

C-Kit Education / Space



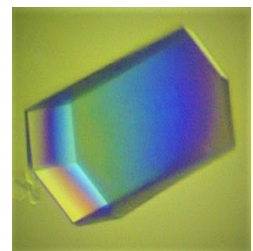
Protein Crystallization Experiment Kit Series

C-Kit Education/Space are active learning kits for high school students or higher on the theme of protein crystal growth. In the experiment, protein crystal growth is caused by specific salt concentration. Success of these experiments is to obtain beautiful crystals which are visible and memorable for students. C-Kit Space will make students getting closer to the International Space Station (ISS).

“C-Kit Education” is an experimental kit for science literacy education in class. It enables students to investigate protein crystallization experiments with the goal of obtaining high-quality crystals.

“C-Kit Space”, an advanced kit, provides students the opportunity to take part in space experiment to crystallize their samples under the microgravity in ISS. This experiment can be implemented with the results obtained by the former kit.

(The microgravity environment with little disturbance is suitable for growing high-quality protein crystals.)



Lysozyme crystal



“C-Kit Education”, which is a science Literacy Learning Kit, consists of “Crystal Preparation Kit” (CRT130-1E) and “Crystal Observation Kit” (CRT130-3E).

The Crystal Preparation Kit contains all experimental tools and reagents : NaCl solution, KCl solution, buffer solution and Lysozyme, a stable anti-bacterial protein. It enables to investigate the effects of 6 salt solutions at different concentrations. The purpose of this kit is learning how to design experiments, how to mix reagents, how to observe and discuss the results.



CRT130-1E

C-Kit Education / Space



Protein Crystallization Experiment Kit Series

The kit includes a detailed instruction with web videos for students, and a teaching material for teachers to lead the active learning successful. The teaching material shows micrographs of the experimental results with the crystallization reagents at various concentrations. **Crystal Observation Kit** contains a light and a loupe to observe crystals without a microscope.

“C-Kit Space” is a teaching material for the “**space experimental class** (<https://www.asmill.com/en-universe/detail/?id=2010>)” held by Manned Space Systems Corporation, Japan (JAMSS). This class consists of a lecture on the space environment by experts, and sample preparation for space experiment. The crystallization samples are loaded onto a rocket and transported to ISS. High-quality crystals are grown on the ISS for a month and then returned to the students. By watching the live streaming (NASA TV) of launching rocket carrying their samples, students will be motivated to participate in science and technology development in the future.

C-Kit Education
Science literacy study



C-Kit Space
Exposure to cutting-edge
science and technology

CRT130-1E : JPY 35,000-
CRT130-3E : JPY 3,100-
Suggested retail price
(excluding tax and shipping fees)

Additional fee is required
for the space experiments.
Please contact to JAMSS.

Products / General Information

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Information for space experiment

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Chiyoda-ku Tokyo, 100-0004 Japan
TEL +81-3-3211-2060
https://www.jamss.co.jp/space_utilization/kirara/

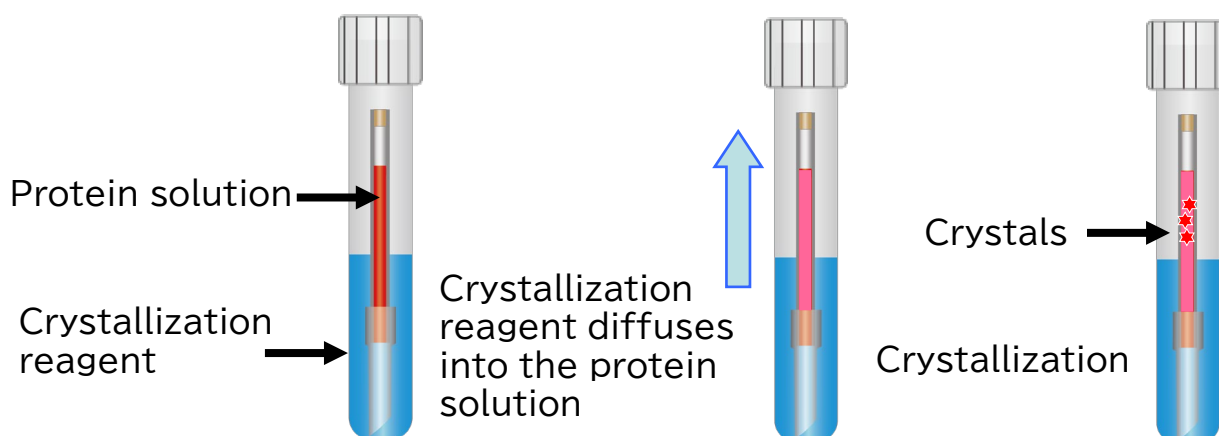
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C-Kit Education

