PROGETTO CAMBRIDGE PER FISICA E MATEMATICA AL LICEO CLASSICO

MATTEO ERBA

Fonte: Syllabus
Cambridge IGCSE™ (9–1)
Physics 0972

IL METODO CAMBRIDGE PERMETTE DI EFFETTUARE UN ESAME IN INGLESE ALLA FINE DEL PRIMO O SECONDO BIENNIO

Assessment overview

All candidates take three papers.

Candidates who have studied the Core subject content, or who are expected to achieve a grade 3 or below, should be entered for Paper 1, Paper 3 and either Paper 5 or Paper 6. These candidates will be eligible for grades 5 to 1.

Candidates who have studied the Extended subject content (Core and Supplement), and who are expected to achieve a grade 4 or above, should be entered for Paper 2, Paper 4 and either Paper 5 or Paper 6. These candidates will be eligible for grades 9 to 1.

Core candidates take:	Extended candidates take:
Paper 1 45 minutes Multiple Choice (Core) 30% 40 marks 40 four-option multiple-choice questions Questions will be based on the Core subject content Externally assessed	**Paper 2** 45 minutes Multiple Choice (Extended) 30% 40 marks 40 four-option multiple-choice questions Questions will be based on the Extended subject content (Core and Supplement) Externally assessed
and Core candidates take:	**and Extended candidates take:**
Paper 3 1 hour 15 minutes Theory (Core) 50% 80 marks Short-answer and structured questions Questions will be based on the Core subject content Externally assessed	**Paper 4** 1 hour 15 minutes Theory (Extended) 50% 80 marks Short-answer and structured questions Questions will be based on the Extended subject content (Core and Supplement) Externally assessed
All candidates take either:	**or:**
Paper 5 1 hour 15 minutes Practical Test 20% 40 marks Questions will be based on the experimental skills in Section 4 Externally assessed	**Paper 6** 1 hour Alternative to Practical 20% 40 marks Questions will be based on the experimental skills in Section 4 Externally assessed

SCELTA

PROGETTO CAMBRIDGE

- IL METODO CAMBRIDGE RICHIEDE UNA SPECIFICA MODALITA' DI VERIFICA ALLA FINE DI UN BIENNIO.

- L'ESAME CAMBRIDGE VIENE SEMPRE SUPERATO, MA CON VOTO VARIABILE (A*,A,B,C,D,E,F,G)

- I RISULTATI SONO OGGETTIVI, L'ESAME IDENTICO PER TUTTI.

- GLI STUDENTI CONTINUANO A FARE NORMALI VERIFICHE SCRITTE/ORALI NELLE DISCIPLINE COINVOLTE CHE PORTANO AI SOLITI VOTI CURRICULARI.

PROGETTO CAMBRIDGE

- DA PUNTO DI VISTA DEL METODO, E' PIU' INNOVATIVA LA METODOLOGIA CLIL.

- DAL PUNTO DI VISTA DEI CONTENUTI DI FISICA, IL CAMBRIDGE E' MOLTO SIMILE AL PROGRAMMA DI FISICA AL LC, CON ALCUNI ARGOMENTI IN PIU' E UN LIVELLO DI APPROFONDIMENTO INFERIORE

CI SONO VARIE SCELTE DA EFFETTUARE PER FISICA/MATEMATICA

- FISICA O MATEMATICA?
- PRIMO BIENNIO O SECONDO BIENNIO?
- SYLLABUS: A-LEVEL O IGCSE?
- SYLLABUS: IGCSE CORE O EXTENDED?

MATEMATICA

- SE SI SCEGLIE MATEMATICA, SOLO IL SYLLABUS IGCSE PUO' ESSERE ADATTO AL LICEO CLASSICO

- IN TAL CASO PERO' IL LIVELLO DEL SYLLABUS E' ADATTO SOLO AL PRIMO BIENNIO

- TUTTAVIA AL MOMENTO NELLA NOSTRA SCUOLA SI E' DECISO DI ATTIVARE IL PROGETTO CAMBRIDGE SOLO AL SECONDO BIENNIO: QUINDI MATEMATICA NON E' UNA SCELTA ADATTA.

MATEMATICA

- QUESTA SCELTA E’ GIUSTIFICATA DAL FATTO CHE GLI STUDENTI IN MEDIA NON POSSIEDONO UNA CONOSCENZA ADEGUATA DELLA LUINGUA INGLESE

- IL POTENZIAMENTO DI INGLESE (1h/SETTIMANA) E’ UN ULTERIORE RAFFORZO DELLE LORO CONOSCENZE NEL PRIMO BIENNIO.

FISICA

- ANCHE SE SI SCEGLIE FISICA, SOLO IL SYLLABUS IGCSE PUO' ESSERE ADATTO AL LICEO CLASSICO

- IN TAL CASO CI SONO DUE OPZIONI CORE E EXTENDED

- IL CORE SYLLABUS E' MOLTO ESSENZIALE ED E' SOPRATTUTTO QUALITATIVO CON POCHI ESERCIZI DI CALCOLO: PERMETTE VOTI SOLO FINO AL LIVELLO C.

- L'EXTENDED SYLLABUS E' PIU' ADATTO AL SECONDO BIENNIO, CONTIENE ANCHE ESERCIZI QUANTITATIVI CON CALCOLI MOLTO SIMILI A QUELLI CHE SI SVOLGONO ATTUALMENTE CON IL METODO CLIL

- PROBLEMA: IL SYLLABUS EXTENDED CONTIENE PIU' ARGOMENTI DI QUELLI ATTUALMENTE SVOLTI NEL BIENNIO DEL LC

SYLLABUS IGCSE EXTENDED

- E’ ORA NECESSARIO ANALIZZARE NEL DETTAGLIO IL SYLLABUS (PROGRAMMAZIONE) IGCSE EXTENDED CHE E’ DISPONIBILE SUL SITO CAMBRIDGE

- COSI’ SARA’ POSSIBILE VALUTARE SE E’ ADATTO AL LICEO CLASSICO E QUALE POTREBBE ESSERE UNA SCANSIONE TEMPORALE ADEGUATA

SYLLABUS IGCSE EXTENDED

1.1 Length and time

Core

- 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)

Supplement

- Understand that a micrometer screw gauge is used to measure very small distances

GLOSSARIO

STRUMENTI DI MISURA, GRANDEZZE FONDAMENTALI: QUESTA PARTE POTREBBE ESSERE IN PARTE ANTICIPATA AL PRIMO BIENNIO

SYLLABUS IGCSE EXTENDED

1.2 Motion

Core

- Define speed and calculate average speed from $\frac{\text{total distance}}{\text{total time}}$
- 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

Supplement

- Distinguish between speed and velocity
- Define and calculate acceleration using $\frac{\text{change of velocity}}{\text{time taken}}$
- Calculate speed from the gradient of a distance–time graph
- Calculate acceleration from the gradient of a speed–time graph
- Recognise linear motion for which the acceleration is constant
- Recognise motion for which the acceleration is not constant
- Understand deceleration as a negative acceleration
- Describe qualitatively the motion of bodies falling in a uniform gravitational field with and without air resistance (including reference to terminal velocity)

