Wave Motion and Sound

- 1. A back and forth motion that repeats itself is a
 - a. Spring
 - b. Vibration
 - c. Wave
 - d. Pulse
- 2. The number of vibrations that occur in 1 second is called
 - a. A Period
 - b. Frequency
 - c. Amplitude
 - d. Sinusoidal
- 3. Frequency is measured in units of
 - a. Time
 - b. Cycles
 - c. Hertz
 - d. Avis
- 4. The maximum displacement from rest to crest or from rest to trough of a wave is called
 - a. Wavelength
 - b. Period
 - c. Equilibrium Position
 - d. Amplitude
- 5. A wave with motion perpendicular to the direction that the wave is moving is classified as a
 - a. Longitudinal wave
 - b. Transverse wave
 - c. Water wave
 - d. Compression wave
- 6. Your brain interprets a frequency as a sound with a certain
 - a. Speed
 - b. Loudness
 - c. Pitch
 - d. Harmonic
- 7. Sound waves with frequency greater than 20,000 Hz are
 - a. Infrasonic waves
 - b. Supersonic waves
 - c. Ultrasonic waves
 - d. Impossible
- 8. Generally, sounds travel faster than
 - a. Solids
 - b. Liquids
 - c. Gases
 - d. Vacuums
- 9. Sounds travel faster in
 - a. Warmer air
 - b. Cooler air
 - c. Temperature does not influence the speed of sound
 - d. A vacuum

- 10. The bending of a wave front between boundaries is
 - a. Reflection
 - b. Reverberation
 - c. Refraction
 - d. Dispersion
- 11. The wave front of a refracted sound bends toward
 - a. Warmer air
 - b. Cooler air
 - c. The sky, no matter what the air temperature
 - d. The surface of the earth, no matter the air temperature
- 12. Two in-phase sound waves with the same amplitude and frequency arrive at the same place at the same time, resulting in
 - a. Higher frequency
 - b. Refraction
 - c. A new sound wave with greater amplitude
 - d. Reflection
- 13. Two out-of-phase sound waves with the same amplitude and frequency arrive at the same place at the same time, resulting in
 - a. A beat
 - b. Cancellation of the two sounds
 - c. A lower frequency
 - d. A bouncing of one wave
- 14. Two sound waves of equal amplitude with slightly different frequencies will result in
 - a. An echo
 - b. The Doppler Effect
 - c. Alternation of loudness of sound knows as beats
 - d. Two separate sound
- 15. The energy of a sound wave is proportional to the rate of energy transferred to an area perpendicular to the waves, which is called the sound
 - a. Intensity
 - b. Loudness
 - c. Amplitude
 - d. Decibel
- 16. A resonant condition occurs when
 - a. An external force matches a natural frequency
 - b. A beat is heard
 - c. Two out-of-phase waves have the same frequency
 - d. A pure tone is created
- 17. The fundamental frequency of a string is the
 - a. Shortest wavelength harmonic possible on the string
 - b. Longest standing wave that can fit on the string
 - c. Highest frequency possible on the string
 - d. Shortest wavelength that can fit on the string

- 18. A moving source of sound or a moving observer experiences the apparent shift in frequency called
 - a. Fundamental frequency
 - b. Doppler Effect
 - c. Wave front effect
 - d. Shock waves
- 19. A longitudinal mechanical wave causes particles of a material to move
 - a. Back and forth in the same direction the wave is moving
 - b. Perpendicular to the direction the wave is moving
 - c. In a circular motion in the direction the wave is moving
 - d. In a circular motion opposite the direction the wave is moving
- 20. A transverse mechanical wave causes particles of a material to move
 - a. Back and forth in the same direction the wave is moving
 - b. Perpendicular to the direction the wave is moving
 - c. In a circular motion in the direction the wave is moving
 - d. In a circular motion opposite the direction the wave is moving
- 21. Transverse mechanical waves will move only through
 - a. Solids
 - b. Liquids
 - c. Gases
 - d. All of the above
- 22. Longitudinal mechanical waves will move only through
 - a. Solids
 - b. Liquids
 - c. Gases
 - d. All of the above
- 23. The characteristic of a wave that is responsible for what you interpret as pitch is the wave
 - a. Amplitude
 - b. Shape
 - c. Frequency
 - d. Height
- 24. Sound interference is necessary to produce the phenomenon known as
 - a. Resonance
 - b. Decibels
 - c. Beats
 - d. Reverberation
- 25. The fundamental frequency of a standing wave on a string has
 - a. One node and one antinode
 - b. One node and two antinodes
 - c. Two nodes and one antinode
 - d. Two nodes and two antinodes
- 26. What is changed by destructive interference of a sound wave?
 - a. Frequency
 - b. Phase
 - c. Amplitude
 - d. Wavelength

