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1.2 Uncertainties & Errors

Easy

PHYSICS

IB HL

EXAM PAPERS PRACTICE

1.2 Uncertainties & Errors

Question Paper

Course	DP IB Physics
Section	1. Measurement & Uncertainties
Topic	1.2 Uncertainties & Errors
Difficulty	Easy

Time allowed: 20

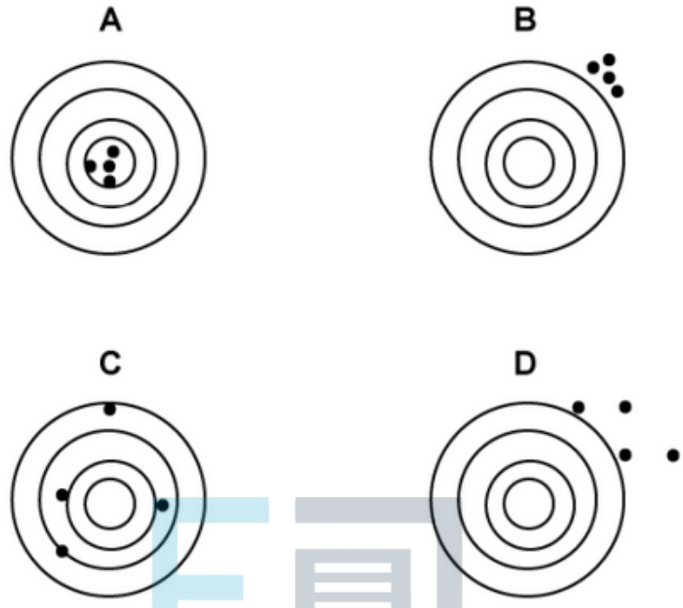
Score: /10

Percentage: /100

Question 1

Four people participate in a shooting competition. Each person gets four shots. The diagram shows the target boards of each participant after their turn.

Which target has a low precision and a high accuracy?



[1 mark]

Question 2

An ammeter has a systematic error of −0.05 A. The ammeter is then connected to a circuit and shows a reading of 2.45 A.

What should the real reading be?

A. 2.35 A

B. 2.40 A

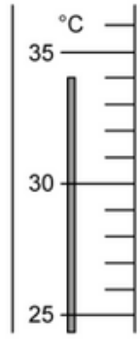
C. 2.50 A

D. 2.55 A

[1 mark]

Question 3

Part of a thermometer is shown below.



What is the correct reading on the thermometer and the uncertainty in this reading?

	reading / °C	uncertainty in reading / °C
A.	34	±0.5
B.	34	±0.1
C.	34.0	±1.0
D.	34.0	±0.5

[1 mark]

Question 4

A student carries out a series of determinations of the acceleration of free fall, g. The table shows the results.

g_1 / m s^{-2}	g_2 / m s^{-2}	g_3 / m s^{-2}	g_4 / m s^{-2}	g_5 / m s^{-2}	g_6 / m s^{-2}
4.91	4.89	4.88	4.90	4.93	4.92

What can be said about the results obtained in this experiment?

A. The results are accurate and precise

B. The results are accurate but not precise

C. The results are not accurate and not precise

D. The results are precise but not accurate

[1 mark]

Question 5

What is the absolute uncertainty for the following measurements?

16.8 cm	16.6 cm	16.7 cm	16.4 cm	16.4 cm	16.6 cm

A. 0.012

B. 0.024

C. 0.2 cm

D. 0.4 cm

[1 mark]

Question 6

A micrometer is used to measure the diameters of two spheres.

Diameter of first sphere	15.01 ± 0.01 mm
Diameter of second sphere	17.38 ± 0.02 mm

The difference in the diameters is calculated.

What is the uncertainty in this difference?

A. ± 0.01 mm

B. ± 0.02 mm

C. ± 0.03 mm

D. ± 0.06 mm

[1 mark]

Question 7

A student carries out an experiment and reaches a result which is far from the true value. They carry out an evaluation of the experiment to identify potential sources of systematic and random errors.

Which of the following would **not** eliminate any systematic errors?

