# 2017 Ph H1 Q14

**Section: Particles and Waves**

**Topic: Radiation – Inverse Square Law**

## Question Summary

A student investigates how irradiance varies with distance from a lamp. The graph of irradiance versus $1/d^2$ suggests a systematic uncertainty. Which action would be most likely to reduce it?

## Worked Solution

Systematic uncertainty is caused by a constant bias or offset in readings, not random scatter.

In this experiment, background light shifts all irradiance values upwards.

Repeating and averaging reduces random errors only.

A larger/dimmer lamp or wider distance range does not fix background.

Performing the experiment in a darkened room removes background light → reduces systematic uncertainty.

## Final Answer

D

## Revision Tips

• Irradiance: $I = P / (4\pi d^2)$ for a point source.

• Systematic = consistent bias (e.g. background light, miscalibrated meter).

• Random = scatter (reduced by repeats/averages).

• Ask: does the change reduce scatter, or remove a bias?

- Dark room removes background light — systematic error source.