Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	SOLVED BY SMART EXAM RESOURCES		
CENTRE NUMBER		CANDIDATE NUMBER	

0333479926

PHYSICS **0625/43**

Paper 4 Theory (Extended) **October/November 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

DC (PQ/SG) 174869/4

Cambridge Assessment International Education

1 Fig. 1.1 is the top view of a tank in an aquarium. The tank is filled with salt water.

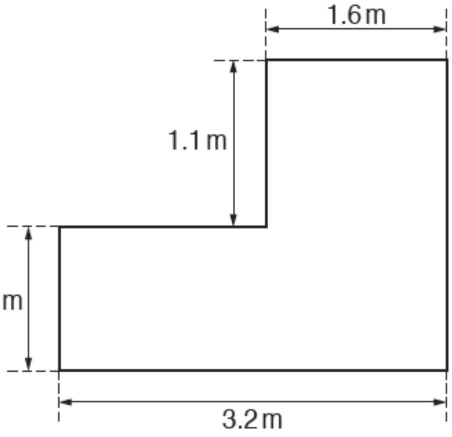


Fig. 1.1 (not to scale)

The depth of the water in the tank is 2.0 m.

(a) Calculate the volume of the water in the tank.

Volume = Area of the base x height
= (1 x 3.2)+2.2 x 1.6) x 2
$=9.9\text{m}^3$

volume = 9.9m^3 [3]

(b) The density of the water in the tank is $1.1 \times 10^3\,\text{kg/m}^3$.

Calculate the mass of the water in the tank.

Density=Mass/Volume
Mass= Density X Volume
$=1.1 \times 10^3 \times 9.9$
$= 1.1 \times 10^4$

mass = 1.1×10^4 [2]

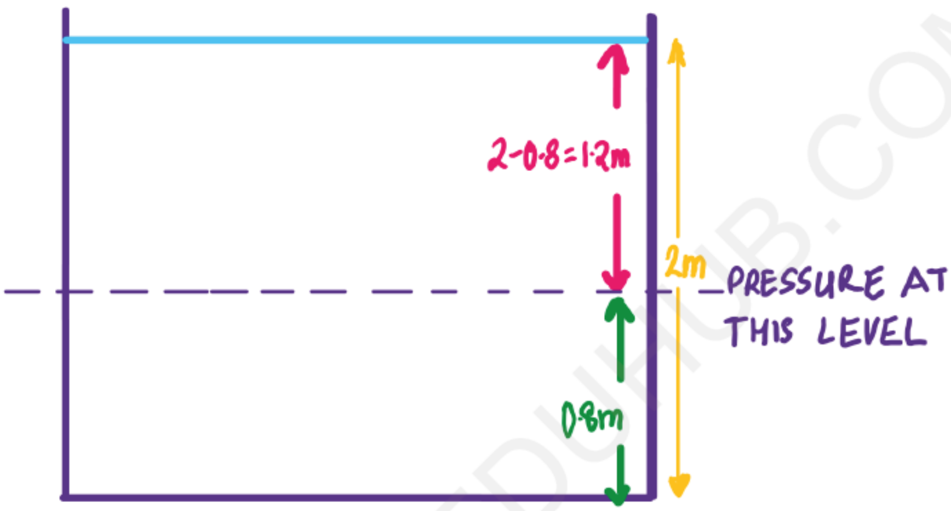
(c) Calculate the pressure due to the water at a level of 0.80 m above the base of the tank.

Depth of water=(2-0.8)m=1.2m

Pressure= hρg

= 1.2 x 1.1 x10^3 x 10

= 1.3 x 10^4 Pa



pressure = 1.3 x 10^4 .... [3]

[Total: 8]

2 (a) (i) State, in words, the equation that defines the *moment of a force*.

Moment of a force= Force x Perpendicular distance from the pivot

[2]

(ii) State what is meant by the *moment of a force*.

Moment of a force means turning effect. [1]

(iii) *Force* is a vector quantity.

Explain what is meant by the term *vector*.

Vector is a quantity that has both, magnitude as well as direction

[1]

(b) Fig. 2.1 shows a tower crane used to lift a load on a construction site.

