Day 7—Waves, Sound, Light

a. **Waves**-transfer of energy without the transfer of matter

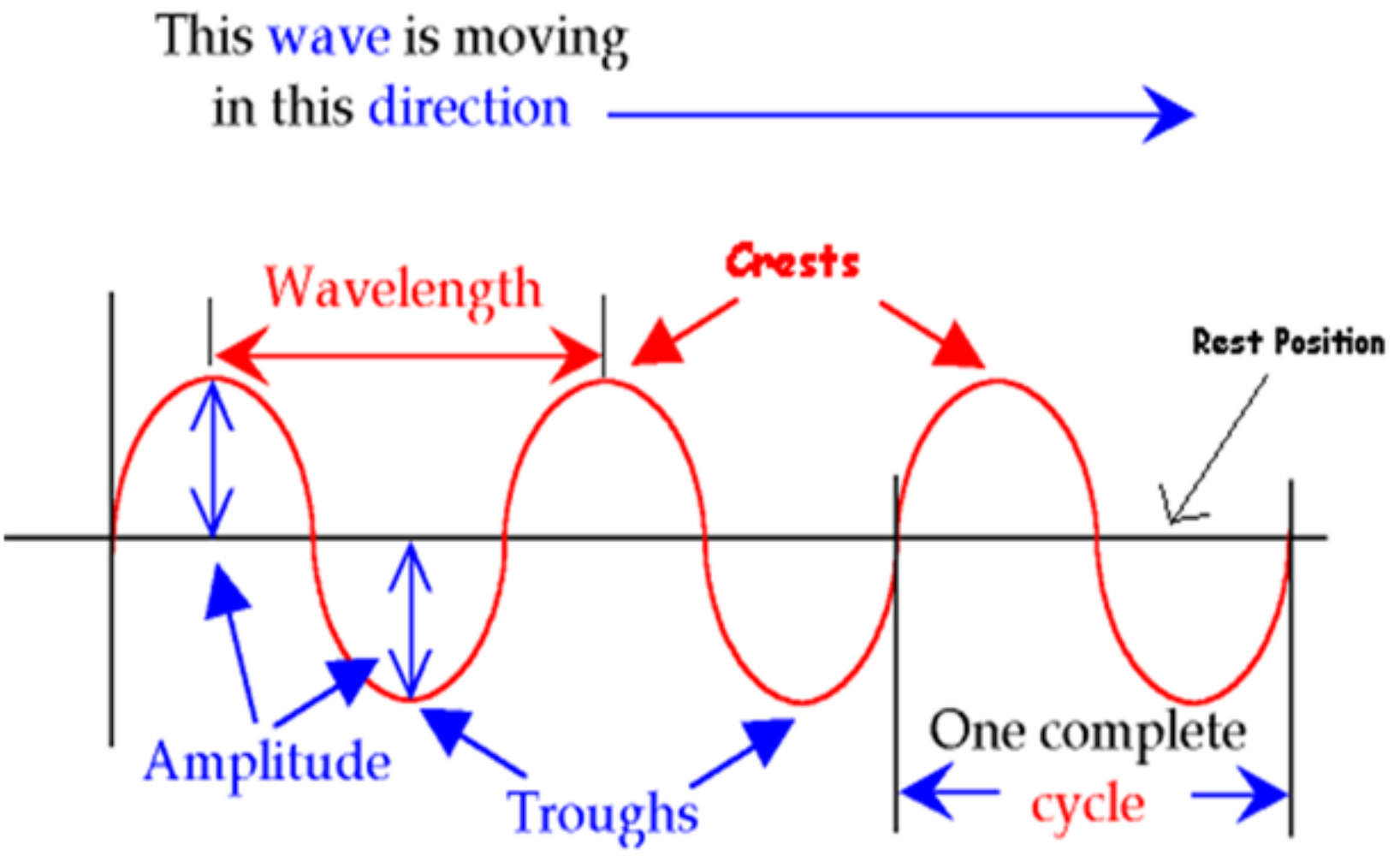
b. **Mechanical Wave**—wave that requires a medium

c. **Electromagnetic wave**—wave that does not require a medium

d. **Transverse wave**—displacement is perpendicular to propogation

e. **Longitudinal wave**-displacement is parallel to the propogation

a. **Crest**—high pt. of wave.
b. **Trough**—low pt. of wave
c. **Frequency(f)**—number of waves(crests or troughs) that pass a given pt. in unit time
    i. Measured in **Hertz(Hz)**
d. **Period(T)**—time between passage of two successful waves past a given pt.
    i. Measured in seconds(s)
e. **Wavelength(λ)--**distance advanced by the wave motion in one period.
f. **Amplitude(A)**—Maximum displacement of the wave from the equilibrium position.
    i. Corresponds to the amount of energy being carried.
g. **Wave velocity(v)**—how fast the waves move.


