DUNMAN HIGH SCHOOL
Preliminary Examinations
Year 6
Higher 1

CANDIDATE NAME

CLASS

INDEX NUMBER

PHYSICS

8866/02

Paper 2 Structured Questions

14 September 2017

2 hours

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name in the spaces at the top of this page.

Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

The use of an approved scientific calculator is expected, where appropriate.

Section A
Answer **all** questions.

Section B
Answer any **two** questions.

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.

For Examiner's Use	
Section A	
1	**7**
2	**8**
3	**8**
4	**6**
5	**11**
Section B	
6	**20**
7	**20**
8	**20**
Total	**80**

This document consists of **23** printed pages and **1** blank page.

Data

speed of light in free space,	c	$= 3.00 \times 10^{8}\ \mathrm{m\,s^{-1}}$
elementary charge,	e	$= 1.60 \times 10^{-19}\ \mathrm{C}$
the Planck constant,	h	$= 6.63 \times 10^{-34}\ \mathrm{J\,s}$
unified atomic mass constant,	u	$= 1.66 \times 10^{-27}\ \mathrm{kg}$
rest mass of electron,	m_e	$= 9.11 \times 10^{-31}\ \mathrm{kg}$
rest mass of proton,	m_p	$= 1.67 \times 10^{-27}\ \mathrm{kg}$
acceleration of free fall,	g	$= 9.81\ \mathrm{m\,s^{-2}}$

Formulae

uniformly accelerated motion,	s	$= ut + \frac{1}{2}at^2$
	v^2	$= u^2 + 2as$
work done on/by a gas,	W	$= p\,\Delta V$
hydrostatic pressure,	p	$= \rho gh$
resistors in series,	R	$= R_1 + R_2 + \ldots$
resistors in parallel,	$1/R$	$= 1/R_1 + 1/R_2 + \ldots$

Section A

Answer **all** the questions in this section.

1 A 20 kg monkey has a firm hold on a light rope that passes over a frictionless pulley and is attached to a 20 kg bunch of bananas, as shown in Fig. 1.1. The monkey looks up, sees the bananas, and starts to climb the rope to get them.

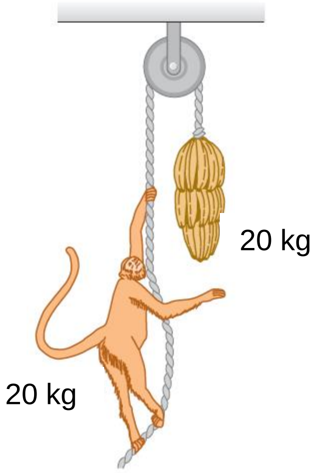

Fig. 1.1

(a) As the monkey climbs,

(i) State the forces acting on the monkey.

……………………………………………………………………………………………………

……………………………………………………………………………………………………[1]

(ii) Hence or otherwise, state and explain whether the bananas move up, down or remain at rest.

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………[3]

(iii) State and explain whether the vertical separation between the monkey and the bananas decrease, increase or remain constant.

………………………………………………………………………………………………

………………………………………………………………………………………………[1]

(b) The monkey releases her hold of the rope and both the monkey and bananas fall.

Before reaching the ground, the monkey grabs the rope to stop her fall. State and explain the motion of the bananas while monkey slows down to a complete stop.

………………………………………………………………………………………………

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………………………………………………………………………………………………

………………………………………………………………………………………………[2]

2 A block of mass 0.40 kg slides in a straight line with a constant speed of 0.30 m s^{-1} along a horizontal surface, as shown in Fig. 2.1.

Fig. 2.1

The block hits a spring and decelerates. The speed of the block becomes zero when the spring is compressed by 8.0 cm.

(a) Calculate the initial kinetic energy of the block.

kinetic energy = …………………….. J [1]

(b) The variation of the compression x of the spring with the force F applied to the spring is shown in Fig. 2.2.

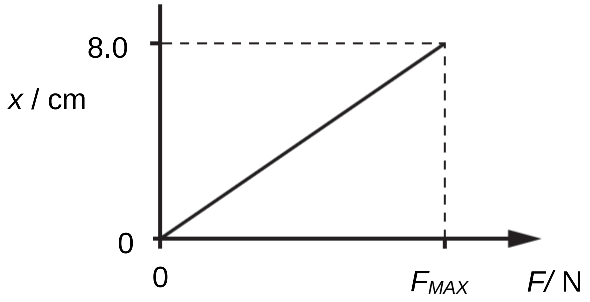


Fig. 2.2

Use your answers in **(a)** to determine the maximum force F_{MAX} exerted on the spring by the block.

F_{MAX} = …………………….. N [1]

(c) Calculate the maximum deceleration of the block.

decceleration = …………………….. m s^{-2} [1]

(d) State and explain whether the block is in equilibrium when its speed becomes zero.

…………………………………………………………………………………………………

…………………………………………………………………………………………………[1]

(e) The length of the spring is then cut in half. The same block travelling at the same speed of 0.30 m s^{-1} hits the spring.

