



ISTITUTO DI ISTRUZIONE SECONDARIA

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PROGRAMMAZIONE DEL GRUPPO DISCIPLINARE A.S. 2022/2023

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

Libri di testo

- David Sang, Cambridge IGCSE Physics, Coursebook – Third Edition, Cambridge University Press
- David Sang, Cambridge IGCSE Physics, Workbook – Third Edition, Cambridge University Press
- Heather Kennet, Cambridge IGCSE Physics, Laboratory Practical Book, Hodder Education
- J Walker, Fisica. Presente e futuro. Vol.1, Pearson Science
- J Walker, Fisica. Presente e futuro. Quaderno per il Ripasso e il Recupero, Pearson Science

	Syllabus IGCSE	Coursebook	Workbook + Laboratory	Approfondimenti in italiano
IQ	<p>Length and time</p> <ul style="list-style-type: none"> • 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) <p>Density</p> <ul style="list-style-type: none"> • 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 	<p>1. Making measurements</p> <p>1.1 Measuring length and volume 1.2 Improving precision in measurements 1.3 Density 1.4 Measuring time</p>	<p>Workbook</p> <p>Ex 1.1 The SI system of units Ex 1.2 Accurate measurements Ex 1.3 Paper measurements Ex 1.4 Density data</p> <p>Laboratory</p> <p>1.1 Simple pendulum 1.2 Density</p>	<ul style="list-style-type: none"> • 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

IQ	<p>Motion</p> <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> – 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 	<p>2. Describing motion</p> <p>2.1 Understanding speed 2.2 Distance-time graphs 2.3 Understanding acceleration 2.4 Calculating speed and acceleration</p>	<p>Workbook</p> <p>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</p> <p>Laboratory</p> <p>1.3 Motion</p>	<ul style="list-style-type: none"> ● 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
IQ	<p>Effect of forces</p> <ul style="list-style-type: none"> • 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 	<p>3. Forces and motion</p> <p>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</p> <p>5. Forces and matter</p> <p>5.1 Forces acting on solids 5.2 Stretching springs</p>	<p>Workbook</p> <p>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 Stretching a spring Ex 5.2 Stretching a rubber</p>	<ul style="list-style-type: none"> ● 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)

<ul style="list-style-type: none"> • 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 • Understand the concepts of momentum and impulse • Recall and use the equation momentum = mass \times velocity, $\mathbf{p} = \mathbf{m}\cdot\mathbf{v}$ • Recall and use the equation for impulse $\mathbf{F}\cdot\mathbf{t} = \mathbf{m}\cdot\mathbf{v} - \mathbf{m}\cdot\mathbf{u}$ • 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 $\mathbf{F} = \mathbf{k}\cdot\mathbf{x}$, 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), $\mathbf{F} = \mathbf{m}\cdot\mathbf{a}$ • Describe qualitatively motion in a circular path due to a perpendicular force ($\mathbf{F} = \mathbf{m}\cdot\mathbf{v}^2/r$ is not required) 	<p>5.3 Hooke's law</p>	<p>Laboratory 1.4 Hooke's law Attrito Piano inclinato</p>	<ul style="list-style-type: none"> ● Uso della calcolatrice scientifica ● Applicazioni delle funzioni goniometriche ai triangoli rettangoli ● Vettori e regola del parallelogramma ● Somma di vettori per componenti
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<p>II Q</p>	<p>Turning effect</p> <ul style="list-style-type: none"> • 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 <p>Conditions for equilibrium</p> <ul style="list-style-type: none"> • Recognise that, when there is no resultant force and no resultant turning effect, a system is in equilibrium <p>Centre of mass</p> <ul style="list-style-type: none"> • 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 	<p>4. Turning effects of forces</p> <p>4.1 The moment of a force 4.2 Calculating moments 4.3 Stability of center of mass</p>	<p>Workbook</p> <p>Ex 4.1 Turning effect of a force Ex 4.2 Calculating moments Ex 4.3 Stability and center of mass Ex 4.4 Make a mobile</p> <p>Laboratory</p> <p>1.5 Balancing a beam 1.6 Centre of mass</p>	
<p>II Q</p>	<p>Pressure</p> <ul style="list-style-type: none"> • 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 	<p>5. Forces and matter</p> <p>5.4 Pressure 5.5 Calculating pressure</p>	<p>Workbook</p> <p>Ex 5.3 Pressure</p> <p>Laboratory</p> <p>1.7 Pressure</p>	

