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PROGRAMMAZIONE DEL GRUPPO DISCIPLINARE

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
1 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	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	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 Stretching a spring Ex 5.2 Stretching a rubber	● 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)

	• 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 • 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 ($\mathbf{F} = \mathbf{m} \cdot \mathbf{v}^2 / \mathbf{r}$ is not required)	5.2 Stretching springs 5.3 Hooke's law	Laboratory 1.4 Hooke's law Attrito Piano inclinato	● 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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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 effect 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	5. Forces and matter 5.4 Pressure 5.5 Calculating pressure	Workbook Ex 5.3 Pressure Laboratory 1.7 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 $p = h \cdot \rho \cdot g$			
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 ($K.E. = \frac{1}{2}mv^2$) 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)	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 $W = F \cdot d = \Delta E$ Power • 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	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	
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II Q	Thermal physics <i>Simple kinetic molecular model of matter</i> <i>States of matter</i> • State the distinguishing properties of solids, liquids and gases <i>Molecular model</i> • 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 <i>Evaporation</i> • 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	
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	• 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 <i>Pressure changes</i> • 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 $pV = \text{constant}$ for a fixed mass of gas at constant temperature			
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II Q	Thermal properties and temperature <i>Thermal expansion of solids, liquids and gases</i> • 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 <i>Measurement of temperature</i> • 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 <i>Thermal capacity (heat capacity)</i> • 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	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
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	• Describe an experiment to measure the specific heat capacity of a substance • Recall and use the equation change in energy = $m \cdot c \cdot \Delta T$ <i>Melting and boiling</i> • 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 = $\lambda \cdot m$			
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II Q	Thermal processes <i>Conduction</i> • 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 <i>Convection</i> • Recognise convection as an important method of thermal transfer in fluids • Relate convection in fluids to density changes and describe experiments to illustrate convection <i>Radiation</i> • 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 <i>Consequences of energy transfer</i> • 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	
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