This wave is moving
in this direction
Wavelength
Crests
Rest Position
Amplitude
Troughs
One complete
cycle

On each of the figures below, 1 square of the grid represents 1 unit. Use Figure 1 to answer questions 1–4. On the blank, write the letter of the correct answer.

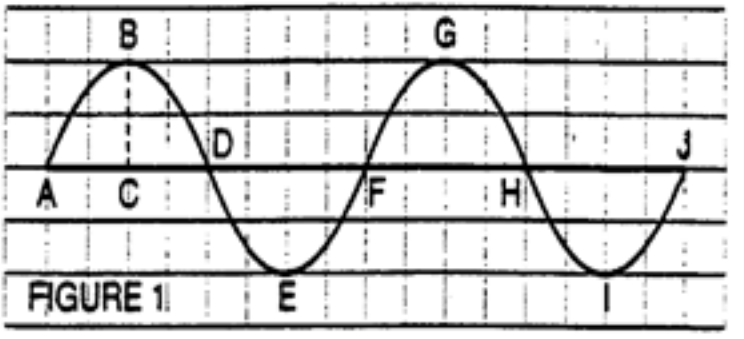


FIGURE 1

____ 1. Which distance is exactly 1 wavelength?

a. A–J b. A–D c. D–F **d. B–G** e. D–J

____ 2. Which distance is the amplitude?

a. B–C b. A–D c. E–G d. E–I e. A–J

____ 3. How many units measure one wavelength?

a. 2 b. 4 c. 6 **d. 8** e. 10

____ 4. Which letters are the crests?

a. A, D b. E, I c. H, J **d. B, G** e. F, H

Wave Examples:

___1. What is the speed of a wave with a frequency of 100 Hz and a wavelength of 15 m?

a) .015 m/s b) 150 m/s c) 1500 m/s d) 15,000 m/s

$f = 100\ Hz$

$\lambda = 15\ m$

$V =$

$V = f \times \lambda$

$= 100(15)$

$= 1500\ m/s$

v
$f \lambda$

Find frequency.