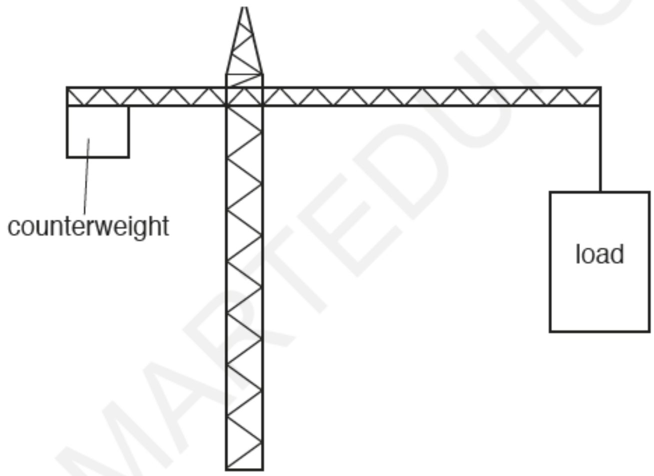


Fig. 2.1

Explain how the counterweight prevents the crane from toppling over.

The counterweight provides an anticlockwise moment. This

anticlockwise moment= The clockwise moment provided by the load

[2]

[Total: 6]

3 **(a)** Fig. 3.1 shows a waterfall.

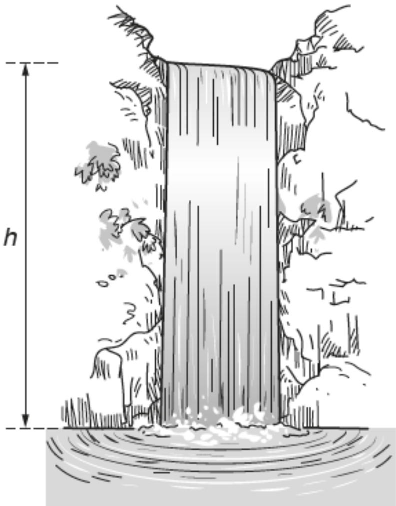


Fig. 3.1

(i) Describe the main energy transfer which is taking place as the water falls.

Main energy changes are from Gravitational potential energy to kinetic energy [2]

(ii) The speed of the water as it hits the bottom is 21 m/s.

Calculate the height *h* of the waterfall.

Kinetic energy gained= Potential energy lost

$1/2\ (mv^2) = mgh$

$h = [1/2\ mv^2)]/mg$

$h = v^2/2g$

$h = (21)^2/2 \times 10$

$h = 22m$

height = 22m [3]

(iii) State and explain any assumption you made in **(ii)**.

No energy is lost to surroundings as thermal energy [1]

(b) The Sun is the source of energy for most energy resources used to produce electricity.

State **two** energy resources that have another source for their energy.

1. Geothermal
2. Nuclear

[or] Tidal [2]

[Total: 8]

[Turn over

4 Solids have a fixed shape. Liquids adapt to the shape of their container. Gases fill their container.

Explain in terms of forces between molecules and arrangement of molecules, why solids, liquids and gases have these properties.

Solids The mlecules are in a lattice arrangement .There exist strong forces of attraction between molecules.

Liquids .The average forces are too weak to keep the molecules in a definite pattern [OR] The forces are just enough to hold the molecules in the bulk of the liquid. iquid.

Gases :The molecules are far apart. There are weak forces between the molecules, except during collisions

[6]

[Total: 6]

5 An electric kettle contains water at a temperature of 19 °C. The kettle has a power rating of 3.0 kW and is switched on for 3.5 minutes.

(a) Calculate the energy supplied to the kettle by the electricity supply.

Energy = power x time

= 3000 × 3.5 × 60

=630 000 J

Always remember to convert time to seconts and power to watts, if energy is in Joules.

electrical energy = 630000J .... [3]

(b) At 3.5 minutes, the temperature of the water reaches 100 °C. The volume of the water in the kettle is 1700 cm^3 and its density is 1.0 g / cm^3. The specific heat capacity of water is 4200 J / (kg °C).

