STEM Sims™

Blood Gas

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Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.

Start learning right now about the human body takes in oxygen and delivers this to cells. Take the following brief quiz to see how much you already know about blood gas. See the bottom of page 4 to check your answers.

1. What is the normal range for the pH of arterial blood?
   a. 6.55 – 7.02
   b. 7.03 – 7.37
   c. 7.38 – 7.42
   d. 7.43 – 7.62

2. What is the normal oxygen saturation level for a person at sea level?
   a. 70 – 80%
   b. 81 – 93%
   c. 94 – 100%
   d. above 100%

3. Which term is defined as “low oxygen levels in blood?”
   a. hypermia
   b. hypoxemia
   c. hypnomia
   d. hypermia

4. At which oxygen saturation level should a person need to immediately consult with medical personnel?
   a. 100%
   b. 98%
   c. 95%
   d. 90%

5. A person who lives in a location at a high altitude would be expected to have lower concentrations of oxygen in the bloodstream than a person living at sea level.
   a. true
   b. false

What is a Sigmoidal Curve?

The oxygen dissociation curve for hemoglobin is a sigmoidal curve. But what exactly is a sigmoidal curve and why should you care? Many processes in nature follow this type of curve. The titration of a strong acid with a strong base, how much wheat can be harvested depending on the salinity of the soil, and even the relationship between time and the learning of a new language. The table below shows the progress of how many new words of a foreign language a person learned over a period of 20 weeks.

Materials

1- Sheet of Standard Graphing Paper

Directions

1. Label the x-axis on your graph paper as “Time (in weeks)”
2. Label the y-axis on your graph paper as “The Number of New Words Learned.”
3. Create a scale on the x-axis from 1 – 20 weeks.
4. Create a scale on your y-axis from 0 – 100 words.
5. Plot the points from Table 1 below onto your graph.
6. Draw the “best-fit-line” through the points on your graph.
7. Answer the questions below.

Week	New Words Learned	Week	New Words Learned
1	3	11	90
2	3	12	91
3	4	13	92
4	5	14	93
5	6	15	94
6	8	16	96
7	15	17	98
8	40	18	98
9	60	19	99
10	80	20	100

Questions

1. What is the overall shape of the curve on your graph?

2. Describe in words what’s happening over time with respect to learning the new language.

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Moving on Up to Train!

Many elite athletes in the world temporarily move to high altitudes to conduct their training activities. These people seek out elevations of 7,000 to 8,000 feet (2,100 m – 2,400 m) above sea level. Since higher altitudes are associated with a lower concentration of oxygen in the air they breathe, the workouts are harder on the athletes' bodies, and they tire more easily.

Muscles that are fatigued increase the production a substance called erythropoietin (EPO) that is a hormone that increases the production of red blood cells. Over time and with many intense workouts, the athletes' bodies adjust to this new environment and produce many more red blood cells in their bloodstreams to cope with the lack of oxygen in the air.

Working out at altitude also increases the maximal oxygen intake ability of a person which increases the endurance of the athlete. A final benefit is that the athlete has a greater capacity for tolerating lactic acid buildup in the muscles of the body. Lactic acid is produced during vigorous muscular activity and produces fatigue and soreness in the muscles. This improved tolerance of lactic acid allows the athletes to feel less pain as they push their bodies beyond their normal capacities. The physiological gains made by training at altitude last for a short time once the athlete returns to a lower altitude.

Please visit our site for more helpful information:
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Answers: Page 2 Answers: 1) a, 2) c, 3) b, 4) d, 5) d. **Page 3 What is a Sigmoidal Curve Answers:** 1) The shape of the graph looks like the letter "S". 2) Answers will vary. The learning starts out very slowly, then increases rapidly for a while, and then follows a consistent level of learning new words.and place a carbon material on a paper in the form of this tracing.