1. This Quiz covers 2 labs on Respiration and Photosynthesis. We used pH indicator Phenol Red – red in color at pH = 7 or above and yellow in color at pH = below 7. If CO$_2$ is added, respiration or fermentation, to a system it combines with water to form H$_2$CO$_3$, Carbonic acid which yields H$^+$ ions leading to lowering of pH and color changes from red to yellow. The reverse happens when CO$_2$ is taken, photosynthesis, out of a system, H$^+$ ions are removed and pH is raised – color changes from yellow to red.

2. Photosynthesis: 6CO$_2$ + 6H$_2$O + Sunlight $\rightarrow$ C$_6$H$_{12}$O$_6$ + O$_2$. The 2 photosystems, having Chlorophyll and other pigments, present in leaves, use the energy of sunlight to produce Glucose. It means removal of CO$_2$ from a system or addition of O$_2$ to a system indicates occurrence of photosynthesis. Removal of O$_2$ or addition of CO$_2$ indicates cellular respiration.

3. 1$^{st}$ Lab: Hypothesis: Green parts of Coleus leaf – have chlorophyll and perform photosynthesis leading to synthesis of glucose and starch. Yellow parts lack chlorophyll, therefore no photosynthesis no starch. Experiment: We break cell membranes by boiling the leaf in water and transfer it to alcohol which extracts the pigments and make the leaf white. On pouring Iodine the parts having green colors originally, turn black, indicating presence of starch and photosynthesis. Originally yellow parts turn brown indicating absence of starch and photosynthesis. Conclusion – Chlorophyll is necessary for photosynthesis.

4. 2$^{nd}$ Lab: When you blow your breath in phenol red addition of CO$_2$ lowers the pH and changes the color from red to yellow. The half yellow phenol red having an Elodea twig changes back its color to red because Elodea performs photosynthesis and removes CO$_2$ from the solution. The other half keeps its red/pink color. Conclusion - Photosynthesis uses CO$_2$ to synthesize glucose.

5. 3$^{rd}$ Lab: Hypothesis – Apparatus with CO$_2$ from NaHCO$_3$ should generate more O$_2$ than with only water. Our experiment failed due to old Elodea plants. Even when students placed the 2 apparatuses in direct sunlight in porch and none generated O$_2$. It means poor light is ruled out.

6. 4$^{th}$ Lab: Search google images for ‘paper chromatography of plant pigments’ and you can get some nice images. Memory aid is bax-c. At the bottom is Chlorophyll b, Chlorophyll a, Xanthophyll (yellow) and Carotene (red) at the top. Some of you correctly noted yellow going above green of chlorophylls. The different pigments have different structure and move at different speeds when passing through the channels of chromatographic paper. Therefore different pigments get separated.

7. I gave you a wrong memory aid for chromatography of plant pigments. The correct one is shown below and explained above.
8. 5th Lab: Fermentation is the breakdown of glucose in absence of O₂. Microorganisms like yeast break glucose to ethyl alcohol and CO₂. In fermentation tube no oxygen is available and when fermentation takes place CO₂ accumulates at the top of the tube. This experiment showed the role of substrate sucrose (sugar) versus protein. It also compared the effect of temperature on fermentation. The tube with sucrose at normal temperature showed maximum production of CO₂ or speed of fermentation. When the tube with sucrose was placed in Fridge the gas released was minimal. It indicated enzymes responsible for fermentation were not working efficiently at cold temperature of the fridge. The tube with protein at room temperature also had little fermentation because main substrate is sugar and not protein.

10. 6th Lab: Peas were placed in phenol red. Peas undergo aerobic respiration and produce CO₂. It lowers the pH by adding CO₂ and changes the color from red to yellow.