

Name: \_\_\_\_\_ Block: \_\_\_\_\_ Date: \_\_\_\_\_

# NNHS Introductory Physics: MCAS Review Packet #5

## Introductory Physics, High School *Learning Standards for a Full First-Year Course*

### I. CONTENT STANDARDS

#### 4. Waves

*Central Concept:* Waves carry energy from place to place without the transfer of matter.

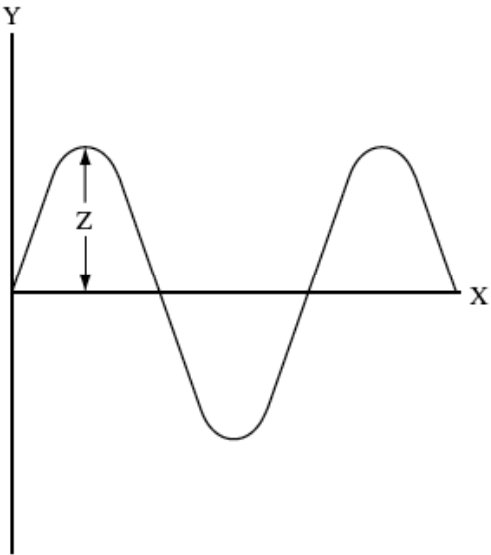
- 4.1 Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period) and explain the relationships among them. Recognize examples of simple harmonic motion.
- 4.2 Distinguish between mechanical and electromagnetic waves.
- 4.3 Distinguish between the two types of mechanical waves, transverse and longitudinal.
- 4.4 Describe qualitatively the basic principles of reflection and refraction of waves.
- 4.5 Recognize that mechanical waves generally move faster through a solid than through a liquid and faster through a liquid than through a gas.
- 4.6 Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect).

#### 6. Electromagnetic Radiation

*Central Concept:* Oscillating electric or magnetic fields can generate electromagnetic waves over a wide spectrum.

- 6.1 Recognize that electromagnetic waves are transverse waves and travel at the speed of light through a vacuum.
- 6.2 Describe the electromagnetic spectrum in terms of frequency and wavelength, and identify the locations of radio waves, microwaves, infrared radiation, visible light (red, orange, yellow, green, blue, indigo, and violet), ultraviolet rays, x-rays, and gamma rays on the spectrum.

## NNHS Introductory Physics: MCAS Review Packet #5

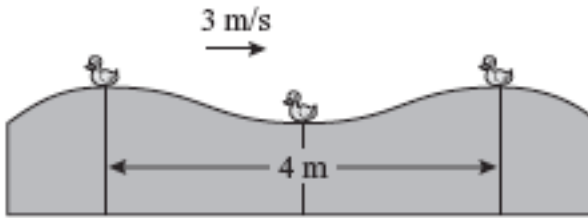
<p><b>4. Waves</b></p> <p><i>Central Concept:</i> Waves carry energy from place to place without the transfer of matter.</p>	
<p>1. Which of the following is the best example of a wave?</p> <p>A. a stone rolling downhill          B. a vehicle traveling on a bumpy road          C. a string vibrating on a guitar          D. a grasshopper jumping up and down occasionally.</p>	<p>2. The diagram below shows a wave trace.</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>Distance Z is a measure of</p> <p>A. amplitude.          B. frequency.          C. wavelength.          D. wave speed.</p>
<p>My Answer and Explanation:</p>	<p>My Answer and Explanation:</p>
<p>Correct Answer and Explanation:</p>	<p>Correct Answer and Explanation:</p>

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### 4. Waves

*Central Concept:* Waves carry energy from place to place without the transfer of matter.

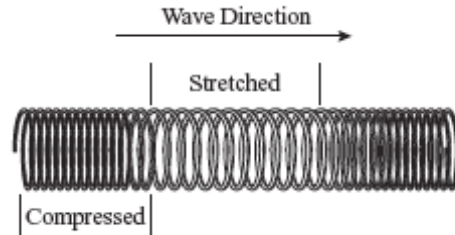
3. The illustration below shows three toy ducks floating on water, moving up and down as a wave travels to the right with a velocity of 3 m/s.



Which of the following is the frequency of the wave?