- 27. Resonance occurs when an external force matches the
 - a. Interference frequency
 - b. Decibel frequency
 - c. Beat frequency
 - d. Natural frequency
- 28. What happens if the source of a sound is moving toward you at a high rate of speed?
 - a. The sound will be traveling faster than from a stationary source
 - b. The sound will be moving faster only in the direction of travel
 - c. You will hear a higher frequency, but people with the source will not
 - d. All observers in all directions will hear a higher frequency

b, b, c, d, b, c, c, a, a, c, b, c, b, c, a, a, b, b, a, b, a, d, c, c, c, c, d, c

Electricity

- 1. Electrostatic charge results from
 - a. Transfer or redistribution of electrons
 - b. Gain or loss of protons
 - c. Separation of charge from electrons and protons
 - d. Failure to keep the object clean of dust
- 2. The unit of electric charge is the
 - a. Volt
 - b. Amp
 - c. Coulomb
 - d. Watt
- 3. An electric field describes the condition of the space around a
 - a. Charged particle
 - b. Magnetic pole
 - c. Mass
 - d. All of the above
- 4. A material that has electrons that are free to move throughout the material is a (an)
 - a. Electrical conductor
 - b. Electrical insulator
 - c. Thermal conductor
 - d. Thermal insulator
- 5. The rate at which a electric current flows through a circuit is measured in units of
 - a. Volt
 - b. Amp
 - c. Coulomb
 - d. Watt

- 6. The law that predicts the behavior of electrostatic forces acting through space is
 - a. Law of universal gravitation
 - b. Watt's law
 - c. Coulomb's law
 - d. Ohm's law
- 7. What type of electric current is produced by fuel cells and solar cells?
 - a. AC
 - b. DC
 - c. 60 Hz
 - d. 120 Hz
- 8. The electrical resistance of a conductor is measured in units of
 - a. Volt
 - b. Amp
 - c. Ohm
 - d. Watt
- 9. Units of joules per second is a measure called a
 - a. Volt
 - b. Amp
 - c. Ohm
 - d. Watt
- 10. The north pole of a suspended or floating bar magnet currently points directly toward Earth's
 - a. north magnetic pole
 - b. south magnetic pole
 - c. north geographic pole
 - d. south geographic pole
- 11. Magnetism is produced by
 - a. An excess of north monopoles
 - b. An excess of south monopoles
 - c. Moving charges
 - d. Separation of positive and negative charges
- 12. Earth's magnetic field
 - a. Has undergone many reversals in polarity
 - b. Has always been as it is now
 - c. Is created beneath Earth's north geographic pole
 - d. Is created beneath Earth's south geographic pole
- 13. In an electric current, the electrons are moving
 - a. At a very slow rate
 - b. At the speed of light
 - c. Faster than the speed of light
 - d. At the speed described as supersonic
- 14. In which of the following currents is there no electron movement from one end of the conducting wire to the other?
 - a. Electron current
 - b. Direct current
 - c. Alternating current
 - d. None of the above

- 15. A permanent magnet has magnetic properties because
 - a. The magnetic fields of its electrons are balanced
 - b. Of an accumulation of monopoles in the ends
 - c. The magnetic domains are aligned
 - d. All of the above
- 16. A positive and a negative charge are initially 2 cm apart. What happens to the force on each as they are moved closer and closer together? The force
 - a. Increases while moving
 - b. Decreases while moving
 - c. Remains constant
 - d. Nobody knows

1.a 2.c 3.a 4.a 5.b 6.c 7.b 8.c 9.d 10.a 11.c 12.a 13.a 14.c 15.c 16.a

Light

- 1. Light interacts with matter by which process?
 - a. Absorption
 - b. Reflection
 - c. Transmission
 - d. All of the above
- 2. Materials that do not allow the transmission of any light are called
 - a. Transparent
 - b. Colored
 - c. Opaque
 - d. Blackbody
- 3. Light is said to travel in straight line paths, called rays, until it interacts with matter. A line representing the original ray before it interacts with matter is called
 - a. Incoming light ray
 - b. Incident ray
 - c. Reflected ray
 - d. Normal ray
- 4. Refraction of light happens when light undergoes
 - a. Reflection from a surface
 - b. A change of speed between two transparent materials
 - c. Movement through a critical angle
 - d. A 90° angle of incidence

