

# Syllabus for Community Science Academy 1

Held at Caltech from June 19 to July 28, 10 am to 3:30 pm, Mon/Wed/Fridays

## Week 1: Soil and water quality

| Monday, June 19     |      |   |
|---------------------|------|---|
| 10:00 am – 11:30 am | CTLO | Introduction + nitrogen cycles                    |
| 11:30 am – 12:30 pm | CTLO | Lunch   |
| 12:30 pm – 2:00 pm  | CTLO | Design aquarium experiments + get outdoor samples |
| 2:00 pm – 3:30 pm   | Lab  | Build aquariums + take first measurements         |

| Wednesday, June 21  |      |  |
|---------------------|------|--|
| 10:00 am – 11:30 am | CTLO | Dye challenges 1 and 2   |
| 11:30 am – 12:30 pm | CTLO | Lunch  |
| 12:30 pm – 1:30 pm  | CTLO | Dye challenges 3 + baking cookies  |
| 1:30 pm – 3:30 pm   | CTLO | Standard measurements + fertilizer comparisons; take aquarium measurements |

| Friday, June 23     |      |  |
|---------------------|------|--|
| 10:00 am – 11:30 am | CTLO | Color and DIY colorimetry  |
| 11:30 am – 12:30 pm | CTLO | Lunch  |
| 12:30 pm – 2:00 pm  | CTLO | Using the DIY colorimeter: drops of dye; take aquarium measurements. |
| 2:00 pm – 3:30 pm   | CTLO | Humanities 1: organizing ideas into a story                          |

## Week 2: Soil and water quality (continued)

| Monday, June 26     |      |   |
|---------------------|------|---|
| 10:00 am – 11:30 am | CTLO | Advanced colorimeter + Beer's Law   |
| 11:30 am – 12:30 pm | CTLO | Lunch   |
| 12:30 pm – 2:00 pm  | CTLO | Line fitting, standard curves, and accurate measurements                        |
| 2:00 pm – 3:30 pm   | CTLO | Students create video explanations of core concepts; take aquarium measurements |

| Wednesday, June 28  |      |   |
|---------------------|------|---|
| 10:00 am – 11:30 am | CTLO | Reproducing colors by mixing concentrated dyes; take aquarium measurements. |
| 11:30 am – 12:30 pm | CTLO | Lunch   |
| 12:30 pm – 2:00 pm  | Lab  | Lab tour (TBD)  |
| 2:00 pm – 3:30 pm   | CTLO | Humanities 2: creating a persuasive argument                                |

| Friday, June 30 (Presentation Day) |      |   |
|------------------------------------|------|---|
| 10:00 am – 11:30 am                | CTLO | Prepare aquarium presentations            |
| 11:30 am – 12:30 pm                | CTLO | Lunch ( <i>students present</i> )         |
| 12:30 pm – 3:30 pm                 | CTLO | Humanities 3: public service announcement |

### Week 3: Pest control

| Monday, July 3      |      |   |
|---------------------|------|---|
| 10:00 am – 11:30 am | CTLO | Principles of refractive optics + bag challenge + telescope |
| 11:30 am – 12:30 pm | CTLO | Lunch   |
| 12:30 pm – 2:00 pm  | CTLO | Designing a camera  |
| 2:00 pm – 3:30 pm   | CTLO | Making and testing the camera                               |

| Wednesday, July 5   |      |   |
|---------------------|------|---|
| 10:00 am – 11:30 am | CTLO | Building a simple microscope                |
| 11:30 am – 12:30 pm | CTLO | Lunch                                       |
| 12:30 pm – 2:00 pm  | CTLO | Holographic tomography + experiment design  |
| 2:00 pm – 3:30 pm   | CTLO | Perform and document tomography experiments |

| Friday, July 7      |      |   |
|---------------------|------|---|
| 10:00 am – 11:30 am | CTLO | Students create video explanations of core concepts |
| 11:30 am – 12:30 pm | CTLO | Lunch   |
| 12:30 pm – 2:00 pm  | CTLO | Principles of fluorescent imaging                   |
| 1:30 pm – 3:30 pm   | CTLO | Build a fluorescent imager                          |

