Black Body Radiation

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Describe what is meant by a perfect black body. (2 marks)

Step 1 · Absorbing

An object that absorbs all of the radiation that falls on it; none is reflected or transmitted.

Step 2 · Emitting

Because it is a good absorber, it is also the best possible emitter of radiation.

Answer: Absorbs all incident radiation; best possible emitter

Check: No real object is perfect, but a matt black surface comes close.

2. Now try one with the steps

Describe how the radiation emitted by an object changes temperature increases. (3 marks)

Step 1 · Amount

Step 2 · Wavelength

Step 3 · Example

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Define a perfect black body. [1]

2. State what all objects emit, whatever their temperature. [1]

3. Describe how the intensity and wavelength of the radiation from an object change gets hotter. [2]

4. Explain why a metal poker heated in a fire glows red and then, if hotter still, yellow-white. [2]

5. State the condition for an object's temperature to stay constant. [1]

6. State what happens to an object's temperature if it absorbs radiation faster than it emits it. [1]

7. The peak wavelength of a star's radiation is 500 nm; another star's peak is 900 nm. State which star is hotter. [1]

8. Explain why the Sun looks yellow-white but a cooler star looks red. [2]

9. Explain why a hot cup of tea cools until it reaches room temperature and then stays at that temperature. [2]

10. Explain why a perfect absorber of radiation is also the best emitter. [1]

11. Describe three factors that affect the temperature of the Earth. [3]

12. Explain how greenhouse gases cause the Earth's surface temperature to rise. [2]

13. Explain why cloudy nights are usually warmer than clear nights. [2]

14. Suggest why melting of polar ice can increase the rate of global warming. [2]

4. Before you hand it in

"Cold objects do not emit radiation."

Every object emits radiation; hotter objects emit more, and at shorter wavelengths.

"Hotter objects emit longer wavelengths."
As temperature rises, the peak moves to shorter wavelengths.

"An object at constant temperature does not absorb or emit radiation."
Constant temperature means the rates of absorption and emission are equal.

"Greenhouse gases trap heat like a lid."
Greenhouse gases absorb outgoing infrared and re-emit it, reducing the rate of energy loss to space.