

Light, Heat, Waves, Thermodynamics, Electricity and Magnetism

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Practice Problems with Solution

Question 1: The characteristics of sound that distinguishes a female voice from a male voice is called _____

- A: pitch
- B: phase
- C: quality
- D: loudness

Question 2: Stationary wave is formed by _____

- A: a transverse wave superimposing a longitudinal wave
- B: two waves of the same speed superimposing
- C: two waves of the same frequency travelling in the same direction
- D: two waves of same frequency travelling in opposite direction

Question 3: In MRI machines, which one of the following is used?

- A: Sound waves
- B: X-rays
- C: Ultra sound waves
- D: Magnetic waves

Question 4: Sound travels the fastest in which among the following mediums?

- A: steel
- B: air
- C: vacuum
- D: water

Question 5: To measure the speed of an approaching car, a police vehicle shines _____

- A: light waves on it
- B: micro waves on it
- C: radio waves on it
- D: ultra high frequency waves on it

Question 6: Gas thermometers are more sensitive than liquid thermometers because gases _____

- A: are lighter
- B: have low specific heat
- C: have high specific heat
- D: have large coefficient of expansion

Question 7: Centigrade and Fahrenheit temperatures are same at _____

- A: -273°
- B: -40°
- C: 32°
- D: 40°

Question 8: A small gap is left at the joints of rails in a railway track to _____

- A: avoid the tracks being distorted due to seasonal temperature variations
- B: avoid the heating of tracks to high temperature
- C: control the speed of trains
- D: keep the rails equidistant

Question 9: Water is used in hot water bags because _____

- A: it is easily obtained
- B: it is more viscous than other liquids
- C: it has high specific heat
- D: it has high specific gravity

Question 10: What change will happen to a bowl of ice and water kept at exactly zero degree Celsius?

- A: All ice will melt
- B: All water will become ice
- C: No change will happen
- D: Only some ice will melt

Answers and Solutions

1:- A

Solution: Pitch is that characteristic of sound which distinguishes a sharp or shrill sound from a grave flat sound. Pitch depends upon frequency. The higher the frequency, the higher will be the pitch and shriller will be the sound. Pitch of a man's voice fall under low frequency whereas a woman's voice has a higher frequency and hence a higher pitch.

2:- D

Solution: When two waves of same frequency travelling in opposite direction superimpose, they form a stationary wave.

3:- D

Solution: MRI [Magnetic Resonance Imaging] makes use of the property of Nuclear Magnetic Resonance [NMR] to capture the image of nuclei of atoms inside the body.

In the MRI scanner, the patient lies within a large powerful magnet where the magnetic field is used to align the magnetisation of some atomic nuclei in the body causing the nuclei to produce a rotating magnetic field detectable by the scanner.

4:- A

Solution: The speed of sound basically depends on the elasticity and density of the medium and steel has the highest elasticity and density among the given mediums. The speed of sound in air, water and steel is 344 m/s, 1482 m/s and 5941 m/s respectively. Sound will not pass through vacuum as it requires a medium to propagate it.

5:- B

Solution: Micro waves and laser radars measure the relative speed of an approaching vehicle. If the vehicle is travelling directly at the radar, the relative speed is the actual speed of the vehicle. If the vehicle is not travelling directly at the radar, then the relative speed is slightly lower than the actual speed.

6:- D

Solution: Gases have higher coefficient of expansion than liquids and hence they are more sensitive. The change per unit volume of gas per unit degree Celsius at constant pressure is known as coefficient of volume expansion of gases.

7:- B

Solution: The formula is $[F-32]/9 = C/5$ where F is the temperature in Fahrenheit and C is the temperature in Centigrade. If $F=C$, then

$$[F-32]/9 = F/5$$

$$5F-160 = 9F$$

$$4F = -160$$

$$F = -40$$

So Fahrenheit and Centigrade temperatures will be same at -40°

8:- A

Solution: The rail pieces will expand when the temperature rises during summer and this may cause distortion if the rails are closely joined together.

9:- C

Solution: Specific heat is the amount of heat required to raise the temperature of 1g of substance by 1°C . The specific heat of water is higher than any other common liquid and hence it is used in hot water bags.

10:- C

Solution: Zero degree Celsius is called the freezing point of water at which the mixture of fresh water and ice has an equilibrium temperature. When heat is added to the mixture, ice starts melting but when heat is removed water starts freezing. As long as the mixture is kept at exactly zero degree Celsius, no change will happen to the mixture.

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