Suggest and explain the change, if any, on the length of compression of the spring when the speed of the block becomes zero.

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………[2]

(f) The mass *m* of the block is now varied. The initial speed of the block remains constant and the spring continues to obey Hooke's law.

On Fig. 2.3, sketch the variation with mass *m* of the maximum compression x_0 of the spring. [2]

Fig. 2.3

3 A resistor of resistance 2.0 Ω is connected to a circuit with a supply of internal resistance 0.80 Ω and another resistor of resistance 5.0 Ω as shown in Fig. 3.1.

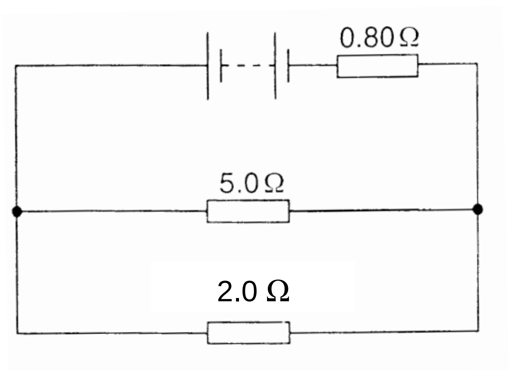


Fig. 3.1

The current through the 5.0 Ω resistor is 0.85 A. Calculate

(a) the p.d. across 2.0 Ω resistor,

p.d. = ... V [2]

(b) the total current from the supply,

current = ... A [2]

(c) the e.m.f. of the supply,

e.m.f. = ...V [2]

(d) the energy supplied to 2.0 Ω resistor in 20 minutes.

energy = ...J [2]

For Examiner's Use

4 **(a)** A uniform magnetic field has constant flux density *B*. A straight wire of fixed length carries a current I at an angle θ to the magnetic field, as shown in Fig. 4.1.

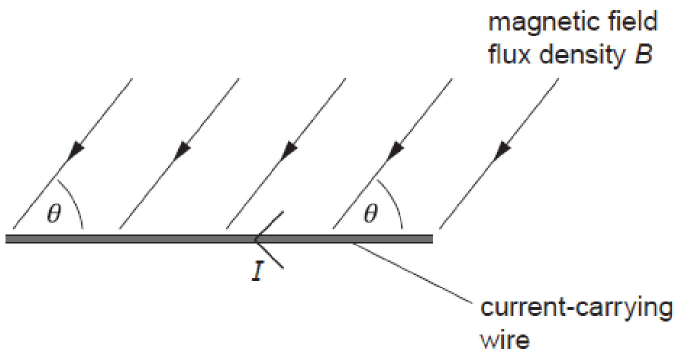
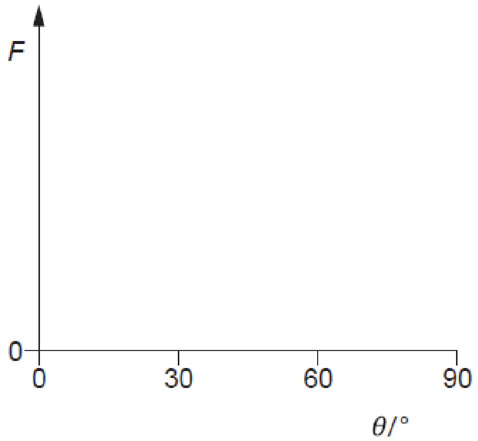


Fig. 4.1

The angle θ between the wire and the magnetic field is now varied. The current I is kept constant.

On Fig. 4.2, sketch a graph to show the variation with angle θ of the force *F* on the wire.



[3]

Fig. 4.2

(b) A small bar magnet is suspended 5.0 cm away from a long straight wire which is orientated in a north-south direction. The magnet is on the right side of the wire. When there is no current in the wire, the north pole of the magnet dips at an angle of 5.0° below the horizontal, as shown in Fig. 4.3.

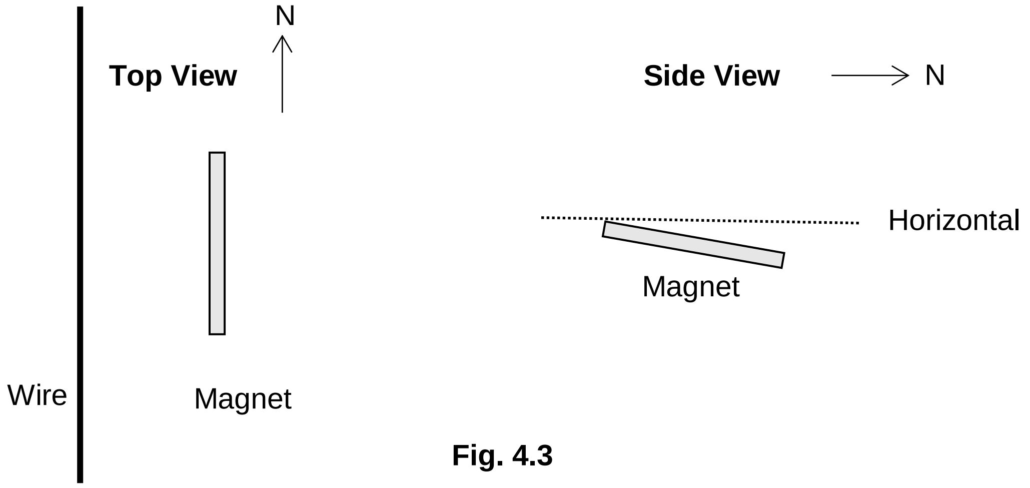


Fig. 4.3

A current is then supplied to the wire to move the magnet back to the horizontal position. Determine the magnitude and the direction of the current required.

