Electromagnetic Waves and the Spectrum

Choose one answer per question. Circle A, B, C, or D.

1. Which named region of the electromagnetic spectrum contains the wavelengths human eyes can see?
   A. Visible light
   B. Infrared
   C. Radio waves
   D. X-rays

2. Which band has longer wavelengths than infrared, visible light, and ultraviolet?
   A. X-rays
   B. Gamma rays
   C. Radio waves
   D. Ultraviolet

3. Which band lies between visible light and X-rays in the usual order of increasing frequency?
   A. Infrared
   B. Ultraviolet
   C. Radio
   D. Microwave

4. In the usual visible spectrum, which of these colors corresponds to the longest wavelengths?
   A. Green
   B. Violet
   C. Blue
   D. Red

5. A thermal camera maps temperature differences by detecting radiation beyond the red end of visible light. Which band is it designed to detect?
   A. Ultraviolet
   B. Infrared
   C. Gamma rays
   D. Visible violet

6. A pulse of infrared and a pulse of ultraviolet leave the same point in a vacuum at the same instant. Which arrives first at a detector a fixed distance away?

A. They arrive together
B. The infrared pulse
C. The ultraviolet pulse
D. Both stop without air

7. Two electromagnetic waves are in a vacuum. Wave A has half the wavelength of Wave B. How do their frequencies compare?

A. Wave A has four times the frequency
B. Wave A has half the frequency
C. They have equal frequencies
D. Wave A has twice the frequency

8. A beam has a wavelength of about 550 nm in vacuum. Which region is it in?

A. Radio waves
B. Gamma rays
C. Visible light
D. Microwaves

9. A telescope records a long-wavelength radio signal from a galaxy but no detectable visible light from it. What can be concluded from the radio detection alone?

A. The galaxy emits electromagnetic radiation our eyes cannot see
B. The telescope detected a sound wave traveling through space
C. The radio signal must have a higher frequency than visible light
D. The radio detection proves visible light travels faster

10. Which has more energy per photon, ultraviolet light or infrared light?

A. Energy depends only on the beam’s total brightness
B. Infrared light
C. They always have equal photon energy
D. Ultraviolet light

11. A radio wave has frequency 100 MHz. Using 3.00×10^8 m/s for light speed in vacuum, what is its wavelength?

A. 300 m
B. 0.333 m
C. 3.00 m
D. 0.0300 m

12. A beam has a wavelength of 600 nm in vacuum. Using 3.00×10^8 m/s, what is its frequency?

A. 2.00×10^{14} Hz
B. 5.00×10^{14} Hz
C. 5.00×10^{6} Hz
D. 1.80×10^{11} Hz

13. A photon’s wavelength in vacuum is one-quarter that of another photon. What is the ratio of their energies, shorter-wave photon to longer-wave photon?

A. 16 to 1
B. 1 to 4
C. 1 to 1
D. 4 to 1

14. Two steady beams have equal total power. Photons in beam A carry three times as much energy per photon as those in beam B. How many photons per second does A deliver compared with B?

A. One-third as many
B. Three times as many
C. The same number
D. Nine times as many

15. A detector compares infrared, visible, ultraviolet, and X-ray photons. Which ordering goes from the lowest to the highest energy per photon?

A. X-ray, ultraviolet, visible, infrared
B. Infrared, ultraviolet, visible, X-ray
C. Infrared, visible, ultraviolet, X-ray
D. Visible, infrared, ultraviolet, X-ray