- 5. The ratio of the speed of light in a vacuum to the speed of light in a transparent material is called
 - a. Index of deflection
 - b. Index of reflection
 - c. Index of refraction
 - d. Index of diffusion
- 6. The part of the electromagnetic spectrum that our eyes can detect is
 - a. Ultraviolet
 - b. Infrared
 - c. Visible
 - d. All of the above
- 7. The color order of longer wavelength to smaller wavelength waves in the visible region is
 - a. Red, orange, yellow, green, blue, violet
 - b. Red, violet, blue, yellow, green, orange
 - c. Violet, blue, green, yellow, orange, red
 - d. Violet, red, blue, green, yellow, orange
- 8. The separation of white light into its component colors is
 - a. Reflection
 - b. Refraction
 - c. Dispersion
 - d. Transmission
- 9. The photoelectric effect is best explained by considering light to be a
 - a. Wave
 - b. Particle
 - c. Both answers are correct
 - d. Neither answer is correct
- 10. The concept that vibrating molecules emit light in discrete amounts of energy, called quanta, was proposed by
 - a. Newton
 - b. Fresnel
 - c. Planck
 - d. Maxwell
- 11. The photoelectric effect was explained, using Planck's work, by
 - a. Planck
 - b. Einstein
 - c. Maxwell
 - d. Young
- 12. Today, light is considered to be packets of energy with a frequency related to its energy. These packets are called
 - a. Gravitons
 - b. Gluons
 - c. Photons
 - d. Quarks

- 13. You are able to see in shaded areas, such as under a tree, because light has undergone
 - a. Refraction
 - b. Incident bending
 - c. A change in speed
 - d. Diffuse reflection
- 14. Any part of the electromagnetic spectrum, including the colors of visible light, can be measured in units of
 - a. Wavelength
 - b. Frequency
 - c. Energy
 - d. Any of the above
- 15. A prism separates the colors of sunlight into a spectrum because
 - a. Each wavelength of light has its own index of refraction
 - b. Longer wavelengths are refracted more than shorter wavelengths
 - c. Red light is refracted the most, violet light the least
 - d. All of the above
- 16. Of the following, the electromagnetic wave with the shortest wavelength is
 - a. A radio wave
 - b. Infrared light
 - c. Ultraviolet light
 - d. X-rays
- 17. Of the following, the electromagnetic wave with the lowest energy is
 - a. A radio wave
 - b. Infrared light
 - c. Ultraviolet light
 - d. X-rays
- 18. Green grass reflects
 - a. Yellow light
 - b. Green light
 - c. Blue light
 - d. White light
- 19. Green grass absorbs
 - a. Yellow light
 - b. Only green light
 - c. Blue light
 - d. All light but green
- 20. We see a blue sky because
 - a. Air molecules absorb blue light
 - b. Air molecules reflect red light
 - c. Air molecules and dust scatter colors of long wavelengths
 - d. Air molecules and dust scatter colors of short wavelengths

- 21. A pencil is placed in a glass of water and appears to be bent. This is an example of
 - a. Reflection
 - b. Refraction
 - c. Dispersion
 - d. Polarization
- 22. A mirage is the result of light being
 - a. Reflected
 - b. Refracted
 - c. Absorbed
 - d. Bounced around a lot
- 23. An instrument the produces a coherent beam of single frequency, in-phase light is a
 - a. Telescope
 - b. Laser
 - c. Camera
 - d. Flashlight

d, c, b, b, c, c, a, c, b, c, b, c, d, d, a, d, a, b, d, d, b, b, b

Atoms & the Periodic Table

- 1. According to Rutherford's calculations, the volume of an atom is mostly
 - a. Occupied by protons and neutrons
 - b. Filled with electrons
 - c. Occupied by tightly bound protons, electrons and neutrons
 - d. Empty space
- 2. The atomic number is the number of
 - a. Protons
 - b. Protons plus neutrons
 - c. Protons plus electrons
 - d. Protons, electrons and neutrons
- 3. All neutral atoms of an element have the same
 - a. Atomic number
 - b. Number of electrons
 - c. Number protons
 - d. All of the above

- 4. The main problem with the solar system model of the atom is that
 - a. Electrons move in circular, not elliptical orbits
 - b. The electrons should lose energy since they are accelerating
 - c. Opposite charges should attract one another
 - d. The mass ratio of the nucleus to the electrons is wrong
- 5. Atoms of an element that have different numbers of neutrons are called
 - a. Allotropes
 - b. Isomers
 - c. Isotopes
 - d. Radioactive
- 6. The sum of the number of protons and neutrons in the nucleus of an atom is called
 - a. Nucleon number
 - b. Mass number
 - c. Atomic weight
 - d. Isotope number
- 7. Atomic mass is
 - a. Determined by weighing individual atoms
 - b. An average weight of the isotopes of an element
 - c. The number of protons and neutrons in a nucleus
 - d. A weighted average of the masses of the isotopes of an element based on fractional abundance
- 8. This isotope provides the standard to which the masses of all other isotopes are compared
 - a. Carbon-12
 - b. Oxygen-16
 - c. Hydrogen-1
 - d. Gold-197
- 9. Energy of the electron is expressed in units of
 - a. Electron volts
 - b. Electron watts
 - c. Quantum leaps
 - d. Orbital numbers
- 10. The major success of the Bohr theory was in explaining
 - a. How electrons move in circular orbits
 - b. Why radiationless orbits existed
 - c. The colors in the hydrogen line spectrum
 - d. How electrons were emitted
- 11. Light from an incandescent gas is dispersed into narrow lines of colors with no light between them. This is called a (an)
 - a. Impossible spectrum
 - b. Emission spectrum
 - c. Absorption spectrum
 - d. Rainbow spectrum

