

Checking units, uncertainties and vector components

Physics grades 11-12 (A Level · IB · Class 11-12) · Test

Name: _____ Date: _____ Class: _____ Mark: ____ / 20

This test covers base units, homogeneity, uncertainties and vectors. Use a calculator, show your working and give units with every final answer. Take $g = 9.81 \text{ m/s}^2$ where needed. The test is worth 20 marks.

Level: Physics grades 11-12 (A Level · IB · Class 11-12) · **Curriculum:** A Level 1, IB A

Time: 40 minutes · 8 questions · Total: 20 marks · Calculator allowed

Question 1 Base units (2 marks)

- Write the pascal in base units. (1 mark)
- Write the unit of power in base units. (1 mark)

Question 2 Test an equation (3 marks)

A student proposes that the kinetic energy of a body is $E = mv$, where m is mass and v is speed.

- Write the base units of E and of mv . (2 marks)
- State and justify whether the equation can be correct. (1 mark)

Question 3 Uncertain area (3 marks)

A cricket pitch strip is measured as $20.12 \pm 0.02 \text{ m}$ long and $3.05 \pm 0.01 \text{ m}$ wide.

- Calculate the area. (1 mark)
- Calculate the percentage uncertainty in the area. (1 mark)
- Calculate the absolute uncertainty in the area. (1 mark)

Question 4 Two forces (4 marks)

Use the figure. Two forces act on a point.

- Calculate the magnitude of the resultant. (2 marks)
- Calculate the angle between the resultant and the 40 N force. (2 marks)



Two perpendicular forces.

Question 5 Resolve a kick (2 marks)

Mei kicks a football so that it leaves the ground at 18 m/s at 50° above the horizontal. Calculate the horizontal and the vertical components of its velocity. (2 marks)

Question 6 Scalar and vector (2 marks)

State one difference between speed and velocity, and give one journey where the average speed is not zero but the average velocity is zero. (2 marks)

Question 7 Random and systematic (2 marks)

Wanjiru times a trolley with a stopwatch and gets 3.2 s, 3.4 s, 3.1 s, 3.3 s and 3.5 s. Her stopwatch also starts 0.2 s late every time.

- Calculate the mean time and the uncertainty from half the range. (1 mark)
- Explain which type of error the late start is. (1 mark)

Question 8 Close readings (2 marks)

A student measures the length of a spring as 12.4 ± 0.1 cm unstretched and 12.9 ± 0.1 cm stretched. Calculate the extension with its percentage uncertainty. (2 marks)