CINEMATICA:
QUESTA PARTE
POTREBBE ESSERE IN PARTE
ANTICIPATA AL PRIMO BIENNIO

SYLLABUS IGCSE EXTENDED

1.5 Forces

1.5.1 Effects of forces

Core

- 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
- Understand friction as the force between two surfaces which impedes motion and results in heating
- Recognise air resistance as a form of friction

Supplement

- State Hooke's law and recall and use the expression $F = kx$, 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), $F = ma$
- Describe qualitatively motion in a circular path due to a perpendicular force ($F = mv^2/r$ is **not** required)

DINAMICA,
MOTO CIRCOLARE UNIFORME

SYLLABUS IGCSE EXTENDED

1.6 Momentum

Supplement

- Understand the concepts of momentum and impulse
- Recall and use the equation momentum = mass × velocity, $p = mv$
- Recall and use the equation for impulse $Ft = mv - mu$
- Apply the principle of the conservation of momentum to solve simple problems in one dimension

QUANTITA' DI MOTO:
SOLO SEMPLICI PROBLEMI
UNIDIMENSIONALI

SYLLABUS IGCSE EXTENDED

1.7 Energy, work and power

1.7.1 Energy

Core

- 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

Supplement

- Recall and use the expressions kinetic energy = $\frac{1}{2}mv^2$ and change in gravitational potential energy = $mg\Delta h$
- 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)

SYLLABUS IGCSE EXTENDED

1.7.2 Energy resources

Core

- 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 impact
- Show a qualitative understanding of efficiency

Supplement

- 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 equations:

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{energy input}} \times 100\%$$

$$\text{efficiency} = \frac{\text{useful power output}}{\text{power input}} \times 100\%$$

ED CIVICA

DEFINIZIONE DI EFFICIENZA ENERGETICA, DISCUSSIONE SU VANTAGGI E SVANTAGGI DELLE FORME DI ENERGIA

SYLLABUS IGCSE EXTENDED

1.7.3 Work

Core

- 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

Supplement

- Recall and use $W = Fd = \Delta E$

LAVORO E POTENZA,
CON SEMPLICI DEFINIZIONI

1.7.4 Power

Core

- Relate (without calculation) power to work done and time taken, using appropriate examples

Supplement

- Recall and use the equation $P = \Delta E / t$ in simple systems

SYLLABUS IGCSE EXTENDED

3.1 General wave properties

Core

- Demonstrate understanding that waves transfer energy without transferring matter
- Describe what is meant by wave motion as illustrated by vibration in ropes and springs and by experiments using water waves
- Use the term wavefront
- Give the meaning of speed, frequency, wavelength and amplitude
- Distinguish between transverse and longitudinal waves and give suitable examples
- Describe how waves can undergo:
  - reflection at a plane surface
  - refraction due to a change of speed
  - diffraction through a narrow gap
- Describe the use of water waves to demonstrate reflection, refraction and diffraction

Supplement

- Recall and use the equation $v = f\lambda$
- Describe how wavelength and gap size affects diffraction through a gap
- Describe how wavelength affects diffraction at an edge

ONDE MECCANICHE CON POCHE FORMULE, ANCHE IN EXTENDED

SYLLABUS IGCSE EXTENDED

3.4 Sound

Core

- Describe the production of sound by vibrating sources
- Describe the longitudinal nature of sound waves
- State that the approximate range of audible frequencies for a healthy human ear is 20 Hz to 20 000 Hz
- Show an understanding of the term ultrasound
- Show an understanding that a medium is needed to transmit sound waves
- Describe an experiment to determine the speed of sound in air
- Relate the loudness and pitch of sound waves to amplitude and frequency
- Describe how the reflection of sound may produce an echo

Supplement

- Describe compression and rarefaction
- State typical values of the speed of sound in gases, liquids and solids

ONDE SONORE SOLO QUALITATIVE, ANCHE IN EXTENDED

SYLLABUS IGCSE EXTENDED

3.2 Light

3.2.1 Reflection of light

Core

- Describe the formation of an optical image by a plane mirror, and give its characteristics
- Recall and use the law
  angle of incidence = angle of reflection

Supplement

- Recall that the image in a plane mirror is virtual
- Perform simple constructions, measurements and calculations for reflection by plane mirrors

OTTICA GEOMETRICA

3.2.2 Refraction of light

Core

- Describe an experimental demonstration of the refraction of light
- Use the terminology for the angle of incidence i and angle of refraction r and describe the passage of light through parallel-sided transparent material
- Give the meaning of critical angle
- Describe internal and total internal reflection

Supplement

- Recall and use the definition of refractive index n in terms of speed
- Recall and use the equation $\frac{\sin i}{\sin r} = n$
- Recall and use $n = \frac{1}{\sin c}$
- Describe and explain the action of optical fibres particularly in medicine and communications technology

SYLLABUS IGCSE EXTENDED

1.8 Pressure

Core

- 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

Supplement

- Recall and use the equation $p = h\rho g$

PRESSIONE:
LEGGE DI STEVINO,
MANOMETRO

SYLLABUS IGCSE EXTENDED

2.1.2 Molecular model

Core

- 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

Supplement

- 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

TEORIA CINETICA
A LIVELLO QUALITATIVO

SYLLABUS IGCSE EXTENDED

TERMOLOGIA
(NO TERMODINAMICA)

2.2.3 Thermal capacity (heat capacity)

Core

- 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

Supplement

- 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
- Recall and use the equation change in energy = $mc\Delta T$

SYLLABUS IGCSE EXTENDED

3.3 Electromagnetic spectrum

Core

- Describe the main features of the electromagnetic spectrum in order of wavelength
- State that all electromagnetic waves travel with the same high speed in a vacuum
- Describe typical properties and uses of radiations in all the different regions of the electromagnetic spectrum including:
  - radio and television communications (radio waves)
  - satellite television and telephones (microwaves)
  - electrical appliances, remote controllers for televisions and intruder alarms (infrared)
  - medicine and security (X-rays)
- Demonstrate an awareness of safety issues regarding the use of microwaves and X-rays

Supplement

- State that the speed of electromagnetic waves in a vacuum is 3.0×10^8 m/s and is approximately the same in air

CONOSCENZA DELLO SPETTRO ELETTROMAGNETICO

APPLICAZIONI
REALTA' QUOTIDIANA

SYLLABUS IGCSE EXTENDED

4.1 Simple phenomena of magnetism

Core

- Describe the forces between magnets, and between magnets and magnetic materials
- Give an account of induced magnetism
- Distinguish between magnetic and non-magnetic materials
- Describe methods of magnetisation, to include stroking with a magnet, use of direct current (d.c.) in a coil and hammering in a magnetic field
- Draw the pattern of magnetic field lines around a bar magnet
- Describe an experiment to identify the pattern of magnetic field lines, including the direction
- Distinguish between the magnetic properties of soft iron and steel
- Distinguish between the design and use of permanent magnets and electromagnets

