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Mark Scheme

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GCE

GCE Physics 6PH02/01

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These instructions should be the first page of all mark schemes

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Mark
1	B	
2	B	
3	D	
4	C	
5	B	
6	C	
7	B	
8	B	
9	A	
10	C	

Question Number	Answer	Mark
11(a)	Current (through a conductor) is (directly) proportional to the potential difference/voltage (across it) providing the temperature of conductor remains constant OR external conditions remain constant.	**1** **1**
(b)	**Ohmic conductor; fixed resitor** horizontal straight line **Filament lamp;** graph showing increasing resistance (straight line or curve) from a non zero resistance start (conditional on 2nd mark)	**1** **1** **1**
(c)	Filament lamps work at high temperatures OR as temp of lamp increases OR as lamp heats up. Resistance of conductor changes OR the ions vibrate more.	**1** **1**
	Total for question	**7**

Question Number	Answer	Mark
12(a)	Unpolarised light oscillates/vibrates in many planes/ directions while polarised oscillates/vibrates in one plane/direction only OR labelled diagram	**1**
(b)	Filters at 90^{o} to the (polarised) reflected light. sunglasses cut out the reflected light/polarise light/glare But not the light from the fish OR light from fish is unpolarised.	**1** **1** **1**
(c)	Sound is a longitudinal wave OR sound is not a transverse wave OR oscillations in one direction already OR only transverse waves can be polarised.	**1**
	Total for question	**5**

Question Number	Answer	Mark
13(a)	Use of resistors in parallel formula *R* = 9.1 Ω **Example of answer** $1/R = 1/10 + 1/100$ $1/R = 11/100$ $R = 9.1\ \Omega$	**1** **1**
(b)	Voltmeter is connected in parallel (stated or implied) OR voltmeter draws little/no current Resistors in parallel formula with either R_V or large value used $1/R_V$ is <u>very</u> small/negligible OR calculated value of 9.1 Ω with comment	**1** **1** **1**
	Total for question	**5**

Question Number	Answer	Mark
14(a)	ANY THREE Sound waves are longitudinal waves (1) Air molecules vibrate (1) Parallel to the direction of travel of the wave (1) In a series of compressions and rarefactions (1)	 **3**
(b)	Frequency is the number of cycles/oscillations/waves per second/per unit time OR number of cycles/oscillations/waves passing a point per second.	 **1**
(c)	Use of $v = f\lambda$ $V = 3000\ \text{m s}^{-1}$ **Example of answer** $v = 1500\ \text{m s}^{-1} \times 2\ \text{Hz}$ $v = 3000\ \text{m s}^{-1}$	**1** **1**
(d)	Animals detect infrasound / lower frequencies than humans / vibrations through the ground Infrasound travels faster than the tidal wave	 **1** **1**
	Total for question	**8**

Question Number	Answer	Mark
15(a)	Use of potential divider formula with 40 Ω in numerator and 120 Ω in denominator *V* = 3.0 V **OR** ohm's law to whole circuit to find current (1) V=IR applied to 40 Ω resistor (1) **Example of answer** p.d. = 40 × 9.0 / (40 + 80) p.d. = 3.0 V	 **1** **1**
(b)	**QOWC** **Work must be clear and organised in a logical sequence** Resistance of parallel combination increases as temperature decreases Total resistance of circuit increases e.m.f./p.d. remains constant therefore current decreases.	 **1** **1** **1**
	Total for question	**5**

Question Number	Answer	Mark
16	**QOWC** **Work must be clear and organised in a logical sequence** **Particle theory** Reference to $E=hf$ or quanta of energy /packets of energy/photons (1) Increased f means more energy of photon (1) Release of electron requires minimum energy /work function (1) One photon releases one electron (1) Greater energy of photon means greater KE of electrons (1) More intense light means more photons, therefore more electrons (1) **Wave theory** Wave energy depends on intensity (1) More intense light should give greater K.E of electrons (1) Energy is spread over the whole wave (1) If exposed for long enough photons eventually released, doesn't happen. (1) **Max 4 for particles and max 2 for waves.**	**6**
	Total for question	**6**

Question Number	Answer	Mark
17(a)	Use of $I = nqvA$ with e 1.6 × 10^{-19} C and 8 × 10^{-3} A $v = 2.8 \times 10^{-7}$ m s^{-1}	**1** **1**
(b)	Value for semiconductor is much greater n for semiconductor (much) less than for conductor	**1** **1**
(c)	Its resistance decreases because (as temperature increases) n increases OR there are more electrons /charge carriers.	**1** **1**
		6

Question Number	Answer	Mark
18(a)	**Coherent:** Waves of constant phase relationship **Standing wave:** no (net) transfer of energy OR pattern of nodes and antinodes OR points of maximum displacement and zero displacement	**1** **1**
(b)	**QOWC** **Work must be clear and organised in a logical sequence** Calculation to show a path of 24 cm or 42 cm OR paths of 2λ and 3.5 λ Path difference is 1 ½ λ OR divide path difference by 12 Waves at X in antiphase /180º out of phase/π radians out of phase destructive interference **Example of answer** One path length = 18 cm + 6 cm = 24 cm Other path length = 30 cm + 12 cm = 42 cm Path difference = 42cm – 24 cm = 18 cm Number of wavelengths = 18/12 = 1.5	 **1** **1** **1** **1**
(c)	Food moves through hot and cold spots Over time period all parts of food receive similar amount of energy.	**1** **1**
	Total for question	**8**

Question Number	Answer	Mark
19(a)	**Diagram:** Smaller wavelength before gap Less diffraction and same wavelength	 **1** **1**
(b)	Two sets of concentric circles equal spacing Identification of a line of points of destructive interference Identification of a line of points of constructive interference	**1** **1** **1** **1**
(c)(i)	Attempt to use inverse relationship (e.g. 1.2 × 0.60 =constant) Separation =1.8 mm **Example of answer** 1.2 = constant / 0.6 Constant = 0.72 Spacing = 0.72/ 0.4 = 1.8 mm	**1** **1**
(ii)	(Initially bands) will get close together Eventually gap too large for overlap to occur, no fringes seen OR reference to fringes produced providing overlap still occurs	**1** **1**
	Total for question	**10**

Question Number	Answer	Mark
20(a)(i)	e.m.f./total resistance (accept *E*/(*R*+*r*))	**1**
(ii)	= D4*A4 or p.d. = current × <u>load</u> resistance OR (B4*A4)/(A4+C4) or p.d. = e.m.f. – (internal resistance x current) OR F4/D4 or p.d.=power/current	**1**
(iii)	9.2 (W) *R* and *r* in series	**1**
(b)	*R* and *r* in series Potential divider *r* constant so as *R* increases p.d. also increases **OR** *V* = *E* - *Ir* *E* and *r* constant Identifies that the term *Ir* decreases **OR** *E* = *I*(*R*+*r*) *E* and *r* constant As *R* increases *I* decreases	**1** **1** **1**
(c)(i)	(power) increases and then decreases Maximum power when load equals 0.8 Ω	**1** **1**
(ii)	Similar pattern of power increasing to a max and decreasing	**1**
	Maximum power when load resistance is 1.6 Ω	**1**
	Total for question	**10**