___ 2. A wave has a speed of 300 m/s and a wavelength of 30 m?

a) .10 Hz b) 1 Hz c) 10 Hz d) 100 Hz

$v = 300 \frac{m}{s}$

$\lambda = 30 m$

$f = ?$

$v = f\lambda$

$f = \frac{v}{\lambda} = \frac{300}{30} = 10 Hz$

___3. A sound wave has a frequency of 120 Hz and a wavelength of 4.5 m. Determine the velocity of the wave?

a) 210 m/s b) 360 m/s c) 540 m/s d) 690 m/s

$f = 120\,Hz$

$\lambda = 4.5\,m$

$V =$

$V = f\lambda$

$= 120(4.5)$

$= 540\,m/s$

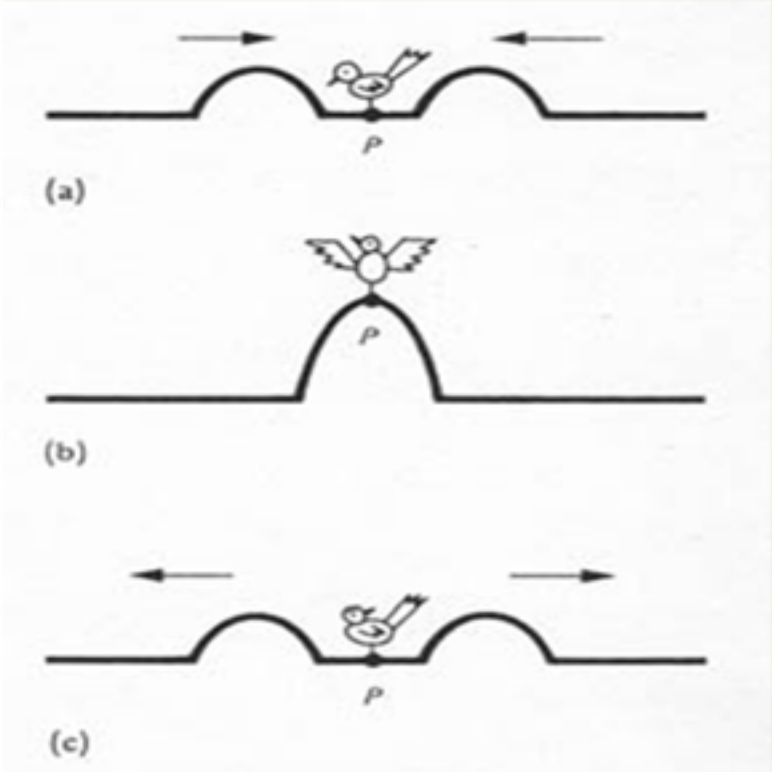
Wave Interactions

a. Reflection—bouncing back of a wave
b. Refraction—the bending of a wave as it passes from one medium to another.
c. Diffraction—bending of waves around a barrier(same medium)
d. Interference—Two or more waves that combine to form a new wave.
    i. Two types:
        1. Constructive
        2. Destructive

2 types of interference

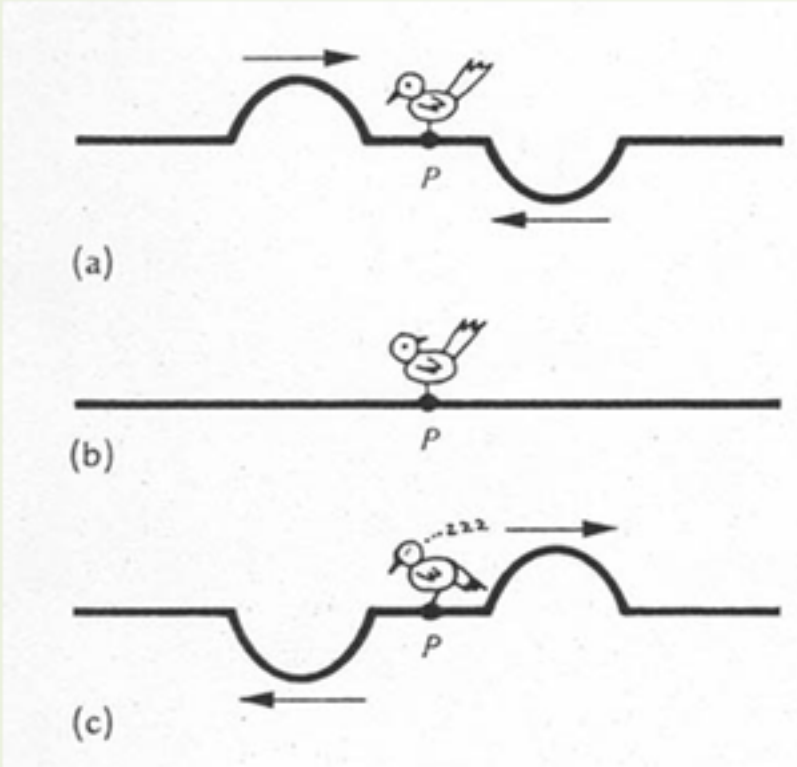
Constructive Interference

- Waves "add together" because they are in "phase" with one another.

