

Physics 20083 – Spring 2007 Exam #1a

Instructions:

1. Answer the following four questions in the space provided. If you need extra space, please use the back of the page and make an appropriate notation on the front of the page so that I will know where to look for your complete answer.
2. Each question is worth a total of 25 points.
3. Each question requires an answer that is typically no more than two or three sentences long or perhaps a diagram and one or two sentences. Some questions do not require explanations. This will always be explicitly stated.
4. You may **not** use your own paper, book, notes or a calculator for this exam.
5. You will have 30 minutes to complete the exam and turn it in.

$$\text{Wave Equation: } \text{Frequency}(f) = \frac{\text{Speed}(v)}{\text{Wavelength}(\lambda)}$$

$$\text{Energy and Wavelength: } \text{Energy}(E) \propto \frac{1}{\text{Wavelength}(\lambda)}$$

$$\text{Continuous Radiation: } \text{Temperature}(T) \propto \frac{1}{\lambda_{\text{peak}}}$$

$$\text{Resolution Equation: } \text{Resolution} = \frac{\text{Diameter}(d)}{\text{Wavelength}(\lambda)}$$

#1. Describe the history of the Millikan oil drop experiment and what happened with similar subsequent experiments in the scientific community, a history Feynman felt was very embarrassing to scientists.

#2. In tonight's sky about three hours after sunset, the planet Saturn will be prominent in the Eastern sky.

a) (10 pts) Explain why the sun appears red at sunset. A diagram may help.

b) (15 pts) Explain why planets like Saturn do not twinkle while some stars, which are often brighter than the planets, do twinkle.

#3. Most Astronomers today use reflecting telescopes to attain the highest quality images of celestial objects, but they still have to overcome atmospheric effects.

a) (12 pts) Name and explain one reason why Astronomers prefer to use reflecting telescopes over refracting telescopes.

b) (13 pts) Describe how adaptive optics works to overcome atmospheric “seeing”.

#4. Explain the “solar neutrino problem”. Also, explain why, even before the problem was successfully resolved by proving that neutrinos oscillate, scientists still believed that the theory of nuclear fusion was the correct explanation for the Sun’s energy.