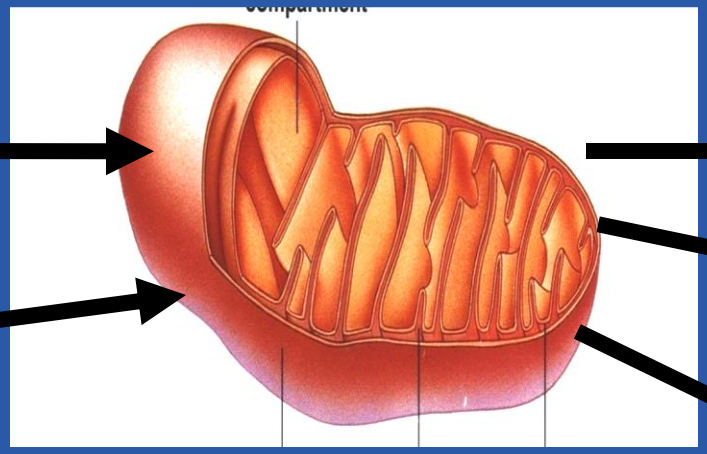


LET'S REVIEW **AEROBIC** RESPIRATION

Input Materials

glucose

O_2



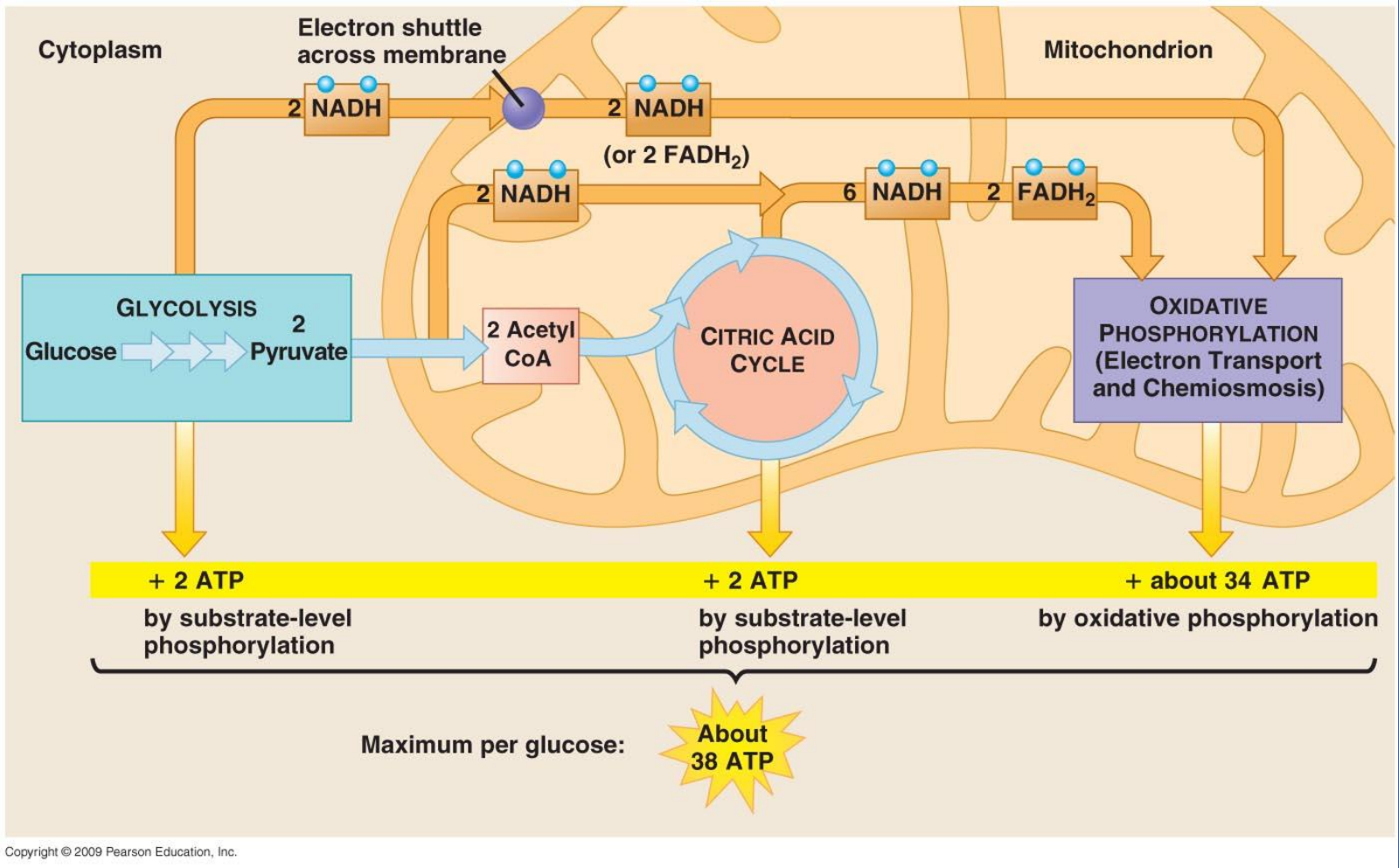
Output Materials

CO_2

H_2O

38 ATP

Glycolysis Song Kreb's Song OP Song



Cell respiration Song

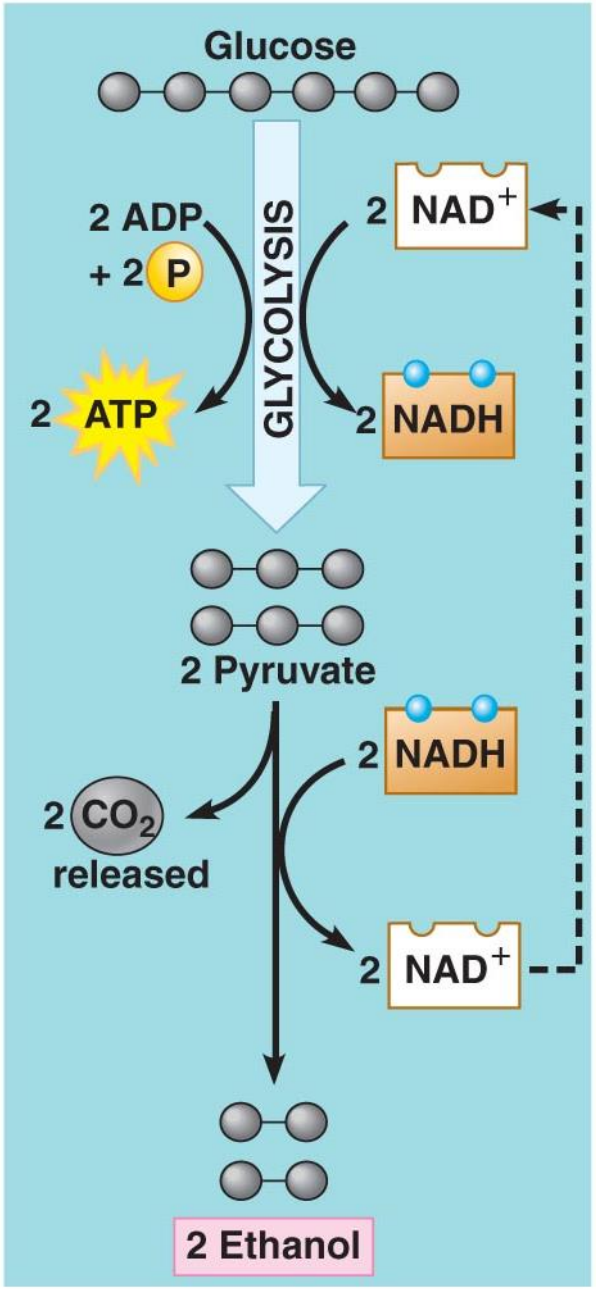
CELLS CAN GENERATE **ATP ENERGY** FROM GLUCOSE IN **2** DIFFERENT WAYS:

2. **Anaerobic** Respiration breaks down glucose without **oxygen** in the cytoplasm to release **2** ATP per glucose

- Results in a short, quick **blast** of energy
- Glucose is partially broken down into **Lactic Acid** which leads to sore and quickly fatigued muscles

WHAT MAKES BREAD DOUGH RISE?

