1. Intro to Physics 2

1) What time zone are you in?

A. Hawaii-Aleutian
B. Alaska
C. Pacific
D. Mountain
E. Central
F. Eastern
G. Atlantic
H. other

2) Heat can cause magnets to lose their magnetism.

A. True
B. False

3) Should Math Dad keep his beard or shave?

A. Keep the beard
B. Shave it off

4) Which of the following are considered spam in the chat?

A. A comment that is repeated multiple times
B. A long drawn-out word (Hoooooorrrrrrraaaaaayyyyyyyyy!)
C. A long string of emojis
D. All of the above

5) The smallest monkey in the world is:

A. Mouse lemur
B. Mandril
C. Marmoset
D. Moustached tamarin

Key:
1.
2. A
3.
4. D
5. C

2. What's the Matter

1) What is the charge of a proton?

A. positive
B. negative
C. neutral

2) What is the name of the smallest fundamental unit of a substance such as water, iron, or carbon dioxide? Hint: this thing is often made of two or more atoms bonded together.

A. Atom
B. Element
C. Compound
D. Molecule

3) All atoms of the same element contain the same number of

A. Electrons
B. Neutrons
C. Protons

4) What subatomic particle is often shared or transferred when chemical bonds are formed?

A. Electrons
B. Neutrons
C. Protons

5) In what chemical bond do atoms share electrons evenly?

A. Ionic bond
B. Covalent bond
C. Metallic bond
D. Hydrogen bond

Key:
1. A
2. D
3. C
4. A
5. B

3. Elemental

1) Select each true statement.

Choose all that apply:

A. Water is an element.
B. Iron is an element.
C. The smallest unit of an element is called a molecule.
D. The smallest unit of an element is called an atom.

2) Which state of matter has a fixed volume but not a fixed shape?

A. Solid
B. Liquid
C. Gas
D. Plasma

3) Which of these states of matter has particles with the highest kinetic energy?

A. Solid
B. Liquid
C. Gas

4) What happens to the particles in a substance when it changes from liquid to solid?

A. They move closer together and more slowly.
B. They move further apart and more quickly

5) What is the phase change from gas to liquid called?

A. Melting
B. Freezing
C. Evaporation
D. Condensation

Key:
1. B, D
2. B
3. C
4. A
5. D

5. No Such Thing as Cold

1) Which statement is true?

A. Thermal expansion means a drop in temperature causes an increase in volume.
B. Heat is a measure of the average kinetic energy of the molecules in a substance.
C. Most of the world's population uses the Fahrenheit scale to measure temperature.
D. All of the above statements are true
E. None of the above statements are true

2) Which of the following can be a consequence of thermal expansion?

A. Sea level rising
B. A thermometer indicating a change in temperature
C. A volcanic eruption
D. All of the above

3) The average kinetic energy of the particles in a system is called:

A. Heat
B. Temperature
C. Warmth
D. Marmoset

4) In which temperature scale is 23° a comfortable temperature for humans?

A. Celsius
B. Fahrenheit
C. Kelvin
D. None of the above

5) What always flows from a hotter object or body to a colder object or body?

A. Heat
B. Temperature

Key:
1. E
2. D
3. B
4. A
5. A

6. Heat Transfer

1) When the firefighters wrap the sequoia trees with reflective blankets, what form of heat transfer are they protecting against?

A. Conduction
B. Convection
C. Radiation

2) If foil reflects heat, then how do foil-wrapped potatoes cook in an oven?

A. The foil traps moisture and heat around the potato, creating a mini-oven effect that cooks the potato evenly.
B. The foil generates additional heat through a chemical reaction with the potato skin, speeding up the cooking process.
C. Foil doesn't cook potatoes. You must always bake potatoes without foil if you want them to cook.

3) It is springtime and Bob wants the water in his swimming pool to get warmer. A neighbor offers to let Bob borrow a pool cover each night for 1 week. Will putting a cover on the pool each night help the pool get warmer?

A. Yes
B. No, it will make the pool cooler.
C. It will make no difference

4) Why does the tile floor in a bathroom feel colder than a rug?

A. The tile is more reflective so it will always be colder than the rug.
B. The tile is a better conductor of heat and takes more heat from your feet than the rug.
C. The tile is a poorer conductor of heat so it stays colder than the rug.
D. The tile is better at giving cold energy to your feet.

5) Why does a vacuum thermos do a good job of keeping things hot or cold?

A. The only heat transfer that can travel through a vacuum is conduction.
B. The only heat transfer that can travel through a vacuum is convection.
C. The only heat transfer that can travel through a vacuum is radiation.
D. There is no type of heat transfer that can travel through a vacuum.

Key:
1. C
2. A
3. A
4. B
5. C

8. Specific Heat and Phase Change

1) Over the course of a day, a water puddle dries up and disappears. What phase change did it experience?

A. condensation
B. deposition
C. sublimation
D. evaporation

2) Select each consequence of water having a high specific heat capacity.

Choose all that apply:
A. Water heats up faster than other liquids.
B. Water heats up slower than other liquids.
C. Water cools down faster than other liquids.
D. Water cools down slower than other liquids.

3) Select each phase change that absorbs heat.

Choose all that apply:
A. Melting
B. Freezing
C. Condensation
D. Evaporation
E. Deposition
F. Sublimation

4) Why does frost irrigation save crops from a frost?

A. Water releases heat when it freezes.
B. Cold is afraid of ice.
C. Ice releases heat when it melts.
D. Thirsty plants can't handle the cold.

5) A mixture of ice and water is being stirred in a pot. The pot is on a hot stove. Which statements are true?

Choose all that apply:

A. The temperature of the water is 0°C.
B. The temperature of the ice is 0°C, but the water is much warmer.
C. The heat energy is melting the ice.
D. The heat energy is raising the temperature.

