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Critical Phenomena in Organic Binary Liquid Mixtures

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The principle of critical point universality is known to govern critical effects in physical phenomena such as superconductivity, superfluidity, and the liquid – vapor transition. Using a binary liquid mixture with a critical point of solution, we have shown that critical effects can also be observed in chemical phenomena as diverse as solubility, adsorption, and ion exchange. With but one exception, the binary mixtures which we have used have been water based. In the summer of 2021, we propose to extend these measurements to solvents where both members of the pair are organic liquids. A mixture of nitrobenzene + dodecane comes to mind. The solutes will be organic dies, such pheonolphthalein, whose concentrations can be determined by spectrophotometry. Our 2021 student will set up a thermostat consisting of water bath, stirrer, temperature controller, and thermometer to determine the temperature. The student will collect samples of the supernatant liquid with a seriological pipet. The student will then determine the concentration of dissolved die using a GENESYS 10S UV-vis spectrophotometer. Rising juniors or seniors with majors in Chemistry, Chemical Engineering, or Physics are encouraged to apply.