Calculate the thermal energy gained by the water.

Note: Initial temperature= 19^0C
FInal temperature = 100^0C.
Change in temperature=ΔT
= 100-19=81^0C
$1.0g/cm^3$= 1 x $10^{-3}/10^{-6}$= $10^3 kg/m^3$
$1700cm^3$=1700x $10^{-6}m^3$

$E= mc\Delta T$ ....Equation (1);

Also ; mass= density x volume

mass= 1700 x $10^{-6}/10^3$

=1700 x 10^{-3}= 1700/1000

ΔT = (100–19) OR ΔT = 81

It is important to convert into correct units

Substituting in Equation 1 we get,

E= m x c x ΔT = 1700/1000 x4200 x 81

=580 000J

thermal energy = 580 000J .... [5]

(c) Calculate the efficiency of the kettle.

Efficiency = $\frac{\text{useful energy output}}{\text{total energy input}}$ OR $\frac{580000}{630000}$ (× 100)

= 0.92 OR 92%

Note:
1)Energy supplied to the kettle= 63000J=Input energy
2) Thermal energy gained by water = Output energy=580000J

efficiency = 0.92J .... [2]

[Total: 10]

7 **(a)** Fig. 7.1 shows the position of a converging lens, its principal axis and an object O.

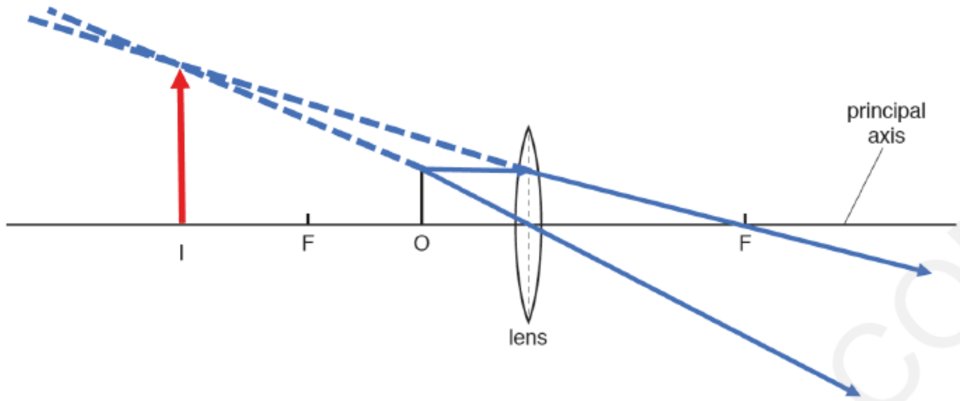


Fig. 7.1

Each principal focus of the lens is labelled F.

On Fig. 7.1, draw a ray diagram to locate the position of the image formed by the lens.

Label the image I. [3]

(b) Describe the nature of the image I.

Enlarged and upright and Virtual

.... [2]

(c) Images formed by lenses sometimes have coloured edges.

Suggest a reason for this.

Because different colours have different wavelengths [or] Different frequencies are refracted by different amounts

.... [1]

[Total: 6]

8 (a) Fig. 8.1 shows a negatively charged conducting sphere.

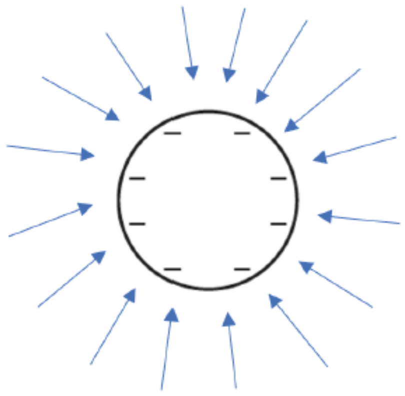


Fig. 8.1

On Fig. 8.1, draw the electric field pattern around the sphere. [2]

(b) The current in an electrical device is 0.21 A.

Calculate the charge that flows during a 75 s period of time.

