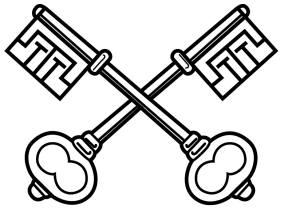

RADLEY

Starlight and revision

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Today we shall

1. put what we've learnt about starlight together,
2. show that we can answer questions which might come up, and
3. do some revision of previous topics.

Textbook p. 119 [APFY]

Specification Requirement

7 Using radiation to investigate stars

(d) Wien's displacement law, Stefan's law and the inverse square law to investigate the properties of stars – luminosity, size, temperature and distance [NB stellar brightness in magnitudes will not be required]

[Eduqas A Level Physics Specification, 2009/10 onwards]

Warm-up problem: Blackbody temperature of the Earth

Use the Stefan–Boltzmann law $\frac{P}{A} = \sigma T^4$ to predict the surface temperature of the Earth. Your prediction should be somewhat colder than reality. How do you explain the (life-saving) difference between prediction and reality?

Warm-up problem: Blackbody temperature of the Earth

$$P_{\text{Sun}} = 4\pi r_{\text{Sun}}^2 \sigma T_{\text{Sun}}^4$$

$$F_{\text{Earth}} = \frac{L_{\text{Sun}}}{4\pi D^2}$$

$$\text{Area of absorption} = \pi r_{\text{Earth}}^2$$

$$P_{\text{Earth}} = \pi r_{\text{Earth}}^2 \times F_{\text{Earth}}$$

ConcepTest

The Earth and its atmosphere absorbs radiation (mostly visible light) and emits radiation (mostly infrared) back out into space.

The amount of energy emitted by the Earth in the form of IR radiation is

1. greater than the amount of energy in the absorbed sunlight.
2. less than the amount of energy in the absorbed sunlight.
3. the same as the amount of energy in the absorbed sunlight.