

Conceptual Physics CST Practice #2 Thermo and Waves**Multiple Choice**

Identify the choice that best completes the statement or answers the question.

- _____ 1. You are water-skiing on a lake, and you are being pulled by a noisy motorboat. Another motor boat is speeding through the water a bit ahead of your boat so that rarefactions from its motor hit you when compressions from your boat's motor hit you. You hear
- almost nothing due to constructive interference.
 - almost nothing due to destructive interference.
 - louder noise than if you were only listening to one boat.
 - louder noise than if you were only listening to two boats.
- _____ 2. Specific heat capacity is related to the amount of internal energy _____.
- transferred by one molecule
 - one molecule contains
 - a specific object has
 - transferred by one object
 - needed to change the temperature of one gram of a substance one degree
- _____ 3. Consider a gap cut into a metal ring. If the ring is heated, the gap becomes _____.
- wider
 - narrower
 - neither
- _____ 4. The Doppler effect is the change in observed frequency due to
- the original frequency of the source.
 - the type of medium the wave is in.
 - the motion of the source or observer.
 - the type of wave.
 - all of the above

Problem

- If you wished to produce a sound with a wavelength in air equal to the length of a 5-m room, what would its frequency be?
- You note a 2.0-second delay for an echo in a canyon. What is the distance to the wall of the canyon?
- What amount of heat is required to raise the temperature of 150 grams of water by 20°C?
- Mix 4 liters of 30°C water with 6 liters of 40°C water and you'll have water at what temperature?
- Suppose you apply a flame and heat one liter of water and raise its temperature by 40°C. If you instead transfer the same quantity of heat to 8 liters of water at the same temperature, what will be the temperature increase?

10. A 53-g iron bar at 100°C is placed in 300 g of water at 30°C . If the specific heat capacity of iron is $0.11 \text{ cal/g}^{\circ}\text{C}$, to what final temperature will the iron bar cool?
11. A metal bar expands 2.0 cm when heated. How much longer is a bar that expands 8.0 cm?
12. An absolute temperature of 110 K is the same as what Celsius temperature?
13. The temperature of an object is raised by 70°C . This is equivalent to what increase in its absolute temperature?
14. At what temperature would the molecules of a gas have twice the average kinetic energy they have at a 26°C room temperature?
15. Calculate the ideal efficiency of a power plant that runs between temperatures 400 K and 150 K.
16. There is a type of power plant, known as OTEC, that operates on the temperature difference between warm surface waters and cool deep waters. What is the Carnot efficiency of such a plant if the surface water is 25°C and the deep water is 4°C ?
17. Waves in a lake are 1.5 m in length and pass an anchored boat 0.5 s apart. What is the speed of the waves?
18. A boat at anchor is rocked by waves whose crests are 28 m apart and whose speed is 7 m/s. How often do these waves reach the boat?
19. Radio amateurs are permitted to communicate on the "10-meter band". What frequency of radio waves corresponds to a wavelength of 10 m? (The speed of radio waves is $3.0 \times 10^8 \text{ m/s}$.)
20. A radio station broadcasts at a frequency of 600 kHz. Knowing that radio waves have a speed of $3.00 \times 10^8 \text{ m/s}$, what is the wavelength of these waves?
21. A supersonic aircraft produces a shock wave that describes a 30° cone. What happens to the angle of the cone as the aircraft travels faster?