

**Liceo Scientifico “B. Tousek” - Grottaferrata (RM)**  
**Gruppo disciplinare di Matematica e Fisica**  
**Anno Scolastico 2021/2022**

**PROGRAMMAZIONE FISICA E PHYSICS**

**BIENNIO DIPIC**

**OBIETTIVI DIDATTICI**

Gli obiettivi didattici coincidono:

Per il primo anno con gli obiettivi indicati nel syllabus dell'esame Cambridge IGCSE (tipologia Extended), reperibile al seguente link: <https://www.cambridgeinternational.org/Images/595430-2023-2025-syllabus.pdf>

Per il secondo anno con gli obiettivi indicati nel syllabus dell'esame Cambridge IGCSE (tipologia Extended), reperibile al seguente link: <https://www.cambridgeinternational.org/Images/414447-2020-2021-syllabus.pdf>

**I YEAR**

- Measurements and units
- Introduction to speed and acceleration\*
- Forces and pressure
- Thermal effects
- Waves and sounds<sup>1</sup>
- Rays and waves<sup>1</sup>
- Atoms and radioactivity<sup>2</sup>
- The Earth in space<sup>2</sup>

\* optional

<sup>1</sup> alternative to “2”

<sup>2</sup> alternative to “1”

**II YEAR**

- Forces and motion
- Waves and sounds<sup>3</sup>
- Rays and waves<sup>3</sup>



- Electricity
- Magnets and currents
- Electronics
- Atoms and radioactivity

<sup>3</sup> If not completed on first year

## I YEAR

### Measurements and units

Numbers and units. Scientific Notation. SI units. Mass, time, length, volume and density. Measuring time and length. Measuring volume and density. Comparing masses.

### Introduction to speed and acceleration\*

Speed and acceleration.

Free fall: the acceleration of free fall  $g$  and its measure.

Forces in balance: balanced forces, motion without force, terminal velocity.

### Forces and pressure

Vectors and scalars. Adding vectors: the parallelogram rule. Components of a vector.

Stretching and compressing: elastic and plastic, stretching a spring, Hooke's law.

Spring constant.

Friction and braking.

Force, weight and gravity.

Pressure.

Pressure in liquids.

Hydraulic systems.

Pressure from the air.

### Thermal effects

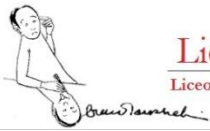
Moving particles, temperature and thermometers, Kelvin and Celsius scales, Expanding solids and liquids, heating gases, ideal gas (transformation at constant volume, constant pressure)

Thermal conduction, convection, thermal radiation (Greenhouse effect, the solar panel, the vacuum flask)

Liquid and vapours, evaporation, boiling, condensation, specific heat capacity, thermal capacity, Measuring heat capacity, storing thermal energy, latent heat.

### Waves and sounds<sup>1</sup>

Transverse and longitudinal waves, speed, frequency, wavelength and amplitude, the wave equation, the Ripple tank: reflection, refraction and diffraction,



Sound waves and their nature, diffraction of sound waves, Huygens principle, speed of sound and echos, pitch, quality and amplitude, the wave equation, ultrasound.

### **Rays and waves<sup>1</sup>**

Light rays and waves, reflection In plane mirrors, finding the position of an image, finding the position of an image by construction, reflection problem.

Refraction of light, real and apparent depth, refractive index, refraction by a prism, total internal reflection, prism, optical fibres, Snell's law, critical angle.

### **Concave and convex lenses<sup>1</sup>**

Standard rays, images formed by lenses, measuring the focal length, magnifying glass, linear magnification, camera, projector and enlarger, the human eye, correcting defects in vision.

### **Electromagnetic waves<sup>1</sup>**

Electromagnetic waves and spectrum, radio waves, infrared radiation, light, ultraviolet, x-rays, Gamma rays, communications.

### **Atoms and radioactivity<sup>2</sup>:**

Atoms, isotopes, nuclear radiation (alpha, beta and gamma radiation; dangers, background radiation), Geiger Muller tube.

Radioactive decay, alpha and beta decay, conservation laws, half-life and activity. Nuclear reactions: fission and fusion. Radioactivity applications.

### **The Earth in space<sup>2</sup>**

Sun, Earth, Moon and the Solar System. Orbits.

Stars and Galaxies. The expansion of the Universe

## **II YEAR**

### **Motion**

Speed, Velocity and acceleration.

Motion graphs: distance-time graphs, speed-time graphs (with uniform and non uniform acceleration).

Free fall: the acceleration of free fall  $g$  and its measure.

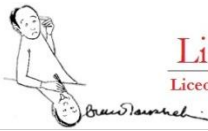
Forces in balance: balanced forces, motion without force, terminal velocity.

Circular motion

Newton's first law of motion.

Forces, mass and acceleration: inertia and mass, Newton's second law of motion.

Action and reaction: Newton's third law of motion.



Momentum: a different formulation of Newton's second law of motion, impulse, conservation of momentum.

### **Electricity**

Electric charge, electric fields; current, potential difference and resistance; Ohm's law, Joule effect, serial and parallel circuits, electrical energy and power.

### **Magnets and currents**

magnets and magnetic fields; magnetic effects of a current, magnetic force on a current, electromagnets and electric motors.

Magnetic relay, circuit breaker.

Electromagnetic induction, Lenz's law and Eddy's currents, a.c. generators and transformers, energy transmission.

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