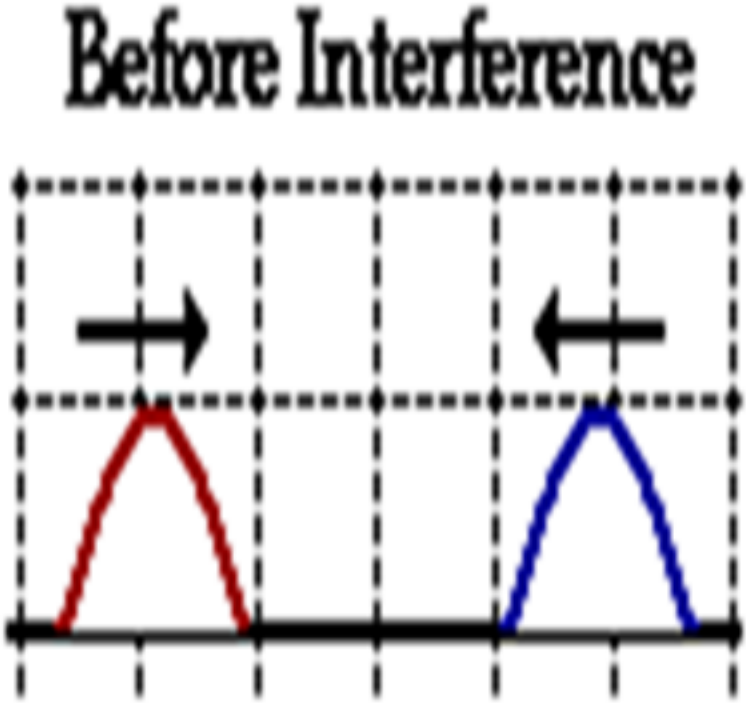


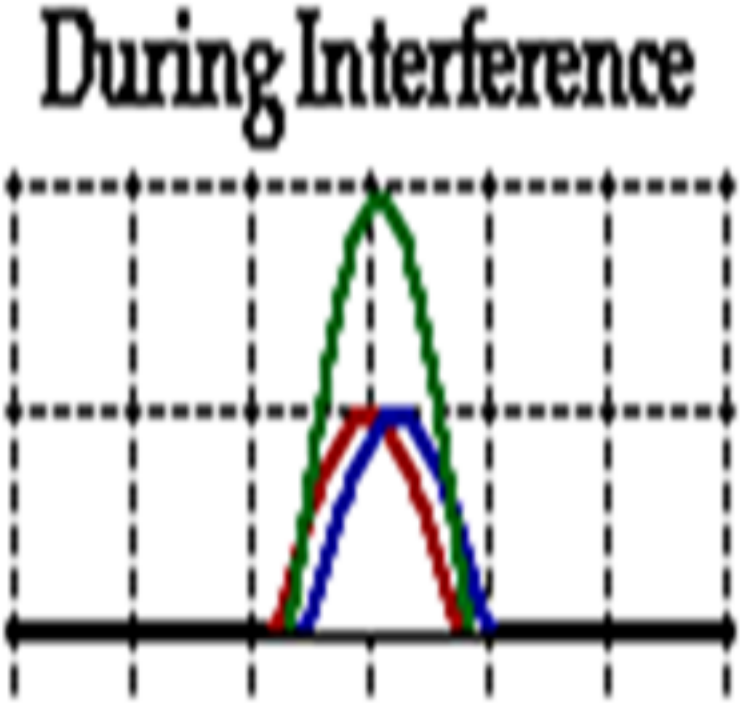
Destructive Interference

- Waves "cancel" because they are out of "phase" with each other.