	<ul style="list-style-type: none"> • Use and describe the use of a manometer • Recall and use the equation $p = h \cdot \rho \cdot g$ 			
II Q	<p>Energy</p> <ul style="list-style-type: none"> • 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 ($K.E. = \frac{1}{2} mv^2$) and change in gravitational potential energy ($G.P.E. = m \cdot g \cdot \Delta h$) • 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) 	<p>6. Energy transformation and energy transfers</p> <p>6.1 Form of energy 6.2 Energy conversions 6.3 Conservation of energy 6.4 Energy calculations</p>	<p>Workbook</p> <p>Ex 6.1 Recognising forms of energy Ex 6.2 Energy efficiency Ex 6.3 Energy calculations</p>	
II Q	<p>Energy resources</p> <ul style="list-style-type: none"> • Describe how electricity or other useful forms of energy may be obtained from: <ul style="list-style-type: none"> – 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 	<p>7. Energy resources</p> <p>7.1 The energy we use 7.2 Energy from Sun</p>	<p>Workbook</p> <p>Ex 7.1 Renewables and non-renewables Ex 7.2 Wind energy Ex 7.3 Energy from the Sun</p>	

	<p>Impact</p> <ul style="list-style-type: none"> • 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: 			
<p>II Q</p>	<p>Work</p> <ul style="list-style-type: none"> • 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 $W = F \cdot d = \Delta E$ <p>Power</p> <ul style="list-style-type: none"> • Relate (without calculation) power to work done and time taken, using appropriate examples • Recall and use the equation $P = \Delta E / \Delta t$ in simple systems 	<p>8. Work and power</p> <p>8.1 Doing work 8.2 Calculating work done 8.3 Power 8.4 Calculating power</p>	<p>Workbook</p> <p>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</p>	

<p>II Q</p>	<p>Thermal physics</p> <p><i>Simple kinetic molecular model of matter</i></p> <p><i>States of matter</i></p> <ul style="list-style-type: none"> • State the distinguishing properties of solids, liquids and gases <p><i>Molecular model</i></p> <ul style="list-style-type: none"> • 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 <p><i>Evaporation</i></p> <ul style="list-style-type: none"> • 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 	<p>9. The kinetic model of matter</p> <p>9.1 State of matter</p> <p>9.2 The kinetic model of matter</p> <p>9.3 Forces and kinetic theory</p> <p>9.4 Gas and the kinetic theory</p>	<p>Workbook</p> <p>Ex 9.1 Change of state</p> <p>Ex 9.2 The kinetic model of matter</p> <p>Ex 9.3 Brownian motion</p> <p>Ex 9.4 Understanding gases</p> <p>Ex 9.5 Boyle's law</p>	
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	<ul style="list-style-type: none">• 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 <p><i>Pressure changes</i></p> <ul style="list-style-type: none">• Describe qualitatively, in terms of molecules, the effect on the pressure of a gas of:<ul style="list-style-type: none">– a change of temperature at constant volume– a change of volume at constant temperature• Recall and use the equation $pV = \text{constant}$ for a fixed mass of gas at constant temperature			
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<p>II Q</p>	<p>Thermal properties and temperature</p> <p><i>Thermal expansion of solids, liquids and gases</i></p> <ul style="list-style-type: none"> • 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 <p><i>Measurement of temperature</i></p> <ul style="list-style-type: none"> • 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 <p><i>Thermal capacity (heat capacity)</i></p> <ul style="list-style-type: none"> • 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 	<p>10. The kinetic model of matter</p> <p>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</p>	<p>Workbook</p> <p>10.1 Calibrating a thermometer 10.2 Energy and temperature 10.3 Demonstrating thermal expansion 10.4 Thermal expansion 10.5 Heat Calculation</p> <p>Laboratory</p> <p>2.1 Specific heat capacity 2.2 Specific latent heat 2.3 Conduction and radiation</p>	<ul style="list-style-type: none"> • 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
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- Recall and use the equation **change in energy = $m \cdot c \cdot \Delta T$**

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 = $\lambda \cdot m$**

<p>II Q</p>	<p>Thermal processes</p> <p><i>Conduction</i></p> <ul style="list-style-type: none"> • 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 <p><i>Convection</i></p> <ul style="list-style-type: none"> • Recognise convection as an important method of thermal transfer in fluids • Relate convection in fluids to density changes and describe experiments to illustrate convection <p><i>Radiation</i></p> <ul style="list-style-type: none"> • 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 <p><i>Consequences of energy transfer</i></p> <ul style="list-style-type: none"> • Identify and explain some of the everyday applications and consequences of conduction, convection and radiation 	<p>11. Thermal (heat) energy transfers</p> <p>11.1 Conduction 11.2 Convection 12.3 Radiation 13.4 Some consequences of thermal energy transfer</p>	<p>Workbook</p> <p>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</p>	
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