Supplement

- Explain that magnetic forces are due to interactions between magnetic fields
- Describe methods of demagnetisation, to include hammering, heating and use of alternating current (a.c.) in a coil

MAGNETISMO QUALITATIVO

SYLLABUS IGCSE EXTENDED

4.2.1 Electric charge

Core

- State that there are positive and negative charges
- State that unlike charges attract and that like charges repel
- Describe simple experiments to show the production and detection of electrostatic charges
- State that charging a body involves the addition or removal of electrons
- Distinguish between electrical conductors and insulators and give typical examples

Supplement

- State that charge is measured in coulombs
- State that the direction of an electric field at a point is the direction of the force on a positive charge at that point
- Describe an electric field as a region in which an electric charge experiences a force
- Describe simple field patterns, including the field around a point charge, the field around a charged conducting sphere and the field between two parallel plates (not including end effects)
- Give an account of charging by induction
- Recall and use a simple electron model to distinguish between conductors and insulators

ELETTROSTATICA QUALITATIVA

SYLLABUS IGCSE EXTENDED

4.2.2 Current

Core

- State that current is related to the flow of charge
- Use and describe the use of an ammeter, both analogue and digital
- State that current in metals is due to a flow of electrons

Supplement

- Show understanding that a current is a rate of flow of charge and recall and use the equation $I = Q/t$
- Distinguish between the direction of flow of electrons and conventional current

DEFINIZIONI UTILI PER I CIRCUITI

4.2.3 Electromotive force

Core

- State that the electromotive force (e.m.f.) of an electrical source of energy is measured in volts

Supplement

- Show understanding that e.m.f. is defined in terms of energy supplied by a source in driving charge round a complete circuit

SYLLABUS IGCSE EXTENDED

CIRCUITI IN SERIE E PARALLELO

4.3.2 Series and parallel circuits

Core

- Understand that the current at every point in a series circuit is the same
- Give the combined resistance of two or more resistors in series
- State that, for a parallel circuit, the current from the source is larger than the current in each branch
- State that the combined resistance of two resistors in parallel is less than that of either resistor by itself
- State the advantages of connecting lamps in parallel in a lighting circuit

Supplement

- Calculate the combined e.m.f. of several sources in series
- Recall and use the fact that the sum of the p.d.s across the components in a series circuit is equal to the total p.d. across the supply
- Recall and use the fact that the current from the source is the sum of the currents in the separate branches of a parallel circuit
- Calculate the effective resistance of two resistors in parallel

SYLLABUS IGCSE EXTENDED

4.6.1 Electromagnetic induction

Core

- Show understanding that a conductor moving across a magnetic field or a changing magnetic field linking with a conductor can induce an e.m.f. in the conductor
- Describe an experiment to demonstrate electromagnetic induction
- State the factors affecting the magnitude of an induced e.m.f.

Supplement

- Show understanding that the direction of an induced e.m.f. opposes the change causing it
- State and use the relative directions of force, field and induced current

INDUZIONE E.M.

COMMAND WORDS

4.6.2 a.c. generator

Core

- Distinguish between d.c. and a.c.

Supplement

- Describe and explain a rotating-coil generator and the use of slip rings
- Sketch a graph of voltage output against time for a simple a.c. generator
- Relate the position of the generator coil to the peaks and zeros of the voltage output

SYLLABUS IGCSE EXTENDED

TRASFORMATORE

4.6.3 Transformer

Core

- Describe the construction of a basic transformer with a soft-iron core, as used for voltage transformations
- Recall and use the equation $(V_p / V_s) = (N_p / N_s)$
- Understand the terms step-up and step-down
- Describe the use of the transformer in high-voltage transmission of electricity
- Give the advantages of high-voltage transmission

Supplement

- Describe the principle of operation of a transformer
- Recall and use the equation $I_p V_p = I_s V_s$ (for 100% efficiency)
- Explain why power losses in cables are lower when the voltage is high

SYLLABUS IGCSE EXTENDED

5 Atomic physics

5.1 The nuclear atom

5.1.1 Atomic model

Core

- Describe the structure of an atom in terms of a positive nucleus and negative electrons

Supplement

- Describe how the scattering of α-particles by thin metal foils provides evidence for the nuclear atom

5.1.2 Nucleus

Core

- Describe the composition of the nucleus in terms of protons and neutrons
- State the charges of protons and neutrons
- Use the term proton number Z
- Use the term nucleon number A
- Use the term nuclide and use the nuclide notation ${}^{A}_{Z}X$
- Use and explain the term isotope

Supplement

- State the meaning of nuclear fission and nuclear fusion
- Balance equations involving nuclide notation

FISICA NUCLEARE

SYLLABUS IGCSE EXTENDED

5.2 Radioactivity

5.2.1 Detection of radioactivity

Core

- Demonstrate understanding of background radiation
- Describe the detection of α-particles, β-particles and γ-rays (β^+ are not included: β-particles will be taken to refer to β^-)

5.2.2 Characteristics of the three kinds of emission

Core

- Discuss the random nature of radioactive emission
- Identify α-, β- and γ-emissions by recalling
  - their nature
  - their relative ionising effects
  - their relative penetrating abilities (β^+ are not included, β-particles will be taken to refer to β^-)

Supplement

- Describe their deflection in electric fields and in magnetic fields
- Interpret their relative ionising effects
- Give and explain examples of practical applications of α-, β- and γ-emissions

RADIOATTIVITA’

SYLLABUS IGCSE EXTENDED

5.2.4 Half-life

Core

- Use the term half-life in simple calculations, which might involve information in tables or decay curves

Supplement

- Calculate half-life from data or decay curves from which background radiation has not been subtracted

5.2.5 Safety precautions

Core

- Recall the effects of ionising radiations on living things
- Describe how radioactive materials are handled, used and stored in a safe way

VITA MEDIA, SICUREZZA

SYLLABUS IGCSE EXTENDED - CONCLUSIONI

- IL SYLLABUS IGSCE CONTIENE ALCUNI ARGOMENTI IN PIU' RISPETTO ALLA PROGRAMMAZIONE ATTUALE, MA IL LIVELLO DI APPROFONDIMENTO E' INFERIORE

- MANCA DEL TUTTO LA PARTE DI TERMODINAMICA

- L'E.M. E' SVOLTO PER SINGOLI ARGOMENTI ED ESERCIZI, MANCANO LE EQUAZIONI DI MAXWELL.

- LE ONDE QUASI SOLO A LIVELLO QUALITATIVO.

SYLLABUS IGCSE EXTENDED - CONCLUSIONI

- ARGOMENTI AGGIUNTIVI SONO: OTTICA GEOMETRICA, DIODI E CIRCUITI LOGICI, FISICA ATOMICA.

- INOLTRE CON IL CAMBRIDGE SI HA SOLO IL SECONDO BIENNIO, MENTRE ATTUALMENTE SI HANNO TRE ANNI PER FISICA AL LC.

SYLLABUS IGCSE EXTENDED - CONCLUSIONI

- PER I MOTIVI DETTI PRIMA, E' INDISPENSABILE USARE ALMENO ENTRAMBE LE ORE DI FISICA NEL SECONDO BIENNIO CON IL CAMBRIDGE.

