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PROGRAMMAZIONE DEL GRUPPO DISCIPLINARE A.S. 2020/2021

INDIRIZZO SCOLASTICO: LICEO SCIENTIFICO		
DISCIPLINA: FISICA	**ORE SETTIMANALI: 2 (Physics) + 1 (Fisica)**	**CLASSI PRIME**

Libri di testo

- David Sang, Cambridge IGCSE Physics, Coursebook – Second Edition, Cambridge University Press
- David Sang, Cambridge IGCSE Physics, Workbook – Second Edition, Cambridge University Press
- Heather Kennet, Cambridge IGCSE Physics, Laboratory Practical Book, Hodder Education

	Syllabus IGCSE	*Coursebook*	*Workbook + Laboratory*	*Approfondimenti in italiano*
I Q	**Length and time** • Use and describe the use of rules and measuring cylinders to find a length or a volume • Use and describe the use of clocks and devices, both analogue and digital, for measuring an interval of time • Obtain an average value for a small distance and for a short interval of time by measuring multiples (including the period of a pendulum) **Density** • Recall and use the equation **$\rho = m/V$** • Describe an experiment to determine the density of a liquid and of a regularly shaped solid and make the necessary calculation • Describe the determination of the density of an irregularly shaped solid by the method of displacement • Predict whether an object will float based on density data	**1. Making measurements** 1.1 Measuring length and volume 1.2 Improving precision in measurements 1.3 Density 1.4 Measuring time	***Workbook*** Ex 1.1 The SI system of units Ex 1.2 Accurate measurements Ex 1.3 Paper measurements Ex 1.4 Density data ***Laboratory*** 1.1 Simple pendulum 1.2 Density	• Prefissi • Notazione scientifica • Equivalenze • Errori nella misura sperimentale (errore assoluto e relativo) • Formule e formule inverse (formule di aree e volumi, densità, velocità) • Equazioni dimensionali

I Q	**Motion** • Define speed and calculate average speed from total time / total distance • Plot and interpret a speed-time graph or a distance-time graph • Recognise from the shape of a speed-time graph when a body is – at rest – moving with constant speed – moving with changing speed • Calculate the area under a speed-time graph to work out the distance travelled for motion with constant acceleration • Demonstrate understanding that acceleration and deceleration are related to changing speed including qualitative analysis of the gradient of a speed-time graph • State that the acceleration of free fall for a body near to the Earth is constant	**2. Describing motion** 2.1 Understanding speed 2.2 Distance-time graphs 2.3 Understanding acceleration 2.4 Calculating speed and acceleration	***Workbook*** Ex 2.1 Measuring speed Ex 2.2 Speed calculations Ex 2.3 More speed calculations Ex 2.4 Distance – time graphs Ex 2.5 Acceleration Ex 2.6 Speed – time graphs ***Laboratory*** 1.3 Motion	• Rappresentazione nel piano cartesiano di **y=mx+q**; significato di m e q (caso particolare della proporzionalità diretta y=mx; determinazione e significato della pendenza) • Proporzionalità inversa e quadratica
I Q	**Effect of forces** • Recognise that a force may produce a change in size and shape of a body • Plot and interpret extension-load graphs and describe the associated experimental procedure • Describe the ways in which a force may change the motion of a body • Find the resultant of two or more forces acting along the same line • Recognise that if there is no resultant force on a body it either remains at rest or continues at constant speed in a straight line	**3. Forces and motion** 3.1 We have lift-off 3.2 Mass, weight and gravity 3.3 Falling and turning 3.4 Force, mass and acceleration 3.5 The idea of momentum 3.6 More about scalars and vectors **5. Forces and matter** 5.1 Forces acting on solids 5.2 Streching springs 5.3 Hooke's law	***Workbook*** Ex 3.3 Combining forces Ex 3.4 Force, mass and acceleration Ex 3.5 Mass and weight Ex 3.6 Falling Ex 3.7 Vector quantities Ex 3.8 Momentum calculations Ex 5.1 Streching a spring Ex 5.2 Streching a rubber ***Laboratory*** 1.4 Hooke's law Attrito	• Rappresentazione di dati nel piano cartesiano (scelta delle scale per la rappresentazione dei dati) • Elementi di trigonometria (seno, coseno e tangente di un angolo e funzioni inverse) • Uso della calcolatrice scientifica

	• Understand the concepts of momentum and impulse • Recall and use the equation momentum = mass × velocity, **p = m·v** • Recall and use the equation for impulse **F·t = m·v – m·u** • Apply the principle of the conservation of momentum to solve simple problems in one dimension • Understand friction as the force between two surfaces which impedes motion and results in heating • Recognise air resistance as a form of friction • State Hooke's Law and recall and use the expression **F = k·x**, where k is the spring constant • Recognise the significance of the 'limit of proportionality' for an extension-load graph • Recall and use the relationship between force, mass and acceleration (including the direction), **F = m·a** • Describe qualitatively motion in a circular path due to a perpendicular force (**F = m·**v^2**/r** is not required)		Piano inclinato	• Applicazioni delle funzioni goniometriche ai triangoli rettangoli • Vettori e regola del parallelogramma • Somma di vettori per componenti