A. Performing more trials with the same equipment and using the same techniques

B. Performing more trials with the same equipment but using different techniques

C. Performing more trials with different equipment but using the same techniques

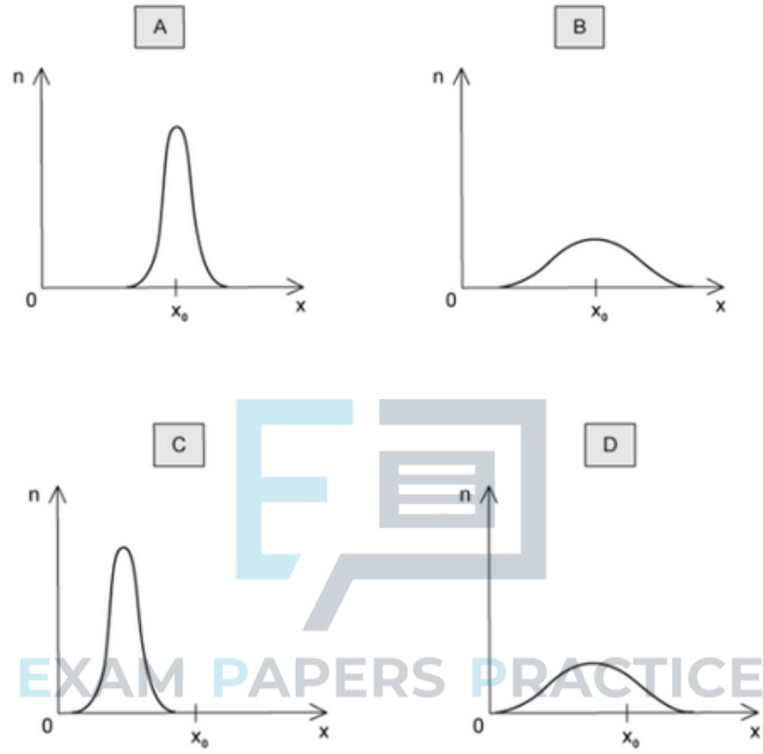
D. Checking the calibration of the equipment

[1 mark]

Question 8

A fixed quantity x_0 is measured many times in an experiment that has experimental uncertainty. A graph is plotted to show the number, *n*, of times that a particular value of *x* is obtained.

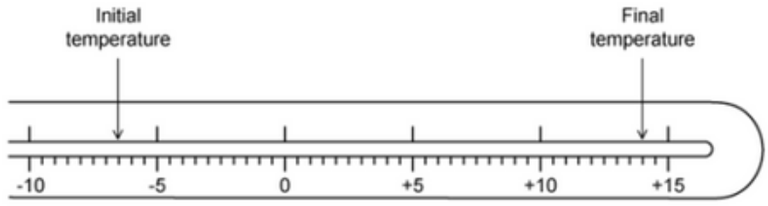
Which graph could be obtained if the measurement of x_0 has a high precision and a low accuracy?



[1 mark]

Question 9

The diagram shows the stem of a Celsius thermometer marked to show initial and final temperature values.



What is the temperature change with its absolute uncertainty?

A. 20.5 ± 0.25 °C

B. 20.5 ± 0.5 °C

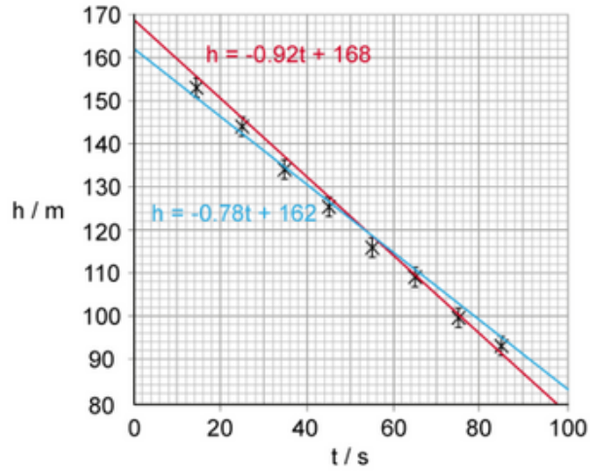
C. 21 ± 1 °C

D. 22.0 ± 0.5 °C

[1 mark]

Question 10

A student plots a graph of height, *h*, against time, *t*, to show the motion of an object in a fluid. They include the error bars on their plotted points and maximum and minimum lines with their associated equations.



Which of the following equations would correctly calculate the percentage uncertainty in the gradient of the graph?

A. $\frac{0.92+0.78}{2} \times 100\%$

B. $\frac{0.92-0.78}{2} \times 100\%$

C. $\frac{168+162}{2} \times 100\%$

D. $\frac{168-162}{2} \times 100\%$