Classe 2E

Liceo Morgagni di Roma

Programma di Fisica

anno scolastico 2021-2022

Docente: Enrico Campagna / Giorgia Cabitza
Codocente: Ginny Prince

Libro adottato: "Complete Physics for Cambridge IGCSE, 3rd ed." di S. Pople, ed. Oxford University Press

Eserciziario: "Complete Physics for Cambridge IGCSE - Workbook" di S. Lloyd, ed. Oxford University Press

0. Review of last year topics: Vectors, composition, decomposition, sine and cosine on the goniometric circumference, moments, mass, gravitational force, velocity, acceleration (the uniformly accelerated motion).

1. Motion on the plane: The circular motion. Tangential and centripetal acceleration. Angular velocity. The uniform circular motion: relation among velocity, angular velocity and acceleration.

2. Properties of waves: Mean of propagation. Definition of wavelength and period. The hertz. Amplitude related to intensity and frequency to pitch. Relation between lambda, T and speed. Meaning of longitudinal and transverse waves (with a class experience). Describing waves. Resonant waves, normal modes on a spring.

3. Sound: Generating sounds. Fundamental mode and harmonics of a string. The phenomenon of echo. Time of travel. Incidence angle, reflection angle. Law of reflection and refraction (Snell's law).

4. Light: Reflecting light. Refracting light. Total internal reflection. Lenses: How to find conjugate points (source and images) with biconvex lenses. Real and virtual images.

5. Spectra: Dispersion of light and the dependence of the refraction index with frequency. The electromagnetic spectrum.

6. Magnetism: Soft and hard magnetic materials, the demagnetization (hammering, heating up, with cycles with an electromagnet). Magnetic fields. The earth magnetic field and the compass.

7. Static electricity: Charging and discharging. Electrical induction. Polarization. The electric-field lines. Insulating and conducting materials. Explaining static electricity. Electric field and electric charge.

8. Electrical quantities: Current in electric circuits: Electrical resistance. First and second Ohm's laws. Electricity and energy. Electrical power.

9. Electric circuits: Circuit components (cell, battery, switch, ammeter, voltmeter, variable resistor, potential divider, LDR, thermistor, diode). Resistors in series and in parallel: the equivalent resistance. Electronic circuits and logic gates (NOT, AND, OR, NAND, NOR). Electrical safety: fuses, grounding, trip switch..

10. Electromagnetic forces: The magnetic field generated by a wire and by a solenoid (the grab right-hand rule). The electromagnets and their use (electric bells, relays). How electric motor are constructed. Force on a current-carrying conductor (Fleming's left-hand rule).

11. Electromagnetic induction: The induced current (Fleming's right-hand rule). The induced e.m.f. Generating alternate current. Power lines and transformers. How transformers work.

12. The nuclear atom: Atomic structure. The Rutherford experiment. Protons, neutrons and electrons. Atomic number, mass number. Isotopes. The lepton family, the barions and the quarks.

13. Radioactivity: Contamination and irradiation. Natural background and artificial sources. Alpha, beta and gamma decays. Penetrating and ionizing power. The half-life. Using radioactivity (smoke detectors, thickness measurement, medical diagnosis, fault detection, food irradiation and sterilization. Fission and fusion. The novae and supernovae.

Laboratory experiences:

- Curved mirror and lenses
- Circuits
- Static friction

Roma, 06/06/2022

Il docente del corso
prof. Enrico Campagna

I rappresentanti degli studenti