Unit 4: Chemical Reactions

Chromatography Lab

The use of color additives increased dramatically in the United States in the second half of the the nineteenth century. As the economy became more industrial, fewer people lived on farms, city populations grew, and people became more dependent on mass produced foods.

Food dyes were initially used to make food more visually appealing to the consumer and, in some cases, to mask poor-quality, inferior, or imitation foods. For example, meat was colored to appear fresh long after it would have naturally turned brown. Jams and jellies were colored to give the impression of higher fruit content than they actually contained. Some food was colored to look like something else—imitation crab meat, for example. Many food colorings and additives were later discovered to be harmful or toxic.

Food colorants were initialy added to food with little or no health testing. In 1907, the USDA reduced the number of synthetic food dyes approved for use from 695 to just seven. Only two of the original dyes from 1907 are still accepted for use today. Five others have been added between 1907 and 1971. Only seven dyes are approved for use in the United States today. All of the FD&C approved food dyes are charged, water-soluble organic compounds that bind to natural ionic and polar sites in large food molecules, including proteins and carbohydrates.

Food dyes can be separated and identified by paper chromatography. Paper chromatography is an example of a more general type of chromatography called *adsorption chromatography*. The paper acts as an adsorbent, a solid which is capable of attracting and binding the components in a mixture (see Figure 1). The mixture to be separated is "spotted" onto the surface of the paper and a solvent is allowed to seep or flow through the paper by capillary action. If one of the components in the mixture is more strongly adsorbed onto the paper than another, it will move up the paper more slowly than the solvent. Components that are not strongly adsorbed onto the paper will move up the paper at a faster rate. This "partitioning" of the components of a mixture between the paper and the solvent separates the components and gives rise to different bands or spots. If the components of the mixture are colored, like food dyes or pigments in an ink, the colored bands are easily distinguished.

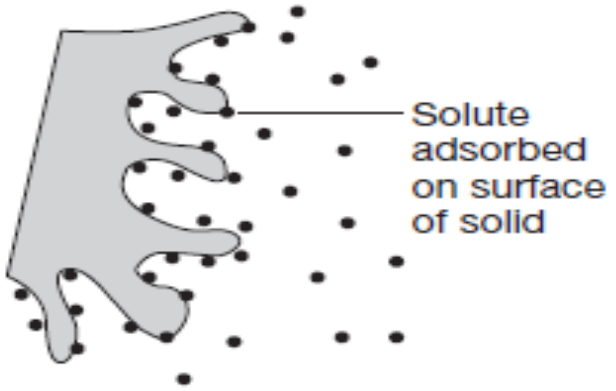

Figure 1. Adsorption of solute particles onto the surface of a solid.

The distance a sample moves along the chromatography paper is compared to the overall distance the solvent travels—this ratio is called the R_f or rate of flow. In general, food dye molecules that are more highly charged, that is, have more ionic binding sites and are more polar, will be attracted to the paper more strongly and will have lower R_f values.

Lab Report Rubric

	4	3	2	1
Title Page	Appropriate and Relevant title. Name, period and class included.	Appropriate title. Name, period and class included (one may be missing or incomplete).	Title incomplete. Name, period and class included (one or more may be missing or incomplete).	Missing most/incomplete.
Claim	Question of focus is boldfaced/identified. Question is answered directly in 1-2 clear and concise sentences.	Question of focus is boldfaced/identified. Question is answered in 1-2 sentences. May need some improvement	Question of focus is not identified. Question is answered in 1-2 sentences. Needs improvement	Question of focus is not identified. Question is not fully answered. Needs significant improvement
Experiment	All materials are listed in a clear list format. Procedure is listed in a clear and concise format. All parts and steps are present and accurate.	Most (1 missing) materials are listed in a clear list format. Procedure is listed in a clear and concise format. Most parts and steps are present and it is mostly accurate.	Materials are provided (may not be in a list). Procedure is included (not a list format). Some parts and steps are present and it needs improvement	Materials and procedure are incomplete and unclear. They do not fully represent the scope of the experiment.
Data	Data table is clear, labeled (with units) and contains all the data collected in the lab. Calculations (as either a picture or typed) are present, clearly labeled, and accurate. Chromatogram is present (picture or digital recreation) and is fully labeled.	Missing 1 - 2: Data table is clear, labeled (with units) and contains all the data collected in the lab. Calculations (as either a picture or typed) are present, clearly labeled, and accurate. Chromatogram is present (picture or digital recreation) and is fully labeled.	Missing 3 - 4: Data table is clear, labeled (with units) and contains all the data collected in the lab. Calculations (as either a picture or typed) are present, clearly labeled, and accurate. Chromatogram is present (picture or digital recreation) and is fully labeled.	Missing a lot: Data table is clear, labeled (with units) and contains all the data collected in the lab. Calculations (as either a picture or typed) are present, clearly labeled, and accurate. Chromatogram is present (picture or digital recreation) and is fully labeled.
CER	Sections of rough draft are fully complete and reflect CER style: Claim, Evidence (only specific evidence pieces without explanation), Reasoning (how the data applies to claim). Final Draft follows paragraph format, reflects the rough draft in content, but follows Evidence-Reasoning cycle. Claim is substantiated by the evidence and reasoning presented.	Rough Draft may be missing one thing. Final draft needs improvement on Evidence Reasoning cycle. Claim is supported by evidence and reasoning, but needs improvement.	Rough Draft is missing 2 or 3 things. Final draft needs improvement on CER format. Claim is not fully supported by evidence and reasoning and CER needs work.	Rough Draft is missing several things. Final draft missing or incomplete.

Peer Review: Chromatography Lab

1. Grab **your** Chromebook and open up your lab report.
2. Share your lab report with the student Ms. Wilson has assigned and give them your performance task packet, open to the rubric.
3. You will be providing detailed suggestions to the student about how to make their lab report better, so that everyone gets a good grade.
4. Circle the appropriate areas on the rubric and grade their lab report.
5. When you are done, use the rest of class to finalize your lab report.

Your final version of the Lab report is DUE TONIGHT AT MIDNIGHT!

Email Ms. Wilson "I am done with my lab report." so she knows you have "turned it in".
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