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Mark Scheme
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GCE

GCE Physics (6732/01)

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1	$J\,C^{-1}$		
(i)	Potential difference	✓	
(ii)	Product of two quantities Potential difference	✓	
(iii)	Rate of change current	✓	
(iv)	Base quantity current	✓	
	(for any part if two answers are given score is zero)		4
			4

2(a)	(As temperature of thermistor increases) its resistance decreases [Do not credit the converse] any TWO (slight) decrease in *v* (symbol, velocity or drift velocity) Large increase in *n* increases [accept electrons/charge carriers for *n*] A,Q and (pd) remain constant [ignore any reference to *v* staying constant] (n constant, can't score mark for 3,4)	✓ ✓✓	3
(b)			
(i)	**ammeter** reading decreases **voltmeter** reading unaltered	✓ ✓	
(ii)	ammeter is used to indicate temperature	✓	
(iii)	Assumption: <u>ammeter</u>; ideal/ has zero/negligible resistance (Reference to meters is zero mark)	✓	4

3(a)

Tungsten filament

Qowc	✓	
I is not (directly) proportional to *V*		
Temperature of filament increases/ filament heats up/ gets hotter as current/pd increases [accept bulb or lamp but not wire]		
Links temperature increase to resistance increases		
tungsten filament does not obey Ohm's law/not an Ohmic conductor or resistor.	✓✓✓	
Any THREE		
		4

(b)(i)

Reading current from graph 1.5 A	✓	
answer 5.3 Ω	✓	
(misread current →0/2)		**2**

Example of answer

$V = IR$

$R = 8.0 \div 1.5 = 5.3\ \Omega$

(ii)

Addition of two currents	✓	
OR use of R = V/I **and** resistors in parallel formula		
1.5 + 1.2 = 2.7 A	✓	
ecf candidates' current from above		**2**
[If you see 2.7 A give 2marks]		
		8

4(a)(i) Use of $P = V^2 / R$ OR $P=IV$ and $V=IR$ ✓
Total $R = 4.5\ \Omega$ ✓

2

Example of answer
$R = V^2 \div P = 12\ V \times 12\ V \div 32\ W$
$R = 4.5\ \Omega$

(ii) Use of $1/R = 1/R_1 + 1/R_2$..... OR $\Sigma R = 1/5R$ ✓
[OR find total current, divide that by 5 and use $V=IR$]
Resistance of strip = 22.5 Ω ✓
ecf candidates' R.

2

[common error is to divide by 5 → 0.9 Ω scores 0/2 but ecf to next part gives l = 0.033 m which will then score 3/3]

(b) $R = \rho l / A$ or correct rearrangement ✓
Correct substitution ✓
Length = 0.82 m ✓
ecf candidates' R

3

Example of answer
$l = RA/\rho = (22.5\ \Omega \times 4.0 \times 10^{-8}\ m^2) \div 1.1 \times 10^{-6}\ \Omega\ m$
$l = 0.82$ m

(c)

See $P = V^2 / R$ OR $P=IV$ leading to increase in current or decrease in resistance ✓
more strips in parallel / material of lower resistivity ✓
[not greater conductivity]

2

9

5(a) E.M.F. = work done / charge OR energy transferred / charge ✓
OR power / current

1

[There is only one mark here and this is consistent with specification but it must not be Joules or coulombs]

(b)(i) Use of $V = IR$ ✓
$I = 2.0$ A ✓

2

Example of answer
$I = V / R = 8.0$ V / 4.0 Ω
$I = 2.0$ A

(ii) Uses p.d. = 4.0 V ✓
$r = 2.0$ Ω ecf their I ✓

2

Example of answer
$r = V / I = 4.0$ V / 2.0 A
$r = 2.0$ Ω

(iii) Use of $P = VI$ // I^2R // V^2/R ✓
$P = 16$ W ecf their I ✓

2

Example of answer
$P = VI = 8$ V × 2 A
$P = 16$ W

(iv) Uses 4V or 2A×2Ω or their $I \times r$ ✓
see 5 x 60 s in an energy equation ✓
energy = 2400 J ✓

3

Example of answer
$E = VIt = 4$ V × 2 A × 5 × 60 s
$E = 2400$ J

10

6(a)(i)	Specific heat capacity is the energy required when a kg / unit mass	✓		
	undergoes a temp change of 1°C / 1K	✓		
	OR equation(1 mark) terms defined (1 mark)			**2**
	[there must be a reference to a temperature so " energy to raise a kg by 1°C " does not get the 2nd mark. This is a definition which should be learnt. Also 2nd mark lost if 1 C or 1°K]			
(ii)	It is the sum/total of the molecular/atomic	✓		
	Potential and kinetic energies	✓		
	[not particles, or gravitational potential energy]			**2**
	[it is not enough to say it is the KE and PE.....]			
(b)	Use of $\Delta E = mc\Delta T$ there must be a temperature difference for this mark	✓		
	ΔT = 50 °C or K	✓		
	Energy = 4.4×10^7 J	✓		
	[Ignore any negative signs]			**3**
	Example of answer $\Delta E = 800\ \text{kg} \times 1.1 \times 10^3\ \text{J kg}^{-1}\ \text{K}^{-1} \times 50\ ^\circ\text{C}$ $\Delta E = 4.4 \times 10^7$ J			
			5	**7**

7(a)	To (transfer) thermal energy/heat energy from a cold (reservoir) to a hot (reservoir) or against the temperature gradient. [Do not accept just heat or just energy]	✓ ✓	**2**
(b)(i)	A single, approx horzt arrow labelled W near heat pump symbol Pointing towards heat pump symbol	✓ ✓	**2**
(ii)	Hot reservoir is the room the refrigerator is in // refrigerator surroundings // pipes at back of refrigerator Cold reservoir is the inside of the refrigerator or anything in the refrigerator. (Do not accept refrigerant or coolant)	✓ ✓	**2**
			6

8(a)(i)	ΔU = 0 no u.p Filament(lamp) temperature remains constant. [not thermal equilibrium]	✓ ✓	**2**
(ii)	ΔW = 36 x 60 = 2160 J u.p Statement about work done <u>on</u> the filament (accept system)	✓ ✓	**2**
(iii)	ΔQ = -2160 J (This answer must be consistent with answers to (i) and (ii) Thermal energy lost from the filament // because the equation applies// $\Delta Q = -\Delta W$	✓ ✓	**2**
(b)	Identifies the useful energy as <u>light</u> the rest/non useful energy becomes thermal energy/heat energy of the (surroundings) or emitted as IR [accept heat if in a sentence that has already said energy] Must refer correctly to 4% and 96% [96 might be implied by the use of the word "rest or remaining"] <u>Model answer</u> Only 4% of the energy is emitted as light. The rest of the energy is lost as thermal energy to the surroundings [candidates can demonstrate understanding of conservation of energy without actually answering the question, be careful not to give them marks they haven't earned] [don't give credit if they say rest of energy is lost as heat energy and light]	✓ ✓ ✓	**3** **9**
		Total for paper	**60**