



TEACHER WORKSHEET

CYCLE 4 • BODY, HEALTH, WELLNESS, AND SAFETY BIOLOGY,
PHYSICAL SCIENCES, MATHEMATICS, MORAL AND CIVIC EDUCATION

SPORTS AND THE FIGHT AGAINST DOPING

INTERDISCIPLINARY PRACTICAL EDUCATION OVERVIEW

ISSUE

Why and how to gain awareness about doping, its intended effects, and above all the harmful side effects on health.

PROJECT OVERVIEW

The purpose of the project is to make students more aware about doping, its intended effects, and its harmful side effects to health, by organizing a symposium entitled “Sports and the Fight Against Doping”.

To do that, students are to research various types of doping substances and their effects (biology), determine the molecular structure of substances used (chemistry in the physical sciences), role-play as a physician interpreting a medical test (mathematics), and be able to understand why doping is harmful to health and why drug use should be penalized (moral and civic education).

Roles should then be assigned, public speaking skills developed, and invitations to the symposium written and sent out.

AGE GROUP

12–13 yr 13–14 yr 14–15 yr

OBJECTIVES, KNOWLEDGE, AND SKILLS

Basic fields:

Field 1: Languages for thinking and communicating.

- Understand and express oneself using math, science, and computer skills.

Field 3: Educating the individual and the citizen.

👉 OLYMPIC GAMES KEYWORDS:

RESPECT • SPORT • COMPETITION • FAIR PLAY • HEALTH AND HEALTHY HABITS •
RULES AND REGULATIONS • EQUAL RIGHTS • IOC



INTERDISCIPLINARY PROGRAM DISCIPLINES

► BIOLOGY

Research the various categories of doping substances, their effects on athletic performance, and their long-term health consequences.

RELEVANT PROGRAM COMPONENTS

Section: Health and the human body.

Knowledge:

Connect certain behaviors to their effects on how the nervous system functions.

Skills:

Brain activity, healthy habits: conditions for proper functioning of the nervous system, disturbances by certain situations or drug use (threshold, excess, doping, limits, and effects of training).

End-of-cycle outcomes:

Explain some of the biological processes involved in how the human organism functions, down to the molecular level: muscular, nervous, and cardiovascular activity; brain activity; nutrition and digestion; relationship with the microbial world; reproduction and sexuality.

Connect knowledge of those biological processes to issues related to responsible individual and group behaviors in terms of health.

SUPPORT DOCUMENTS FOR TEACHERS

La chimie au service du dopage (Chemistry in Doping).

<https://www.jeanpierrevarlenge.com/sciences/chimie-vivant-une-si-longue-histoire/l-chimie-et-dopage-1-la-chimie-au-service-du-dopage/>

Outils du chimiste contre le dopage (Chemist Tools Against Doping).

<https://www.jeanpierrevarlenge.com/sciences/chimie-vivant-une-si-longue-histoire/li-chimie-et-dopage-2-les-outils-du-chimiste-contre-le-dopage/>

► PHYSICAL SCIENCES

Research chemical formulas of the substances used and understand the mechanical effects of doping.

RELEVANT PROGRAM COMPONENTS

Knowledge:

Associate symbols with elements using the periodic table.

Interpret a chemical formula in atomic terms.

End-of-cycle outcomes:

Describe how substances are structured.

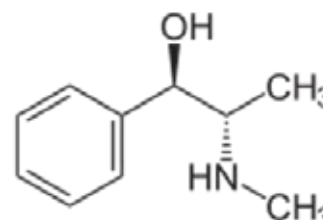
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Use the document to find the molecular formulas (give displayed formulas to facilitate reading).

For example, give students the structural formula for ephedrine (the condensed format is shown here) and ask students to determine the simple formula ($C_{10}H_{13}ON$).





▶ MATHEMATICS

Interpret blood test results from different athletes and determine whether doping substances were used.

RELEVANT PROGRAM COMPONENTS

• Section: Data organization and management.

Knowledge:

Read raw data, tables, and graphs.

• Section: Numbers and calculations.

Knowledge:

Compare, arrange, and understand inequalities.

End-of-cycle outcomes:

Interpret, depict, and process data.

SUPPORT DOCUMENTS FOR TEACHERS

Urine or blood tests that can be found on the Internet (such as those provided below) will have to be adapted, based on whether or not the athlete has used doping substances.

The following documents (which show test results based on whether or not the athlete has used doping substances), can be used in mathematics, and adapted to student progress.

Example 1

	ATHLETE	NORMAL SUBJECT
Red blood cell count	4,580,000/uL	4–5.3 million/uL
Hemoglobin	14.1 g/dL	12–16 g/dL
Hematocrit	41%	37–46%
Mean corpuscular hemoglobin (MCH)	32.6	>27%
Mean corpuscular volume (MCV)	91 fL	80–95 fL
Red cell distribution width (RDW)	15.5%	<20%
Mean corpuscular hemoglobin concentration (MCHC)	30.4%	28–36%
Erythropoietin (EPO)	5.7%	-

Example 2

BLOOD ELEMENT	NORMAL SUBJECT	NORMAL SUBJECT, 2 DAYS POST-EPO INJECTION
RBC count (per liter)	4.9×10^{12}	7.1×10^{12}
White blood cell (WBC) count (per liter)	7×10^9	7×10^9
Platelets (per liter)	300×10^9	300×10^9
MCV (per liter)	95	92
Hemoglobin (per liter)	150	190
Hematocrit (per liter)	0.45	0.65



► MORAL AND CIVIC EDUCATION

Understand that doping, in any form, is illegal; doping means a lack of fair play towards other athletes.