II Q	**Turning effect** • Describe the moment of a force as a measure of its turning effect and give everyday examples • Understand that increasing force or distance from the pivot increases the moment of a force • Calculate moment using the product **force × perpendicular distance from the pivot** • Apply the principle of moments to the balancing of a beam about a pivot **Conditions for equilibrium** • Recognise that, when there is no resultant force and no resultant turning effect, a system is in equilibrium **Centre of mass** • Perform and describe an experiment to determine the position of the centre of mass of a plane lamina • Describe qualitatively the effect of the position of the centre of mass on the stability of simple objects	**4. Turning effects of forces** 4.1 The moment of a force 4.2 Calculating moments 4.3 Stability of center of mass	***Workbook*** Ex 4.1 Turning effectf of a force Ex 4.2 Calculating moments Ex 4.3 Stability and center of mass Ex 4.4 Make a mobile ***Laboratory*** 1.5 Balancing a beam 1.6 Centre of mass	
II Q	**Pressure** • Recall and use the equation **p=F/A** • Relate pressure to force and area, using appropriate examples • Describe the simple mercury barometer and its use in measuring atmospheric pressure • Relate (without calculation) the pressure beneath a liquid surface to depth and to density, using appropriate examples • Use and describe the use of a manometer • Recall and use the equation $p = h \cdot \rho \cdot g$	**5. Forces and matter** 5.4 Pressure 5.5 Calculating pressure	***Workbook*** Ex 5.3 Pressure ***Laboratory*** 1.7 Pressure	

II Q	**Energy** • Identify changes in kinetic, gravitational potential, chemical, elastic (strain), nuclear and internal energy that have occurred as a result of an event or process • Recognise that energy is transferred during events and processes, including examples of transfer by forces (mechanical working), by electrical currents (electrical working), by heating and by waves • Apply the principle of conservation of energy to simple examples • Recall and use the expressions kinetic energy (**K.E. = ½ mv²**) and change in gravitational potential energy (**G.P.E.= m·g·Δh**) • Apply the principle of conservation of energy to examples involving multiple stages • Explain that in any event or process the energy tends to become more spread out among the objects and surroundings (dissipated)	**6. Energy transformation and energy transfers** 6.1 Form of energy 6.2 Energy conversions 6.3 Conservation of energy 6.4 Energy calculations	***Workbook*** Ex 6.1 Recognising forms of energy Ex 6.2 Energy efficiency Ex 6.3 Energy calculations	
II Q	**Energy resources** • Describe how electricity or other useful forms of energy may be obtained from: – chemical energy stored in fuel – water, including the energy stored in waves, in tides, and in water behind hydroelectric dams – geothermal resources – nuclear fission – heat and light from the Sun (solar cells and panels) – wind • Give advantages and disadvantages of each method in terms of renewability, cost, reliability, scale and environmental	**7. Energy resources** 7.1 The energy we use 7.2 Energy from Sun	***Workbook*** Ex 7.1 Renewables and non-renewables Ex 7.2 Wind energy Ex 7.3 Energy from the Sun	

	Impact • Show a qualitative understanding of efficiency • Understand that the Sun is the source of energy for all our energy resources except geothermal, nuclear and tidal • Show an understanding that energy is released by nuclear fusion in the Sun • Recall and use the equation:			
II Q	**Work** • Demonstrate understanding that work done = energy transferred • Relate (without calculation) work done to the magnitude of a force and the distance moved in the direction of the force • Recall and use **W = F·d = ΔE** **Power** • Relate (without calculation) power to work done and time taken, using appropriate examples • Recall and use the equation **P = ΔE/Δt** in simple systems	**8. Work and power** 8.1 Doing work 8.2 Calculating work done 8.3 Power 8.4 Calculating power	***Workbook*** Ex 8.1 Forces doing work, transferring energy Ex 8.2 Calculating work done Ex 8.3 Measuring work done Ex 8.4 Work done	