Key:
1. D
2. B, D
3. A, D, F
4. A
5. A, C

9. The Laws of Thermodynamics

1) What is entropy?

A. A measure of the total energy in a system that can be used to do work.
B. A measure of the orderliness or predictability of a system.
C. A measure of the disorder or randomness in a system.
D. The amount of heat required to raise the temperature of 1 kilogram of water by 1°C.

2) Is it possible to reach absolute zero?

A. Yes
B. No
C. Maybe so

3) An engine will never be 100% efficient. Which law of thermodynamics guarantees this?

A. 1st Law
B. 2nd Law
C. 3rd Law

4) If two objects with the same mass receive the same amount of heat, then their temperatures will increase the same amount.

A. True
B. False

5) When temperatures approach absolute zero, heat will often spontaneously flow from a colder body to a hotter body without external energy input.

A. True
B. False

Key:
1. C
2. B
3. B
4. B
5. B

11. Thermodynamics Quiz Show

1) What is the first law of thermodynamics?

A. Energy cannot be created or destroyed, only transformed.
B. The total entropy of an isolated system always increases over time.
C. Heat flows from a hot object to a cold object.
D. The universe tends towards disorder.

2) When water in a pot is heated, the water at the bottom gets hot first. It becomes less dense and rises, while the cooler, denser water sinks to the bottom. What type of heat transfer is this?

A. Conduction
B. Convection
C. Radiation

3) Select each sequence of tranformations a substance can undergo consecutively. (Hint: A phase change always has to start with the right phase of matter. For instance, you can't melt a gas.)

Choose all that apply:

A. deposition → melting → evaporation
B. sublimation → freezing → condensation
C. evaporation → melting → freezing
D. melting → freezing → melting

4) Which type of heat transfer is primarily responsible for the heating of the Earth's atmosphere by the sun?

A. Conduction
B. Convection
C. Radiation

5) The temperature of a substance always increases when heat is added.

A. True
B. False

6) In which state(s) of matter does a substance have a fixed volume?

Choose all that apply:
A. Solid
B. Liquid
C. Gas

7) Which state of matter has particles with the highest energy?

A. Solid
B. Liquid
C. Gas

8) What does high entropy mean for the state of a system?

A. The system is highly ordered.
B. The system is highly disordered
C. The temperature is rapidly rising.
D. The temperature is rapidly falling.

9) Select each true statement.

Choose all that apply:
A. Conductors have a low specific heat capacity.
B. Water has a high specific heat capacity.
C. If you double the amount of a substance, you also double its specific heat capacity.

10) What is the unit of heat in the International System of Units (SI)?

A. Kelvin
B. Joule
C. Celsius
D. Watt

11) What is conduction?

A. Heat transfer by currents in a fluid.
B. Heat transfer through electromagnetic waves.
C. Heat transfer through direct contact between materials.
D. The conversion of heat energy into work.

12) In which direction does heat naturally flow?

A. From a colder body to a hotter body.
B. From a hotter body to a colder body.
C. It does not flow; it stays constant.

13) What is specific heat capacity?

A. The maximum heat a substance can absorb.
B. The heat required to change the state of a substance without changing its temperature.
C. The amount of heat required to raise the temperature of a gram of a substance by one degree Celsius.
D. The amount of heat released when a substance cools down.

14) Select each temperature where somebody might be comfortable walking around without a coat.

Choose all that apply:

A. 24°F
B. 65°C
C. 24°C
D. 124 K

15) Select each true statement about heat and temperature?

Choose all that apply:

A. Heat is energy in transit, while temperature is a measure of the average kinetic energy of particles.
B. Heat and temperature are essentially the same thing.
C. Heat is measured in Joules, while temperature is measured in Kelvin.
D. Two substances at the same temperature will always give off heat at the same rate.

16) Sweat is useful for cooling us off. Why?

A. The evaporation process releases heat.
B. The evaporation process absorbs heat.

17) One end of a metal rod is placed in the hot embers of a fire. Soon the entire rod is hot. What type of heat transfer is occuring?

A. conduction
B. convection
C. radiation

Key:
1. A
2. B
3. D, A
4. C
5. B
6. B, A
7. C
8. B
9. B, A
10. B
11. C
12. B
13. C
14. C
15. A, C
16. B
17. A

12. Pressure and Fluids

1) Calculate the pressure exerted by a 40 lb box lying on a side that has an area of 10 in^2.
_____ PSI

2) If the area where a force is applied DECREASES but the force remains the same, what will happen to the pressure?

A. It will increase.
B. It will decrease.
C. It will stay the same.

3) Why do snowshoes help people walk on snow better?

A. They reduce the weight.
B. They increase the weight.
C. They reduce the pressure.
D. They increase the pressure.

4) Air is a fluid.

A. True
B. False

5) How does a fluid distribute pressure on its container?

A. Evenly in all directions
B. Downward
C. Upward
D. Marmoset

Key:
1. 4
2. A
3. C
4. A
5. A

13. Going for a Swim

1) If you double the depth of a submerged object, what happens to the pressure it experiences?

A. Pressure is cut in half.
B. Pressure stays the same.
C. Pressure is doubled.
D. Pressure is quadrupled.

2) A floating object displaces a volume of water that is

A. Greater than its own weight
B. Equal to its own weight
C. Less than its own weight

3) What factors influence the pressure an object would experience when submerged in a fluid? (Select all that apply.)

Choose all that apply:

A. The fluid's density
B. The depth or height of the fluid column
C. The force of gravity
D. The pH of the fluid

4) What causes buoyancy?

A. Pressure increases with depth.
B. Pressure decreases with depth.
C. Water has upward currents.
D. Water has downward currents.