Here is a HINT



Alcohol fermentation

FACTORS THAT AFFECT CELLULAR RESPIRATION

SPEED UP

- Increased oxygen
- Increased glucose
- Increased temperature

SLOW DOWN

- Decreased oxygen
- Decreased glucose
- Decreased temperature
- Extreme (hot or cold) temperatures could spell DEATH!!!!!

LET'S COMPARE AEROBIC AND ANAEROBIC RESPIRATION

Topics	Aerobic Respiration	Anaerobic Respiration
1) INPUT material?	Glucose O_2	Glucose
2) OUTPUT material?	CO_2 H_2O	Lactic Acid
3) Muscle Fiber Type?	Slow-fiber	Fast-fiber
4) Cell Location?	Mitochondria	Cytoplasm
5) # ATP Produced?	38	2
6) Energy is Delivered?	Low n steady	High n quick

LET'S COMPARE PHOTOSYNTHESIS AND CELLULAR RESPIRATION

Topics	Photosynthesis	Cell Respiration
1) INPUT material?	CO_2 H_2O	Glucose O_2
2) OUTPUT material?	Glucose O_2	CO_2 H_2O
3) Energy direction?	Absorbed	Released
4) Energy TERM?	Endergonic	Exergonic
5) Chemical bonds are?	formed	broken
6) Organelle needed?	Chloroplast	Mitochondria
7) Cell type?	Plant Only	Both Plant & Animal

IF I CARVE THIS TURKEY … DO I GET WHITE MEAT OR DARK MEAT?

IF I CARVE THIS TURKEY … DO I GET WHITE MEAT OR DARK MEAT?

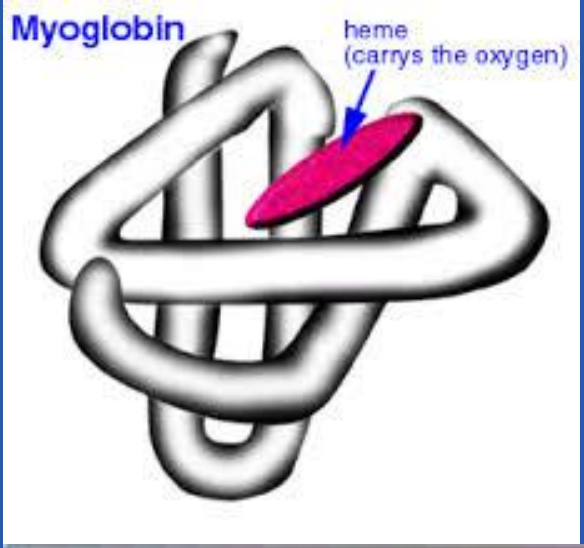
IF I CARVE THIS GOOSE… DO I GET WHITE MEAT OR DARK MEAT?

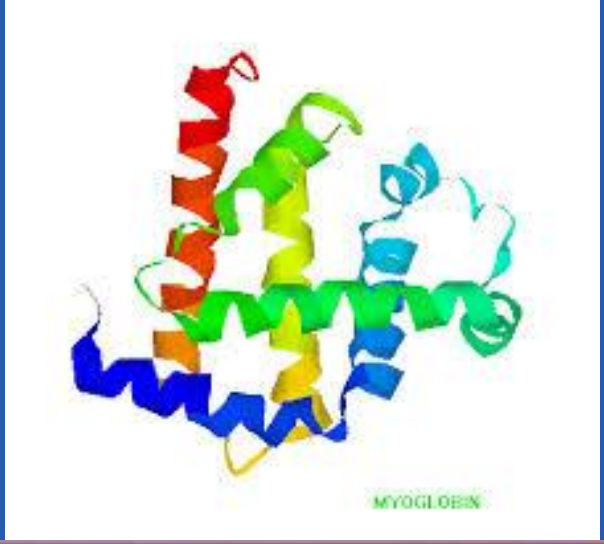
IF I CARVE THIS GOOSE… DO I GET WHITE MEAT OR DARK MEAT?

W vs D video 1

W vs D video 2

MEET MYOGLOBIN … THE O_2 "TAXI"