II Q	**Thermal physics** *Simple kinetic molecular model of matter* *States of matter* • State the distinguishing properties of solids, liquids and gases *Molecular model* • Describe qualitatively the molecular structure of solids, liquids and gases in terms of the arrangement, separation and motion of the molecules • Interpret the temperature of a gas in terms of the motion of its molecules • Describe qualitatively the pressure of a gas in terms of the motion of its molecules • Show an understanding of the random motion of particles in a suspension as evidence for the kinetic molecular model of matter • Describe this motion (sometimes known as Brownian motion) in terms of random molecular bombardment • Relate the properties of solids, liquids and gases to the forces and distances between molecules and to the motion of the molecules • Explain pressure in terms of the change of momentum of the particles striking the walls creating a force • Show an appreciation that massive particles may be moved by light, fast-moving molecules *Evaporation* • Describe evaporation in terms of the escape of more-energetic molecules from the surface of a liquid • Relate evaporation to the consequent cooling of the liquid	**9. The kinetic model of matter** 9.1 State of matter 9.2 The kinetic model of matter 9.3 Forces and kinetic theory 9.4 Gas and the kinetic theory	***Workbook*** Ex 9.1 Change of state Ex 9.2 The kinetic model of matter Ex 9.3 Brownian motion Ex 9.4 Understanding gases Ex 9.5 Boyle's law	

	• Demonstrate an understanding of how temperature, surface area and draught over a surface influence evaporation • Explain the cooling of a body in contact with an evaporating liquid *Pressure changes* • Describe qualitatively, in terms of molecules, the effect on the pressure of a gas of: – a change of temperature at constant volume – a change of volume at constant temperature • Recall and use the equation pV = constant for a fixed mass of gas at constant temperature			

II Q	**Thermal properties and temperature** *Thermal expansion of solids, liquids and gases* • Describe qualitatively the thermal expansion of solids, liquids, and gases at constant pressure • Identify and explain some of the everyday applications and consequences of thermal expansion • Explain, in terms of the motion and arrangement of molecules, the relative order of the magnitude of the expansion of solids, liquids and gases *Measurement of temperature* • Appreciate how a physical property that varies with temperature may be used for the measurement of temperature, and state examples of such properties • Recognise the need for and identify fixed points • Describe and explain the structure and action of liquid-in-glass thermometers • Demonstrate understanding of sensitivity, range and linearity • Describe the structure of a thermocouple and show understanding of its use as a thermometer for measuring high temperatures and those that vary rapidly • Describe and explain how the structure of a liquid-in-glass thermometer relates to its sensitivity, range and linearity *Thermal capacity (heat capacity)* • Relate a rise in the temperature of a body to an increase in its internal energy • Show an understanding of what is meant by the thermal capacity of a body • Give a simple molecular account of an increase in internal energy • Recall and use the equation thermal capacity = mc • Define specific heat capacity • Describe an experiment to measure the specific heat capacity of a substance	**10. The kinetic model of matter** 10.1 Temperature and temperature scales 10.2 Designing a thermometer 10.3 Thermal expansion 10.4 Thermal capacity 10.5 Specific heat capacity 10.6 Latent heat	***Workbook*** 10.1 Calibrating a thermometer 10.2 Energy and temperature 10.3 Demonstrating thermal expansion 10.4 Thermal expansion 10.5 Heat Calculation ***Laboratory*** 2.1 Specific heat capacity 2.2 Specific latent heat 2.3 Conduction and radiation	• Applicazione della formula **$Q = m \cdot c \cdot \Delta T$** nella risoluzione di esercizi elementari • Applicazioni della formula **$Q=\lambda \cdot m$** nella risoluzione di esercizi elementari

	• Recall and use the equation **change in energy = m·c·ΔT** *Melting and boiling* • Describe melting and boiling in terms of energy input without a change in temperature • State the meaning of melting point and boiling point • Describe condensation and solidification in terms of molecules • Distinguish between boiling and evaporation • Use the terms latent heat of vaporisation and latent heat of fusion and give a molecular interpretation of latent heat • Define specific latent heat • Describe an experiment to measure specific latent heats for steam and for ice • Recall and use the equation **energy = λ·m**			

II Q	**Thermal processes** *Conduction* • Describe experiments to demonstrate the properties of good and bad thermal conductors • Give a simple molecular account of conduction in solids including lattice vibration and transfer by electrons *Convection* • Recognise convection as an important method of thermal transfer in fluids • Relate convection in fluids to density changes and describe experiments to illustrate convection *Radiation* • Identify infra-red radiation as part of the electromagnetic spectrum • Recognise that thermal energy transfer by radiation does not require a medium • Describe the effect of surface colour (black or white) and texture (dull or shiny) on the emission, absorption and reflection of radiation • Describe experiments to show the properties of good and bad emitters and good and bad absorbers of infra-red radiation • Show understanding that the amount of radiation emitted also depends on the surface temperature and surface area of a body *Consequences of energy transfer* • Identify and explain some of the everyday applications and consequences of conduction, convection and radiation	**11. Thermal (heat) energy transfers** 11.1 Conduction 11.2 Convection 12.3 Radiation 13.4 Some consequences of thermal energy transfer	***Workbook*** Ex 11.1 Conduction of heat Ex 11.2 Convection currents Ex 10.3 Radiation Ex 10.4 Losing heat Ex 10.5 Warming up, cooling down	