Key:
1. C
2. B
3. B, C, A
4. A

15. Density and Buoyancy

1) An object **submerged** in a fluid experiences a buoyant force. What does this force depend on? (Select all the apply.)

Choose all that apply:

A. The mass of the object.
B. The volume of the object.

2) If two objects have the SAME volume but DIFFERENT masses, which one has a higher density?

A. The one with the smaller mass
B. The one with the larger mass
C. Both have the same density
D. It depends on the shape

3) Which of the following could be a unit used to measure density? (Select all that apply.)

Choose all that apply:

A. Kilograms (kg)
B. Cubic meters (m^3)
C. Kilograms per cubic meter (kg/m^3)
D. Grams per cubic centimeter (g/cm^3)

4) What is more dense: 5 grams of gold or 125 grams of coal?

A. 5 grams of gold
B. 125 grams of coal
C. Both have the same density.

5) The density of mercury is 13.59 g/cm^3. A block of tungsten has a volume of 25 cubic centimeters and weighs 481 grams. Would the tungsten sink or float in mercury?

A. Sink
B. Float
C. There is not enough information to tell.

Key:
1. B
2. B
3. D, C
4. A
5. A

16. Ocean of Air

1) What would likely happen to a sealed, flexible container of air if it were taken from sea level to a high elevation?

A. The container would expand due to decreased external pressure.
B. The container would shrink due to increased external pressure.
C. The container's size would remain unchanged.
D. The container would burst due to increased internal pressure.

2) If the temperature remains constant what will happen to the volume of a gas when the pressure increases?

A. The volume will increase.
B. The volume will decrease.
C. The volume will stay the same.
D. The volume will double.

3) If an object is fully submerged in a fluid, how does the buoyant force compare to the weight of the fluid displaced?

A. The buoyant force is greater.
B. The buoyant force is less.
C. The buoyant force is equal to the weight of the fluid displaced.
D. There is no relationship between the buoyant force and the weight of the fluid displaced.

4) If a gas at 25 °C occupies 3 liters at a pressure of 4.00 atm, what will its volume be at a pressure of 6.00 atm?

5) Select each true statement.

A. The density of a gas will decrease if you place the same amount of gas in a larger container.
B. Air has no density.
C. The air pushing down on you from above weighs more than you do.
D. Helium is less dense than nitrogen.

Key:
1. A
2. B
3. C
4. 2 L
5. A, C, D

18. Fluids in Motion

1) Where will air move faster - above or below an airplane wing?

A. The speed is the same both above and below the wing.
B. Above
C. Below

2) Fill in the blanks using two of the choices below. Pressure = _____ / _____

A. Mass
B. Area
C. Volume
D. Density
E. Force

3) Is air pressure greater above or below the airplane wing?

A. The air pressure is the same.
B. Above
C. Below

4) Fill in the blanks using two of the choices below. Density = _____ / _____

F. Mass
G. Area
H. Volume
I. Pressure
J. Force

Key:
1. B
2. Pressure = Force / Area
3. C
4. Density = Mass / Volume

19. When Push Comes to Shove

1) What happens when we bring a deep sea creature up to the surface of the ocean?

A. The deep sea creature is fast and nimble in the lower pressure water.
B. The deep sea creature bloats or bursts.
C. The deep sea creature does not notice the difference.

2) Select each unit that is a unit of pressure.

A. PSI
B. newtons
C. atm
D. Pa
E. lb/ft

3) Which pressure is greatest?

A. 4 kPa
B. 340 Pa
C. 530 N/m²
D. 1 atm

4) It is easier to drink through a straw at a high elevation than at a low elevation.

A. True
B. False

5) The room we are teaching in has a volume of 24 cubic meters. The air in the room weighs roughly as much as:

A. a paper clip
B. a guinea pig
C. a 7-year old child
D. a grand piano

Key:
1. B
2. A, C, D
3. D
4. B
5. C

21. Pressure Quiz Show

1) A force is applied evenly over a region. What will happen if we increase that force and increase the area of the region?

A. Pressure will increase.
B. Pressure will decrease.
C. Pressure will stay the same.
D. There is not enough information to tell.

2) A cube that measures 2 m × 2 m × 2 m weighs 800 N. This cube is resting on the ground. How much pressure is exerted on the ground?

A. 100 Pa
B. 200 Pa
C. 400 Pa
D. 800 Pa

3) Select each unit that is a unit of pressure.

A. Atm
B. N/m^2
C. N/cm^2
D. lb/in

4) Approximately what is the density of water?

A. 1 kg/mL
B. 1 g/L
C. 1000 kg/m^3
D. 1000 g/cm^3

5) A 10 lb ball sinks in a pool and displaces a volume of water that weighs 6 lbs. How much upward force is needed to lift the ball while it is underwater?

A. At least 4 lb
B. At least 6 lb
C. At least 10 lb
D. At least 14 lb

6) A thumb tack has a large flat surface and a pointed end. With the same applied pressure, which part will have the greatest pressure?

A. The pointed end
B. The large flat part where the finger pushes
C. They have the same pressure

7) A diver swimming in the ocean decides to increase their depth from 4 m to 12 m. What happens to the liquid pressure they experience?

A. The pressure stays the same.
B. The pressure triples
C. The pressure increases by 8 kPa.
D. The pressure becomes 8 times bigger.

8) The reason that an iron ship does not sink is because:

A. Iron has a density less than water.
B. The hull has a large surface area.
C. The ships are filled with air.

9) What is more dense, 10 grams of gold or 500 grams of aluminum?

A. 10 g of gold
B. 500 g of aluminum
C. They have the same density.
D. There is not enough information.

10) Which has greater density - a 12 kg object with a volume of 4 L or an 8 kg object with a volume of 3 L?