The Earth's magnetic field in the region around the magnet is 0.17 mT.

The magnetic flux density, B due to a long straight wire carrying a current, I at a distance, d from the wire is given by the expression, $B = \frac{\mu_o I}{2\pi d}$ where μ_o is $4\pi \times 10^{-7}$ H m^{-1}.

direction = ……………………………………………………

magnitude = ………………………… A [3]

5 Resistivity and Temperature

Temperature generally affects current in an electrical circuit by changing the speed at which the charge carriers travel. In metals, this is due to an increase in resistance of the circuit that results from the increase in temperature.

Over a limited temperature range, the resistivity of different materials varies linearly with temperature according to the expression

$$\rho = \rho_0[1+\alpha(T-T_0)]$$

where ρ is the resistivity at some temperature T (in degrees Celsius), ρ_0 is the resistivity at the reference temperature T_0 = 20ºC, and α is a constant called the temperature coefficient of resistivity.

The resistivity at 20ºC and the temperature coefficients of resistivity for some materials are shown in the table of Fig. 5.1 below.

Material	ρ_0 / **Ω m**	α / **ºC^{-1}**
Gold	2.44 x 10^{-8}	3.4 x 10^{-3}
Tungsten	5.60 x 10^{-8}	4.5 x 10^{-3}
Silver	1.59 x 10^{-8}	3.8 x 10^{-3}
Platinum	11.0 x 10^{-8}	3.9 x 10^{-3}
X	1.50 x 10^{-6}	0.40 x 10^{-3}
Y	10.0 x 10^{-8}	5.0 x 10^{-3}

Fig. 5.1

(a) Distinguish between electrical *resistance* and *resistivity.*

....

....

....

....

.... [3]

For Examiner's Use

(b) Calculate the resistivity, at 120°C, of

(i) gold

resistivity = ……………..………… Ω m [1]

(ii) tungsten

resistivity = ……………..………… Ω m [1]

(c) A 5.0 cm length of gold wire, of diameter 0.240 mm, is soldered to a 5.0 cm length of tungsten wire, of diameter 0.140 mm, to form a composite wire, in the configuration as shown in Fig. 5.2.

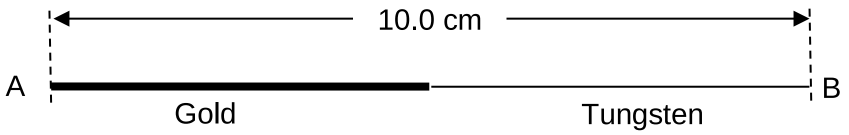


Fig. 5.2

(i) Calculate the resistance across A and B at a temperature of 120°C.

resistance = ……………..………… Ω [3]

(ii) The composite wire in Fig 5.2 is now bent into a square loop, as shown in Fig. 5.3.

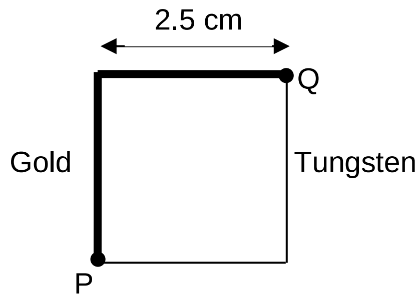


Fig 5.3

Calculate the resistance across P and Q at a temperature of 120°C.

resistance = ………….…………….. Ω [2]

(d) A student would like to make an electric kettle with a coil of wire made from either material **X** or **Y**. Suggest with a reason which material, **X** or **Y**, is more suitable to be used as a heating element in an electric kettle.

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………[1]

Section B

Answer **two** of the questions in this section.

6 Fig. 6.1 shows an object M on a smooth slope.

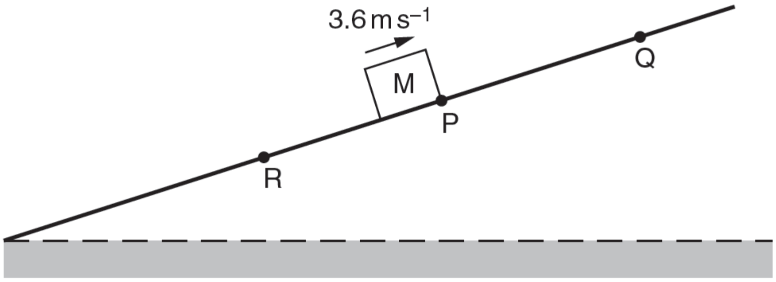


Fig. 6.1

M moves up the slope, comes to rest at point Q and then moves back down the slope to point R. M has a constant acceleration of 3.0 m s^{-2} down the slope at all times.