CHRISTMAS ISLAND

RED CRABS

Video 1

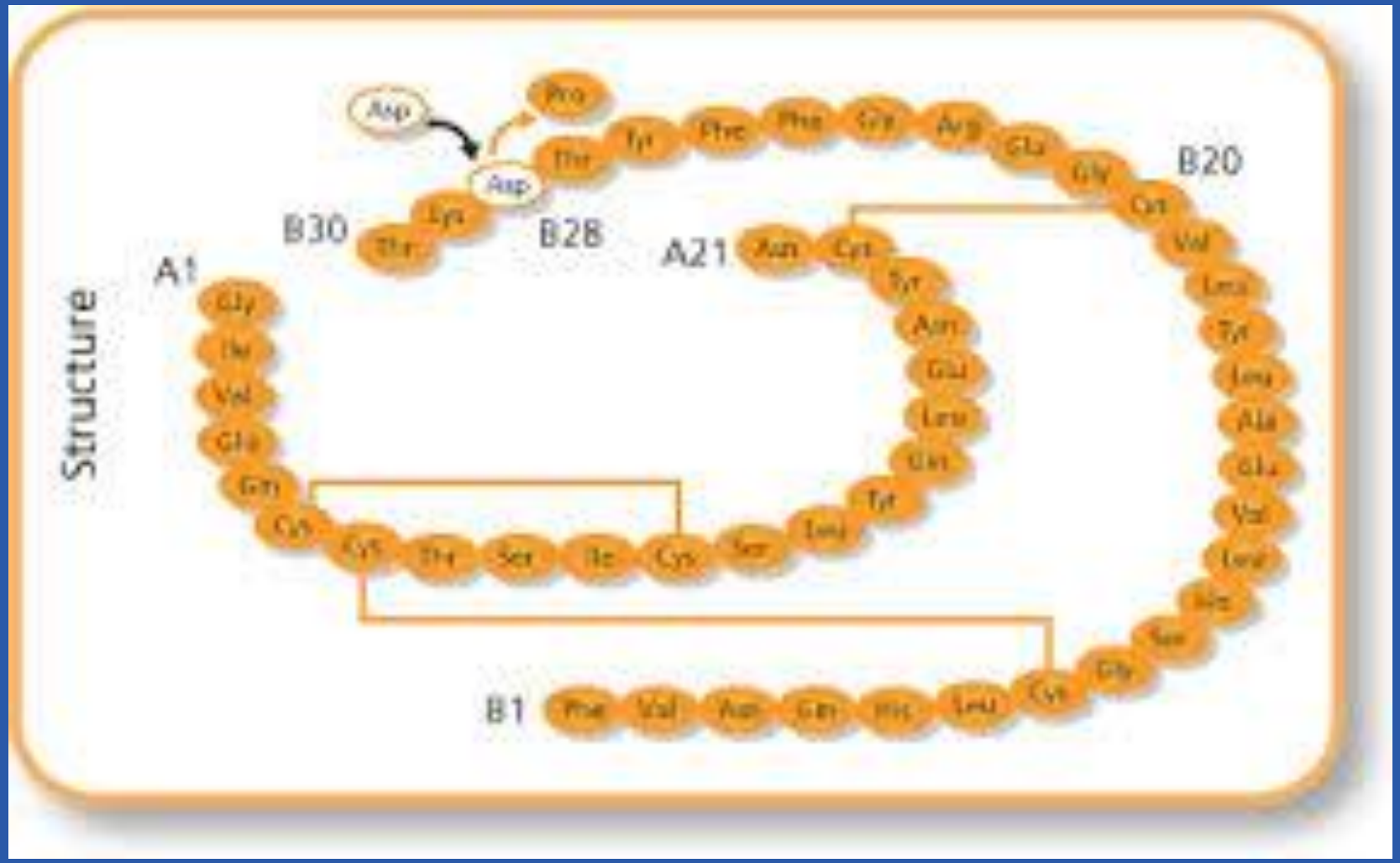
Video 2

Crab Migration

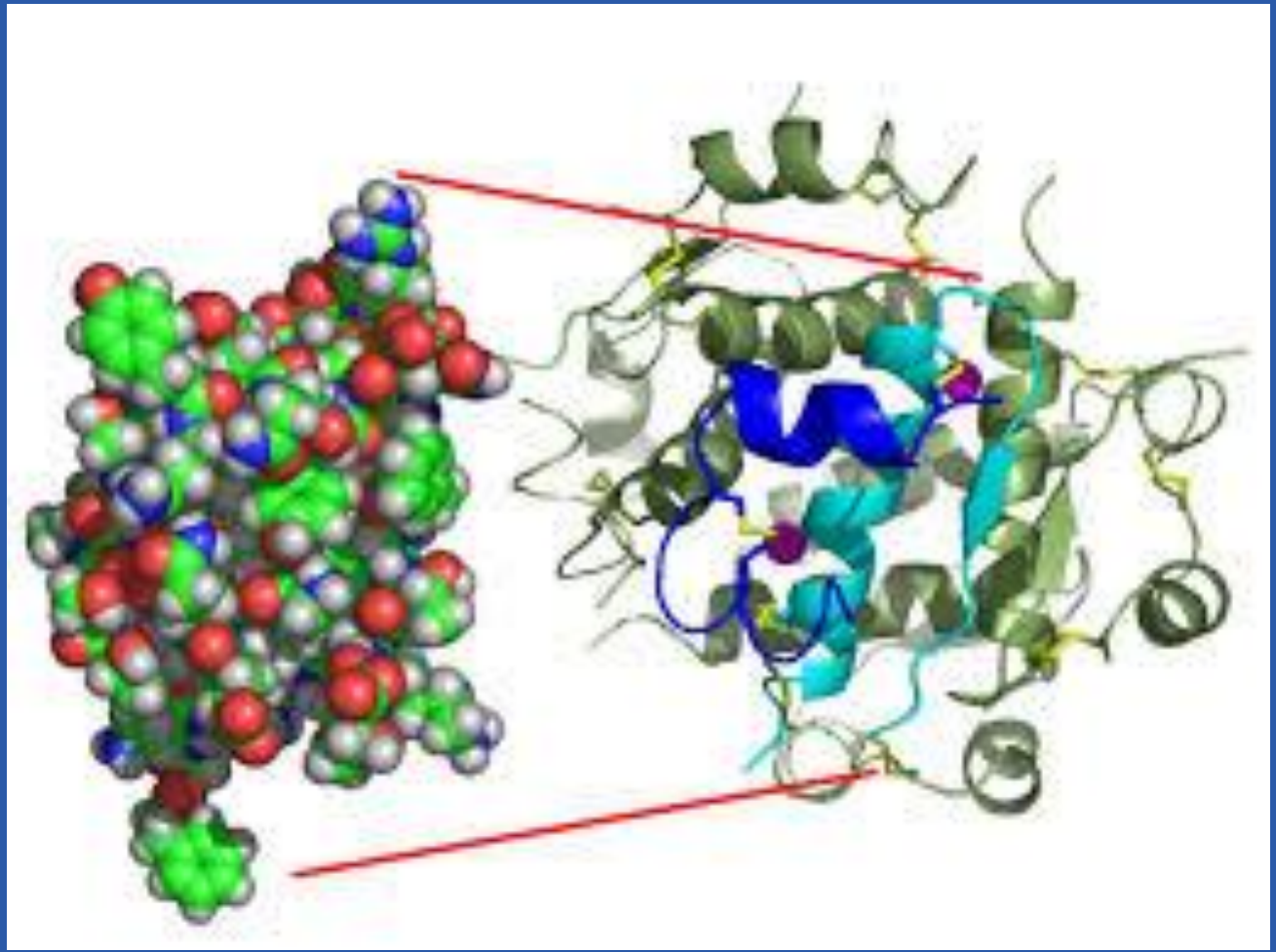
Good Luck Dance

Babies Return

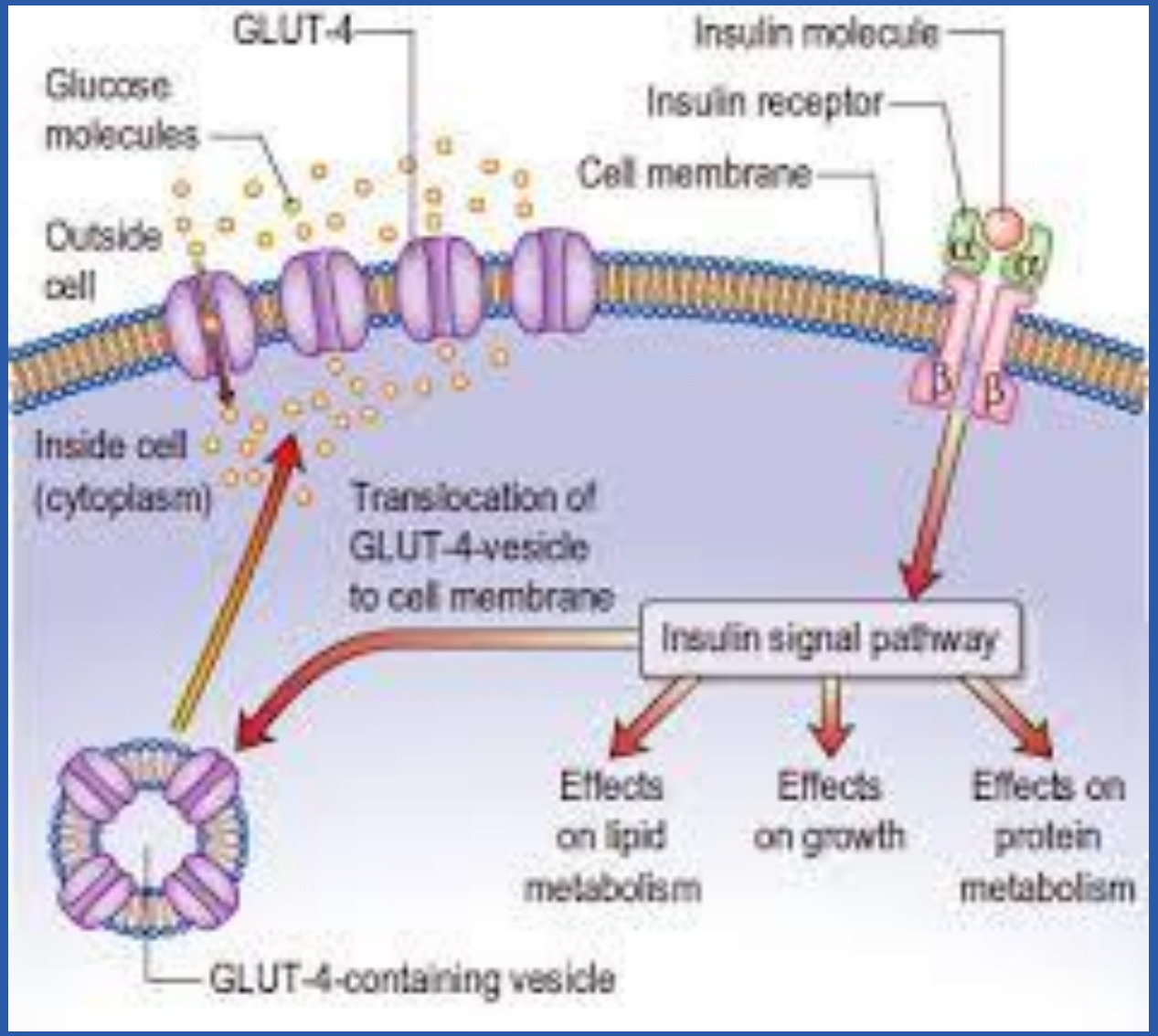
MEET INSULIN … THE "KEY" THAT OPENS THE TRANSPORT PROTEIN FOR GLUCOSE