Q= I t
= 0.21 x 75
= 16C

charge = 16C [2]

[Total: 4]

9 Fig. 9.1 shows a circuit containing an LED and two resistors in parallel, each of resistance *R*.

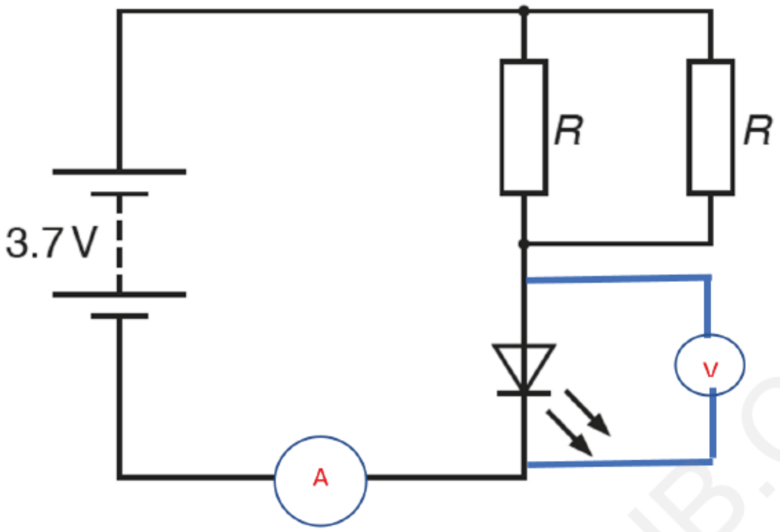


Fig. 9.1

The normal operating voltage of the LED is 2.1 V and the normal current is 0.19 A.

(a) **(i)** The potential difference (p.d.) across the LED is measured with a voltmeter.

On Fig. 9.1, draw the symbol for this voltmeter connected to the circuit. [1]

(ii) The current in the LED is measured with an ammeter.

On Fig. 9.1, draw the symbol for this ammeter connected to the circuit. [1]

(b) Calculate the value of *R* when the LED is operating normally.

I=0.19A
Voltage across the resistors R = 3.7V-2.1V= 1.6V
Value of R/2= V/I = 1.6/0.19=8.4 Ω . Hence R=17Ω

In the above calculation, Ohm's law has been applied.

R = 17 Ω [5]

[Total: 7]

10 **(a)** A magnet and a coil are attached separately to a door and a door frame as shown in Fig. 10.1.

The purpose of the arrangement is to activate a circuit connected to an LED indicator when the door is opening or closing. This will provide a visual indication that the door is being used.