A. The 12 kg object
B. The 8 kg object
C. They have the same density.
D. There is not enough information.

11) A person exerts a pressure of 3 PSI when standing on one foot. What pressure does the person exert on the ground if standing on both legs?

A. 12 PSI
B. 6 PSI
C. 3 PSI
D. 1.5 PSI

12) If two objects are made from the same material, but one is larger, which statement is true?

A. The larger object is denser.
B. The smaller object is denser.
C. Both have the same density.
D. Cannot determine without knowing their masses.

13) Bernoulli's principle is best demonstrated by which of the following scenarios?

A. Water boiling at a higher temperature at sea level than on a mountain.
B. A piece of paper rising when you blow over the top of it.
C. Ice melting in warm water.
D. A boat floating due to its shape.

14) Which of the following statements is correct according to the principle of buoyancy?

A. An object will float if its density is greater than the density of fluid it is placed in.
B. An object will sink if it displaces a weight of fluid less than its own weight.
C. An object will sink if it is larger than the volume of the fluid it displaces.

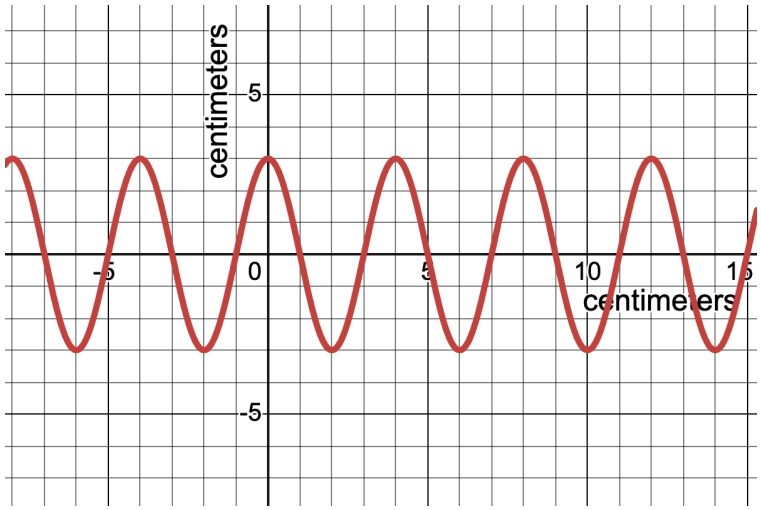
15) How does a vacuum cleaner remove dirt and dust from the floor?

A. It creates a high-pressure area inside its nozzle which sucks up dirt and dust.
B. It creates a low-pressure area inside its nozzle which causes atmospheric pressure to push dirt into the vacuum.
C. The vacuum cleaner is actually a secret portal for dust bunnies to return to their home dimension.
D. Vacuum cleaners are powered by tiny, invisible elephants that suck up dirt through their trunks.

Key:
1. D
2. B
3. A, B, C
4. C
5. A
6. A
7. B
8. C
9. A
10. A
11. D
12. C
13. B
14. B
15. B

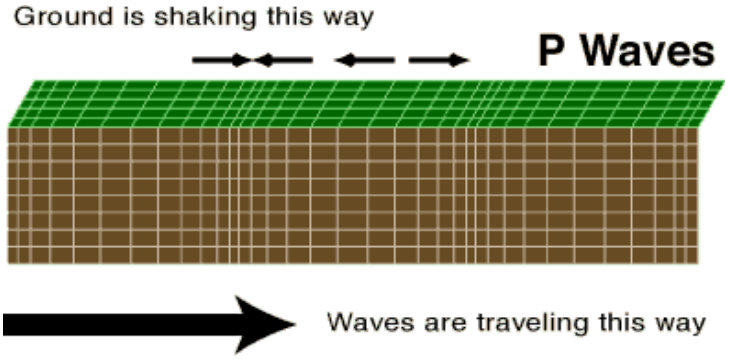
22. Making Waves

1) What is the amplitude of the wave pictured below?



A. 2 cm
B. 3 cm
C. 4 cm
D. 6 cm

2) Earthquakes send out a p-wave that oscillates in the SAME direction that the earthquake travel as pictured below.



What type of wave is this? (Select all that apply.)

A. transverse
B. longitudinal
C. mechanical
D. electromagnetic

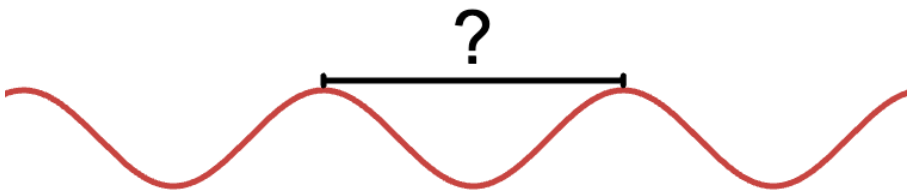
3) The number of wave cycles that pass a point per second is the:

A. wavelength
B. amplitude
C. frequency

4) What statement is true of electromagnetic waves?

A. They can travel through a vacuum.
B. They require a medium to travel.

5) What wave quantity is displayed below?



A. wavelength
B. amplitude
C. frequency

Key:
1. B
2. B, C
3. C
4. A
5. A

23. Good Vibrations

1) What is the name of the squeezed together and spread out regions in a sound wave?

A. Crest and Trough
B. Wavelength and Frequency
C. Compressions and Rarefactions
D. Marmoset

2) What is a hertz?

A. A painful experience
B. How many cycles happen per second
C. The speed of sound
D. The wavelength of a sound

3) What do we call a sound frequency that is too high for humans to hear?

A. Infrasonic
B. Hypersonic
C. Ultrasonic
D. Supersonic

4) What does amplitude measure in a sound wave?

A. The pitch of the sound
B. The speed of the sound
C. The loudness of the sound
D. The color of the sound

5) Which of the following is NOT a characteristic of sound waves?

