Launch Lab: The Chemical Blues Answer Key

Answers to Procedure Questions

10. Initially, the solution in the Erlenmeyer flask is blue due to the addition of methylene blue, which is a redox indicator. Swirling the flask contents should quickly cause the glucose to reduce methylene blue to its colourless form. When the flask is shaken, the solution goes blue, but turns colourless again on standing. You may observe a thin layer of blue on the surface of the colourless solution. The colour changes of the solution indicate a reversible reaction.

If the experiment is carried out in a test tube rather than a flask, there will be little air present above the glucose solution. When the tube is shaken, the solution in the test tube should therefore remain colourless, since there is little oxygen present to react with the methylene blue. The air above the solution in the Erlenmeyer flask is the key difference. Since $O_2(g)$ is much more reactive than $N_2(g)$, you could hypothesize that the methylene blue in the solution in the Erlenmeyer flask is reacting with oxygen. You could test this hypothesis in a number of ways, for example, by generating oxygen gas and bubbling it through the solution. You could also introduce another gas, such as methane, into the flask to replace the oxygen and observe whether a colour change takes place when the flask is shaken.

Answers to Analysis Questions

1. Some of the principles demonstrated by the activity are the following:
- Methylene blue is a redox indicator that can be reduced by glucose and oxidized by oxygen in the air.
- Oxygen can act as an unintentional gaseous reactant that can affect the outcome of a reaction.
- The oxidation of methylene blue by molecular oxygen is a reversible process.
- Reaction between a gas phase and a liquid phase is dependent on the surface area over which the phases can interact.

2. Unanswered questions will depend on how thoroughly you discuss the experiment as a class.