- 12. The lowest energy state or level of an atom is the
 - a. Bottom state
 - b. Lowest level
 - c. Ground state
 - d. Basement state
- 13. The basis of the quantum mechanics theory of the atom is
 - a. Spin and quantum leaps of electrons
 - b. Elliptical orbits of electrons
 - c. How electron particles move in orbits
 - d. The wave nature of electrons
- 14. An electron moving from an excited state to the ground state
 - a. Emits a photon
 - b. Gains a photon
 - c. Gains a charge
 - d. Loses a charge
- 15. The existence of matter waves was proposed by
 - a. Planck
 - b. Bohr
 - c. De Broglie
 - d. Einstein
- 16. The arrangement of electrons in orbitals is called
 - a. Electron configuration
 - b. Periodic table
 - c. Quantum numbers
 - d. Energy levels
- 17. The gain or loss of electrons from an atom results in the formation of a (an)
 - a. Ion
 - b. Metal
 - c. Semiconductor
 - d. Isotope
- 18. Elements that have properties of both the metals and the non-metals are
 - a. Semimetals
 - b. Transition elements
 - c. Semiconductors
 - d. Noble gases
- 19. The energy of a photon
 - a. Varies inversely with the frequency
 - b. Is directly proportional to the frequency
 - c. Varies directly with the velocity
 - d. Is inversely proportional to the velocity
- 20. The lines of color in a line spectrum from a given element

- a. Change colors with changes in the temperature
- b. Are always the same, with a regular spacing pattern
- c. Are randomly spaced, having no particular pattern
- d. Have the same colors, with a spacing pattern that varies with the temperature
- 21. Hydrogen, with its one electron, produces a line spectrum in the visible light range with
 - a. One color line
 - b. Two color lines
 - c. Three color lines
 - d. Four color lines
- 22. According to the Bohr model, an electron gains or loses energy only by
 - a. Moving faster or slower in an allowed orbit
 - b. Jumping from one allowed orbit to another
 - c. Being completely removed from an atom
 - d. Jumping from one atom to another
- 23. According to the Bohr model, when an electron in a hydrogen atom jumps from an orbit farther from the nucleus to an orbit closer to the nucleus, it
 - a. Emits a single photon
 - b. Emits four photons
 - c. Emits many photons
 - d. None of the above
- 24. The Bohr model of the atom described the energy state of electrons with one quantum number (n). The quantum mechanics model uses how many quantum numbers to describe the energy state of an atom?
 - a. One
 - b. Two
 - c. Three
 - d. Four
- 25. The space in which it is possible that an electron will be found as described by the quantum model of the atom is a (an)
 - a. Circular orbit
 - b. Elliptical orbit
 - c. Orbital
 - d. Geocentric orbit
- 26. Two different isotopes of the same element have the same number of
 - a. Protons, neutrons and electrons
 - b. Protons and neutrons, but a different number of electrons
 - c. Protons and electrons, but a different number of neutrons
 - d. Neutrons and electrons, but a different number of protons
- 27. The isotopes of a given element always have
 - a. The same mass and chemical behavior
 - b. The same mass but a different chemical behavior
 - c. Different masses and chemical behaviors
 - d. Different masses but the same chemical behavior

- 28. If you want to know the number of protons in an atom of a given element, you would look up the
 - a. Mass number
 - b. Atomic number
 - c. Atomic weight
 - d. Fractional abundance
- 29. If you want to know the number of neutrons in an atom of a given element, you would
 - a. Round the atomic mass to the nearest whole number
 - b. Add the mass number and the atomic number
 - c. Subtract the atomic number from the mass number
 - d. Add the mass number and that atomic number, then divide by two
- 30. Which of the following is always a whole number?
 - a. Atomic mass
 - b. Mass number
 - c. Atomic weight
 - d. None of the above
- 31. A photon is emitted from an atom when an electron
 - a. Jumps from a higher to lower energy level
 - b. Jumps from a lower to a higher energy level
 - c. Reverses is spin by 180°
 - d. Is ionized from the atom

d, a, d, b, c, b, d, a, a, c, b, c, d, a, c, a, a, c, b, b, d, b, a, c, c, c, d, b, c, b, a