RELEVANT PROGRAM COMPONENTS

• Section: Laws and rules—principles for living with others.

Knowledge, skills, and attitudes targeted:

- Understand the reasons for obeying laws and rules in a democratic society.
- Explain the main principles of justice (right to a fair trial, right to counsel) and the connection with school rules and school life.
 - The role of justice: principles and function.
 - The school's rules and the texts that organize educational life.
- Examples in the classroom and at school: the issue of doping based on several entries related to physiology, the analysis of social practices, and the issue of law.
- The issue of doping from a moral standpoint. Doping goes against established rules; it is a deliberate act and therefore considered cheating. The International Olympic Committee (IOC) has made the fight against doping a top priority. It can be mechanical (which students study in biology and physics) as well as technical.
- Optional debate on these issues.

SUPPORT DOCUMENTS FOR TEACHERS

The IOC's policy towards cheaters: zero tolerance.

<https://www.olympic.org/fight-against-doping>

The role of the Court of Arbitration for Sport.

<https://stillmedab.olympic.org/media/Document%20Library/OlympicOrg/Factsheets-Reference-Documents/Medical/Fight-against-Doping/Factsheet-The-Fight-against-Doping-and-Promotion-of-Athletes-Health.pdf>

The Olympic oath at the 2000 Olympic Games in Sydney: the oath included a reference to doping and, for the first time, EPO tests were done and blood samples were taken.

<https://www.olympic.org/sydney-2000>

➔ INTERDISCIPLINARY PROGRAM DURATION:

PHYSICAL SCIENCES: 3 HOURS

BIOLOGY: 4 HOURS

MATHEMATICS: 2 HOURS

MORAL AND CIVIC EDUCATION: 2 HOURS

SYMPOSIUM PLANNING: 3 HOURS



► OPTIONAL EXTENSION

PE

• Section: Producing optimal, measurable performance at a given time.

Utilize and optimize one's resources to achieve the best possible performance at a given time.

Prepare for exercise and train to make progress and excel.

Use external cues and physical indicators to monitor movement and pace.

PATHWAY FOR HEALTH EDUCATION

For more information on the pathway program:

<http://eduscol.education.fr/cid105644/le-parcours-educatif-sante.html>

The pathway for health education program is organized around three points:

- **Health education:** Based on the development of psychosocial skills in relation to the common base of knowledge, skills, and culture.
- **Prevention:** Risk behaviors, addictive behaviors, etc. *The interdisciplinary program helps apply this point in the health education program.*
- **Health protection:** An environment conducive to health and well-being.

There could be a focus on the psychological consequences of the long-term doping behaviors studied (in addition to physiological consequences studied in biology).

PROJECT IMPLEMENTATION

PROJECT OVERVIEW FOR STUDENTS

Teachers are to inform students about:

• Project details

The aim is for you to hold a symposium entitled "Sports and the Fight Against Doping".

The ultimate aim of the project is to:

- Study the substances used in doping, the effects, and the means used to detect doping products.
- Understand why doping is harmful to health and why it should be penalized.

• Work methods

Each subject will contribute to the project, which will be done place at the same time in each discipline. You will be working on your own and in class groups, depending on the discipline and activity.

The symposium will be presented in groups of about a dozen students: one group per teacher (the point of contact).

HOW THE INTERDISCIPLINARY PROGRAM WORKS

Ideally, materials would include a file (digital or other, depending on school resources) which should enable research, written work, and worksheet handouts to be pooled.

Two coordinating sessions could be organized:

- Presentation of the project, issue, and group organization; role assignment; etc.
- Final implementation and co-evaluation session.

Instruction in parallel during project implementation. Teachers follow student progress through the support file.



DIGITAL TECHNOLOGY INVOLVED

Internet connection is required for research in biology on doping products and in chemistry on the chemical formulas of the substances used.

SCHEDULE

Three weeks will need to be reserved over the academic year, based on progress in each discipline, in order to complete each part in the interdisciplinary program.

- 1) Project presentation.
- 2) Specific instruction from teachers in each discipline.
Biology and chemistry sessions should be done simultaneously, while moral and civic education sessions could be incorporated with more flexibility. The interdisciplinary program will conclude with mathematics to interpret blood tests.
- 3) Group work in each discipline to prepare for the symposium.

FINAL PRODUCTION

A symposium on the topic “Sports and the Fight Against Doping” featuring various speakers, including a physician, a researcher, an athlete, an IOC or CNOSF member, and a regulator.

It would also be possible to develop a booklet about research (to be presented to the jury during end-of-year exams for students 14–15 years old), combined with a slide show about the experience, projected during an oral presentation as part of end-of-year exams.

PRESENTATION TO PARENTS

Parents and other students are invited to attend the symposium. The symposium could be recorded for the school website.

Parents should be able to consult a paper version, if produced, or it could be sent via the digital workspace.

POTENTIAL EVALUATION / GRADING CRITERIA

Individual and group evaluations.

The symposium should:

- Summarize research in biology, the physical sciences, and mathematics.
- Show student capacity to discuss the issues together, listen to one another, and experience working together.

The booklet should:

- Report on documentary research.
- Show student investment and initiative.

The grading scale should take into account:

- Student capacity for individual and group work, and student initiative.
- Student involvement in research throughout the sessions in the various disciplines.
- The final booklet.
- The oral evaluation, based on criteria defined in end-of-year exam guidelines.