DEVIL PHYSICS

BADDEST CLASS ON CAMPUS

CHAPTER 1 TEST REVIEW -- MARKSCHEME

1.	A	**4.**	D	**7.**	B
2.	B	**5.**	B	**8.**	B
3.	D	**6.**	A	**9.**	D

10. (a) (i) no
the graph is not linear / not a straight line; 1

(ii) a straight horizontal line through the initial points along the T axis;
a smooth curve through the remaining points (T = 4.4 K to 7.0 K); 2
The straight line and curve do not need to be joined.

(b) $R = 0\ \Omega$; 1
Do not apply unit mark.

(c) (i) 4.2 – 4.4 K; 1

(ii) 4.3 K;
±0.1 (K); 2
Allow ECF from (c)(i).

(iii) more sensitive thermometer / thermometer with a finer graduated scale / by taking resistance measurements at smaller temperature intervals; 1
*Award **[0]** for electronic digital thermometer **only**.*

(d) the data are for low temperatures well below room temperature;
no reason to assume the trend will continue to room temperature;
the data shows R varying sharply at T_C and another such transition might take place below room temperature;
mercury is a liquid at room temperature; 2 max
Award any other sensible answer.

11. (a) smooth curve through all the error bars; 1

(b) (i) the graph is not linear/a straight line (going through the error bars) / does not go through origin; 1

(ii) 7.7 m s^{-1}; 1

Accurate reading from <u>their</u> graph to within $\frac{1}{2}$ square.

Allow ECF from (a).

(c) (i) % uncertainty in $v = \left(\frac{0.3}{0.7} =\right) = 3.9\%$;

doubles 3.9% (*allow ECF from (b)(ii)*) to obtain % uncertainty in v^2(= 7.8%);
absolute uncertainty (= ±[0.078 × 59.3]) = 4.6;
(= ±5 $m^2\ s^{-2}$) 3

or

calculates overall range of possible value as 7.4 – 8.0; (*allow ECF)*
squares values to yield range for v^2 of 54.8 to 64; (*allow ECF)*
so error range becomes 9.2 hence ±4.6; (*must see this value to2 sig fig or better to award this mark)*

(ii) correct error bars added to first point ($\pm\frac{1}{2}$ square) <u>and</u>

last-but-one point (±2.5 squares); (*judge by eye)* 1

(iii) a straight-line/linear graph can be drawn that goes through origin; 1

(iv) uses triangle to evaluate gradient; *(triangle need not be shown if read-offs clear, read-offs used must lie on candidate's drawn line)*

to arrive at gradient value of 1.5 ± 0.2; (*unit not required)*

recognizes that gradient of graph is a^2 <u>and</u> evaluates

$a = 1.2 \pm 0.2$ ($\text{m}^{\frac{1}{2}}\text{s}^{-1}$); 3

or

candidate line drawn through origin <u>and</u> one data point read;

correct substitution into $v^2 = a^2\lambda$; *(a^2 does not need to be evaluated for full credit)*

$a = 1.2 \pm 0.2$($\text{m}^{\frac{1}{2}}\text{s}^{-1}$);

*Award **[2 max]** if line does not go through origin – allow $\frac{1}{2}$ square.*

*Award **[1 max]** if one or two data points used <u>and</u> no line drawn.*

(v) $k = 9.4\ \text{m s}^{-2}$; *(allow ECF from (c)(iv))* 1

12. (a) reads off *R* and *T* values correctly for at least two different coordinates on line;

shows *RT* not constant / other sensible test *e.g. R* halves, *T* does not double;

hence hypothesis not supported; 3

*Award **[0]** for bald unsupported conclusion.*

(b) (i) $\lg R = a + \frac{b}{T}$ is in the form of an equation of a straight line;

the points can be joined by a <u>straight</u> line / graph is a <u>straight</u> line; 2

(ii) draws straight line through all error bars (judge by eye);

evidence of use of line to determine gradient;

b: gradient in range 1500 to 1700;

a: intercept in range –1.7 to –2.3; 4

*Award **[2 max]** for solutions where a and b are found using data points (i.e. no line used)*

(iii) correctly substitutes derived values into equation, e.g. $-2.0 + \frac{1570}{260}$

correct calculation from equation, e.g. $R = 11000\ \Omega$; 2

or

$\frac{1}{T} = \frac{1}{260}$ (= 0.00385) **and** uses straight line to give correct value for lg *R;*

$R = 11000\ (\pm 2000)\ \Omega$;