BIOCITY 2040





PATRASMED

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TABLE OF CONTENTS

01 Safety and Security Objectives

02 Prepare Responsibly

03 Facilitation Principles

04 Activity Flow

06 Closing and Follow-up

07 Contribution to Safety and Security

HIGH SCHOOL ACTIVITY GUIDE - Patras Medicine iGEM 2026

BioCITY 2040

An interactive high-school activity linking synthetic biology, biosafety, biosecurity and responsible decision-making

AUDIENCE	High-school students.
FORMAT	Short introduction, stakeholder role-playing simulation and guided project debrief.
DURATION	Approximately 75 minutes, adaptable to group size and available time.
CORE PRINCIPLE	Every scenario becomes a discussion about evidence, risks, safeguards and responsible decisions; new information may require a decision to change.

Guide purpose: This guide supports teams delivering a stakeholder-based simulation for high-school students. In a fictional future city, participants evaluate biotechnology scenarios, balance scientific evidence, risks and public interests, and reconsider their decisions when new information emerges. The activity develops critical thinking, risk awareness and responsible decision-making.

1. SAFETY AND SECURITY OBJECTIVES

- Introduce biotechnology through clear, age-appropriate examples of opportunities and risks.
- Distinguish accidental biological risks from deliberate misuse or unauthorised access.
- Connect safety and security with safeguards, ethics, transparency and public trust.
- Use fictional scenarios to practise evidence-based decisions under uncertainty and reconsider them when new information emerges.
- Explore stakeholder perspectives in a respectful, collaborative discussion.

2. PREPARE RESPONSIBLY

Coordinate with the host school, organisation or community group

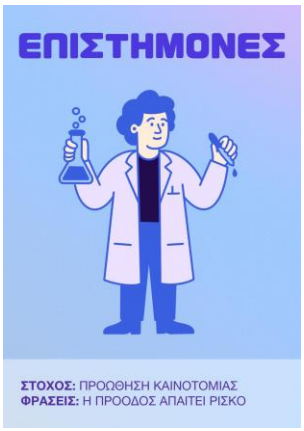
- Confirm the group size, available time, room layout and facilitator support.
- Arrange seating for five stakeholder groups and test the presentation equipment.
- Assign Scientists, Government, Biotechnology Company, Citizens and Biosafety Committee roles, with several students per group where needed.
- Offer an observer or discussion-recorder role to students who prefer not to represent a stakeholder.

Materials

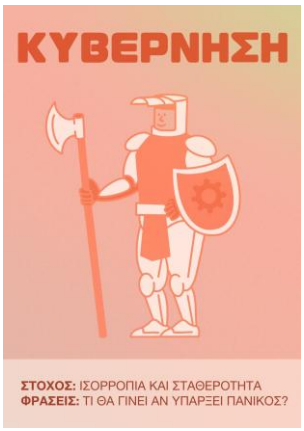
PRESENTATION	Synthetic biology, biosafety, laboratory rules, biosecurity and bioethics
ROLE CARDS	Scientists, Government, Biotechnology Company, Citizens and Biosafety Committee
PROJECT CARDS	Scenario cards, secret objectives and decision sheets
FACILITATOR TOOLS	Event cards, evaluation board, timer and a record of group decisions
EVALUATION	Anonymous pre- and post-activity questionnaires and pens

Role cards created for this activity

The following cards were designed and created by our team specifically for this activity. Distribute role cards and matching secret objectives at the start; keep event cards with the facilitator until the scenarios are underway. The “BIOSECURITY” role card represents the Biosafety Committee in this simulation. Language disclaimer: The activity cards are in Greek, as they were prepared for Greek-speaking students. This guide and its explanatory captions are in English; translate the cards before use with other audiences.



SCIENTISTS



GOVERNMENT



BIOTECHNOLOGY COMPANY



CITIZENS



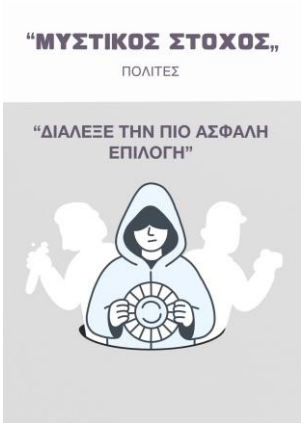
BIOSAFETY COMMITTEE



SECRET OBJECTIVE: SCIENTISTS



SECRET OBJECTIVE: COMPANY



SECRET OBJECTIVE: CITIZENS



SECRET OBJECTIVE: COMMITTEE



EVENT: SIDE EFFECT



EVENT: SOCIAL MEDIA PANIC



EVENT: FUNDING LOST



EVENT: NEW SAFETY DATA



EVENT: A PROBLEM IS LEAKED



EVENT: OTHER COUNTRIES MOVE AHEAD

3. FACILITATION PRINCIPLES

- **Clear rules:** Explain stakeholder roles, secret objectives, scenario discussions, event cards and decision evaluation before distributing cards.
- **Respectful discussion:** Arguments must concern the fictional scenario and available evidence, never a student's personality, identity or real abilities. Allow each group time to speak.
- **Safe language:** Keep incidents fictional and conceptual. Discuss consequences and safeguards without sensationalising risks or providing instructions for harmful actions.
- **Scientific accuracy:** Keep the difference explicit: biosafety addresses accidental exposure or release, while biosecurity addresses unauthorised access and intentional misuse.
- **Inclusive participation:** Give instructions verbally and in writing, allow time to process information and include observers in reflection. Students argue from their assigned role even when it differs from their opinion.

