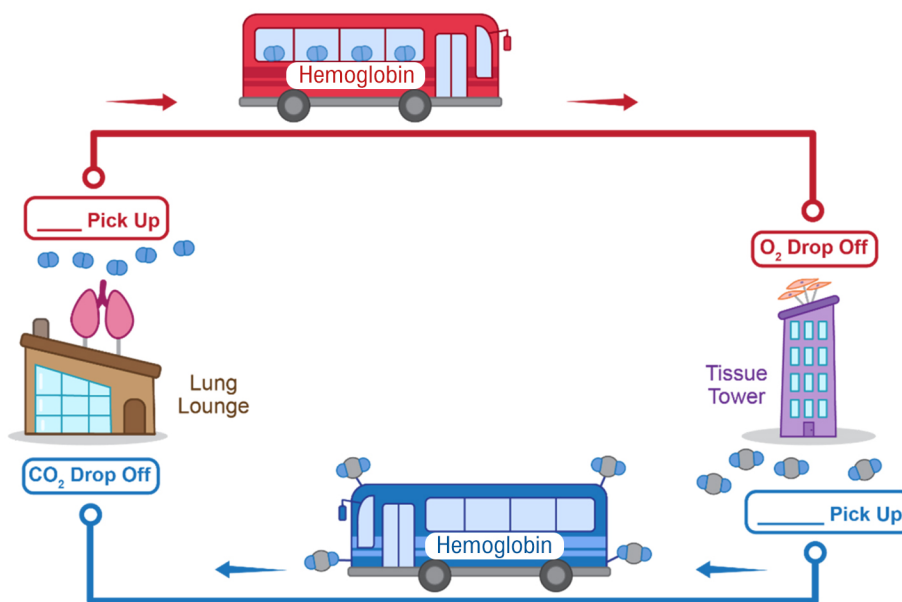


## TOPIC: ERYTHROCYTES: HEMOGLOBIN

### Function of Hemoglobin

- ◆ **Hemoglobin (Hb):** protein inside of RBCs that transports \_\_\_\_\_ and  $\text{CO}_2$ .
  - 1 RBC contains ~250 million hemoglobin molecules, making up ~97% of the RBC's mass.
  - Hemoglobin effectively *transports*  $\text{O}_2$  and  $\text{CO}_2$  because it binds them \_\_\_\_\_ (it binds & releases).



### EXAMPLE

Which of the following is most likely to occur if hemoglobin started binding to oxygen *irreversibly*?

- a) Your blood would circulate through your body slower.
- b) Your blood would circulate through your body faster.
- c) Your tissues would receive less oxygen.
- d) Your tissues would receive more oxygen.

### PRACTICE

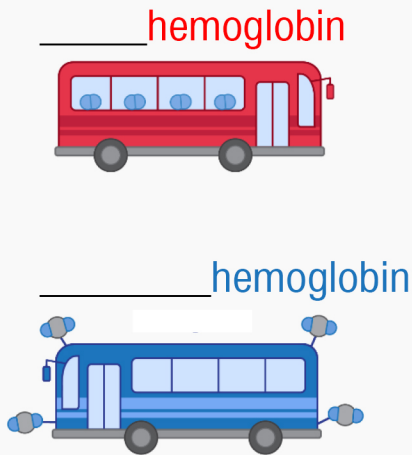
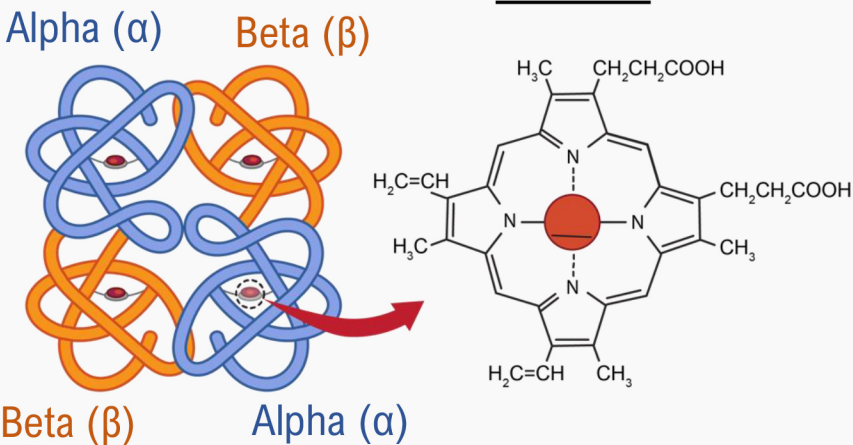
Why is it important for erythrocytes to have a high surface area to volume **ratio**?

- a) Increased cell flexibility.
- b) Allows for more efficient gas exchange.
- c) Allows each RBC to carry more hemoglobin.
- d) Allows RBCs to fit through small gaps.

## TOPIC: ERYTHROCYTES: HEMOGLOBIN

### Structure of Hemoglobin

- ◆ **Hemoglobin (Hb):** 4-subunit protein \_\_\_\_\_ that transports  $O_2$  using \_\_\_\_\_ groups.
- ◆ Each subunit has a heme group with a central  $Fe^{2+}$  that reversibly binds \_\_\_\_\_  $O_2$ , making oxyhemoglobin.
  - ▶ Therefore, each hemoglobin molecule can carry up to \_\_\_\_\_  $O_2$  at once  $\rightarrow Hb(O_2)_4$ .
- ◆ Hemoglobin can also bind \_\_\_\_\_  $CO_2$  at once (forming deoxyhemoglobin) but via *amino groups*, not heme.

	<h3>Hemoglobin Structure</h3> 
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### EXAMPLE

If each erythrocyte can carry 250 million hemoglobin molecules, how many molecules of oxygen can each erythrocyte carry at a time?

- a) 250 million.
- b) 62.5 million.
- c) 500 million.
- d) 1 billion.

### PRACTICE

How many heme groups are required to synthesize 4 hemoglobin molecules?

- |       |        |
|-------|--------|
| a) 4. | c) 16. |
| b) 8. | d) 32. |

## **TOPIC: ERYTHROCYTES: HEMOGLOBIN**

### **PRACTICE**

Cynthia lives in Miami, a city at low altitude. She goes on a month-long trip to the Andes Mountain range (at high altitude) where the air pressure is lower and therefore there is less oxygen in each breath she takes in. Upon returning to Miami, how might a sample of her blood differ from a sample taken before she left for her trip?

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- a) Each of her blood cells would carry fewer hemoglobin molecules.
- b) Each of her hemoglobin molecules would carry 5-6 oxygen molecules.
- c) Her hematocrit will have increased (more erythrocytes per  $\mu\text{L}$ ).
- d) There would likely be no change.

### **PRACTICE**

Anemia is a blood disorder where the  $\text{O}_2$ -carrying capacity of blood is too low to support the body's tissues. Considering this, which of the following is not a possible cause of anemia?

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- a) Iron deficiency.
- b) Blood loss.
- c) Deformed hemoglobin.
- d) Excess erythrocytes.