- A. 0.75 Hz
- B. 1.33 Hz
- C. 1.5 Hz
- D. 6.0 Hz

4. The figure below shows a spring with a wave traveling through it.



Which type of wave is illustrated?

- A. sound
- B. transverse
- C. longitudinal
- D. electromagnetic

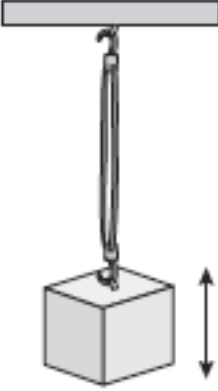
My Answer and Explanation:

My Answer and Explanation:

Correct Answer and Explanation:

Correct Answer and Explanation:

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<p><b>4. Waves</b>  <i>Central Concept:</i> Waves carry energy from place to place without the transfer of matter.</p>	
<p>5. What is the frequency of ocean waves that have a speed of 18 m/s and a wavelength of 50 m?</p> <p>A. 0.18 Hz          B. 0.36 Hz          C. 2.8 Hz          D. 9.0 Hz</p>	<p>6. The diagram below represents a mass suspended vertically by a rubber band. The mass is set in motion by pulling down slightly on the mass and letting go.</p> <div style="text-align: center;">  </div> <p>Which of the following correctly identifies the up-and-down motion of the mass?</p> <p>A. torsional          B. transverse          C. nonharmonic          D. simple harmonic</p>
<p>My Answer and Explanation:</p>	<p>My Answer and Explanation:</p>
<p>Correct Answer and Explanation:</p>	<p>Correct Answer and Explanation:</p>

Name: \_\_\_\_\_ Block: \_\_\_\_\_ Date: \_\_\_\_\_

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<b>4. Waves</b> <i>Central Concept:</i> Waves carry energy from place to place without the transfer of matter.	
7. An organ pipe produces a musical note with a wavelength of 2.72 m. What is the frequency of this note if the speed of sound is 348 m/s? A. 85.7 Hz B. 128 Hz C. 260 Hz D. 466 Hz	8. Which of the following best describes the relationship between frequency and wavelength of electromagnetic waves? A. If the frequency remains constant, the wavelength increases. B. The wavelength decreases as the frequency decreases. C. The frequency increases as the wavelength decreases. D. If the wavelength remains constant, the frequency increases.
My Answer and Explanation:	My Answer and Explanation:
Correct Answer and Explanation:	Correct Answer and Explanation:

Name: \_\_\_\_\_ Block: \_\_\_\_\_ Date: \_\_\_\_\_

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<b>4. Waves</b> <i>Central Concept:</i> Waves carry energy from place to place without the transfer of matter.	
9. Five bowling balls are lined up touching one another on a smooth surface. Striking the first ball with a hammer makes the fifth ball move away from the group. The force of the hammer was transmitted through the line of balls as what type of wave? A. electromagnetic B. heat C. longitudinal D. transverse	10. What causes sound? A. sunlight B. vibrations C. x-rays D. pitch
My Answer and Explanation:	My Answer and Explanation:
Correct Answer and Explanation:	Correct Answer and Explanation:

Name: \_\_\_\_\_ Block: \_\_\_\_\_ Date: \_\_\_\_\_

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### 6. Electromagnetic Radiation

*Central Concept:* Oscillating electric or magnetic fields can generate electromagnetic waves over a wide spectrum.

11. Sound reaches our ears because sound makes air particles  
A. heat up.  
B. cool down.  
C. slow down.  
D. vibrate.

12. What property of electromagnetic waves makes it possible to use these waves to transmit information between a space shuttle and NASA mission control centers on the ground?  
A. Electromagnetic waves are transverse waves.  
B. Electromagnetic waves have very low velocity.  
C. Electromagnetic waves are all visible to human eyes.  
D. Electromagnetic waves can travel through a vacuum.

My Answer and Explanation:

My Answer and Explanation:

Correct Answer and Explanation:

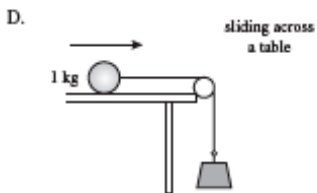
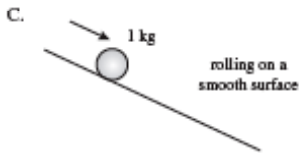
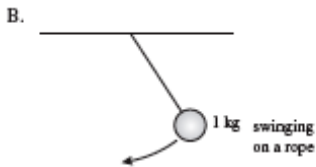
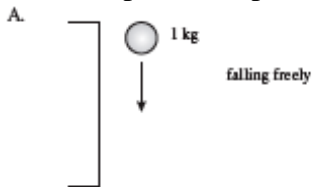
Correct Answer and Explanation:

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## 4. Waves

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13.) Each of the following illustrations shows the movement of a 1 kg object. Which of these is an example of simple harmonic motion?