- VISTO CHE IL PROGRAMMA E' PIU' VASTO, SAREBBE UTILE INIZIARE ALCUNI ARGOMENTI IN METODOLOGIA CLIL IN INGLESE NEL PRIMO BIENNIO, IN PARTICOLARE GLI ARGOMENTI PIU' VICINI ALLA MATEMATICA (ANALISI DEGLI ERRORI, CINEMATICA): QUESTO SAREBBE UTILE ANCHE PER LA PROVA INVALSI DELLE SECONDE.

FISICA: QUINTO ANNO ?

- NEL QUINTO ANNO, ESAURITO IL CAMBRIDGE, RIMANE LA POSSIBILITA' DI RIVISITARE L'ELETTROMAGNETISMO IN MODO PIU' APPROFONDITO USANDO IL METODO CLIL: EQUAZIONI DI MAXWELL, …

- INOLTRE E' POSSIBILE SVOLGERE LA PARTE DI TERMODINAMICA.

FISICA: SYLLABUS CAMBRIDGE IGCSE EXTENDED

ARGOMENTI CHE VENGONO GIA' SVOLTI AL BIENNIO PRESENTI NEL METODO CAMBRIDGE	ARGOMENTI ASSENTI NEL METODO CAMBRIDGE	ARGOMENTI ATTUALMENTE SVOLTI IN QUINTA	ARGOMENTI NUOVI (ATTUALMENTE NON SVOLTI NEL TRIENNIO)
STATICA, DINAMICA, CINEMATICA, ENERGIA	TERMODINAMICA	SPETTRO E.M., ELETTRICITA' E MAGNETISMO, CIRCUITI ELETTRICI	OTTICA GEOMETRICA
TEORIA CINETICA, TERMOLOGIA	EQUAZIONI DI MAXWELL	INDUZIONE ELETTROMAGNETICA	DIODI, CIRCUITI LOGICI
ONDE MECCANICHE			FISICA ATOMICA, RADIOATTIVITA'

POSSIBILE SCANSIONE TEMPORALE PER FISICA

- PRIMO BIENNIO: Cinematica, Nozioni preliminari, Errori di misura.

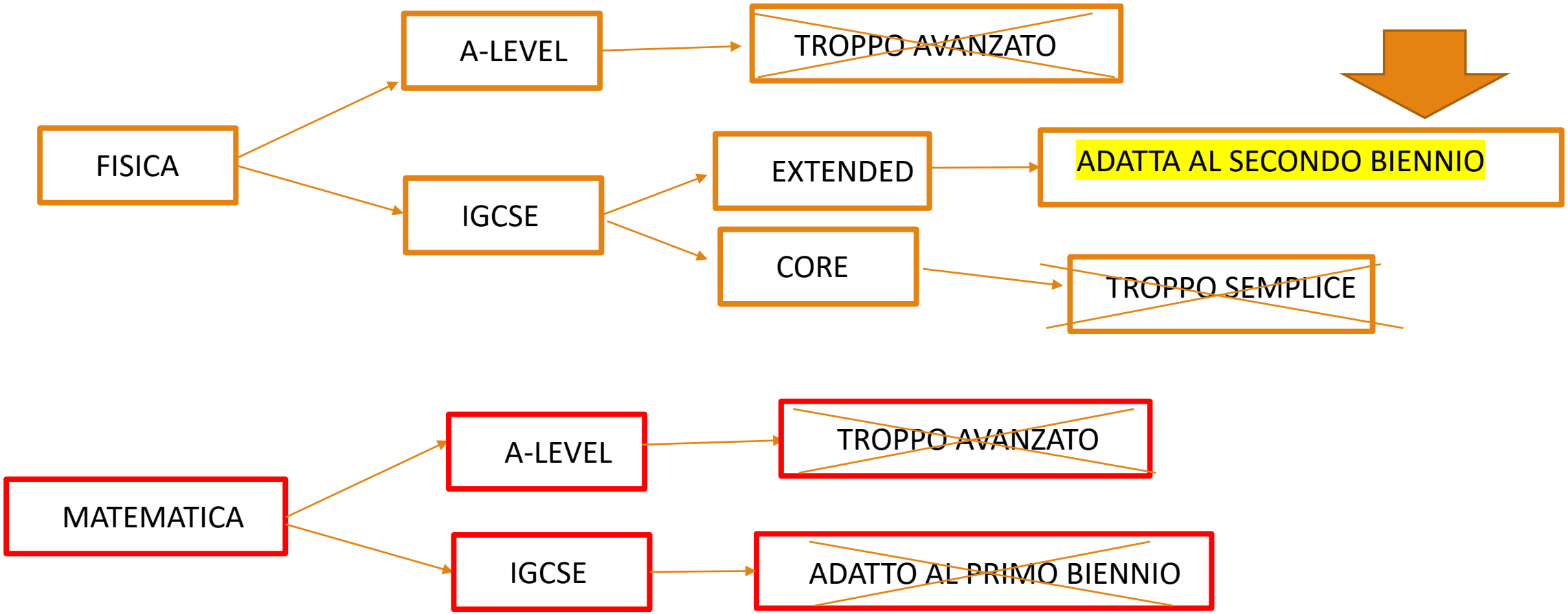
- TERZO ANNO: Statica, Dinamica, Energia, Onde meccaniche.

- QUARTO ANNO: Termologia, Ottica geometrica, Elettromagnetismo, Fisica nucleare, Radioattività.

- QUINTO ANNO (dopo esame Cambridge):

Termodinamica, Elettromagnetismo con equazioni di Maxwell.

SCHEMA RIASSUNTIVO PER LC



CONCLUSIONI PARTE I
perche' adottare il metodo Cambridge?

- IL METODO CAMBRIDGE PERMETTE DI AUMENTARE SENSIBILMENTE LE ORE SVOLTE IN INGLESE AL LICEO CLASSICO PER FISICA: OLTRE AL QUARTO E QUINTO ANNO, ANCHE IL TERZO ANNO DIVENTA COMPLETAMENTE IN INGLESE.

- VIENE ANCHE AUMENTATO IL NUMERO DI ARGOMENTI DI FISICA SVOLTI, DANDO AGLI STUDENTI UNA VISIONE PIU' COMPLETA DELLA DISCIPLINA, ANCHE SE ALCUNI ARGOMENTI SONO SVOLTI IN MODO MENO APPROFONDITO.

- IL PROGETTO CAMBRIDGE E L'ESAME FINALE CON CERTIFICAZIONE AUMENTANO LA MOTIVAZIONE DEGLI STUDENTI QUANDO AFFRONTANO UN ARGOMENTO DISCIPLINARE IN LINGUA INGLESE PER LORO SCELTA.

- INOLTRE FORNISCONO UNA CERTIFICAZIONE OGGETTIVA E RICONOSCIUTA A LIVELLO INTERNAZIONALE DEL LAVORO SVOLTO.