At time t = 0, M is at point P and has a velocity of 3.6 m s^{-1} up the slope.
The total distance from P to Q and then to R is 6.0 m.

(a) Calculate, for the motion of M from P to Q,

(i) the time taken,

time = …………………….. s [2]

(ii) the distance travelled.

distance = …………………….. m [1]

(b) Determine the speed of M at R.

speed of M = …………………….. m s^{-1} [3]

(c) On Fig. 6.2, draw the variation with time *t* of the velocity *v* of M for the motion P to Q to R.

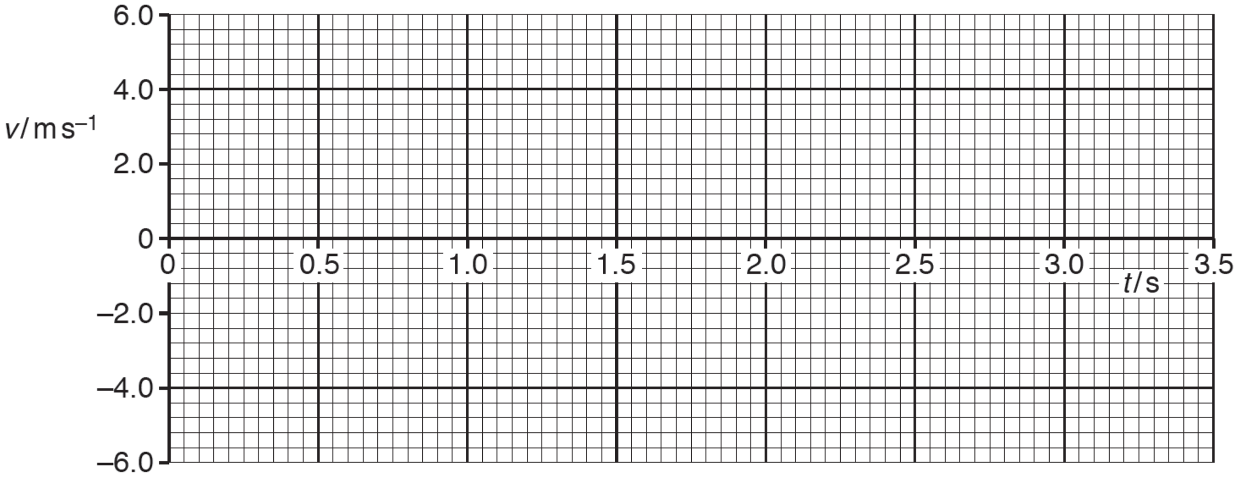


Fig. 6.2

[3]

(d) The mass of M is 450 g.

Calculate the difference in the kinetic energy of M at P and at R.

difference in kinetic energy = …………………….. J [2]

For Examiner's Use

(e) A cart of mass 2.0 kg is moving to the right at a speed of 10 m s^{-1} on a smooth horizontal floor as shown in Fig. 6.3. M continues to slide down the slope that is inclined at an angle θ from the horizontal and leaves the end of the slope with a speed of 6.0 m s^{-1}. M lands in the cart and they roll off together.

The vertical distance between the lower end of the slope and the bottom of the cart is 4.0 m.

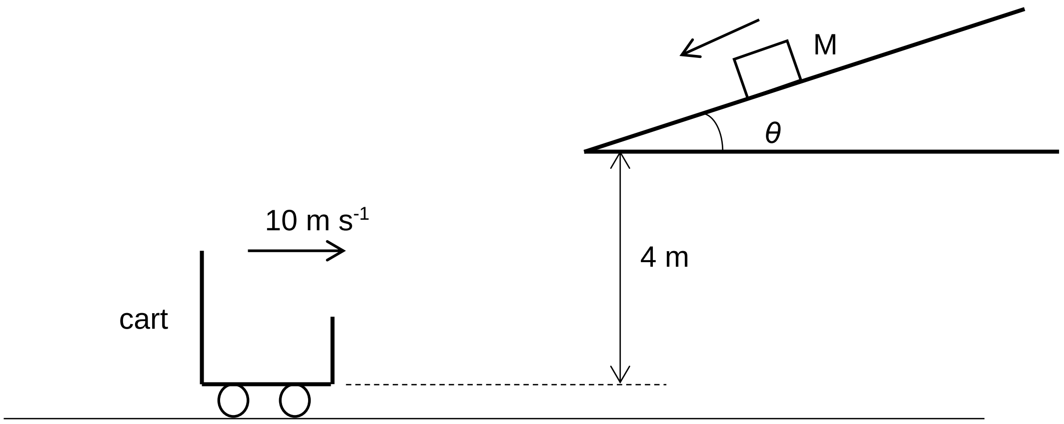


Fig. 6.3 (not to scale)

(i) Given that M has a constant acceleration of 3.0 m s^{-2} down the smooth slope at all times, show that the angle θ is 18°.