4. Activity Flow

Part A: The Scientific Introduction

Briefly introduce synthetic biology and its real-world applications. Explain biosafety, basic laboratory rules, biosecurity and bioethics. Ask students for an example of an accidental risk and an example of deliberate misuse. Introduce BioCity 2040 as a fictional city where biotechnology is part of everyday life and students are responsible for evaluating new proposals. Keep the introduction conceptual; do not use biological materials or provide experimental instructions. Allow approximately five minutes.

Part B: BioCity 2040

How simulation works: Divide students into five stakeholder groups. Scientists prioritise innovation and scientific progress; Government balances societal interests and stability; the Biotechnology Company considers development and economic interests; Citizens prioritise safety and transparency; the Biosafety Committee evaluates risks, ethics and safeguards. Give each group its role, secret objective and decision sheet. Allow approximately five minutes to discuss priorities.

Decision cycle: Present each scenario, allow groups to discuss from their stakeholder perspective, then ask them to state and justify a decision. Introduce an event card and invite them to reconsider. A responsible decision may change when new evidence emerges; groups should explain either their change or why their original position remains justified. The aim is to reason through consequences and competing priorities rather than identify one predetermined correct answer.

Scenario Guide: Focus on the proposal, possible benefits and risks, affected people, evidence gaps and safeguards. Allow approximately 15 minutes each for the first two scenarios and 20 minutes for the third, including event cards and discussion.

SCENARIO 1: Modified Crops

Project purpose: BioCity considers genetically modified crops that could benefit food production, while concerns remain about environmental consequences. Ask whether their use should be approved and under what conditions. Discuss the benefits, environmental risks, responsibility if something goes wrong and evidence needed before approval.

SCENARIO 2: Experimental Gene Therapy

Project purpose: a new gene therapy could offer an important medical benefit, but its long-term risks are not fully understood. Ask whether BioCity should allow it to proceed. Discuss acceptable uncertainty, the balance between benefit and risk, who should decide and which safeguards should be required. Groups must justify the conditions under which their decision could be responsible.

SCENARIO 3: Potential Biosecurity Incident

Scenario purpose: a possible incident involving biological technology occurs while information is incomplete and public concern is increasing. Ask how BioCity should respond, whether the public should be informed immediately and what information should be released. Discuss the risks of withholding information, communicating uncertain findings and causing unnecessary panic, alongside responsible management of misuse risks.

EVENT CARDS: When the Situation Changes

Introduce an event at an appropriate point: a serious side effect appears, panic spreads on social media, funding is reduced, new safety data become available, a problem is leaked, or other countries develop the technology faster. Ask groups to reconsider their previous decision and explain how the new information affects their reasoning.

Decision Evaluation

Evaluate each group's decision through three dimensions: Safety — how well it addresses potential risks; Innovation — whether it allows beneficial development; Public Trust — how it affects confidence in biotechnology and institutions. Explain that maximising one dimension may create trade-offs in another. Assess the reasoning, evidence and proposed safeguards rather than simply rewarding agreement or persistence.

Part C: Project Debrief

Allow approximately 15 minutes for reflection. Ask: How did your assigned role influence your opinion? Did another group offer a perspective you had not considered? Did new information change your decision, and why? Can a decision be responsible when evidence is incomplete? Who should have the final say? What distinguishes biosafety from biosecurity? How can communication build or weaken public trust? The complete session lasts approximately 75 minutes.

6. CLOSING AND FOLLOW-UP

Thank the participants and restate the difference between biosafety and biosecurity. Use short anonymous questionnaires before and after the activity to explore familiarity with synthetic biology, understanding of dilemmas, confidence in decisions under uncertainty, stakeholder perspectives and public trust. Record answers systematically and report missing or unclear responses rather than inferring them. Use the results to adjust the presentation, discussion time and facilitation in future sessions.

7. CONTRIBUTION TO SAFETY AND SECURITY

This activity contributes to biosafety and biosecurity by translating responsible biotechnology decisions into an accessible collaborative experience. Students consider accidental harm, deliberate misuse, safeguards and oversight while encountering different social priorities. Revisiting decisions after new information reinforces the need for continued risk evaluation. The activity does not replace formal laboratory training. It complements it by developing risk awareness, evidence-based reasoning and a culture in which innovation is evaluated for its effectiveness, safety, security and social responsibility.