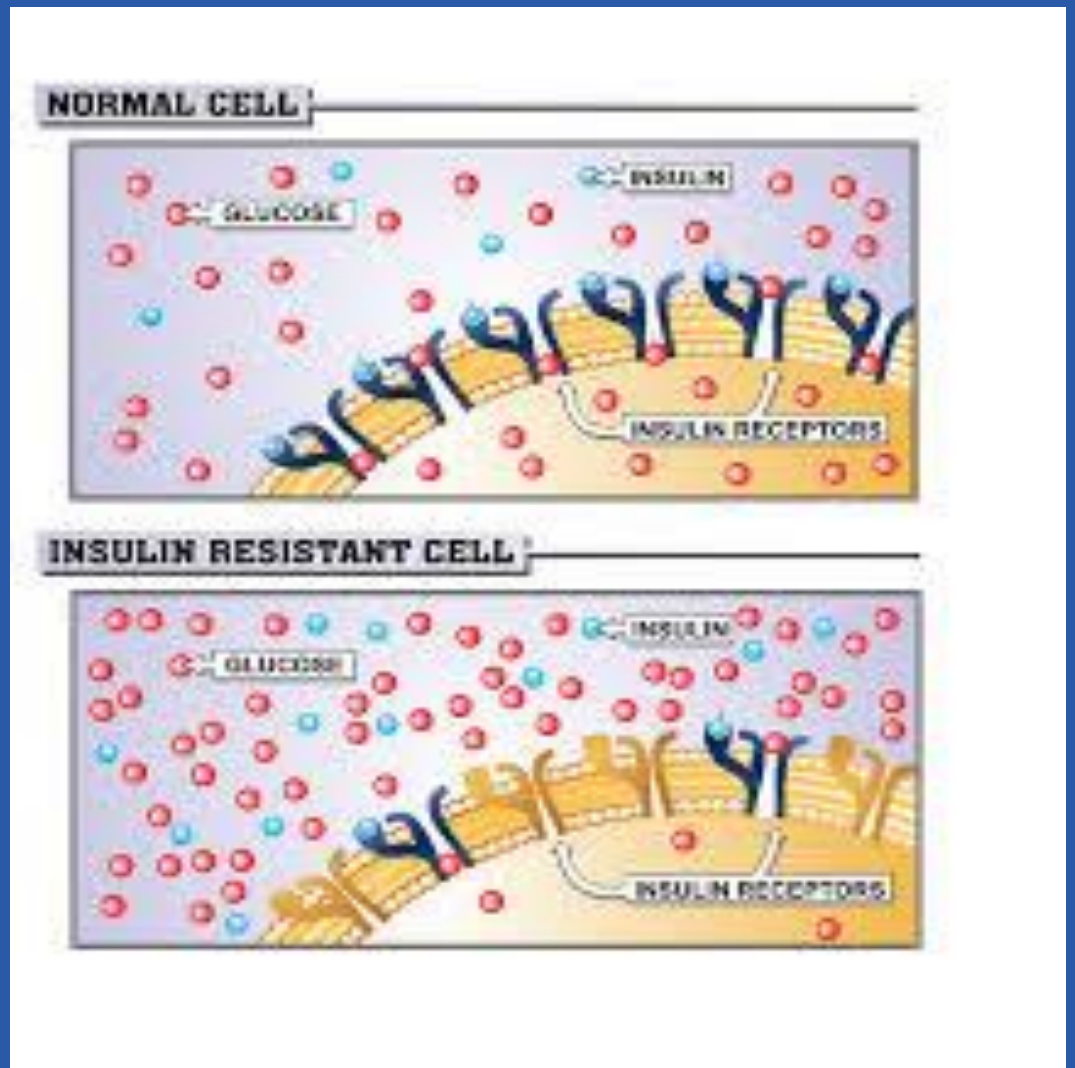
MEET INSULIN … THE "KEY" THAT OPENS THE TRANSPORT PROTEIN FOR GLUCOSE



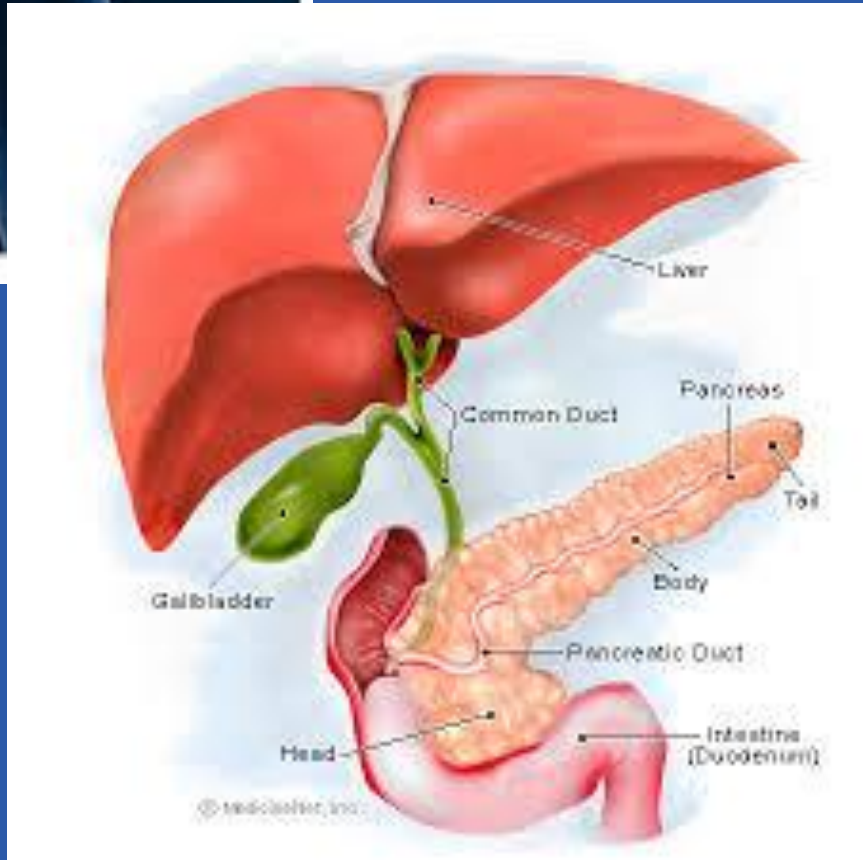
MEET INSULIN … THE "KEY" THAT OPENS THE TRANSPORT PROTEIN FOR GLUCOSE



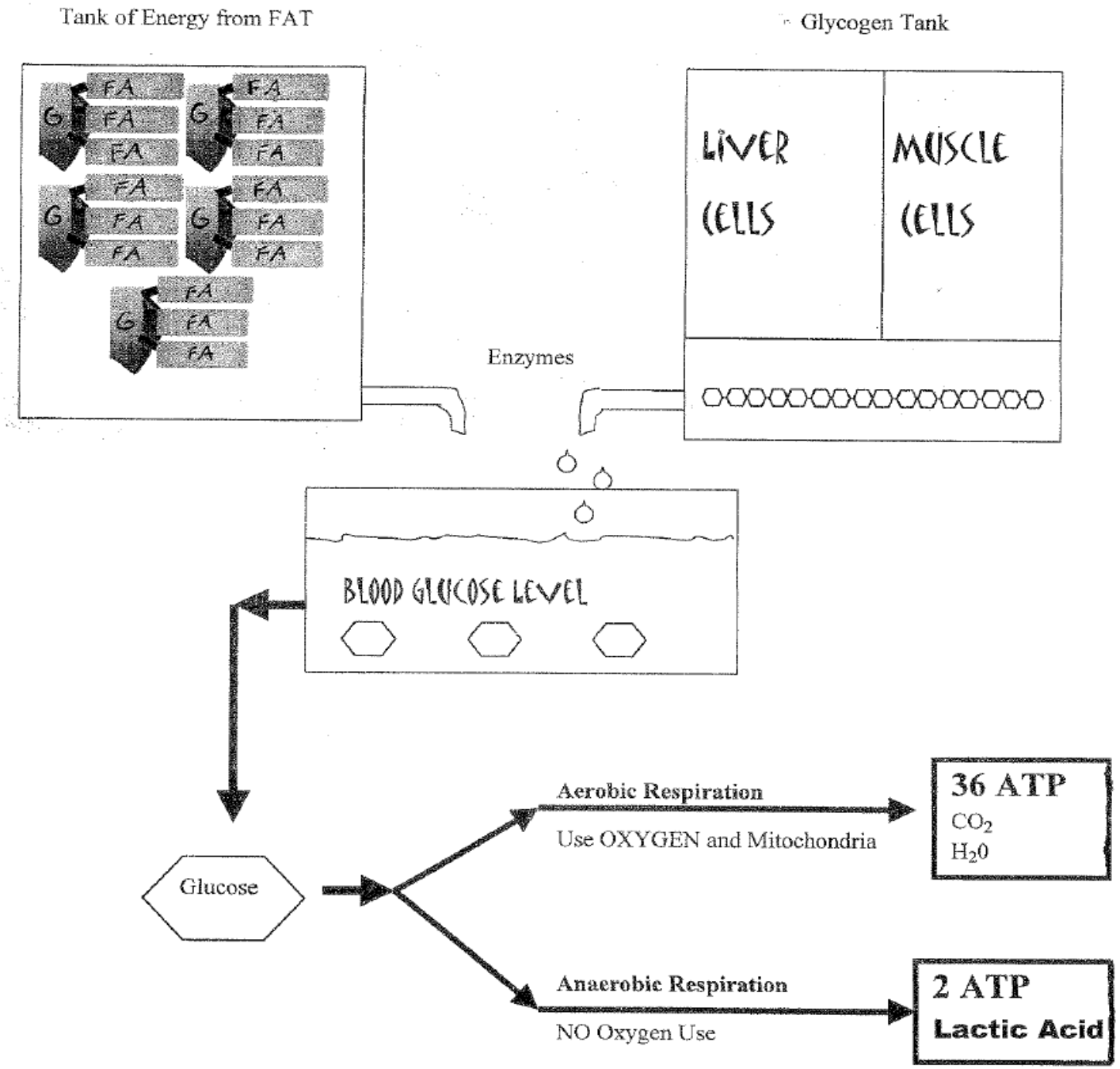
MEET INSULIN … THE "KEY" THAT OPENS THE TRANSPORT PROTEIN FOR GLUCOSE



Insulin video


Liver
Common Duct
Pancreas
Tail
Body
Gallbladder
Pancreatic Duct
Head
Intestine
(Duodenum)

BIG PICTURE of Cellular Respiration Dynamics



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.)