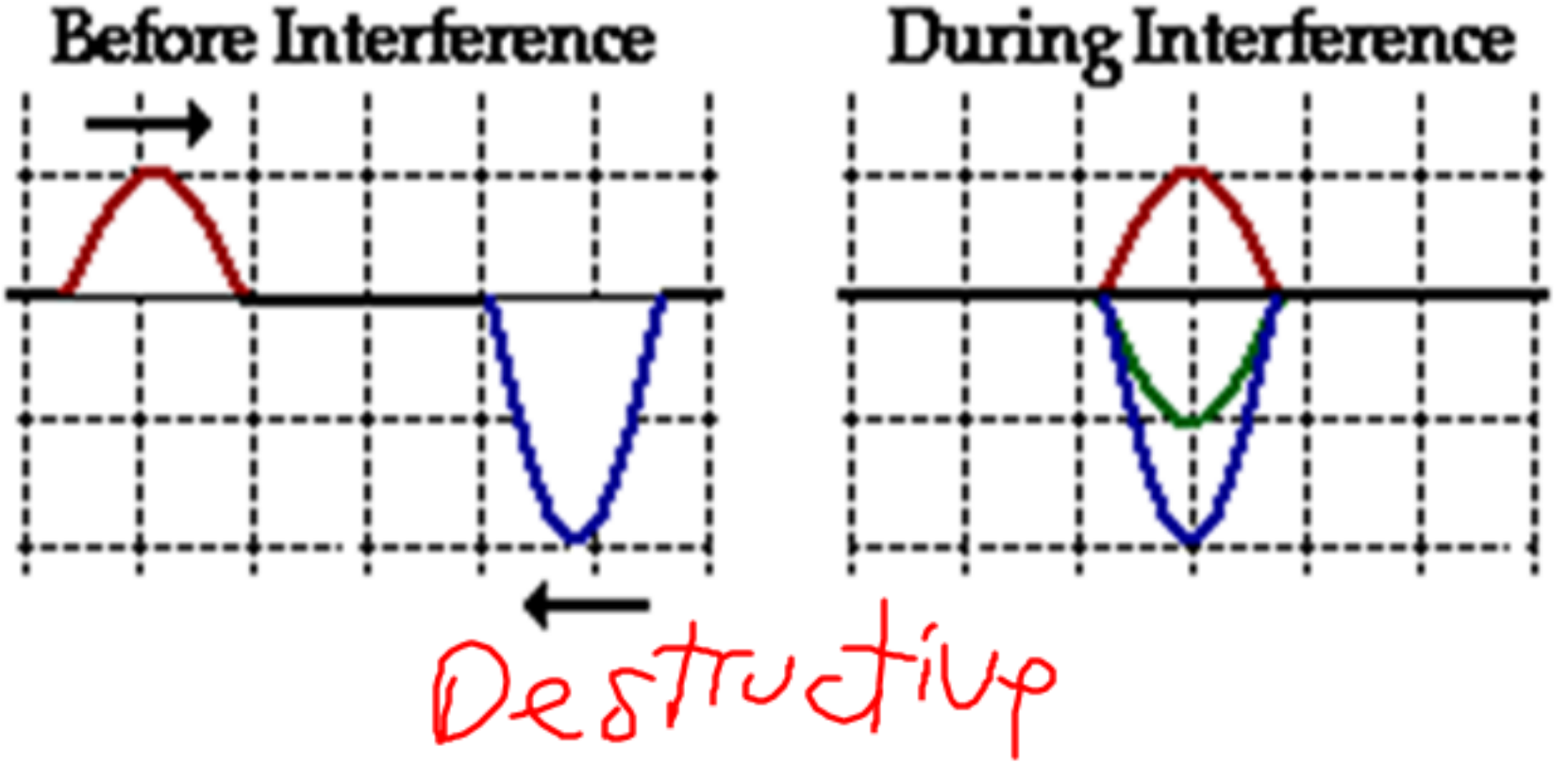
What type of interference is shown?



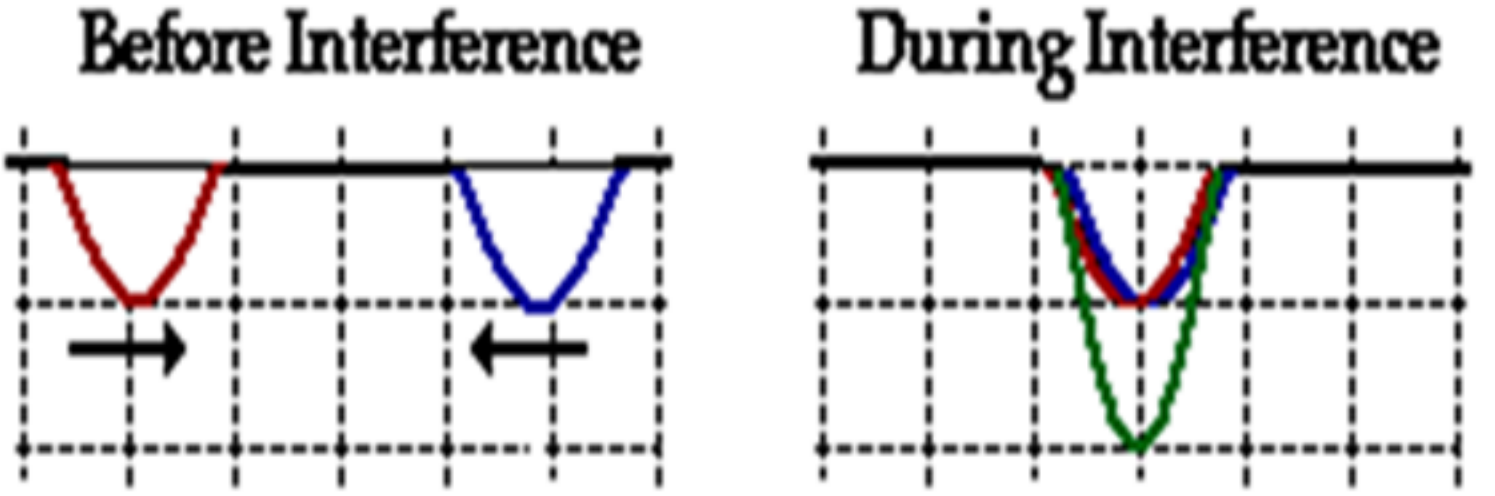


Constructive

What type of interference is shown?



