

Fusion and stars · supported focus

Supported focus · HL

## Supported scope

- Supported HL focus. First assessment 2025; full Physics guide acquired (84 PDF pages). Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

# Space · 1.1

## Reasoning

Two stars can have the same apparent brightness while having different luminosities. Distance changes the flux reaching an observer. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

# Space · 2.1

## Reasoning

Luminosity is total power emitted; flux is power received per area. A stellar spectrum carries information about surface temperature and composition. Fusion transfers energy as light nuclei combine. luminosity: Total emitted power; flux: Power received per unit area.

## Space · 3.1

### Reasoning

For isotropic emission without absorption, flux follows an inverse-square relationship with distance. Observed brightness alone therefore cannot establish luminosity. Keep distance units consistent, identify which quantities are intrinsic to the star, and distinguish observational evidence from a model of stellar evolution. Do not confuse a red giant stage with every possible final remnant.

## Space · 4.1

### Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: distance doubles while luminosity remains fixed. Use  $F$  proportional to  $1/d^2$ . Flux ratio =  $1/2^2 = 1/4$ . A flux of 12 units becomes 3 units. This assumes no change in absorption or source output.

## Space · 4.2

### Reasoning

A source gives flux 18 units. Find flux at three times the distance. Use the same sequence: known quantities  $\rightarrow$  model  $\rightarrow$  relation  $\rightarrow$  substitution  $\rightarrow$  unit and interpretation.

# Space · 5.1

## Reasoning

The Sun is not expected to become a supernova. Redshift can support cosmological expansion; it does not mean every nearby object must move away from every observer. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

## Space · 5.2

### Reasoning

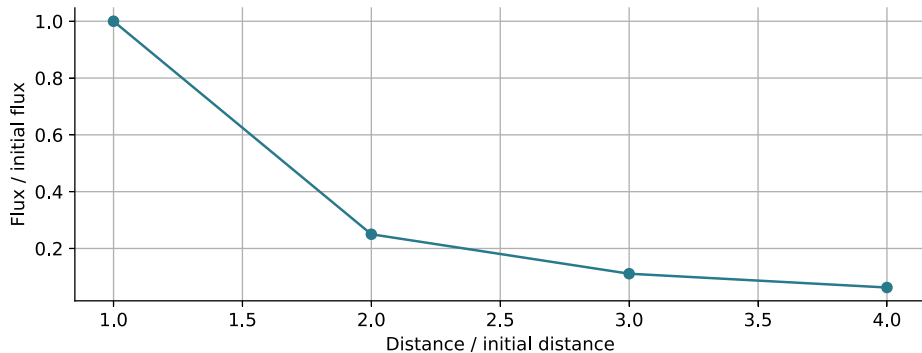
Apparent brightness alone always determines a star luminosity. This claim is false: The Sun is not expected to become a supernova. Redshift can support cosmological expansion; it does not mean every nearby object must move away from every observer.

## Space · 5.3

### Reasoning

Stars, radiation and scale: For isotropic emission without absorption, flux follows an inverse-square relationship with distance. Observed brightness alone therefore cannot establish luminosity.

# Space · diagram



- Original teaching diagram: Stars, radiation and scale
- Use the labels and the stated model together.

## Space · original transfer

### Your turn

Identical sources have fluxes 8 and 2 units. Find their distance ratio. What ambiguity arises if luminosity is not known?

# Space · transfer reasoning

## Method and interpretation

The fainter source is twice as far under inverse-square propagation and equal absorption. Different luminosity or absorption can also lower flux; flux alone is insufficient without calibration.

## Check yourself

- Explain flux using the stated model.
- Explain luminosity using the stated model.
- Change one value in the original transfer; explain which assumption still matters.