[2]

(ii) State the *principle of conservation of linear momentum*.

....

....

....[2]

(iii) Calculate the speed of M just before it lands in the cart.

speed of M = …………………….. m s^{-1} [2]

(iv) Determine the final speed of the cart.

final speed of cart = …………………….. m s^{-1} [3]

For Examiner's Use

7 **(a)** Describe the basic difference between the following terms. You may use diagrams to illustrate your answers.

(i) a *transverse* wave and a *longitudinal* wave,

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………[2]

(ii) a *polarised* wave and a *non-polarised* wave,

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………[2]

(iii) a *stationary* wave and a *progressive* wave.

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………[2]

(b) Fig. 7.1 shows the variation with distance *x* along a wave of its displacement *d* at a particular time.

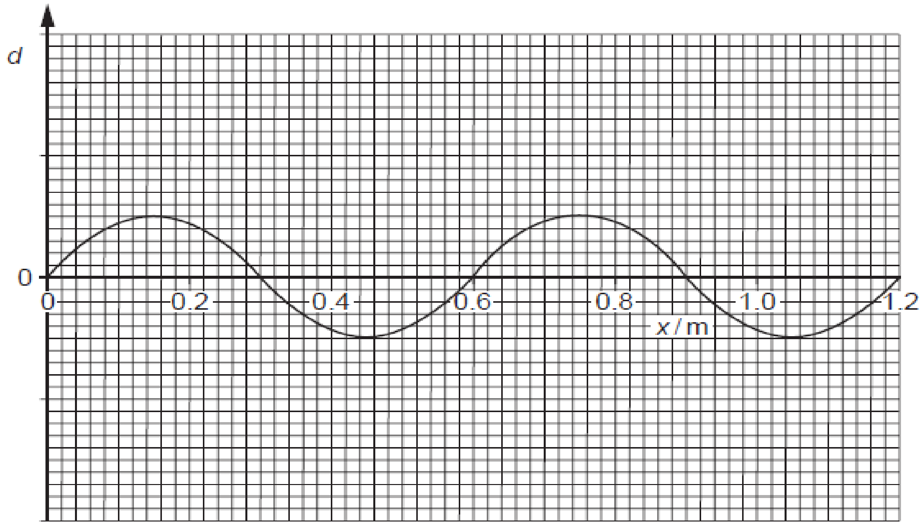


Fig. 7.1

The wave is a progressive wave having a speed of 330 m s^{-1}.

(i) Use Fig. 7.1 to determine the wavelength of the wave.

wavelength = ... m [1]

(ii) Hence calculate the frequency of the wave.

frequency = ... Hz [2]

(iii) A second wave has the same frequency and speed as the wave shown in Fig. 7.1 but has double the intensity.

The phase difference between the two waves is 180°.

On the axes of Fig. 7.1, sketch a graph to show the variation with distance *x* of the displacement *d* of this second wave. [2]

For Examiner's Use

(c) Fig. 7.2 shows wavefronts incident on, and emerging from, a double slit arrangement.

