Waves at Work

Build a spectrum model from real-world uses

PHS.6.6 "Research real-world applications to create models or visible representations of the electromagnetic spectrum, including visible light, infrared radiation, and ultraviolet radiation."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each tool that uses ultraviolet, visible, or infrared radiation. Circle the clues that show where each tool belongs on a spectrum model.

A Shelter After the Storm

1. After a storm, a community shelter needs safe water, working lights, and a way to spot heat escaping from its temporary walls. Its crew carries tools that use three parts of the electromagnetic spectrum. Ultraviolet (UV) radiation has shorter wavelengths than visible light. Visible light is the narrow range human eyes detect. Infrared (IR) radiation has longer wavelengths than visible light. All three are electromagnetic waves, but their different wavelengths make different tools useful. A simple spectrum model could place UV, visible, and IR in that order, with an arrow pointing toward longer wavelengths.

2. At the water station, a sealed UV-C lamp shines through flowing water. With enough UV-C exposure and suitable water clarity, the radiation can inactivate many microbes; it does not remove chemicals or dirt. A worker also uses a UV-A flashlight to make special markings on supply tags glow. The markings give off visible light after absorbing UV, so workers can see them. UV radiation can harm eyes and skin, so the crew keeps the UV-C unit enclosed and avoids shining the UV-A beam at people. Nearby, visible LED lamps let volunteers read names and signs without special equipment.

3. At night, a thermal camera maps infrared radiation emitted by surfaces. A warmer patch on a shelter wall appears different from a cooler patch on the camera screen, helping workers find a possible gap in insulation. The camera's screen itself uses visible light, even though its sensor detects infrared radiation. A television remote offers another infrared application: its LED sends coded infrared pulses to a receiver, rather than measuring heat. In a spectrum model, both the thermal camera's sensing band and the remote's signal band belong on the infrared side of visible light. Neither belongs in the ultraviolet region.

2 ANSWER WITH EVIDENCE

Use the passage

1. If you draw a three-part spectrum strip for the shelter, what labels and wavelength arrow should it have?

2. Where would you connect the water unit and the tag-checking flashlight on your strip? Why can workers see the tag markings?

3. A student places the thermal camera under visible light because its screen can be seen. How should the model be corrected, and why?

4. How could you show the difference between the remote and the thermal camera while placing them in the same band?

3 YOUR TURN

Your own words

Create a three-panel spectrum model for a school after dark. Put UV, visible, and IR in increasing-wavelength order, draw an arrow in that direction, and label one practical school use for each band based on the reading, plus one UV safety note.

Waves at Work

PART 1 · READ AND MARK

Underline each tool that uses ultraviolet, visible, or infrared radiation. Circle the clues that show where each tool belongs on a spectrum model. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	If you draw a three-part spectrum strip for the shelter, what labels and wavelength arrow should it have?	**Label the strip UV, visible, and IR in that order. Point the increasing-wavelength arrow from UV toward IR.**
2	Where would you connect the water unit and the tag-checking flashlight on your strip? Why can workers see the tag markings?	**Connect both tools to UV. The markings absorb UV from the flashlight and give off visible light.**
3	A student places the thermal camera under visible light because its screen can be seen. How should the model be corrected, and why?	**Place the camera's sensing band under IR because its sensor detects infrared radiation. Its screen uses visible light to display the result.**
4	How could you show the difference between the remote and the thermal camera while placing them in the same band?	**Place both in IR. Label the remote as sending coded infrared pulses and the camera as detecting infrared radiation emitted by surfaces.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

UV: An enclosed UV-C unit treats suitably clear drinking water. Keep the unit enclosed to protect eyes and skin. | Visible: LED lamps light the hallways so students can read signs. | IR: A thermal camera helps staff find a possible insulation gap near a classroom window. Arrow: increasing wavelength from UV through visible to IR.

Accept other plausible school uses supported by the passage. The model must order UV, visible, and IR by increasing wavelength and include a relevant UV safety note.