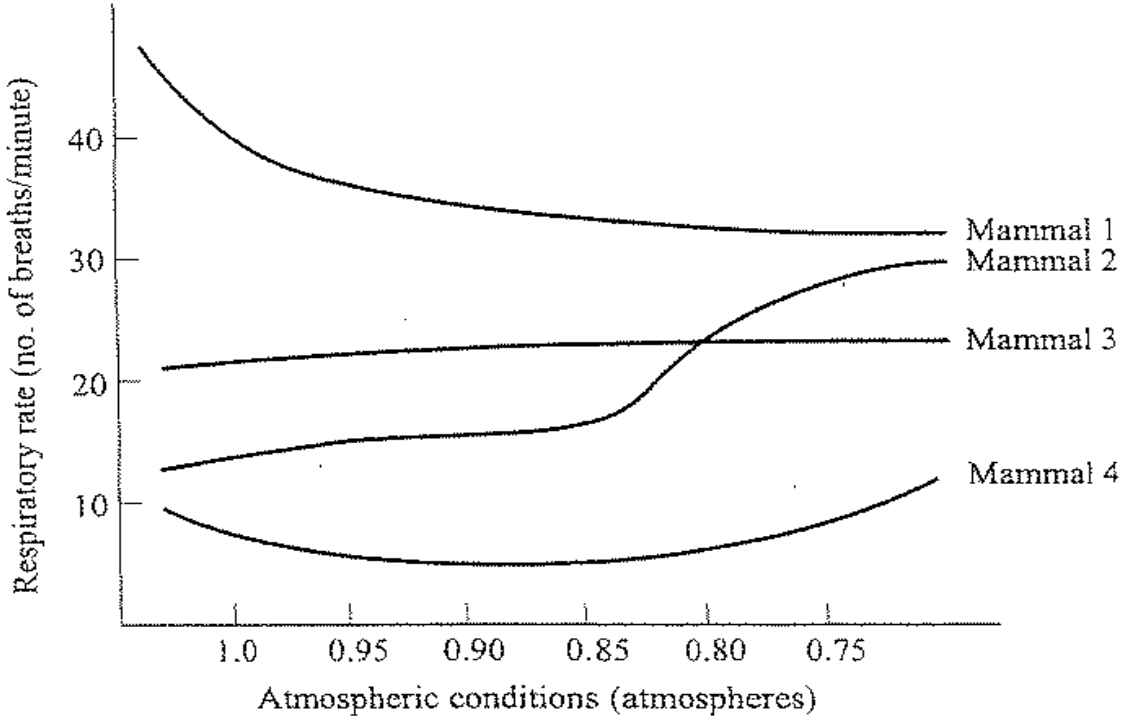


Figure 1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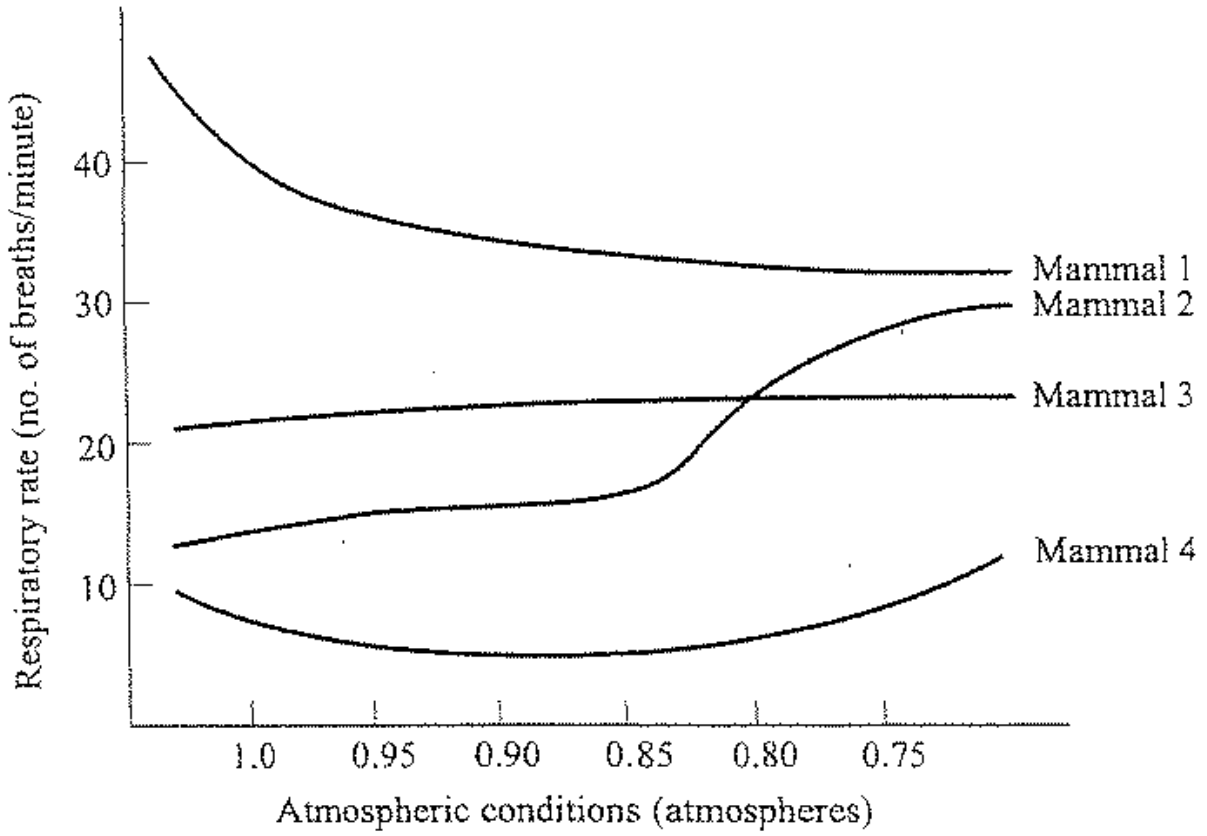