My Answer and Explanation:

Correct Answer and Explanation

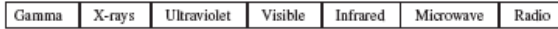
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*Central Concept:* Oscillating electric or magnetic fields can generate electromagnetic waves over a wide spectrum.

14. The chart below shows a portion of the electromagnetic spectrum.



A plastic filter is fitted over a light. The light emits white light, but the filter only lets the longest wavelengths of visible light pass through. Which color would a person looking at the filtered light see?

- A. green
- B. red
- C. violet
- D. yellow

15. Which of the following is designed to transform an electromagnetic wave into a mechanical wave?

- A. a portable radio
- B. a television screen
- C. a computer monitor
- D. a mercury thermometer

My Answer and Explanation:

My Answer and Explanation:

Correct Answer and Explanation:

Correct Answer and Explanation:

Name: \_\_\_\_\_ Block: \_\_\_\_\_ Date: \_\_\_\_\_

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16. The figure below shows the regions of the electromagnetic spectrum.

*Radio   Microwave   Infrared   Visible   Ultraviolet   X-ray   <sup>Gamma</sup> Ray*

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Which of the following statements best compares the wavelengths of the regions of the electromagnetic spectrum?

- A. Microwaves are shorter than x-rays.
- B. Infrared waves are longer than gamma rays.
- C. Radio waves are shorter than visible light waves.
- D. Ultraviolet waves are longer than visible light waves.

My Answer and Explanation:

Correct Answer and Explanation:

Name: \_\_\_\_\_ Block: \_\_\_\_\_ Date: \_\_\_\_\_

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17. Which of the following devices relies on electromagnetic radiation in the radio wave region of the spectrum for operation?

- A. sun tanning lamp
- B. electric light bulb
- C. cellular telephone
- D. electric toaster

18. Which of the following colors of visible light has the longest wavelength?

- A. red
- B. blue
- C. green
- D. orange

My Answer and Explanation:

My Answer and Explanation:

Correct Answer and Explanation:

Correct Answer and Explanation:

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19. Visible light passes through glass. Other types of electromagnetic radiation are able to pass through other materials in a similar way. Which of the following are used in medical technology because they can pass through some parts of the human body?

- A. x-rays
- B. infrared waves
- C. microwaves
- D. ultraviolet rays

20. Some campers are sitting around a campfire outside their tent. Which product of the fire is in the form of electromagnetic waves?

- A. light
- B. smoke
- C. sound
- D. water vapor

My Answer and Explanation:

My Answer and Explanation:

Correct Answer and Explanation:

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Name: \_\_\_\_\_ Block: \_\_\_\_\_ Date: \_\_\_\_\_

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21. Which of the following describes how a microwave oven heats food?

- A. The oven's interior reflects heat onto the food.
- B. The oven's interior, like a lens, focuses heat onto the food.
- C. Water molecules in the food reflect energy from microwave radiation.
- D. Water molecules in the food absorb the energy of microwave radiation.

22. The figure below shows regions of the electromagnetic spectrum.

Radio    Microwave    Infrared    Visible    Ultraviolet    X-rays    Rays  
Gamma

Which of the following waves has the highest frequency?

- A. visible light
- B. microwaves
- C. ultraviolet rays
- D. infrared radiation

My Answer and Explanation:

My Answer and Explanation:

Correct Answer and Explanation:

Correct Answer and Explanation:

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23. A sound wave can be transmitted through all of the following except

- A. a gas.
- B. a liquid.
- C. a solid.
- D. a vacuum.

24. Which of the following statements applies to a longitudinal wave?

- A. The motion of the medium is random.
- B. The motion of the medium is in a circular pattern.
- C. The motion of the medium is parallel to the motion of the wave.
- D. The motion of the medium is perpendicular to the motion of the wave.