A. They can travel through solids, liquids, and gases.
B. They require a medium to travel through.
C. Increasing the frequency will increase the pitch of the sound.
D. They can travel faster in a vacuum than in air.

Key:
1. C
2. B
3. C
4. C
5. D

25. Resonance and Decibels

1) Why don’t we hear echoes in small rooms?

A. Sound waves are too weak.
B. The sound wave returns too quickly for us to hear the echo.
C. Interference patterns cancel the sound.
D. The air indoors can only carry sound in one direction.

2) Which scenario best illustrates constructive interference?

A. Light dimming as it passes through a curtain
B. Two water waves meeting and forming a higher wave
C. Noise canceling headphones.
D. Two shadows overlapping and becoming darker

3) How many times more intense is a sound of 60 decibels than a sound of 30 decibels?

4) “Middle A” has a frequency of 440 Hz, while “middle C” has a frequency of 262 Hz. Which statements about these notes must be true?

A. Middle A has a higher pitch than middle C.
B. Middle A has a lower pitch than middle C.
C. Middle A has a higher volume than middle C.
D. Middle A has a lower volume than middle C.

5) If two waves overlap and the amplitude decreases, this is

A. deconstructive interference
B. constructive interference

Key:
1. B
2. B
3. 1000×
4. A
5. A

26. The Electromagnetic Spectrum

1) Of the EM waves below, which has the highest frequency?

A. Visible light
B. Infrared
C. Ultraviolet light
D. Microwaves

2) What travels faster?

A. X-Rays
B. Radio Waves
C. It depends on the temperature.
D. They both travel at the same speed.

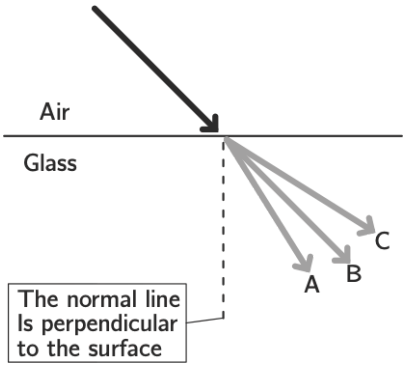
3) What waves are made of photons?
A. Sound Waves
B. X-Rays
C. Radio waves
D. Blue light

4) What types of wavelengths are blocked by the atmosphere?

A. Microwaves
B. X-Rays
C. Red light
D. Radio Waves

5) Light is traveling through the air when it hits a calm pool of water as pictured. Will the light follow path A, B, or C when it enters the glass?

A. A
B. B
C. C



Key:
1. C
2. D
3. B, C, D
4. A, B
5. A

28. Color and Sending Signals

1) Of the colors below, which has the longest wavelength?

A. Green
B. Orange
C. Yellow
D. Blue

2) Which of the following is a characteristic of digital signals?
A. Continuous variation in amplitude
B. Prone to interference over long distances
C. Represented by a sequence of bits
D. Loses information or degrades when copied.

3) Why does a black car get hotter in the summer time than a white car?
A. Black paint absorbs all colors of light, so they absorb more energy.
B. Black cars are made of different metals than white cars.
C. White cars reflect all colors of light, so they absorb more energy.
D. White cars must have their air conditioning on at all times by law.

4) Why are plants green?

A. Plants absorb green light.
B. Plants absorb red and blue light.
C. Plants emit green light as part of photosynthesis.
D. Plants emit carbon dioxide, which is green in color.

5) Which of the following statements about analog signals is true?
A. They are immune to noise and interference.
B. They represent information using continuous waveforms
C. They can only transmit data in binary form.
D. They are more efficient in data compression than digital signals.

Key:
1. B
2. C
3. A
4. B
5. B

29. Wave Quiz Show

Warning: The colors of the waves are swapped for the paper version relative to the video.

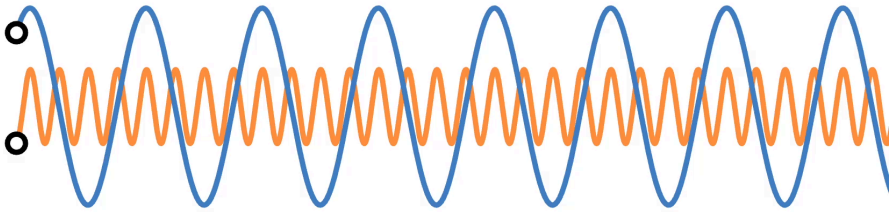
1) Which color of light waves has the most energy?

A. Orange
B. Blue
C. Red
D. Violet

2) Submarines use sonar waves to navigate by bouncing sounds off objects in the water. What type of waves are sonar waves? (Select all that apply.)

A. Mechanical
B. Electromagnetic
C. Longitudinal
D. Transverse

3) Which wave below has a greater amplitude



A. Orange
B. Blue
C. Same
D. Not enough information

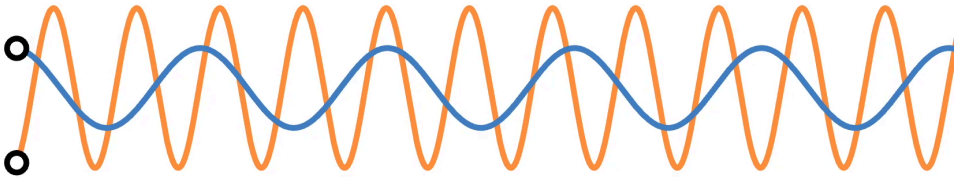
4) How many times more intense is a 70 decibel sound than a 50 decibel sound?

A. 4 times
B. 20 times
C. 40 times
D. 100 times

5) How are X-rays different from sound waves?