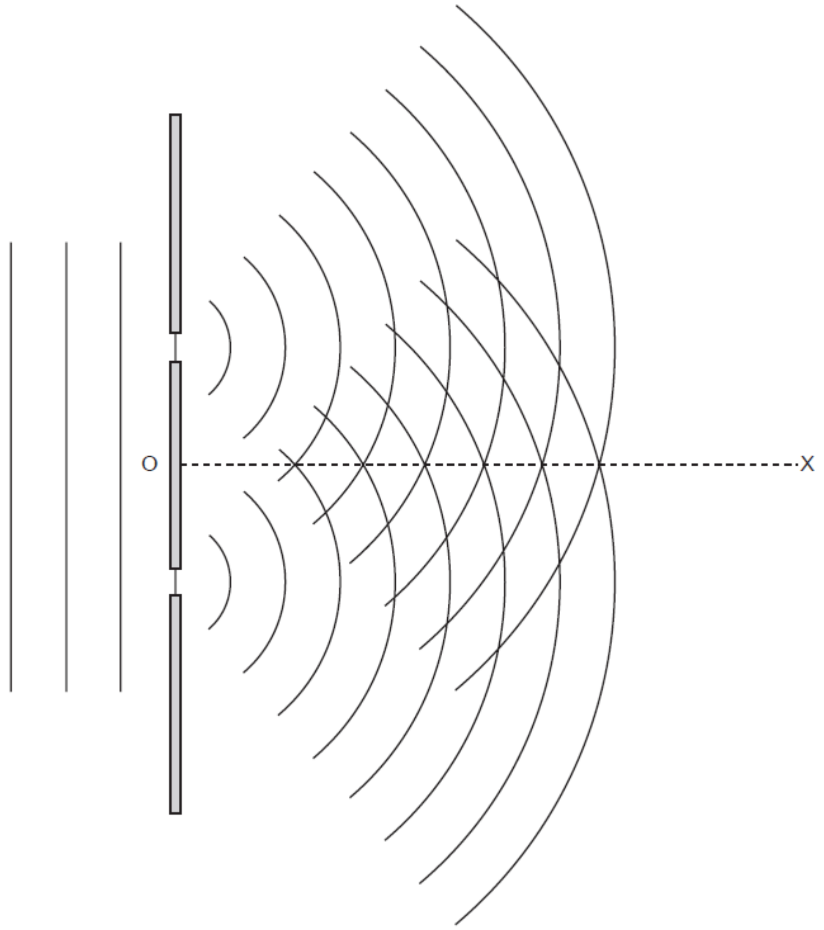


Fig. 7.2

The wavefronts represent successive crests of the wave. The line OX shows one direction along which constructive interference may be observed.

On Fig. 7.2, draw lines to show

(i) a second direction along which constructive interference may be observed (label this line CC),

(ii) a direction along which destructive interference may be observed (label this line DD). [2]

(d) A long tube is open at one end. It is closed at the other end by means of a piston that can be moved along the tube, as shown in Fig. 7.3.

Fig. 7.3

A loudspeaker producing sound of frequency 550 Hz is held near the open end of the tube. The piston is moved along the tube and a loud sound is heard when the distance L between the piston and the open end of the tube is 45 cm.

The speed of sound in the tube is 330 m s^{-1}.

(i) Show that the wavelength of the sound in the tube is 60 cm.

[1]

(ii) On Fig. 7.3, mark all the positions along the tube of

1. the displacement nodes (label these with the letter N),

2. the displacement antinodes (label these with the letter A). [3]

(e) The frequency of the sound produced by the loudspeaker in **(d)** is gradually reduced. Determine the lowest frequency at which a loud sound will be produced in the tube of length L = 45 cm.

frequency = ... Hz [3]

8 **(a)** Experiments are conducted to investigate the photoelectric effect.

(i) It is found that, on exposure of a metal surface to light, either electrons are emitted immediately or they are not emitted at all.

Suggest why this observation does not support a wave theory of light.

....

....

....

.... [3]

(ii) Data for the wavelength λ of the radiation incident on the metal surface and the maximum kinetic energy E_K of the emitted electrons are shown in Fig. 8.1.

λ / nm	E_K / 10^{-19} J
650	–
240	4.44

Fig. 8.1

Without any calculation, suggest why no value is given for E_K for radiation of wavelength 650 nm.

....

.... [1]

(iii) Use data from Fig. 8.1 to determine the work function energy of the surface.

work function energy = ... J [3]

(iv) Radiation of wavelength 240 nm gives rise to a maximum photoelectric current I. The intensity of the incident radiation is maintained constant and the wavelength is now reduced.

State and explain the effect of this change on

1. the maximum kinetic energy of the photoelectrons,

....

....

.... [2]

2. the maximum photoelectric current I.

....

....

.... [2]

(b) State what is meant by *the de Broglie wavelength*.

....

....

.... [2]

(i) An electron is accelerated in a vacuum from rest through a potential difference of 850 V. Calculate

1. the final momentum of the electron.

final momentum = ... N s [3]

2. the de Broglie wavelength of this electron.

wavelength = ... m [2]

(c) A parallel beam of electrons, all travelling at the same speed, is incident normally on a carbon film. The scattering of the electrons by the film is observed on a fluorescent screen, as illustrated in Fig. 8.2.

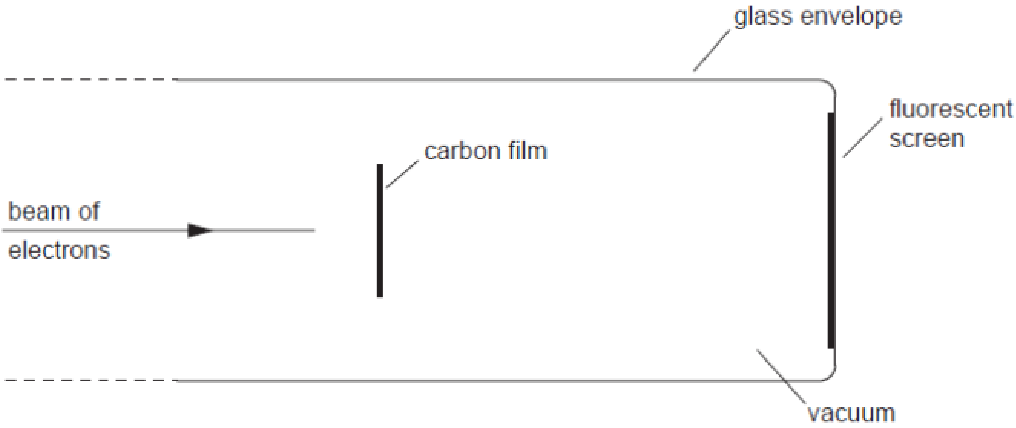


Fig. 8.2

(i) Assuming that the electrons behave as particles, predict what would be seen on the screen.