My Answer and Explanation:

My Answer and Explanation:

Correct Answer and Explanation:

Correct Answer and Explanation:

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<p><b>6. Electromagnetic Radiation</b>  <i>Central Concept:</i> Oscillating electric or magnetic fields can generate electromagnetic waves over a wide spectrum.</p>	
<p>25. A student standing on the edge of a swimming pool sees a painted mark on the bottom of the pool. The mark appears to be at a shallower depth than the actual depth of the pool.</p> <p>Which of the following descriptions of light waves best explains this observation?</p> <p>A. Light from the mark travels through the water in a curved path.          B. Light from the mark is refracted as it travels from the water to the air.          C. Light from the mark is reflected as it travels from the water to the air.          D. Light from the mark bounces off the boundary between the water and the air.</p>	<p>26. A student is sitting in a large stadium far away from the starting line of a footrace, while listening to the footrace on the radio. As the race starts, the student hears the sound of the starting pistol on the radio. Shortly after that, the student hears the sound of the starting pistol from inside the stadium.</p> <p>Which of the following best explains these observations?</p> <p>A. Mechanical waves travel faster than electromagnetic waves.          B. Electromagnetic waves travel faster than mechanical waves.          C. The radio's signal traveled a shorter distance than the sound wave traveled.          D. The radio's microphone was farther away from the starting line than the student was.</p>
<p>My Answer and Explanation:</p>          	<p>My Answer and Explanation:</p>          
<p>Correct Answer and Explanation:</p>          	<p>Correct Answer and Explanation:</p>          

Name: \_\_\_\_\_ Block: \_\_\_\_\_ Date: \_\_\_\_\_

NNHS Introductory Physics: MCAS Review  
Packet #5

Name: \_\_\_\_\_ Block: \_\_\_\_\_ Date: \_\_\_\_\_

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27. People perceive sound differently in air than they do under water. Which of the following correctly compares the motion of sound waves in air and in water?
- A. Sound waves travel faster in air than in water.
  - B. Sound waves travel slower in air than in water.
  - C. Sound waves travel in air but do not travel in water.
  - D. Sound waves travel at the same speed in air and in water.

My Answer and Explanation:

My Answer and Explanation:

Correct Answer and Explanation:

Correct Answer and Explanation:

Name: \_\_\_\_\_ Block: \_\_\_\_\_ Date: \_\_\_\_\_

## NNHS Introductory Physics: MCAS Review Packet #5

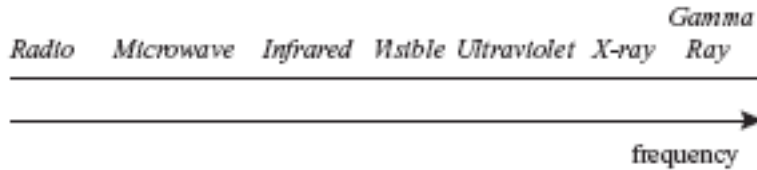
Practice: Open-response question #1

**BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**

**Show all your work (diagrams, tables, or computations)**

**If you do the work in your head, explain in writing how you did the work.**

The electromagnetic spectrum is shown below.



There are multiple stages involved in the transmission, reception, and display of a television broadcast. A signal is sent by satellite from the station and relayed to the television by several methods. The signal is translated electronically and converted into an image on regular, liquid crystal, or plasma TV displays. The viewer then sees the image.

- Identify one region of the electromagnetic spectrum used by television and explain how it is used.
- Select a different portion of the electromagnetic spectrum that is not used by television. Explain a useful application of this spectral region.

Name: \_\_\_\_\_ Block: \_\_\_\_\_ Date: \_\_\_\_\_

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Practice: Open-response question #1

**BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**

**Show all your work (diagrams, tables, or computations)**

**If you do the work in your head, explain in writing how you did the work.**

What happens when light wave strikes a boundary?

QuickTime™ and a  
decompressor  
are needed to see this picture.

- a. Identify each light ray, A, B, and C, as an incident, a refracted, or a reflected ray.
- b. Describe the relationship between angles  $x_1$  and  $x_2$ .
- c. Describe how this setup could be changed so that the size of angle  $x_3$  is different. medium (liquid) than through a less dense medium (gas)