### Week 4: Pest control (continued)

| Tuesday, July 10    |            |                      |
|---------------------|------------|----------------------|
| 10:00 am – 11:30 am | Huntington | Learn about ants     |
| 11:30 am – 12:30 pm | Huntington | Lunch                |
| 12:30 pm – 2:00 pm  | Huntington | Plan ant experiments |
| 2:00 pm – 3:30 pm   | Huntington | Set up ant colonies  |

| Wednesday, July 12  |            |   |
|---------------------|------------|---|
| 10:00 am – 11:30 am | Huntington | Analyze ant colonies + prepare presentation         |
| 11:30 am – 12:30 pm | Huntington | Lunch   |
| 12:30 pm – 1:30 pm  | Huntington | Ant colony presentations                            |
| 1:30 pm – 3:30 pm   | Huntington | Humanities 4: creating and revising plans of action |

| Friday, July 14 (Career Day) |      |  |
|------------------------------|------|--|
| 10:00 am – 11:30 am          | CTLO | Career seminar ( <b>joint with SRC</b> ) |
| 11:30 am – 12:30 pm          | CTLO | Lunch                                    |
| 12:30 pm – 2:00 pm           | CTLO | Humanities 5: creating a job description |
| 2:00 pm – 3:30 pm            | CTLO | Humanities 6: creating a cover letter    |

## Week 5: Plant processing

| Monday, July 17     |      |   |
|---------------------|------|---|
| 10:00 am – 11:30 am | Mead | Safety lecture @ Mead labs – closed-toed shoes, long pants, no contact lenses, hair up! |
| 11:30 am – 12:30 pm | Mead | Lunch   |
| 12:30 pm – 3:30 pm  | Mead | Theory of extraction + isolate dyes from blueberries and carrots                        |

| Wednesday, July 19  |       |   |
|---------------------|-------|---|
| 10:00 am – 11:15 am | Mead  | Theory of chromatography                                  |
| 11:30 am – 12:30 am | Noyes | Lunch & Caltech faculty seminar ( <b>joint with SRC</b> ) |
| 12:45 pm – 3:30 pm  | Mead  | Spinach chromatography                                    |

| Friday, July 21     |      |  |
|---------------------|------|--|
| 10:00 am – 10:45 am | CTLO | Ice cream activity                         |
| 10:45 am – 12:15 pm | CTLO | Humanities 7: Creation of a science lesson |
| 12:15 am – 1:15 pm  | CTLO | Lunch                                      |
| 1:15 pm – 3:30 pm   | Mead | Distillation of orange oil                 |

## Week 6: Plant processing (continued)

| Monday, July 24     |      |   |
|---------------------|------|---|
| 10:00 am – 11:30 am | Mead | Distillation of orange oil or other fruit           |
| 11:30 am – 12:30 pm | Mead | Lunch   |
| 12:30 pm – 2:00 pm  | Mead | Extraction of orange oil                            |
| 2:00 pm – 3:30 pm   | CTLO | Students create video explanations of core concepts |

| Tuesday, July 25 |      |              |
|------------------|------|--------------|
| 1 pm – 5 pm      | Mead | Free lab day |

| Wednesday, July 26 |      |                                      |
|--------------------|------|--------------------------------------|
| 10:00 am – noon    | Mead | Salicin digestion with willow bark   |
| Noon – 1 pm        | Mead | Lunch ( <i>instructors present</i> ) |
| 1 pm – 3:30 pm     | Mead | Extraction of salicylic acid         |

| Friday, July 28     |      |                                   |
|---------------------|------|-----------------------------------|
| 10:00 am – 11:30 am | Mead | Acetylation to produce aspirin    |
| 11:30 am – 12:30 pm | Mead | Lunch ( <i>students present</i> ) |
| 12:30 pm – 2:00 pm  | Mead | Acetylation to produce aspirin    |
| 2:00 pm – 3:30 pm   | CTLO | Final wrap-up and graduation      |