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GCE

Edexcel GCE

Physics (6732/01)

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Mark Scheme (Results)

Edexcel GCE
Physics (6732/01)

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Notes on the Mark Schemes

1. *Alternative responses:* There was often more than one correct response to a particular question and these published mark schemes do not give *all* possible alternatives. They generally show only the schemes for the most common responses given by candidates. They are **not** model answers but indicate what the Examiners accepted in this examination.

2. *Error carried forward:* In general, an error made in an early part of a question is penalised there but not subsequently, i.e. candidates are penalised once only, and can gain credit in later parts of a question by correct reasoning from an earlier incorrect answer.

3. *Quantity algebra:* The working for calculations is presented using quantity algebra in the mark schemes for Units PHY1, PHY2, PHY3 (Topics), PHY4, PHY5/01, and PHY6 but candidates are not required to do this in their answers.

4. *Significant figures:* Use of an inappropriate number of significant figures in the theory papers will normally be penalised only in "show that" questions where too few significant figures has resulted in the candidate not demonstrating the validity of the given answer. Use of an inappropriate number of significant figures will normally be penalised in the practical tests. In general candidates should nevertheless be guided by the numbers of significant figures in the data provided in the question.

5. *Unit penalties:* A wrong or missing unit in the answer to a calculation will generally lose one mark unless otherwise indicated.

6. *Quality of written communication:* Each theory paper will usually have 1 or 2 marks for the quality of written communication. The mark will sometimes be a separate mark and sometimes be an option in a list of marking points.

Within the schemes:

- / indicates alternative marking point
  ( ) brackets indicate words not essential to the answer
  [ ] brackets indicate additional guidance for markers

- The following standard abbreviations are used:

a.e.	arithmetic error (−1 mark)
e.c.f.	error carried forward (allow mark(s))
s.f.	significant figures (−1 mark only where specified)
no u.e.	no unit error

6732 Unit Test PHY2

1. (a)(i) Lamp brightness

Lamp A	✓	
Larger current through it (at 9.0 V)/greater power (at 9.0 V)/smaller resistance (at 9.0 V)	✓	**2**

(ii) Battery current

Addition of currents	✓	
Current = 1.88 – 1.92 A	✓	**2**

(iii) Total resistance

R = 9 V/1.9 A or use of parallel formula	✓	
R = 4.6 – 4.9 Ω [full ecf for their current]	✓	**2**

(b) Lamps in series

Current same in both lamps/current in A reduced from original value	✓	**Any 2**
Pd across A less than pd across B	✓	
Lamp A has a lower resistance than lamp B	✓	
$P = VI$ or $P = RI^2$	✓	
Lamp A will be dimmer than B [conditional on scoring ONE of the above marks]	✓	**1**

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2. (a)(i) Resistance

Use of V/I [ignore 10^x] ✓

3800 Ω (3784 Ω) ✓ **2**

(ii) Resistance of thermistor

Use $\frac{V_R}{V_{TH}} = \frac{R}{R_{TH}}$ OR 9V/.74mA – R OR ✓
$6.2\ V = 0.74\ mA \times R_{TH}$

8400 Ω [8378 Ω] [substituting 4000 Ω gives 8857 Ω ie 8900 Ω] [method 2 substituting 3800Ω gives 8362 Ω: substituting 4000Ω gives 8162Ω] ✓ **2**

(b) Suggestion and Explanation

The milliammeter reading increases ✓

Thermistor resistance 'becomes zero' /Short circuit ✓

Since supply voltage is constant / $I = 9.0\ V/R$ ✓
OR
Circuit resistance reduced **3**

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3. (a) Definition of E.M.F.

Energy (conversion) or work done	✓	
Per unit charge	✓	
OR		
$E = W/Q$	✓	
Symbols defined	✓	
[E = 1J/C scores 1]		
OR		
$E = P/I$	✓	
Symbols defined	✓	
[terminal pd when no current drawn or open circuit scores max 1]		**2**

(b) Voltmeter calculation

Any attempt to find any current	✓	
Attempt to calculate pd across 10 Ω resistor	✓	
5.77 V	✓	
OR		
Potential divider method; ratio of resistors with 10.4 Ω on the bottom	✓	
Multiplied by 6.0 V	✓	
5.77 V	✓	**3**
[For either method, an answer of 0.23 V scores max 1]		

(c) Second battery added

Voltmeter reading increased	✓	
Any two of:		
EMF unchanged		
Total resistance reduced		
current increases or "lost volts" decreases	✓✓	**3**
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4. (a) Homogeneity

$C\ s^{-1}$ [A] ✓
C, ms^{-1}, m [As, ms^{-1}, m] ✓

(b) Not correct:

does not take account of numerical constants ✓

(c) Units of n

m^{-3} / cm^{-3} / mm^{-3} [Not 'per cm^3'] ✓ **4**

5. (a) Diagram of apparatus

- Trapped gas/fixed mass of gas with fixed volume ✓
- Pressure gauge/U-tube or mercury/Pressure sensor ✓
- Water bath completely surrounding gas ✓
- Thermometer in water bath or gas /Temperature sensor ✓ **4**

[Boyle's law apparatus 0/4]

(b) Method

Record pressure and temperature ✓
for a range of temperatures/ every x K deg C or min, due to heating ✓

Processing results

Plot graph of p against T ✓
for temp in Kelvin straight line through origin ✓
OR
Calculate p/T average ✓
and show it is constant for Kelvin temperatures ✓

QOWC ✓ **5**

(c) Precaution

- Stir water ✓
- Remove energy and await steady temperatures ✓
- Wide range of readings/extend range by use of ice bath ✓
- Eye level with mercury meniscus ✓
- Short/thin tube between gauge and sensor ✓ **max 1**

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6. Internal energy & Hammer

(a)(i) Internal energy

Kinetic energy and/or potential energy	✓	
Molecules have KE and PE	✓	
		2

(ii) Kinetic energy

Correct substitution in formula	✓	
KE = 27 J	✓	**2**
Temperature rise		
$mc\Delta\theta = \Delta KE$ with m= 0.18 kg	✓	
See 27 J/30 J multiplied by 10	✓	
12 (11.5 or 11.6) deg. C/K. or 13 (12.8) deg. C/K	✓	**3**

(b) Table

Heat energy/thermal energy change/gain of the lead	-/negative OR 0/zero	✓✓	
Work done on lead	+/positive	✓✓	**4**
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7. (a)(i) Assumptions

1. (All) collisions are elastic/molecules do not lose KE ✓

2. Time for collision is negligible in comparison to time between collision ✓

3. Volume/size of molecules is negligible in comparison to volume of gas/volume of container. ✓

4. Range of the forces is small compared to the average molecular separation OR forces are negligible except during collision ✓

5. Between collisions molecules move at constant speed ✓

6. There is a large number of molecules/collisions ✓

ANY THREE ✓✓✓ **3**

Density of gas and KE of molecules

(ii) $\rho = Nm/V$ ✓ **1**

(iii) KE = $\frac{1}{2}\, m\langle c^2\rangle$ ✓ **1**

(b) Pressure proportional to temperature

substitute for density in the pressure equation ✓

$\frac{1}{2}\, m\langle c^2\rangle = 3pV/2N$ ✓

Equate this expression to constant xT ✓

3

(c) Temperature calculation

Use of $p_1/T_1 = p_2/T_2$ ✓

$T_1 = 293$ K ✓

Temperature 684 K/411 ^{o}C ✓ **3**

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