

# ASTRONOMY 1102 - Section 1

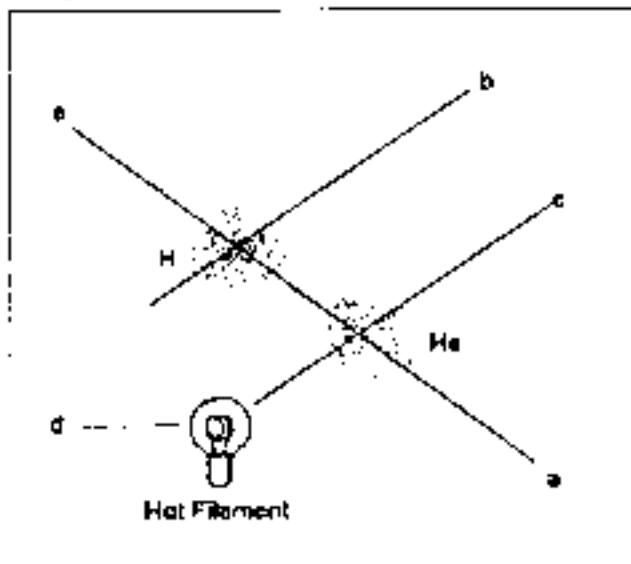
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Homework # 2 due Fri. Jan. 29

## EM Radiation & Doppler Effect

1) The figure shows two low density hot clouds of Hydrogen (H) and Helium (He) and a very hot filament. Describe briefly the kind of spectrum seen by looking along the lines indicated in the figure with a spectroscope.



- a) emission line spectrum of H and He.
- b) emission line spectrum of H.
- c) absorption lines of He on a bright continuum (or He absorption spectrum)
- d) continuum spectrum (nearly black body)

2) The speed of sound in air is 330 m/s. A train moving at a speed of 33 m/s (approximately 74 mi/hr) sounds its whistle, which has a (true) frequency of 500 Hz corresponding to a true wavelength (train+whistle at rest) of  $\lambda_{true} = 66$  cm. Answer the following questions.

$$v = 33 \text{ m/s}$$

$$c = 330 \text{ m/s}$$

$$\Rightarrow v/c = 0.1$$

a) As the train comes toward you what is the apparent wavelength (the one you hear)?

$$\Delta\lambda/\lambda_{emitted} = 0.1 \Rightarrow \Delta\lambda = 6.6 \text{ cm}$$

TOWARD  $\Rightarrow$  BLUESHIFT

Circle the correct answer: Is that a higher lower frequency (pitch)?

$$\lambda_{obs} = (66 - 6.6) \text{ cm}$$

$$\approx 59 \text{ cm}$$

b) After passing you, the train now speeds away. What is the apparent wavelength now (the one you hear)?

$$\lambda_{obs} = (66 + 6.6) \text{ cm}$$

Circle the correct answer: Is that a higher lower frequency (pitch)?