A. Sound waves are longitudinal waves while X-rays are transverse waves.
B. Sound waves are transverse waves while X-rays are longitudinal waves.
C. Sound waves can travel through a vacuum of empty space but X-rays can't.
D. X-rays always have a larger wavelength than sound waves.

6) Which wave has a greater wave speed?

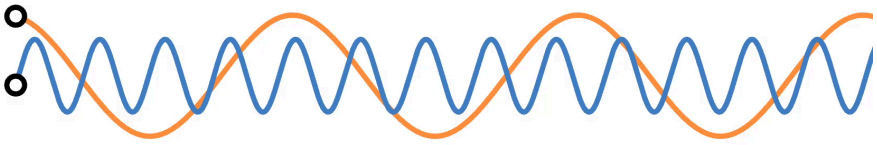


A. Orange
B. Blue
C. Same
D. Not enough information

7) How fast does a wave travel if it has a wavelength of 4 m and a frequency of 12 Hz?

A. 1/3 m/s
B. 3 m/s
C. 8 m/s
D. 48 m/s

8) Which wave below has a greater wavelength?



A. Orange
B. Blue
C. Same
D. Not enough information

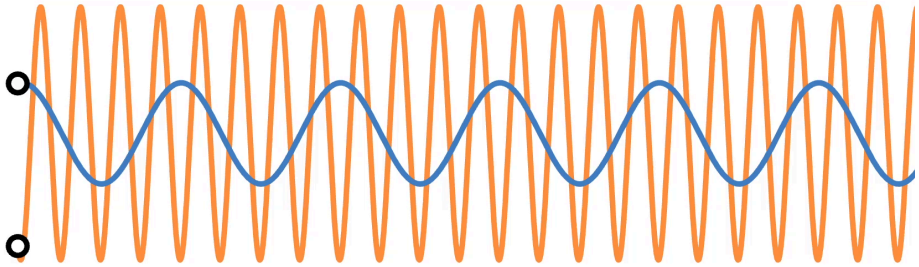
9) It would be possible to learn about an oncoming earthquake via a text or tweet before the earthquake arrives.

A. True
B. False

10) The speed of a sound wave depends on:

A. The medium through which it is traveling
B. The wavelength of the wave
C. The frequency of the wave
D. The amplitude of the wave

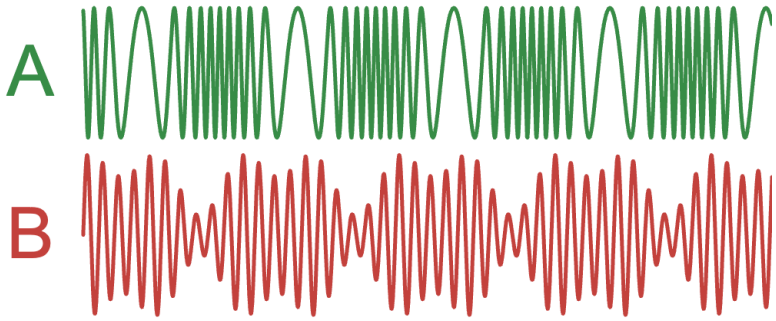
11) Which wave below has a greater frequency?



A. Orange
B. Blue
C. Same
D. Not enough information

12) AM radio signals transfer information by changing the amplitude of signals. FM radio signals transfer information by changing the frequency of the signals. Which radio signal below could be an AM radio signal wave?

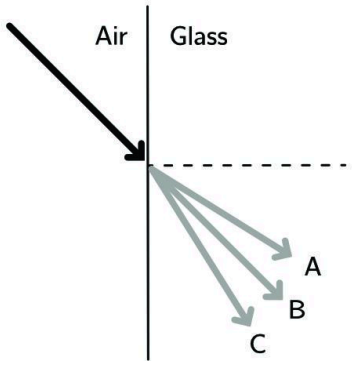
A. A
B. B
C. Both



13) Electromagnetic radiation includes:

A. Radio waves
B. Compression waves
C. Ultraviolet light
D. Microwaves

14) A light wave travels through the air and hits a glass window at an angle. Will the light follow path A, B, or C through the glass?



A. A
B. B
C. C

15) Which wave travels the fastest?

A. Sound through a vacuum
B. Sound through the air
C. Sound through liquid water
D. Sound through a steel beam

Key:
1. D
2. A, C
3. B
4. D
5. A
6. D We don’t know anything about how fast the waves are traveling from a still image.
7. D
8. A
9. A
10. A
11. D We don’t know anything about how fast the waves are oscillating from a still image.
12. B
13. A, C, D
14. A
15. D

30. Electrostatics

1) If filling up your car with gas, you should never get back into your car while refueling. It could cause enough static to create a fire.

A. True
B. False

2) Printers and photocopiers use static electricity to guide the link to the correct spot on the paper

A. True
B. False

3) Semi Trucks are required to have a static discharge chain connected to the ground at all times.

A. True
B. False

4) A balloon is rubbed on a wool blanket. After this friction, it appears to stick to a person's sweater. Which of these answers best explains why the balloon behaves this way?

A. Negative charge on the balloon is attracted to the negative charges in the sweater.
B. Positive charge on the balloon is attracted to the positive charges in the sweater.
C. Negative charge on the balloon is attracted to the positive charges in the sweater.
D. Positive charge on the balloon is attracted to the negative charges in the sweater.

5) If a person's hair stands up during a thunderstorm, it means they have developed a negative charge and so they are less likely to be hit by lightning.

A. True
B. False

Key:
1. A
2. A
3. B
4. C
5. B

31. The Current Event

1) What is electric current?

A. A buildup of charge in a specific location
B. The flow of electrons through a conductor
C. The amount of charge a battery can hold
D. A static discharge like lightning

2) Which unit is used to measure electric current?

A. Ohm
B. Watt
C. Volt
D. Ampere

3) What effect does increasing the voltage have on the current in a circuit, if the resistance stays the same?

