
Class:

Physics worksheet

Mark:

Name:

Subject: *Electromagnetic waves*

1. Waves: Review

- Watch the video on slide 3.

1.1. What did Bill do with the pad? What do we call this phenomenon?

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1.2. What happened to the pad? What do we call this phenomenon? Define it (work in pairs: discuss with your classmate).

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- Watch the video on slide 4.

1.3. Since the ball was knocked after being at rest, can you conclude that the ball gained energy? From where did it gain it? What do you conclude?

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- Watch the video on slide 5.

1.4. What are the characteristics of waves mentioned in the video? Define each (work in pairs: explain it to your classmate then he/she explains it back to you).

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1.5. There are other characteristics not mentioned, what are they? Define each.

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1.6. Calculate the frequency and the period of a wave of speed 150m/s and of wavelength 5m.

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- Watch the video on slide 6.

1.7. How are waves classified by this method? Define each type (work in pairs: explain it to your classmate and then he/she explains it back to you).

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- Watch the video on slide 7.

1.8. There is a sound emitted from the bell inside the bell jar. After evacuating the jar, sound vanishes. Does sound need a material medium to propagate through? What do we call this type of wave?

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1.9. Since we can still see what's inside the jar, does light need a material medium to propagate through?

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- Waves that need a material medium to propagate through (like sound) are mechanical waves, while waves that can propagate through vacuum (like light) are electromagnetic waves.

2. What are electromagnetic waves?

- Watch the video on slide 8. Note that the length of the red vectors represents the electric field intensity, while the length of the blue vectors represents the magnetic field intensity.

2.1. What is happening to the intensities of the electric fields and magnetic fields?

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2.2. What are the directions of the electric field and the magnetic field relative to each other?

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2.3. Name this phenomenon.

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3. Where do electromagnetic waves come from?

- Watch the video on slide 9. The displayed orbits of the electron around the atom are simplified, and in fact, are more complex.

3.1. When do electrons emit electromagnetic radiation?

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3.2. Knowing that electrons are charged particles that emit electromagnetic radiations when they change orbit, and each orbit has its energy level, what can you conclude about the origin of electromagnetic radiations in general? (work in pairs: discuss it with to your classmate)

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4. Are electromagnetic waves transverse or longitudinal?

- Watch the video on slide 10.

4.1. What is the direction of each of the electric field and the magnetic field with respect to the direction of propagation of the wave?

4.2. Are electromagnetic waves transverse or longitudinal?

5. Characteristics of electromagnetic waves

- Watch slide 11.

5.1. What are the characteristics of the electromagnetic wave?

5.2. How are these characteristics related to each other?

5.3. Can you deduce a wave formula other than the displayed one?

5.4. Calculate the wavelength of radio waves from a transmitter, broadcasting at a frequency of 200kHz.

6. Why is light electromagnetic waves?

- Watch slide 12.

6.1. What are the pieces of evidence that lead to the conclusion that light is electromagnetic waves? (work in pairs: discuss with your classmate)

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7. Electromagnetic spectrum

- Watch slides 13 and 14.

7.1. Based on what characteristic is the electromagnetic spectrum arranged?

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7.2. Put the following in order of increasing frequency: ultraviolet, X-rays, red light, violet light, microwaves, infrared, Gamma rays, radio waves.

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7.3. Put the above types of radiation in the order of increasing wavelength

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8. Electromagnetic spectrum - dispersion

- Watch slide 15.

8.1. How does the angle of refraction vary with the frequency of the electromagnetic wave? With the wavelength?

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8.2. What are the main colors of the rainbow? Arrange them in the order of increasing wavelength

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9. Energy of electromagnetic waves

- Watch the video on slide 16.

9.1. How does the energy of the electromagnetic wave vary with the frequency? With the wavelength?

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10. Research

10.1. Do a research about the difference between the 2.4GHz and the 5GHz network routers and the advantage of the 5GHz over the 2.4GHz routers. Think of a new way of utilizing the electromagnetic waves for communication in domestic installation. Think of some flows of the current 2.4GHz routers.