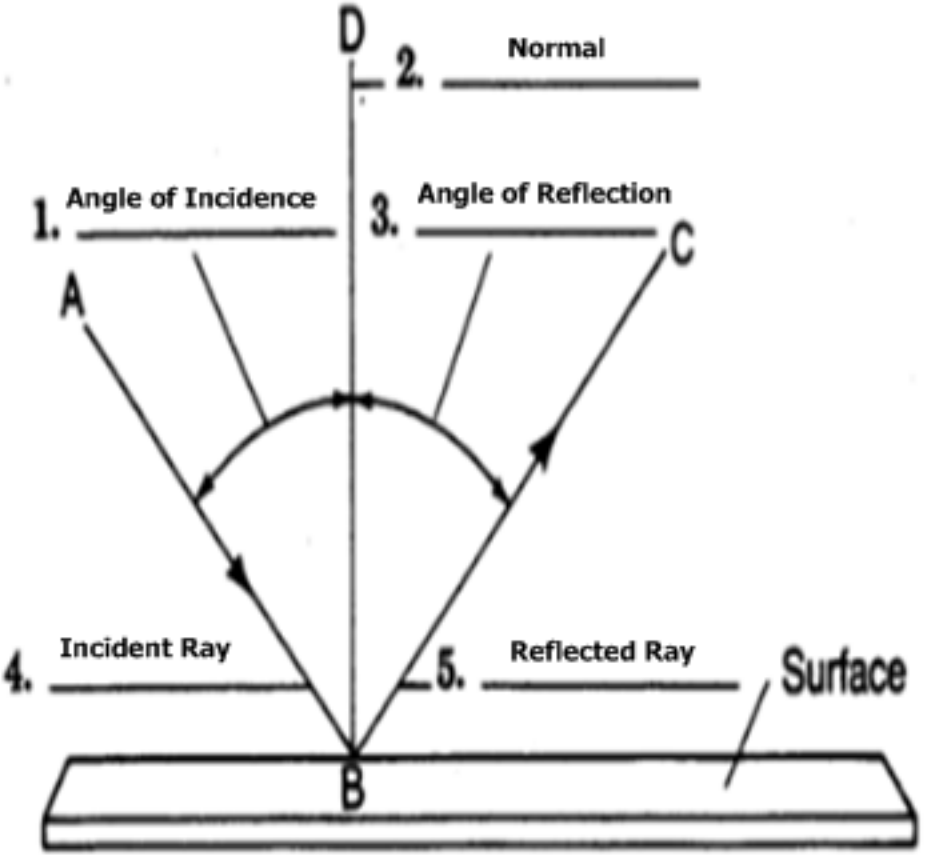
What type of interference is shown?



Constructive

Reflection/Refraction Wst.

