SMART EXAM RESOURCES
9702 PHYSICS TOPIC QUESTIONS
TOPIC: PHYSICAL QUANTITIES AND UNITS
SUB-TOPIC: ERRORS AND UNCERTAINITIES
SUB-SUB-TOPIC: REDUCING ERRORS

1 One end of a wire is connected to a fixed point. A load is attached to the other end so that the wire hangs vertically.

The diameter d of the wire and the load F are measured as

$d = 0.40 \pm 0.02\,\text{mm}$,
$F = 25.0 \pm 0.5\,\text{N}$.

(a) For the measurement of the diameter of the wire, state

(i) the name of a suitable measuring instrument,

.....[1]

(ii) how random errors may be reduced when using the instrument in **(i)**.

.....

.....

.....[2]

MARKING SCHEME:

(i)	micrometer (screw gauge)/digital calipers	**B1**
(ii)	take several readings (and average)	**M1**
	along the wire **or** around the circumference	**A1**

2 **(a)** For each of the following, tick [✓] one box to indicate whether the experimental technique would reduce random error, systematic error or neither. The first row has been completed as an example.

	random error	systematic error	neither
keeping your eye in line with the scale and the liquid level for a single reading of a thermometer		✓	
averaging many readings of the time taken for a ball to roll down a slope			
using a linear scale on an ammeter			
correcting for a non-zero reading when a micrometer screw gauge is closed			

[2]

Mark Scheme:

(a)	2nd row random, 3rd row neither, 4th row systematic all correct two correct scores 1 only	B2	[2]

3 **(b)** State how the instrument in **(a)** is

used so as to reduce random errors.

.....

.....

.....[2]

Mark Scheme:

distance travelled by end of time interval = 90 cm	C1	
$0.90 = ½ \times 9.8 \times t^2$		
$t = 0.43$ s allow 2 SF or greater	C1	
time interval = 0.03 s	A1	[3]

4 A student takes readings to measure the mean diameter of a wire using a micrometer screw gauge.

(a) Make suggestions, one in each case, that the student may adopt in order to

(i) reduce a systematic error in the readings,

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Mark Scheme:

(a)	**(i)**	e.g. check for zero error (on micrometer)/zero the micrometer	**B1**