For science literacy study



C-Kit Education (CRT130-1E/3E) is an experimental kit for group learning on the theme of protein crystal growth. Students investigate the effect of crystallization reagents (NaCl or KCl) on lysozyme crystal growth by the counter diffusion method*. **Through this experiment, students can develop their scientific literacy by designing the experiment, mixing reagents, performing the accurate manipulation, observing crystals, and discussing the results, on their own.** (The kit includes a detailed instruction with web videos for students, and a teaching material for teachers.)



* Mechanism of crystallization using the counter diffusion method

The crystallization reagent slowly diffuses into the lysozyme solution, and generates various forms of crystals or precipitate due to the crystallization reagent.

The lesson in classroom is given as follows.

(This is not the only way.)

1. Each group selects NaCl or KCl as the reagents, that is the main research subject of this experiment.
2. Discuss an experiment to determine the best concentration of salt to grow good Lysozyme crystals (4 conditions). Create a mixing protocol for reagents for the conditions.
3. Conduct the crystallization experiments, and observe the crystal growth on days 7 and 14.
4. Determine the concentration of salt that grows large, well-shaped crystals (high-quality crystals), and then conduct experiments using both NaCl and KCl at the same concentration.
5. Observe the crystal growth on days 7 and 14 to confirm the reproducibility and discuss the difference in effectiveness between NaCl and KCl.
6. Presentation and discussion on the obtained results.

C-Kit Education



Name	Crystal Preparation Kit		
Suggested retail price	35,000 yen (transportation fee, tax, not included)	Model	CRT130-1E
No.	Product name	Qty.	Description
1	Capillary (ϕ 0.7 mm \times 47 mm)	6	Create crystals inside this. Both ends are round cut.
2	Gel tube (ϕ 1.0 mm \times 1 cm)	6	Place between protein solution and crystallization reagent. Soaked in 50 mM acetate buffer.
3	Space grade lysozyme 25 mg/mL, ca. 0.1 mL (for 6 capillaries)	1	Be sure to collect the protein solution at the bottom of the tube. Dissolved in 50 mM acetate buffer.
4	salt solutions for crystallization reagents 4 mL	1 each	2 M NaCl, KCl to prepare crystallization reagents
5	250 mM acetate buffer 4 mL	1	For Lysozyme crystallization, crystallization solutions containing 50 mM acetate buffer (pH 4.5) are required.
6	Ultrapure water 14 mL	1	For reagent dilution
7	sealing compound	1	Used to seal the capillary end
8	Screw cap tube	8	6 for prepare crystallization reagent and 2 spare tubes
9	1 mL syringe	12	2 for salt, 1 for buffer, 6 for crystallization reagent, 1 for ultrapure water, 2 spare syringes
10	Syringe tip parts	12	Use by attaching it to the tip of the syringe
11	Clear round tube (5 mL)	6	For crystal growth observation
12	Paper test tube stand	1	For reagent preparation and crystal growth observation
13	1 pair of polarizing plates	1	For crystal growth observation
14	Instructions	1	

Name	Crystal Observation Kit		
Suggested retail price	3,100 yen (transportation fee, tax, not included)	Model	CRT130-3E
No.	Product name	Qty.	Description
1	Loupe	1	Observe crystals from above
2	LED push light	1	Crystals sandwiched between polarizing plates are irradiated from below.
3	AA battery	3	For push light

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