A. The current decreases.
B. The current increases.
C. The current stays the same.
D. There is not enough information.

4) Which of the following are electrical insulators?

A. Copper
B. Glass
C. Rubber
D. Wood

5) Will Math Dad and Science Mom be able to close their circuit by touching an apple?

A. Yes
B. No

Key:
1. B
2. D
3. B
4. B, C, D
5. B

33. What is a Watt?

1) A toaster uses 6 amps of current and operates at 120 volts. What is the power consumption of the toaster?

A. 20 W
B. 114 W
C. 126 W
D. 720 W

2) If the voltage is doubled in a circuit and the resistance stays the same, what happens to the current?

A. The current is cut in half.
B. The current stays the same.
C. The current is doubled.
D. The current is quadrupled.

3) A circuit contains a 60-watt bulb running at 120 volts. What is the current flowing through the bulb?

A. 0.2 A
B. 0.5 A
C. 1.5 A
D. 2 A

4) Which of the following is true about watts?

A. Watts are a unit of electrical charge.
B. Watts are a unit of electrical current.
C. Watts are a unit of electrical resistance.
D. Watts are a unit of electrical power.

5) Which appliance below uses the most power?

A. Electric can opener
B. Hair dryer
C. DVD player
D. Desktop computer

Key:
1. D
2. C
3. B
4. D
5. B

34. Marvelous Magnets

1) Which of these materials are attracted to a magnet?

A. Nickel
B. Steel
C. Aluminum
D. Gold

2) If you break a magnet in two, what happens?

A. One piece becomes north and the other becomes south.
B. Each half becomes a separate magnet with north and south poles.
C. It loses its magnetism completely.
D. Only the larger piece remains a magnet.

3) Why might an electromagnet be preferred over a permanent magnet in a scrapyard?
It can be turned off when not in use.
It is always stronger than any permanent magnet.
It does not require electricity to operate.
It can attract non-metallic materials.

A. Speakers
B. Bicycles
C. Credit Cards
D. Electric Motors

4) What would happen if a steel paperclip was stored on top of a magnet for several days?

A. The paperclip would be magnetized.
B. The paperclip would become immune to magnets for several days.
C. There would be no change.
D. The magnet would weaken significantly.

5) What happens when two magnets are brought close together with opposite poles facing each other?

A. They attract each other.
B. They repel each other.

C. They become demagnetized.
D. Nothing happens.

Key:
1. A, B
2. B
3. A, C, D
4. A
5. A

36. Electromagnetism

1) What is an electromagnet?

A. A type of magnet that is always magnetic.
B. A magnet that can be turned on and off using electricity.
C. A permanent magnet made of iron.
D. A natural magnet found in the earth.

2) How can the strength of an electromagnet be increased?

A. By using a thinner wire
B. By decreasing the number of coils
C. By increasing the current through the wire
D. By using a wooden core

3) Why might an electromagnet be preferred over a permanent magnet in a scrapyard?

A. It can be turned off when not in use.
B. It is always stronger than any permanent magnet.
C. It does not require electricity to operate.
D. It can attract non-metallic materials.

4) Which is NOT a common use of electromagnets?

A. In cranes to lift heavy metal objects
B. In speakers to produce sound
C. In compasses to show direction
D. In MRI machines in hospitals

5) In which situation would an electromagnet be most useful over a permanent magnet?

A. In a situation where the magnetic field needs to be very stable
B. In toys that use magnets for permanent decoration
C. When a weak, constant magnetic field is needed
D. In devices that require the magnetic strength to be adjusted

Key:
1. B
2. C
3. A
4. C
5. D

37. Going Nuclear

1) Which element is commonly used as fuel in nuclear reactors for fission?

A. Hydrogen
B. Helium
C. Oxygen
D. Uranium

2) What is nuclear fusion?

A. The process of splitting a nucleus into two
B. The combination of lighter nuclei to form a heavier nucleus
C. The removal of neutrons from a nucleus
D. The process of electrons fusing with protons

3) Which particles play a crucial role in maintaining a chain reaction in nuclear fission?

A. Protons
B. Electrons
C. Neutrons
D. Photons

4) Select each true statement about a nuclear reactor.

A. Nuclear reactors use fusion to create energy.
B. Nuclear reactors emit CO_2 during operation.
C. Nuclear reactors can explode like nuclear bombs.
D. Nuclear reactors are nuclear powered water heaters.

5) Which of the following is a challenge associated with using nuclear fusion for generating electricity?

A. It is very easy to initiate.
B. It produces a large amount of nuclear waste.
C. It requires extremely high temperatures to occur.
D. It uses a large amount of carbon-based fuels.

Key:
1. D
2. B
3. C
4. D
5. C

38. Weird World of Quantum

1) What does “quantum” mean?

A. A continuous amount of energy
B. An unpredictable state
C. A discrete quantity or allowed amount
D. Incredibly small

2) Which experiment demonstrated the wave-particle duality of electrons?

A. Gold foil experiment
B. Double-slit experiment
C. Cavendish experiment
D. Cathode ray tube experiment

3) Quantum entanglement involves which of the following?

A. Properties like position and momentum cannot both be measured at the same time.
B. Particles interact at large distances instantaneously.
C. Particles can exist simultaneously in multiple states.
D. Particles can convert matter to energy.

4) At what scale or size does quantum mechanics start to dominate the behavior of objects?

A. Centimeters (one hundredth of a meter)
B. Millimeters (one thousandth of a meter)
C. Nanometers (one billionth of a meter)
D. Picometer (one trillionth of a meter)

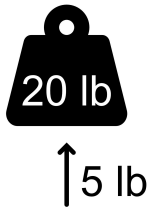
5) Which of the following is a fundamental or elementary particle? Select all that apply.