PARTE II
RELAZIONE TRA CAMBRIDGE E CLIL

- IL METODO CLIL (Content and Language Integrated Learning) E’ UNA METODOLOGIA MOLTO GENERALE CHE PERMETTE DI APPRENDERE CONTENUTI E MIGLIORARE LE PROPRIE ABILITA’ LINGUISTICHE ALLO STESSO TEMPO.

CLIL 4 C’S

CLIL 4 C'S

1 – CONTENUTO (*content*)

I contenuti curricolari spaziano in pressoché tutte le aree disciplinari dei nostri programmi, ma è necessario che nella pianificazione si declini tenendo presente l'ambiente di apprendimento più appropriato. Un conto sarà fare un mo sul DNA per una classe terminale di liceo scientifico, un altro sarà propo classe di Istituto Tecnico.

2- COMUNICAZIONE (*communication*)

Ogni attività CLIL deve avere come finalità la produzione orale o scritta, usando il linguaggio specifico della disciplina. Anche altre forme di linguaggio, molto comune tra i giovani, possono essere veicolo importante della loro comunicazione, mi riferisco a quello legato a immagini e a video. Oramai quest'ultimo tipo di linguaggio permea il loro mondo, a scapito dei primi, e non è quindi da sottovalutare il suo ruolo nella loro vita. Vi ho già dato un esempio di forme alternative, per esempio attraverso l'uso di Thinglink (link alla pagina), e altri verranno prossimamente.

CLIL 4 C’S

3- COGNIZIONE (*cognition*)

La cognizione è infatti un insieme di tutte le abilità mentali e processi collegati alla conoscenza, come attenzione, memoria, capacità di giudizio e di valutazione, ragionamento e calcolo, risoluzione di problemi e presa di decisione, comprensione e produzione di linguaggio. La cognizione quindi usa la conoscenza già acquisita e genera nuova conoscenza. La vecchia cara tassonomia del Bloom

4- CULTURA (culture)

Il CLIL dà l’opportunità di operare in un elevato numero di contesti culturali diversi. Basti pensare a cosa accade quando in classe arriva uno studente straniero, che non parla la nostra lingua: gli alunni si arrabattano per cercare di fare amicizia, cercando di parlare in una lingua comune, magari né quella loro e neanche quella dei nuovi arrivati. Questo non è altro che un esempio di spirito CLIL, mirato allo sviluppo del senso di responsabilità e di rispetto per gli altri, sia a livello locale che globale. Trovare un dialogo comune, a volte fatto anche solo di immagini scritte su un foglio, per farsi comprendere dal compagno di banco, può essere il punto di partenza per una migliore integrazione e una piena accettazione dell’altro.

PARTE II
RELAZIONE TRA CAMBRIDGE E CLIL

- L'ESAME CAMBRIDGE IGCSE E' COSTITUITO DA 3 PROVE SCRITTE (PAPERS) CON OBIETTIVI PRECISI CHE RIGUARDANO CONTENUTI E ABILITA' DEGLI STUDENTI.

- IL METODO CLIL PUO' ESSERE APPLICATO PER RAGGIUNGERE ALCUNI DEGLI OBIETTIVI DELL'ESAME CAMBRIDGE.

ASSESSMENT OBJECTIVES – AO1

CLIL

AO1 Knowledge with understanding

Candidates should be able to demonstrate knowledge and understanding of:

- scientific phenomena, facts, laws, definitions, concepts and theories
- scientific vocabulary, terminology and conventions (including symbols, quantities and units)
- scientific instruments and apparatus, including techniques of operation and aspects of safety
- scientific and technological applications with their social, economic and environmental implications.

Subject content defines the factual material that candidates may be required to recall and explain. Candidates will also be asked questions which require them to apply this material to unfamiliar contexts and to apply knowledge from one area of the syllabus to another.

Questions testing this objective will often begin with one of the following words: *define*, *state*, *describe*, *explain* (*using your knowledge and understanding*) or *outline* (see the *Glossary of terms used in science papers*).

ASSESSMENT OBJECTIVES – AO2

AO2 Handling information and problem-solving

Candidates should be able, in words or using other written forms of presentation (i.e. symbolic, graphical and numerical), to:

- locate, select, organise and present information from a variety of sources
- translate information from one form to another
- manipulate numerical and other data
- use information to identify patterns, report trends and draw inferences
- present reasoned explanations for phenomena, patterns and relationships
- make predictions and hypotheses
- solve problems, including some of a quantitative nature.

CLIL

Questions testing these skills may be based on information that is unfamiliar to candidates, requiring them to apply the principles and concepts from the syllabus to a new situation, in a logical, deductive way.

Questions testing these skills will often begin with one of the following words: *predict*, *suggest*, *calculate* or *determine* (see the *Glossary of terms used in science papers*).

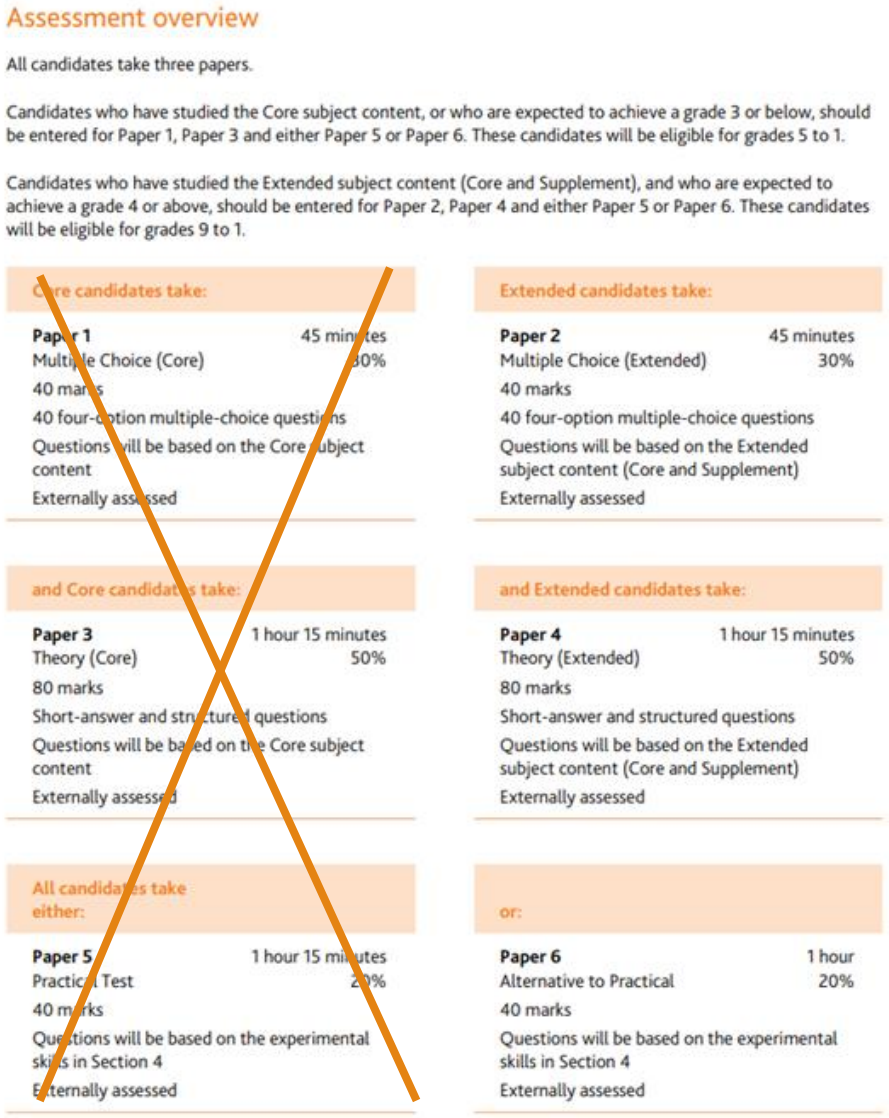
ASSESSMENT OBJECTIVES – AO3

AO3 Experimental skills and investigation

Candidates should be able to:

- demonstrate knowledge of how to safely use techniques, apparatus and materials (including following a sequence of instructions where appropriate)
- plan experiments and investigations
- make and record observations, measurements and estimates
- interpret and evaluate experimental observations and data
- evaluate methods and suggest possible improvements.

PARTE II



Assessment overview

All candidates take three papers.

Candidates who have studied the Core subject content, or who are expected to achieve a grade 3 or below, should be entered for Paper 1, Paper 3 and either Paper 5 or Paper 6. These candidates will be eligible for grades 5 to 1.

Candidates who have studied the Extended subject content (Core and Supplement), and who are expected to achieve a grade 4 or above, should be entered for Paper 2, Paper 4 and either Paper 5 or Paper 6. These candidates will be eligible for grades 9 to 1.

Core candidates take:

Paper 1 — 45 minutes
Multiple Choice (Core) — 30%
40 marks
40 four-option multiple-choice questions
Questions will be based on the Core subject content
Externally assessed

Extended candidates take:

Paper 2 — 45 minutes
Multiple Choice (Extended) — 30%
40 marks
40 four-option multiple-choice questions
Questions will be based on the Extended subject content (Core and Supplement)
Externally assessed

and Core candidates take:

Paper 3 — 1 hour 15 minutes
Theory (Core) — 50%
80 marks
Short-answer and structured questions
Questions will be based on the Core subject content
Externally assessed

and Extended candidates take:

Paper 4 — 1 hour 15 minutes
Theory (Extended) — 50%
80 marks
Short-answer and structured questions
Questions will be based on the Extended subject content (Core and Supplement)
Externally assessed

All candidates take either:

Paper 5 — 1 hour 15 minutes
Practical Test — 20%
40 marks
Questions will be based on the experimental skills in Section 4
Externally assessed

or:

Paper 6 — 1 hour
Alternative to Practical — 20%
40 marks
Questions will be based on the experimental skills in Section 4
Externally assessed

<u>Prima prova scritta: AO1-AO2</u>
<u>PAPER 2</u>

<u>Seconda prova scritta: AO1-AO2</u>
<u>PAPER 4</u>

<u>Prova pratica simulata: AO3</u>
<u>PAPER 6</u>

PAPER 2

IL PAPER 2 RICHIEDE:

- CONOSCENZA CONTENUTI
- CAPACITA’ DI SVOLGERE SEMPLICI CALCOLI
- CONOSCENZA GLOSSARIO SPECIFICO IN INGLESE

- IL PAPER 2 CONSISTE DI DOMANDE A RISPOSTA CHIUSA

PAPER 2

CONTENUTO

GLOSSARIO

1 Which quantity is measured in newton seconds (N s)?

A impulse

B moment

C power

D work done

2 Which measurement can be made using a micrometer screw gauge?

A the air pressure of a tyre

B the diameter of a wire

C the turning effect of a spanner

D the wavelength of microwaves

PAPER 2

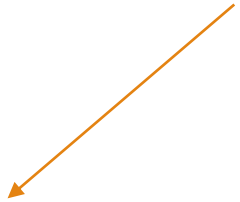
4 An astronaut in an orbiting spacecraft experiences a force due to gravity. This force is less than when she is on the Earth's surface.

Compared with being on the Earth's surface, how do her mass and her weight change when she goes into orbit?

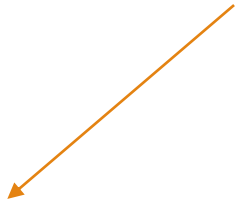
	mass in orbit	weight in orbit
A	decreases	decreases
B	decreases	unchanged
C	unchanged	decreases
D	unchanged	unchanged

PAPER 2

CALCOLO



PAPER 2



PAPER 2

PAPER 2

PAPER 2

- IL PAPER 2 RICHIEDE CONOSCENZA QUALITATIVA E QUANTITATIVA DEGLI ARGOMENTI

- I QUESITI, ANCHE QUELLI CHE RICHIEDONO DEI CALCOLI, SONO TUTTI A RISPOSTA CHIUSA: NON SONO RICHIESTE PARTICOLARI CAPACITA' ESPOSITIVE.

- IL METODO CLIL PUO' ESSERE UTILE PER RAGGIUNGERE UN'ADEGUATA CONOSCENZA DEL GLOSSARIO: MATCHING, FILL THE GAPS, CLOZE, ECC.

PAPER 4

- IL PAPER 4 RICHIEDE CONOSCENZA SOPRATTUTTO QUANTITATIVA DEGLI ARGOMENTI.

- I QUESITI, ANCHE QUELLI CHE RICHIEDONO DEI CALCOLI, SONO A RISPOSTA APERTA: LO STUDENTE DEVE ESSERE IN GRADO DI ESPORRE I RISULTATI O I CONCETTI CON IL GRADO DI APPROFONDIMENTO RICHIESTO.

- QUESTO E' RIASSUNTO DA UNA SERIE DI «COMMAND WORDS» CHE SONO USATI NELLE DOMANDE

COMMAND WORDS

Understanding command words

Command words tell you how to answer a specific exam question or complete an assessment task. Below we list the command words you will see in new and revised syllabuses published from 2019 onwards. The command words published in the syllabus will be in exam and assessment materials from 2022 onwards.

The definitions will help you understand what the words are asking you to do. Any subject-specific command words will also be listed in the syllabus. The list does not include simple instruction words like **write, circle or find**.

COMMAND WORDS

COMMAND WORDS

COMMAND WORDS

COMMAND WORDS

- LA METODOLOGIA CLIL PUO' ESSERE MOLTO UTILE PER INTRODURRE IL SIGNIFICATO E L'UTILIZZO DEI COMMAND WORDS: MATCHING, FILL THE GAPS,ETC.

