Name: Date: Class:

Applying Our Learning to a Problem Worksheet Answer Key

We are ready to take what we've learned and apply it to a problem.

The problem:
In 2019, a nationwide outbreak of lung injuries led to the identification of EVALI, which stands for E-cigarette or vaping product use-associated lung injury. EVALI is a serious—and sometimes fatal—lung condition linked to the use of vaping products, particularly those that are unregulated or altered. The primary cause identified by health experts is vitamin E acetate, a substance that is safe to ingest or apply to the skin but becomes harmful when inhaled. When heated and inhaled, vitamin E acetate disrupts lung function and interferes with surfactants, leading to inflammation and tissue damage. Other toxic chemicals found in vaping products may also contribute to the condition.

Apply your learning to the problem—address the following items in the space below:

Apply your learning
What is the role of surfactants in our lungs? To reduce the surface tension of alveolar fluid, which prevents alveoli in our lungs from collapsing.
Draw a model of a lung alveoli containing alveoli fluid with functional lung surfactant. Be sure to include drawings of the different particles involved and the forces present. Remember to label all parts of your drawing. Refer to the video linked in the "Relating a Phenomenon to Our Everyday Lives - Part 1 " worksheet.

Turn this sheet over

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The potential problem with vape additives is that they can interfere with lung surfactants…
Describe what is meant by the word "interfere." Include the terms cohesion, surface tension, surfactants, and collapse in your response.

Surfactants in the alveolar fluid reduce the surface tension of the fluid and prevent the alveoli from collapsing during breathing. If an additive is interfering with the lung surfactant, that means that the surfactant can't do its job of lowering the surface tension of the alveolar fluid. The alveolar fluid particles are all attracted to each other due to cohesion, and the increased surface tension between the fluid particles pulls the alveoli inward. This can cause the alveoli to collapse, and lead to difficulties in breathing.

The potential problem with vape additives is that they can interfere with lung surfactants…
Explain how the "Investigating the Effects of Additives on Surface Tension" activity could be related to this problem.

There are many possible "good answers" to this prompt. Good answers might include the following ideas:

- In the investigation, water acted as alveolar fluid and soap acted as a vaping additive.
- The data from the investigation showed that even a small amount of soap can have a noticeable change on the surface tension of water.
- Vaping additives might build up in the lungs over time and have a notable effect on the alveolar fluid's surface tension, because it might interfere with the lung surfactants. This would lead to breathing issues.