A. Protons
B. Neutrons
C. Electrons
D. Photons

Key:
1. C
2. B
3. B
4. C
5. C, D

39. Physics 2 Final Quiz Show

1) A 20 lb object is submerged in water. Then, it only takes 5 lb of force to lift the object. What is the weight of the volume of water displaced by the object?



A. 4 lb
B. 5 lb
C. 15 lb
D. 20 lb

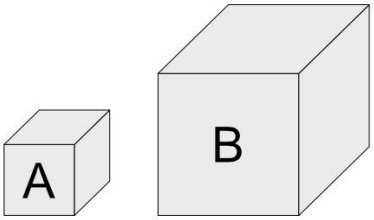
2) Water has a density of 1,000 kg/m³. How much liquid pressure is experienced by a diver who is 10 m deep?

A. 10 kPa
B. 98 kPa
C. 490 kPa
D. 1000 kPa

3) Select each temperature below where water will freeze at 1 Atm of pressure.

A. 8 °C
B. 18 °F
C. 28 K
D. 38 °C

4) Cube B is twice wide as Cube A, but they both have the same density. As they rest on a bottom face, which cube is applying the most pressure on the ground. Ignore atmospheric pressure.



A. Both apply the same pressure on the ground.
B. Cube B applies 2 times the pressure of Cube A.
C. Cube B applies 4 times the pressure of Cube A.
D. Cube B applies 8 times the pressure of Cube A.

5) Select each example of heat transfer that is an example of convection.

A. The handle of a spoon grows hot when the spoon is left in a hot bowl of soup.
B. A hot sidewalk causes your feet to get hot.
C. A nearby fire warms you up.
D. Hot water near the equator rises, creating an ocean current.

6) Which substance below requires the most heat energy to raise the temperature of 1 gram by 1 degree celsius?

A. Steel
B. Glass
C. Water
D. Wood

7) Select each sequence of phase changes that make sense in the order they are listed.

A. Evaporation → Condensation → Freezing
B. Melting → Freezing → Subliming
C. Deposition → Sublimation → Condensation
D. Condensation → Evaporation → Melting

8) Select each true statement.

A. Heat flows from hot objects to colder objects.
B. Entropy increases when an object goes from a more ordered state to a less ordered state.
C. Microwave ovens create energy when they heat up food.
D. Energy is released when a solid melts into a liquid.

9) 1 cm^3 of water has a mass of 1 g. A solid plastic cube has a volume of 4 cm^3 and a mass of 3 g. Will the piece of plastic float or sink in a tub of water?

A. The plastic will float.
B. The plastic will sink.
C. The plastic neither sink nor float.
D. There is not enough information to tell.

10) According to Bernoulli's principle, as the speed of a fluid decreases, its

A. temperature increases
B. temperature decreases
C. pressure increases
D. pressure decreases

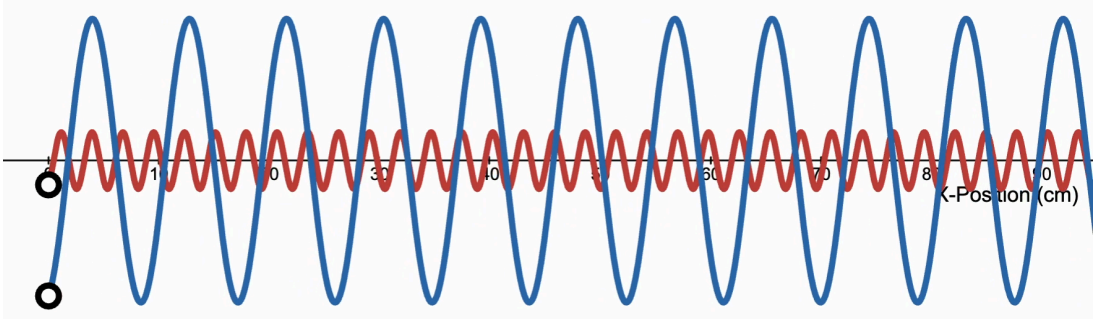
11) Sound waves are:

A. mechanical longitudinal waves
B. mechanical transverse waves
C. electromagnetic longitudinal waves
D. electromagnetic transverse waves

12) Which wave below has the least energy?

A. Ultraviolet
B. X-ray
C. Visible light
D. Infrared

13) Which wave below has the greater wave speed?



A. Blue
B. Red
C. They have the same speed.
D. There is not enough information.

14) A dishwasher is about 50 decibels, while a hair dryer is about 90 decibels. How many times more intense is the sound of a hair dryer than the sound of a dishwasher?

A. 40 ×
B. 450 ×
C. 1,000 ×
D. 10,000 ×

15) If 6 amps of current are flowing through a circuit with a resistance of 2 ohms, what is the voltage of the circuit?

A. 2 V
B. 3 V
C. 8 V
D. 12 V

16) In the analogy between water flow and electrical flow, the rate at which the water is flowing is analogous to _____ in the flow of electricity.

A. current
B. voltage
C. resistance
D. power

17) At a voltage of 120 V, how much current is needed to supply a 60 W bulb?

A. 0.5 A
B. 2 A
C. 60 A
D. 180 A

18) The SI unit of electrical charge is the

A. volt
B. coulomb
C. watt
D. ampere
E. ohm

19) What is the purpose of a nuclear power plant being built next to a water source such as a river, lake, or ocean?

A. Water is used in the fusion reaction
B. A lot of water is needed to run the steam line
C. Water is needed to cool the steam line
D. Water is the primary source of power for the fission reaction

Key:
1. C
2. B
3. B, C
4. B
5. D
6. C
7. A, B, C
8. A, B
9. A
10. C
11. A
12. D
13. D
14. D
15. D
16. A
17. A
18. B
19. C