- DI FATTO CI SONO GIA' MOLTE ATTIVITA' CLIL ADATTE ALLO SCOPO PRONTE PER ESSERE UTILIZZATE

COMMAND WORDS

- ANCHE LA MODALITA’ DI VERIFICA CON DOMANDA APERTA IN UN NUMERO FISSATO DI RIGHE (TIPO EX TERZA PROVA) SPESSO USATA NELLE VERIFICHE CLIL, PUO’ ESSERE ADATTATA ALL’ESAME CAMBRIDGE

PAPER 4: ESEMPI DOMANDE

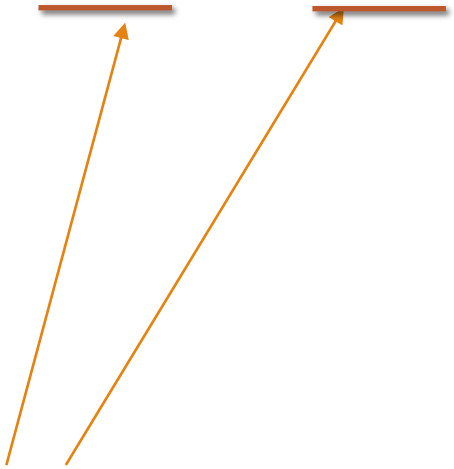
PAPER 4: ESEMPI DOMANDE

(a) The mass of the package is 36 kg.

Calculate the increase in the gravitational potential energy (g.p.e.) of the package when it is raised through a vertical height of 2.4 m.

increase in g.p.e. = ... [2]

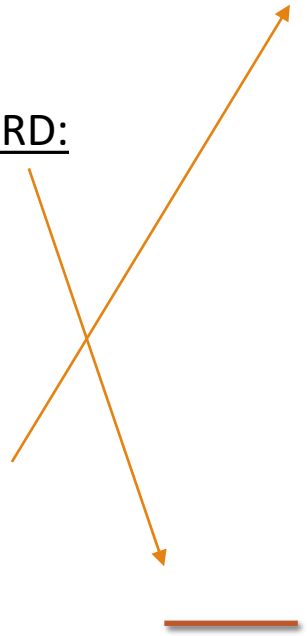
PAPER 4: ESEMPI DOMANDE



COMMAND WORDS:
SUGGEST, EXPLAIN

PAPER 4: ESEMPI DOMANDE

COMMAND WORD:
CALCULATE



PAPER 4: ESEMPI DOMANDE

COMMAND WORD:
CALCULATE

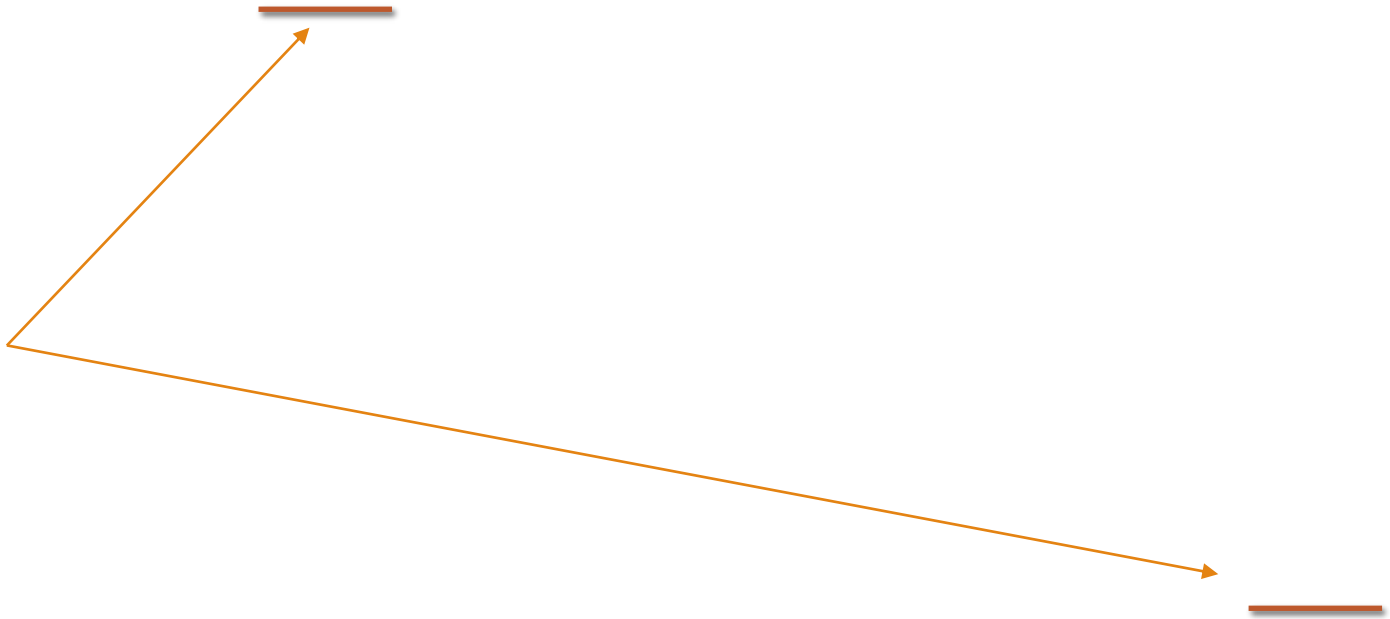
(a) Calculate the momentum of the toy engine before the collision.

momentum = ... [2]

(b) The mass of the truck is 0.30 kg.

Using the principle of conservation of momentum, calculate the speed of the joined engine and truck immediately after the collision.

PAPER 4: ESEMPI DOMANDE



PAPER 4: ESEMPI DOMANDE

(a) Select and explain **three** features of the solar panel that maximise the final temperature of the water.

.....

.....

.....

.....

.....

.....

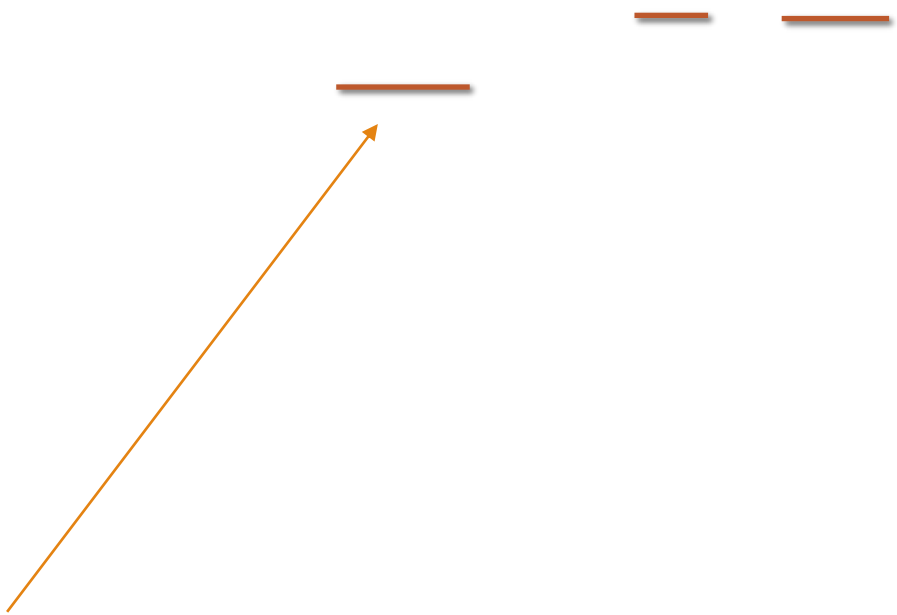
.....

