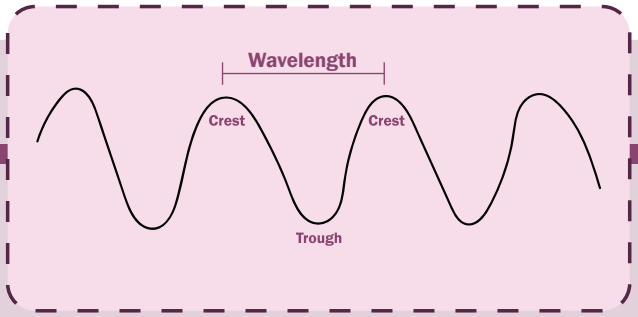
Illuminate NEBRASKA
POWERED BY NEBRASKA PUBLIC POWER DISTRICT

PWM/PID

WAVES

CONCEPT A disturbance that transfers energy.



BACKGROUND

MEDIUM: the material through which a wave travels

TYPE OF PRODUCTION

PULSE: a single burst of wave motion like a single stone dropped in water
PERIODIC: a repeated disturbance like a sustained note on a piano

TYPE OF DISTURBANCE

TRANSVERSE: disturbance is perpendicular to the direction of motion, like light waves
LONGITUDINAL: disturbance is parallel to the direction of motion, like sound waves
SURFACE: disturbance follows a circular pattern, like water waves

PARTS OF A WAVE

CREST: the maximum disturbance
TROUGH: the minimum disturbance
WAVELENGTH: distance between disturbances for a periodic wave
EQUILIBRIUM: the rest position of the medium
DISPLACEMENT: the amount of movement of the medium from equilibrium
CYCLE: the complete motion for the oscillation, like going down and back up
FREQUENCY: the number of cycles that occur in one second
HERTZ (HZ): the unit of frequency, 1 Hertz = 1 cycle per second
WAVE SPEED: the speed of the disturbance through the medium

WAVE PHENOMENON

DIFFRACTION: the bending of waves around obstacles
SUPERPOSITION: when waves meet the total disturbance is the sum of each wave
INTERFERENCE: when superposition creates patterns of reinforcement and cancelation

Make sure it measures up

REAL WORLD CONNECTIONS

Sight is a result of electromagnetic waves entering the eye
The eye is sensitive to a frequency range of electromagnetic waves called visible light
Color is due to different frequencies within the range for visible light
Other electromagnetic waves exist outside the visible range
Radio waves, Heat, and Infrared waves have frequencies below visible light
Ultraviolet, X-Rays and Gamma Rays have frequencies above visible light

Sound is a result of air pressure waves entering the ear
The ear is sensitive to a range of pressure waves called sound waves
Low tones are due to low frequency sound waves
High pitched tones are due to high frequency sound waves

X-rays and ultrasound are used to create medical images
Electricity consists of Alternating Current (AC) waves moving through power lines
The frequency of electrical power in the United States is 60 Hz

EXAMPLES

WATER: water molecules oscillate in the vertical pattern
AIR: air molecules oscillate in the direction of motion
ELECTRICAL: electrical charges oscillate in a conducting wire
ELECTROMAGNETIC: oscillations between electric and magnetic fields

APPLICATION

- A person on the seashore experiences many waves
- The water waves are crashing on the beach producing sound
  Waves in the ocean superimpose to create larger waves
- The sun in the sky providing light waves
- The birds are flying providing sound waves
- The blue sky is a result of light waves scattering off air molecules
- The cell phone is constantly communicating with the cell tower
- The electrical power lines carry electricity
- Cars and trucks on a nearby roadway create sound