....

.... [1]

(ii) In this experiment, the electrons do not behave as particles.

Describe briefly the pattern that is actually observed on the screen. You may draw a sketch if you wish.

....

.... [1]

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For Examiner's Use

Dunman High School Year 6 H1 Physics Prelim Exam Answers

<u>Paper 1</u>

1. B	2. B	3. C	4. A	5. C	6. B	7. B	8. C	9. A	10. D
11. C	12. B	13. D	14. D	15. D	16. D	17. D	18. C	19. B	20. D
21. C	22. A	23. A	24. B	25. B	26. A	27. D	28. D	29. B	30. A

<u>Paper 2</u>
<u>Section A</u>

1 **(a)** **(i)** Weight of monkey and (frictional) force by rope on monkey
Or Weight of monkey and tension of rope on monkey A1

(ii) Monkey climbs up so force by monkey on rope > 20g B1
(Frictionless pulley) tension in the rope is the same on the monkey and on the bananas M1
Bananas move up. A1

(iii) Start <u>at rest with same upwards acceleration</u>, distance is a constant. A1

(b) Bananas slow down at the same rate as that of monkey (same magnitude of force on monkey and bananas). M1
Bananas also come to a complete stop at the same time as that of monkey. A1

2 **(a)** $E_k = ½ mv^2 = ½ \times 0.40 \times 0.30^2 = 1.8 \times 10^{-2}$ J A1

(b) loss in KE = gain in EPE
$1.8 \times 10^{-2} = ½ \times F \times 0.080$
$F_{MAX} = 0.45$ N A1

(c) $a = F/m = 0.45 / 0.40 = 1.1$ m s^{-2} A1

(d) Resultant force is not zero (F_{MAX} acting on block), so not in equilibrium. A1

(e) spring constant increases (by 2 times) M1
maximum compression reduces (is now 5.7 cm) A1

(f) Curved line from origin, B1
With decreasing gradient (no plateau) B1

3 **(a)** pd across 2.0 Ω = pd across 5.0 Ω
= 5 × 0.85 C1
= 4.25 = 4.3 V A1

(b) Total current = 0.85 + 4.25/2 C1
= 2.975 = 3.0 A A1

(c) emf = 4.25 + 2.975(0.8) C1
= 6.63 = 6.6 V A1

(d) Energy = IVt

$= (2.125)(4.25)(20 \times 60)$ C1

$= 10838 = 11000$ J A1

4 **(a)** Maximum force shown at angle $\theta = 90^0$ M1

Zero force shown at $\theta = 0^0$ M1

Reasonable curve with F about ½ max at 30^0 A1

(b) The north pole of the magnet indicates the direction of the Earth's magnetic field which points at an angle of 5^0 below the horizontal.

Vertical component of Earth's magnetic field, B downwards

$= 0.17x10^{-3} \sin 5^o$

$= 1.48 \text{ x } 10^{-5}\ T$ C1

To orientate the magnet horizontally, the magnetic field due to the wire must neutralise the downward field due to the Earth.

$$B = \frac{\mu_o I}{2\pi r} = \frac{4\pi x10^{-7} I}{2\pi(5.0x10^{-2})} = 1.48 \text{ x } 10^{-5}\ T \quad = 3.7 \text{ A}$$ M1

in the north-south direction A1

5 **(a)**

The resistance R of a conductor is defined as the **ratio** $\frac{V}{I}$ where V is the potential difference across the conductor and I is the current flowing through it. -----------------[B1]

Resistivity is a relationship between the dimensions of a specimen of a material and its resistance that is constant at constant temperature and determined by ρ = $\frac{RA}{L}$ where R is resistance, A is cross-sectional area and L is length. ----------------------------[B1]

Resistance is a property of the sample (depends on the dimensions of the sample) whereas resistivity relates to the material. ---[B1]

(b) (i) $3.27 \text{ x } 10^{-8}$ Ωm -----[A1]

(ii) $8.12 \text{ x } 10^{-8}$ Ωm -----[A1]

(c) The 2 wires are in series, thus effective resistance adds up.

Resistance

$= R_{gold,120\deg} + R_{tungsten,120\deg}$

$$= \frac{(3.27\times10^{-8})(0.050)}{\pi(\frac{0.240\times10^{-3}}{2})^2} + \frac{(8.12\times10^{-8})(0.050)}{\pi(\frac{0.140\times10^{-3}}{2})^2}$$ ----[M2, A1]

$= 0.03614 + 0.26374 = 0.300\Omega$

(d) The 2 wires are in parallel,

$R = (1/R_{gold,120\deg} + 1/R_{tungsten,120\deg})^{-1}$

$= (\frac{1}{0.03614} + \frac{1}{0.26374})^{-1} = 0.0318\Omega$ -----[M1,A1]

(e) Material X is more suitable, as it has a larger resistivity. Thus for the same resistance in the heating element, a shorter length of X is required compared to Y.