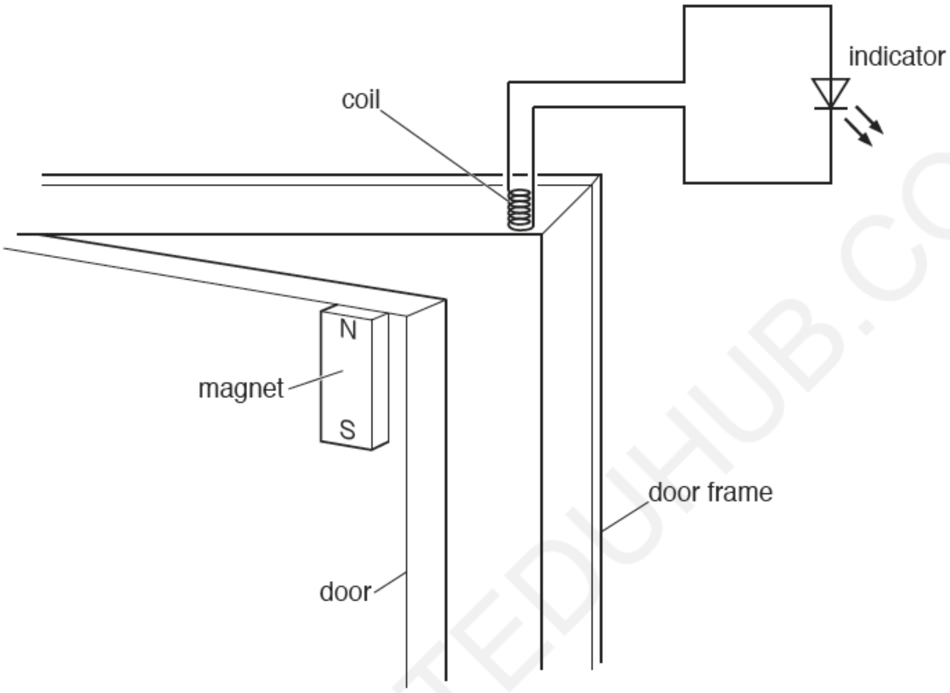


Fig. 10.1

Initially, the door is closed and then it is opened.

(i) Explain why the indicator comes on and then goes off when the door is opened.

Movement of the magnet induces a current in the LED.The light goes off when the magnet is no longer below the coil.

.... [2]

(ii) The door shuts. The indicator comes on more brightly but for a shorter time than it did in **(i)**. Suggest and explain why this happens.

The door closes more quickly than it was opened, so there is a higher current in the LED. The magnet is moving for a shorted period of time . hence the indicator comes on more brightly but for a shorter period of time.

.... [2]

(b) A circuit breaker is recommended for use with an electric lawnmower.

State **two** reasons for this recommendation.

reason 1 Quick response

reason 2 Protects against electric shocks

[2]

[Total: 6]

[or] Protects against overheating
[or] Easily resettable
[or Avoids damage to lawnmovers

11 (a) The circles shown in Fig. 11.1 represent three gold nuclei. Three α-particles are approaching the gold

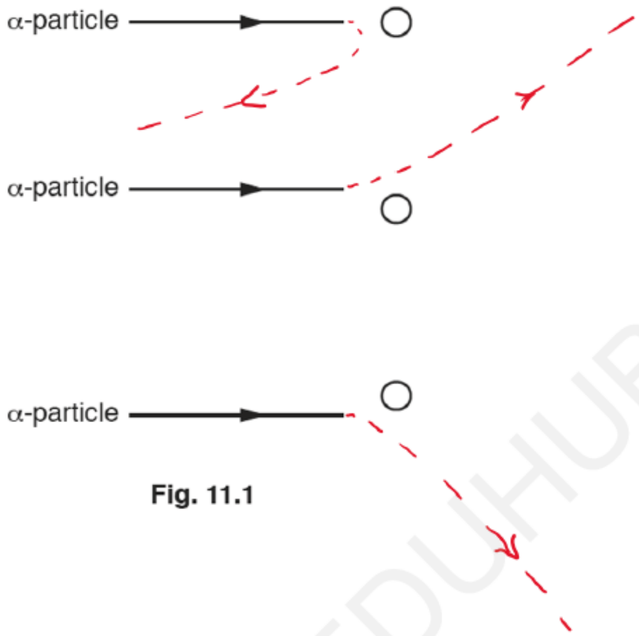


Fig. 11.1

On Fig. 11.1, complete the path of each α-particle. [3]

(b) A detector of radioactivity in a laboratory indicates an average of 16 counts/min when no radioactive samples are present. A radioactive sample of half-life 1.5 days is placed close to the detector, which indicates a count rate of 208 counts/min.

Calculate the count rate that is indicated 6 days later.

Counts due to the radioactive source= 208-16=192
If One half life is 1.5 days ,
Then 1.5 x 4=16, so 4 half lives mhave got completed after 6 days
Hence The actual count rate without background radiation= 192/16= 12
So the count rate indicated by the detector= 12 + 16=28counts

count rate = 28 counts/min [4]

(c) The waste from nuclear power stations includes the isotopes technetium-99, tin-126 and selenium-79. These isotopes are radioactive with half-lives of many thousands of years.

State **three** economic and environmental consequences of producing this waste.

1. The waste must be stored with sheilding
2. The waste must be stored securely
3.The waste must be transported with sheilding

Also acceptable consequences are:
1)The waste must be transported securely
2) It is expensive to store the waste
3) It proves dangerous to the people incase of accidents
4)Site of storage becomes uninhabitable for thousands of years.

.... [3]

[Total: 10]

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