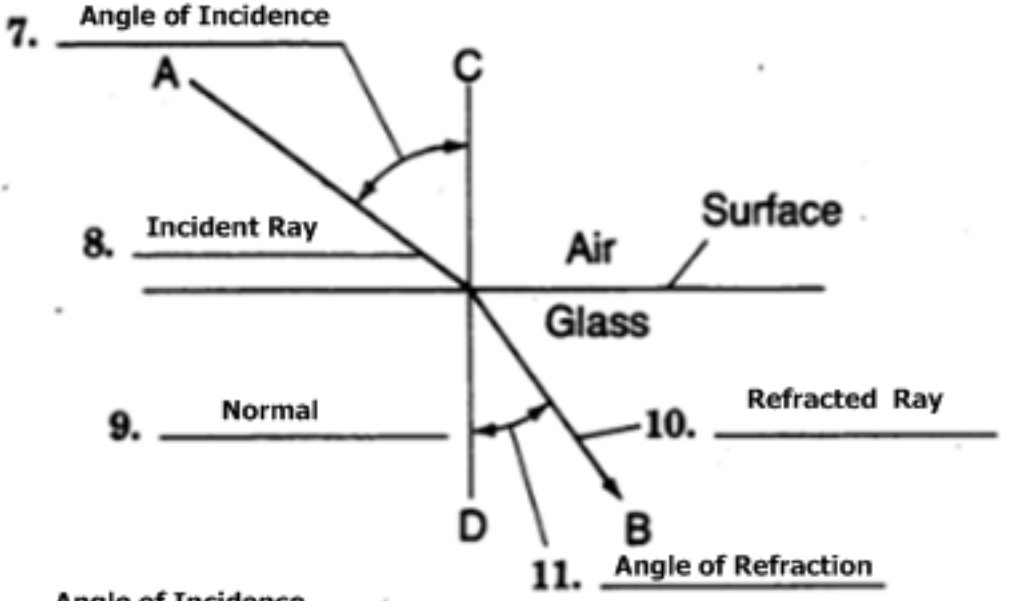
Reflection



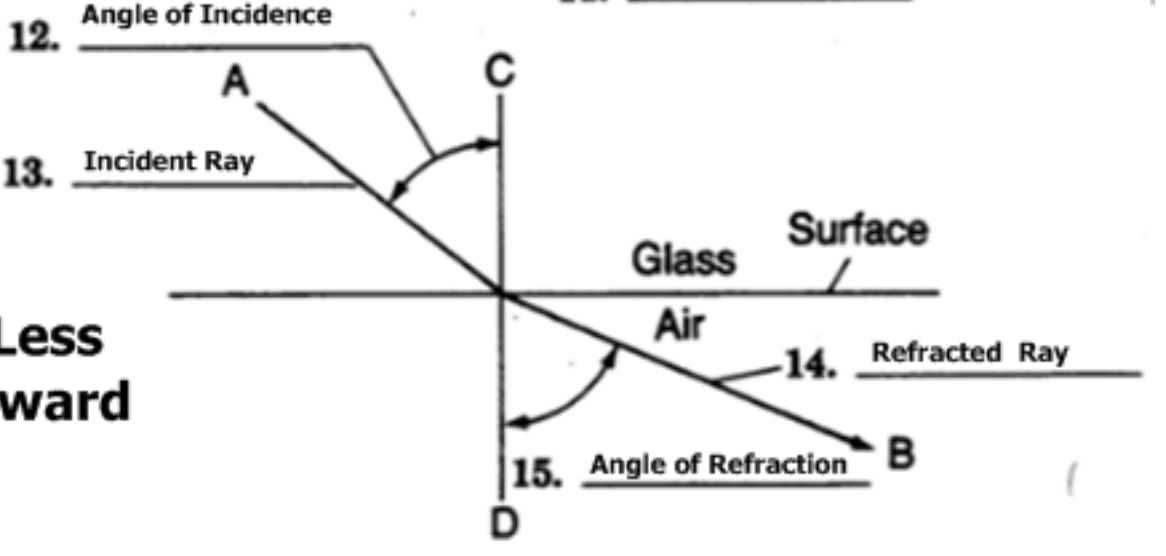
6. Law of Reflection Angle of incidence = Angle of Reflection

Refraction

Less to More bends toward (LMT)



More to Less bends toward (MLA)