OR

Material X is a more suitable material. It has a much smaller temperature coefficient of resistivity α than material Y. The resistance of X and hence the power output will be relatively more constant compared to Y during heating. ---[B1]

6 **(a)** **(i)** $v = u + at$

$0 = 3.6 - 3.0t$ C1

$t = 1.2$ s A1

(ii) distance travelled = ½ $(3.0)(1.2)^2$ = 2.16 = 2.2 m. A1

(b) distance = 6.0 – 2.16 = 3.84 C1

$v^2 = u^2 + 2as$ = 2 x 3.0 x 3.84 = 23.04 C1

v = 4.8 m s^{-1} A1

(c) straight line from v = 3.6 m s^{-1} to v = 0 at t = 1.2 s B1

straight line continues with the same gradient as v changes sign B1

straight line from v = 0 intercept to v = – 4.8 m s-*1* B1

(d) difference in KE = ½ $m(v^2 - u^2)$

= 0.5 x 0.45 x $(4.8^2 - 3.6^2)$ M1

= 2.27 J A1

(e) **(i)** Based on Newton's 2nd Law,

Component of weight down the slope = mass x acceleration B1

$mg\sin\theta = ma$

$\sin\theta = 3/9.81$ M1

θ = 17.8 = 18° A0

(ii) The principle of conservation of linear momentum states that the total momentum of a system remains <u>constant</u> [B1] provided <u>no net external resultant force</u> acts on system [B1].

(iii) Using conservation of energy

½ $(0.45)(6.0)^2 + (0.45)(9.81)(4.0)$ = ½ $(0.45)(v^2)$ C1

v = 10.7 m s^{-1} A1

(iv) horizontal speed of M = 6.0 cos(17.8°) = 5.713 m s^{-1} C1

Apply conservation of momentum in horizontal direction
(2.0)(10) – (0.45)(5.713) = (2.45) *v* C1
v = 7.11 m s^{-1} A1

7 **(a)** **(i)** transverse wave has vibrations perpendicular/normal to direction of energy travel B1
longitudinal wave has vibrations parallel to the direction of energy travel B1
accept answers in terms of a diagram

(ii) polarised with all vibrations in a single axis / direction (normal to direction of energy travel) B1
non-polarised with vibrations in all directions B1
a diagram here must have at least three doubled headed arrows.

(iii) progressive: all particles have same amplitude
stationary: maximum (antinode) to minimum/zero amplitude (node) B1
progressive: adjacent particles are not in phase
stationary: wave particles are in phase (between adjacent nodes) B1
progressive: transfer energy
stationary: do not transfer energy B1
(max 2 marks)

(b) **(i)** $\lambda = 0.60$ m A1

(ii) $f = \frac{v}{\lambda} = \frac{330}{0.60}$ M1
$= 550$ Hz A1

(iii) Amplitude shown is greater than 5 units but less than 10 units and B1
constant correct phase B1
(waves to be at least 3 half-periods, otherwise 1-overall)

(c) **(i)** Any correct line through points of intersection of crests B1
(ii) Any correct line through intersections of a crest and a trough B1

(d) **(i)** λ = (330 x 10^2)/550 M1
= 60 cm A0

(ii) Node labelled at piston B1
Antinode labelled at open end of tube B1
Additional node and antinode in correct positions along tube B1

(e) At lowest frequency, length = $\frac{\lambda}{4}$ C1
λ = 1.8 m

Frequency = 330/1.8 C1
= 180 Hz A1

8 **(a)** **(i)** For a wave,
electron can 'collect' energy continuously B1
electron will always be emitted/will be emitted at all frequencies… M1
after a sufficiently long delay A1

(ii) Either wavelength is longer than threshold wavelength
or frequency is below the threshold frequency
or photon energy is less than work function B1

(iii)

$$\frac{hc}{\lambda} = \phi + E_{max}$$ C1

$$\frac{(6.63\ x\ 10^{-34})(3.0\ x\ 10^{8})}{(240\ x\ 10^{-9})} = \phi + 4.44\ x\ 10^{-19}$$ C1

$$\phi = 3.8\ x\ 10^{-19}\ \text{J}$$ A1

(iv) **1.** Photon energy larger M1
so (maximum) kinetic energy is larger A1

2. Few photons (per unit time) M1
so (maximum) current is smaller A1

(b) Wavelength of wave associated with a particle M1
that is moving A1

(i) **1.** Energy of electron = 850 x 1.6 x10^{-19} = 1.36 x 10^{-16} J C1

$$Energy = \frac{p^2}{2m}$$

$$1.36\ x\ 10^{-16} = \frac{p^2}{2(9.11\ x\ 10^{-31})}$$ M1

$$p = 1.6\ x\ 10^{-23}\ \text{N s}$$ A1

2.

$$\lambda = \frac{h}{p} = \frac{6.63x10^{-34}}{1.6x10^{-23}}$$ M1

$$= 4.1\ x\ 10^{-11}\ \text{m}$$ A1

(c) **(i)** 'Uniform' distribution B1

(ii) Pattern of concentric rings observed B1