.....

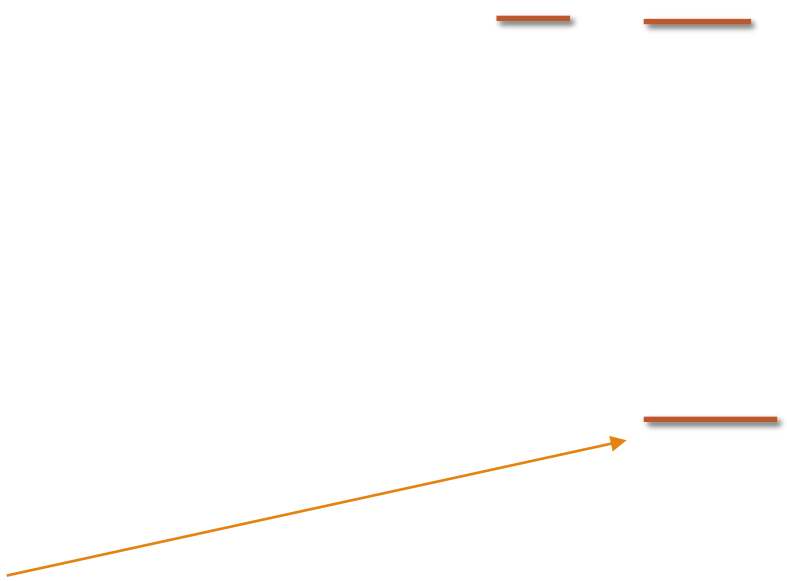
[4]

PAPER 4: ESEMPI DOMANDE

PAPER 4: ESEMPI DOMANDE



PAPER 4: ESEMPI DOMANDE



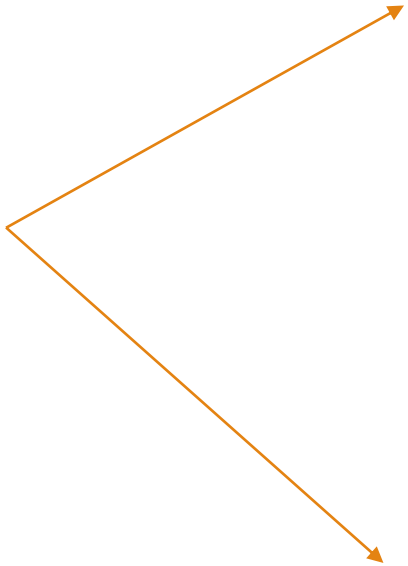
PAPER 4: ESEMPI DOMANDE

PAPER 4: ESEMPI DOMANDE

(b) The wave approaching the barrier has a wavelength of 2.5 cm and a speed of 20 cm / s.

Calculate the frequency of the wave.

ravel



frequency = ... [2]

(c) State what happens, if anything, to the frequency of the wave as it passes through the gap.

..... [1]

PAPER 6

- IL PAPER 6 RIGUARDA LA CAPACITA' DI ANALIZZARE DATI DI UN'ESPERIENZA DI LABORATORIO E TIRARE DELLE CONCLUSIONI: LA FISICA E' UNA SCIENZA SPERIMENTALE

- PER LICEI CLASSICI E LINGUISTICI, E' DISPONIBILE LA MODALITA' DI LABORATORIO SIMULATO, DOVE I DATI SONO GIA' FORNITI E LO STUDENTE DEVE SOLO RIELABORARLI.

PAPER 6 : ARGOMENTI

Experimental skills tested in Paper 5 Practical Test and Paper 6 Alternative to Practical

Candidates may be asked questions on the following experimental contexts:

- measurement of physical quantities such as length or volume or force
- cooling and heating
- springs and balances
- timing motion or oscillations
- electric circuits
- optics equipment such as mirrors, prisms and lenses
- procedures using simple apparatus, in situations where the method may not be familiar to the candidate.

PAPER 6: ESEMPI PROVE

1 A student is determining the mass of a load using a balancing method.

Fig. 1.1 shows the apparatus.

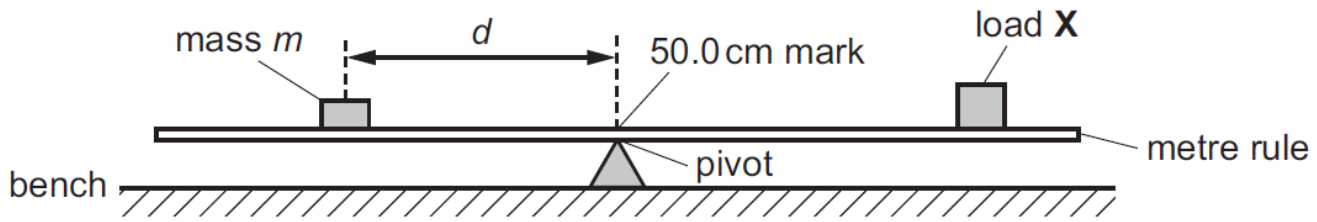


Fig. 1.1

The load **X** has been taped to the metre rule so that its centre is exactly over the 90.0 cm mark. It is not moved during the experiment.

A mass *m* of 40 g is placed on the rule and its position adjusted so that the rule is as near as possible to being balanced with the 50.0 cm mark exactly over the pivot. Fig. 1.2(a) shows part of the rule when it is balanced.

The procedure is repeated for a range of masses. Fig. 1.2(b)–(e) shows the rule when balanced for values of *m* of 50 g, 60 g, 70 g and 80 g.

PAPER 6: ESEMPI PROVE

DATI SIMULATI

PAPER 6: ESEMPI PROVE

CALCOLARE DATI,
ORGANIZZARE DATI
IN TABELLE

PAPER 6: ESEMPI PROVE

(b) Describe one difficulty the student might have when carrying out this experiment, and how he might overcome this difficulty.

.....

.....

..... [2]

COMMAND WORD

PAPER 6: ESEMPI PROVE

RAPPRESENTARE DATI
SU GRAFICI

PAPER 6: ESEMPI PROVE

(b) A student pours hot water into the test-tube until it is about two thirds full of water and places the thermometer in the water.

She measures the initial temperature θ of the hot water and immediately starts a stopclock.

Suggest one precaution the student takes to make sure that her temperature reading is as accurate as possible.

.....

..... [1]

CONCLUSIONI PARTE 2

- LA METODOLOGIA CLIL E' UNO STRUMENTO UTILE PER RAGGIUNGERE OBIETTIVI GENERALI (4C'S)

- PUO' ESSERE USATA PER RAGGIUNGERE ALCUNI OBIETTIVI SPECIFICI DELL'ESAME CAMBRIDGE

- QUESTO E' SOPRATTUTTO UTILE PER :

1) GLOSSARIO SPECIFICO

2) COMMAND WORDS: CAPACITA' DI COMUNICAZIONE ED ESPOSIZIONE, ANCH'ESSE OBIETTIVO DEL METODO CAMBRIDGE