Figure 1

14. What is the general relationship between respiratory rate and atmospheric pressure for Mammal 2?

F. Decreases in pressure decrease the respiratory rate.

G. Decreases in pressure increase the respiratory rate.

H. Pressure changes have no effect on the respiratory rate.

J. Increases in pressure increase the respiratory rate.

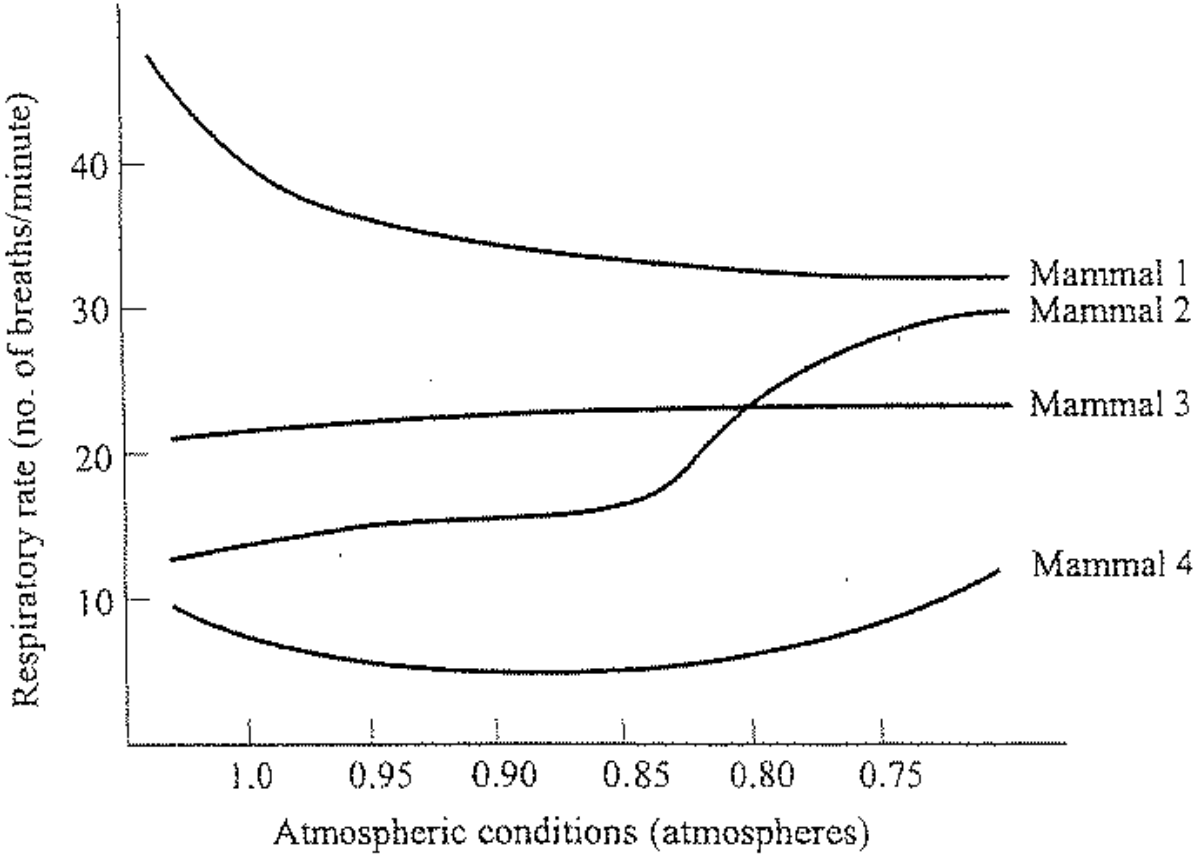


Figure 1

15. At approximately which pressure, in atmospheres, did Mammals 2 and 3 have the same respiratory rate?

A. 1.0
B. 0.95
C. 0.80
D. 0.75

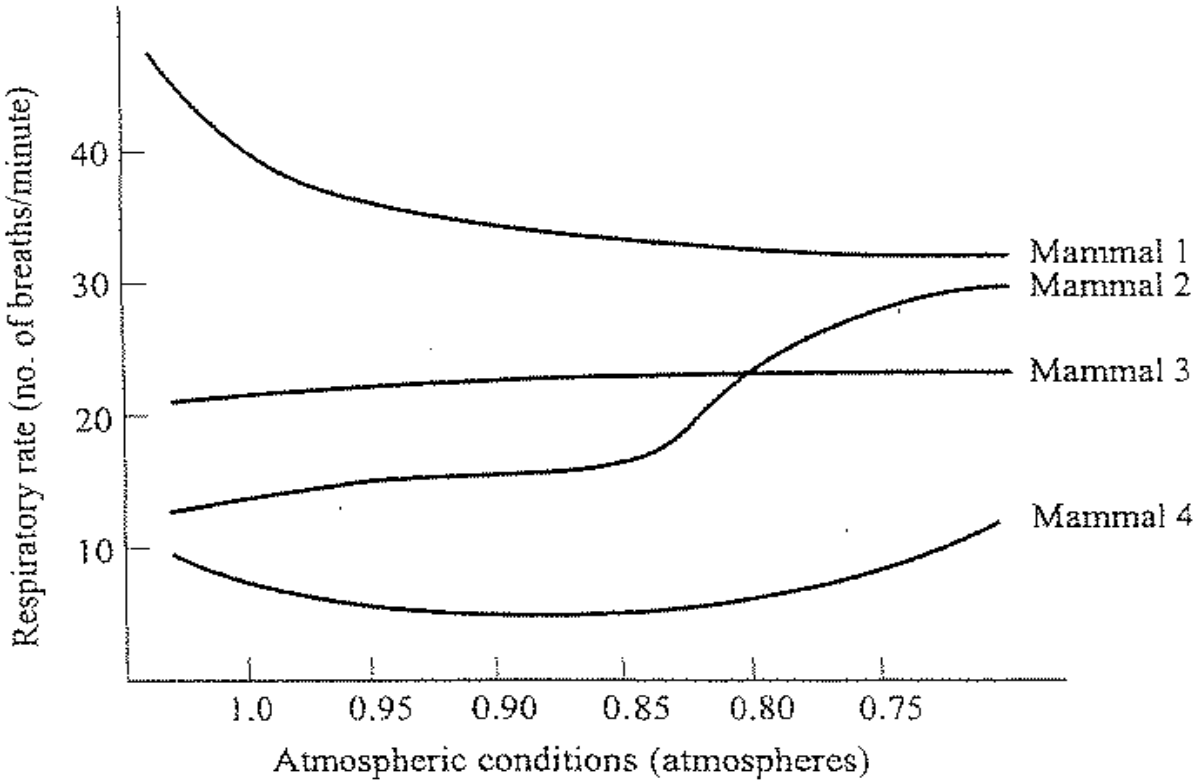


Figure 1

16. 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:
    F. Mammal 4 was in a warmer environment than Mammal 2.
    G. Mammal 4 was significantly larger than Mammal 2.
    H. Mammal 2 was significantly larger than Mammal 4.
    J. Mammals 2 and 4 were the same weight.

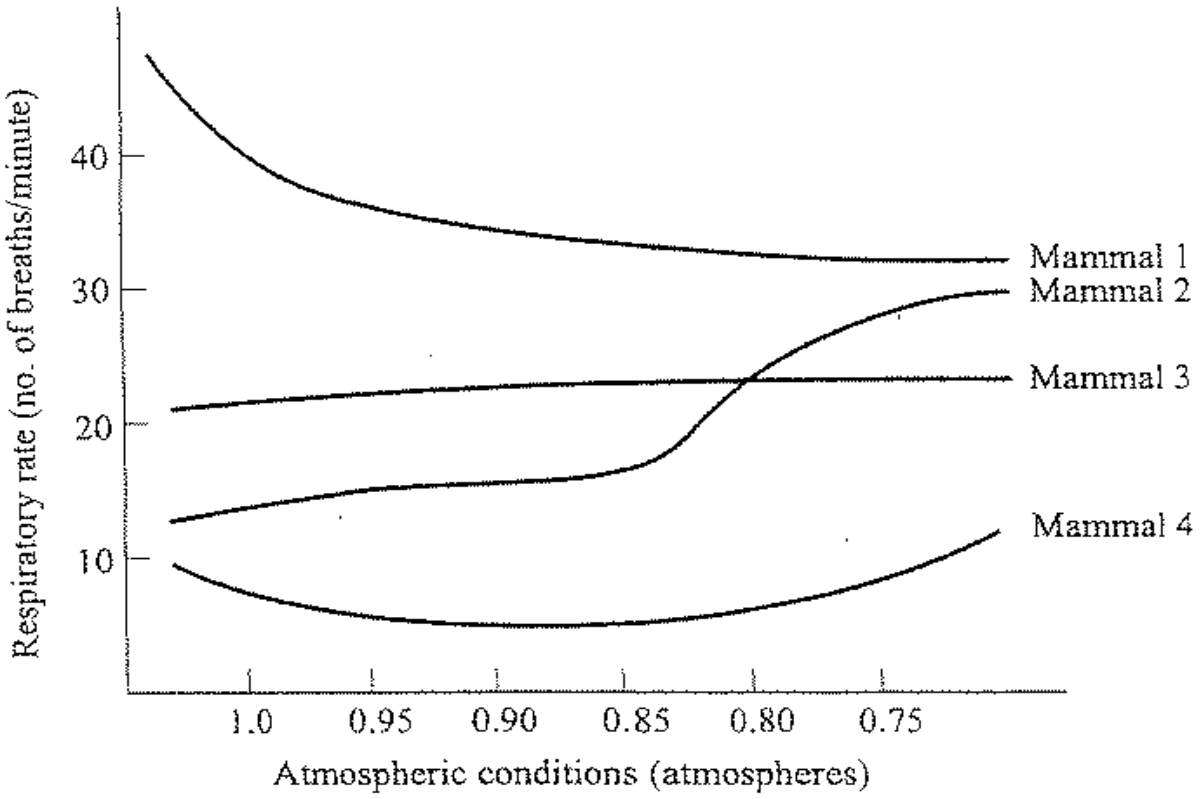


Figure 1

17. 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?