reflection

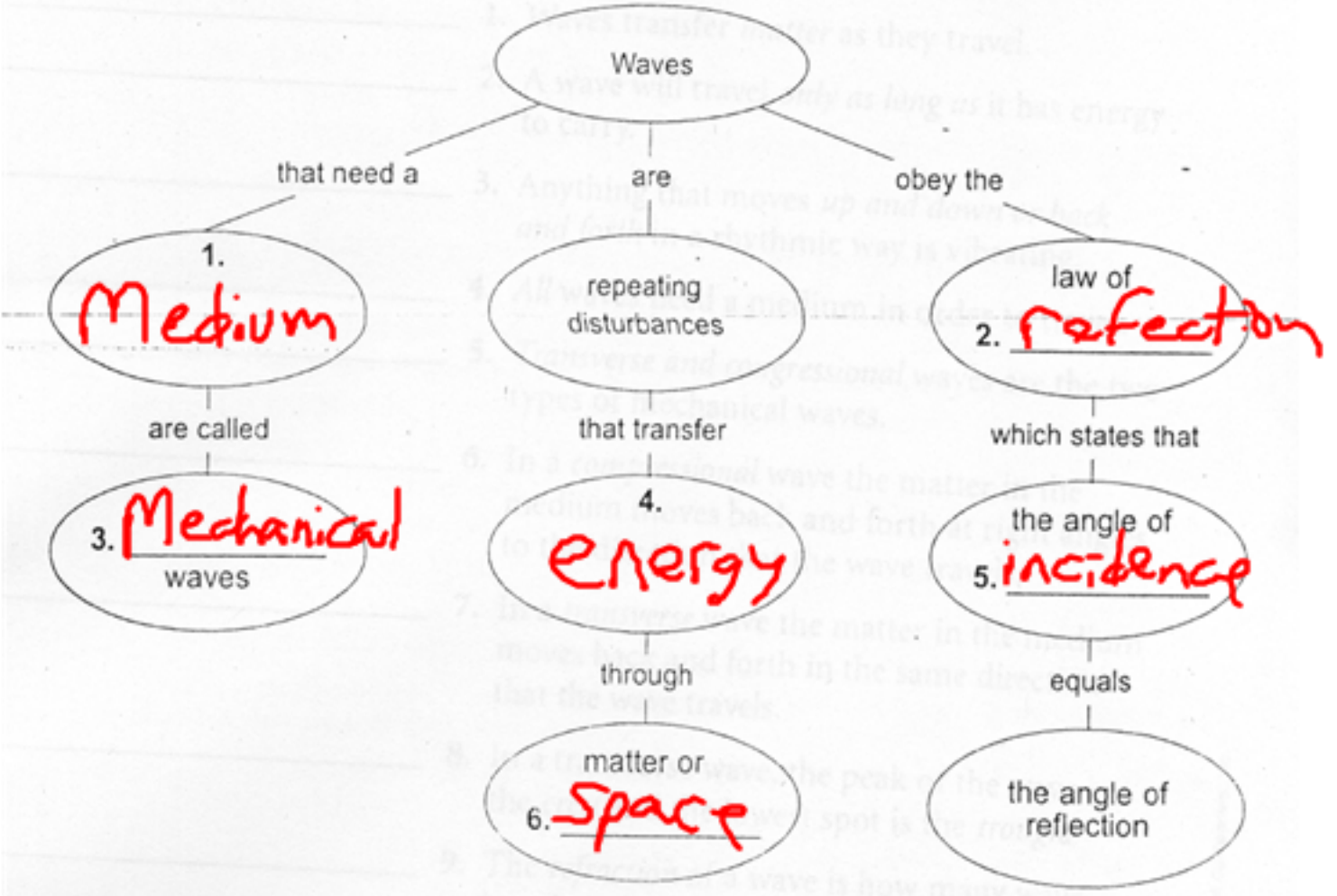
energy

medium

mechanical

incidence

space



Directions: *For each of the following write the letter of the phrase that best completes the sentence.*

C 7. The high point of a transverse wave is _____ .

a. a rarefaction b. the frequency c. the crest

A 8. The less dense region of a compression wave is called _____.

a. a rarefaction b. the frequency c. the crest

B 9. The number of wavelenghts that pass a fixed point each second is _____ of a wave.

a. a rarefaction b. the frequency c. the crest

Energy

1. Waves transfer *matter* as they travel.

True

2. A wave will travel *only as long as* it has energy to carry.

True

3. Anything that moves *up and down or back and forth* in a rhythmic way is vibrating.

F - Some

4. All waves need a medium in order to travel.

Compressional

5. *Transverse and congressional* waves are the two types of mechanical waves.

F - transverse

6. In a *compressional* wave the matter in the medium moves back and forth at right angles to the direction that the wave travels.

F - Compressional

7. In a *transverse* wave the matter in the medium moves back and forth in the same direction that the wave travels.

True

8. In a transverse wave, the peak of the wave is the *crest* and the lowest spot is the *trough*.

F- Frequency

9. The *refraction* of a wave is how many wavelengths pass a fixed point each second.

True

10. The speed of a wave is determined by multiplying the *wavelength by the frequency*.

F - Greater

11. In a compressional wave, the denser the medium is at the compressions the *smaller* its amplitude.

True

12. In a transverse wave, the higher the amplitude, the *more* energy it carries.