A. 1 only
B. 2 only
C. 4 only
D. 1 and 4 only

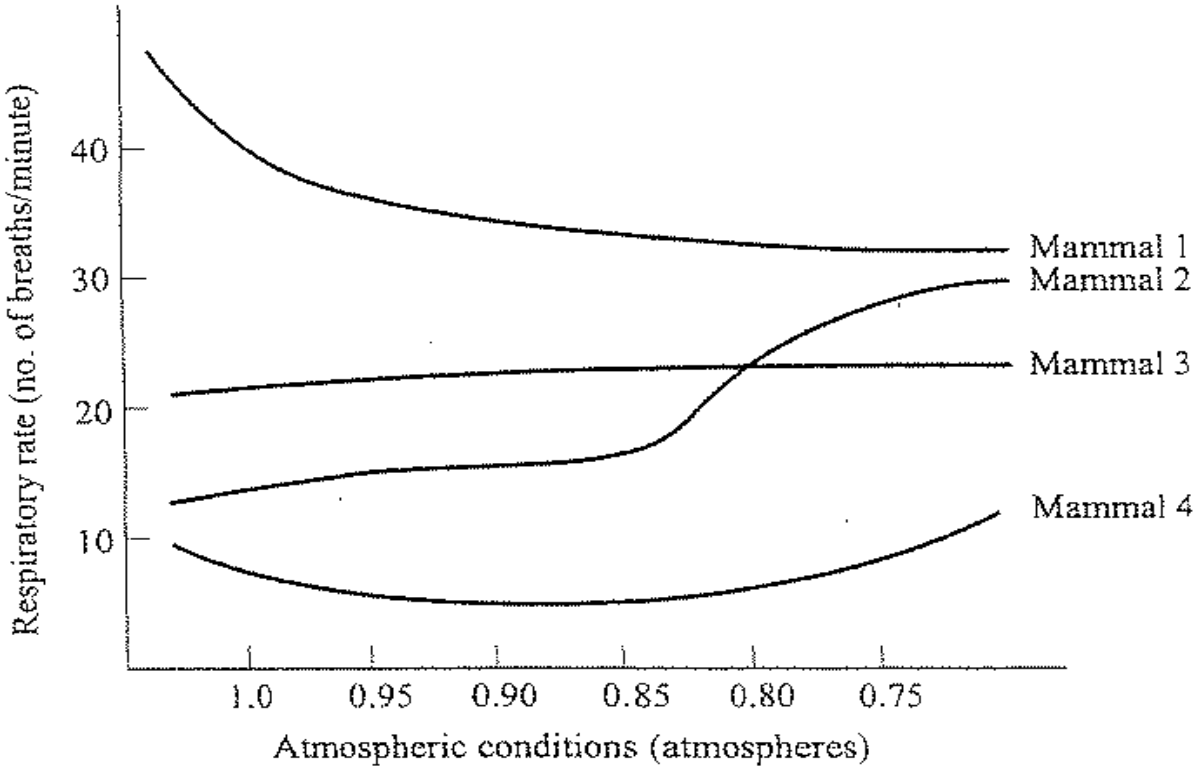
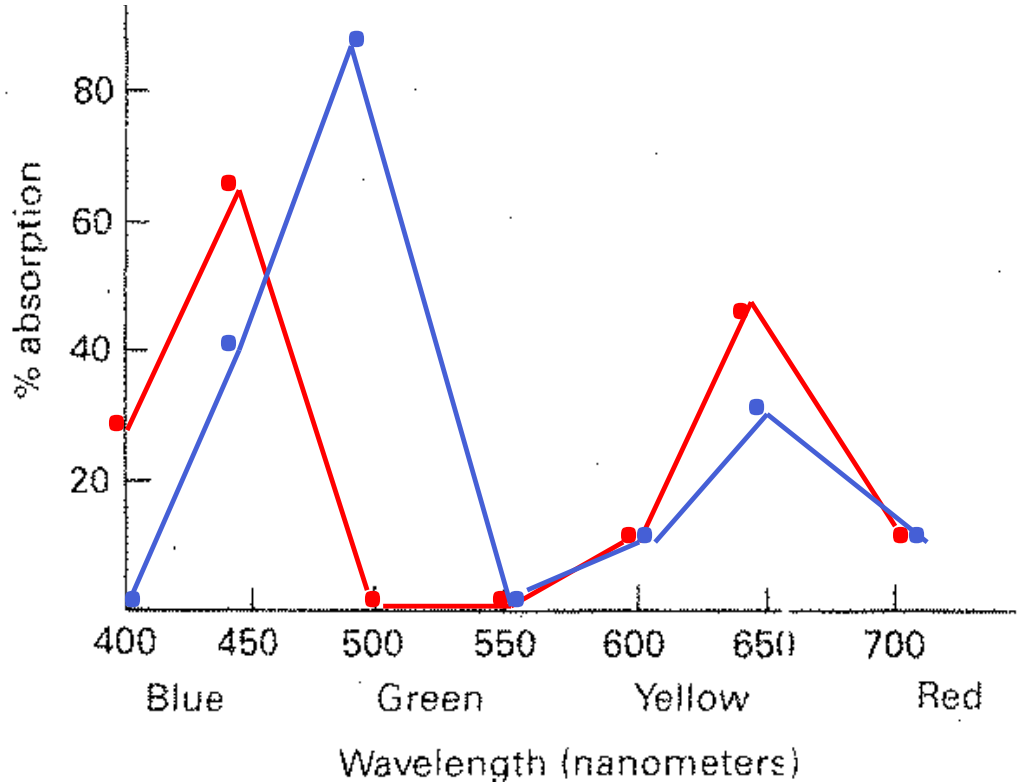


Figure 1

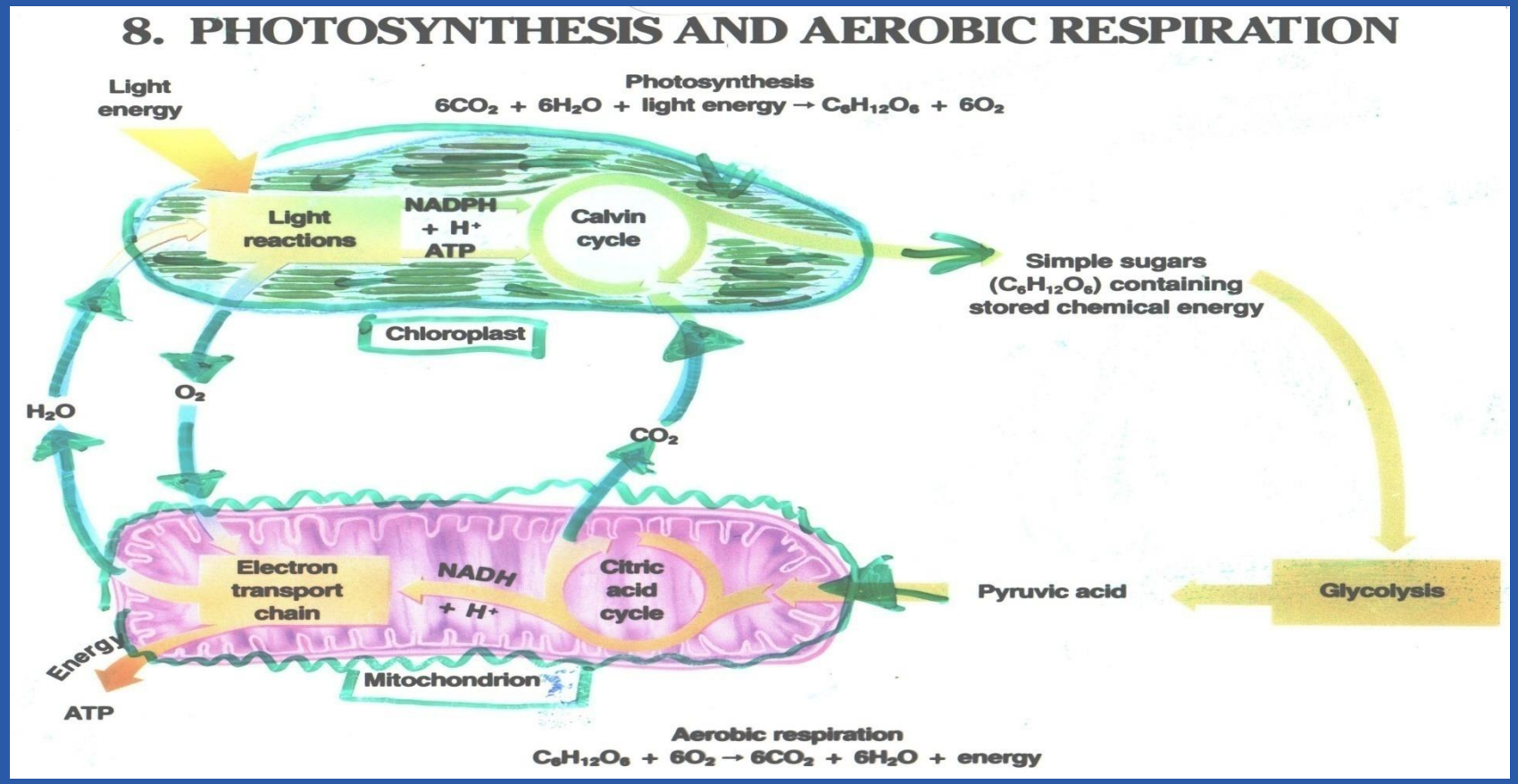
18. Based on the data in the graph, which of the mammals might be native to higher-altitude environments (meaning that they are more comfortable at higher altitudes than at lower altitudes)?

F. 1 only
G. 2 only
H. 3 only
J. 4 only

Wavelength	Chlorophyll A % Absorption	Chlorophyll B % Absorption
400 nanometers	30	0
450 nanometers	65	40
500 nanometers	0	85
550 nanometers	0	0
600 nanometers	10	10
650 nanometers	45	25
700 nanometers	10	10



- Mitochondria and chloroplasts are complementary organelles that both use **membranes with enzyme assembly lines** to process energy in opposite ways



- What color of light does chlorophyll b pigment **capture** the most effectively?
- What color of light does chlorophyll b pigment **reflect** the most effectively?