38 **A heated gas expands, raising a piston. Which of the following describes the energy exchanges of this process?**

A Energy is transferred to the gas by the piston, and to the piston from the heat source.

B Energy is transferred to the gas from the heat source, and to the raised piston from the gas.

C Energy is transferred to the gas in the form of heat and work done by the piston.

D Energy is transferred directly to the piston from the heat source.

CSP20508

39 **An engine has an input of heat energy of 10,750 J and does 2420 J of work. Which of the following is the heat loss?**

A 0.225 J

B 4.44 J

C 8330 J

D 13,170 J

CSP00304

40 **A proposed ideal heat engine would run with a high temperature reservoir at 800 kelvin and a low temperature reservoir at 300 kelvin. When the engine is running, it extracts 400 joules of energy from the hot reservoir and does 250 joules of work each minute. How much energy is expelled to the low temperature reservoir each minute?**

A 150 J

B 250 J

C 300 J

D 400 J

CSP00199

41 **The pressure of a gas inside a closed, rigid container will increase when the gas temperature increases. The pressure of the gas increases because the**

A density of the gas decreases.

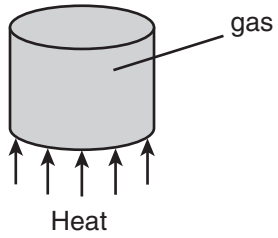
B rate of collisions of gas molecules with the surface increases.

C container expands in size when heated.

D gas molecules bond together to form more massive molecules.

CSP00149

42 **A gas in a sealed cylinder is heated.**



Which of the following does *not* increase as the gas is heated?

A the average number of gas molecules hitting the cylinder walls per second

B the average kinetic energy of the gas molecules

C the average speed of the gas molecules

D the average distance between the gas molecules

CSP00198

43 **When a gas is heated in a closed container, the internal pressure increases. Which *best* describes the reason for the increase in pressure?**

A The average kinetic energy of the gas molecules decreases.

B The potential energy of the gas increases.

C The average kinetic energy of the gas molecules increases.

D The potential energy of the gas decreases.

CSP00315

44 **In which of the following processes is the order of the system increasing?**

A shaking a jar containing separate layers of salt and pepper

B smashing a coffee cup with a hammer

C adding cold milk to a cup of hot coffee

D forming crystals in a solution

CSP10109

45 **A container of cold water is dumped into a larger container of hot water. It is mixed and then left alone for a long time interval. The water temperature is found to**

A randomly vary from region to region in the container.

B be uniform throughout the container.

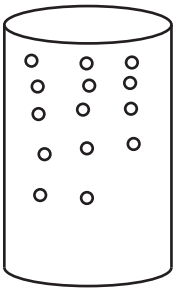
C fluctuate at all positions in the container.

D be greater at the bottom of the container.

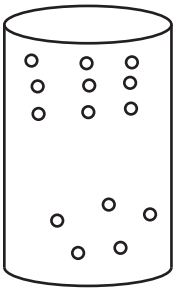
CSP00116

46 **Nitrogen molecules within a glass tube are allowed to move randomly. Which figure shows the molecules in a state of greatest entropy?**

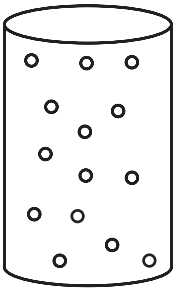
A



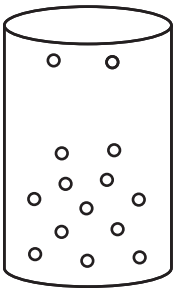
B



C



D



CSP10070

47 **Entropy decreases when**

A wood burns.

B water freezes.

C a snowball melts.

D an iron nail rusts.

CSP20089

48 **A sound wave is produced in a metal cylinder by striking one end. Which of the following occurs as the wave travels along the cylinder?**

A Its amplitude increases.

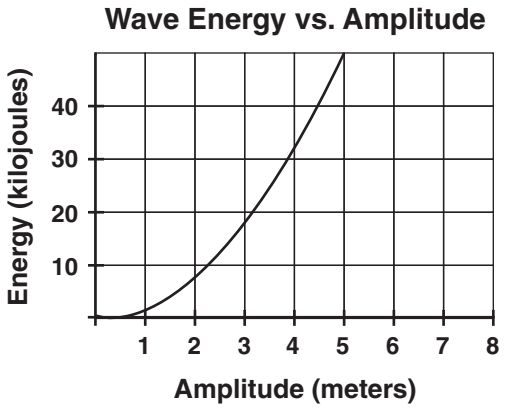
B Its frequency increases.

C It transfers matter.

D It transfers energy.

CSP10246

49 **The graph below depicts the relationship between wave energy and wave amplitude.**



How is the energy of the wave affected if the amplitude of the wave increases from 2 meters to 4 meters?

A It is halved.

B It is doubled.

C It is quadrupled.

D It remains the same.

CSP20769

50 **A radio station transmits to a receiving antenna. The radio wave sent is a**

A sound wave.

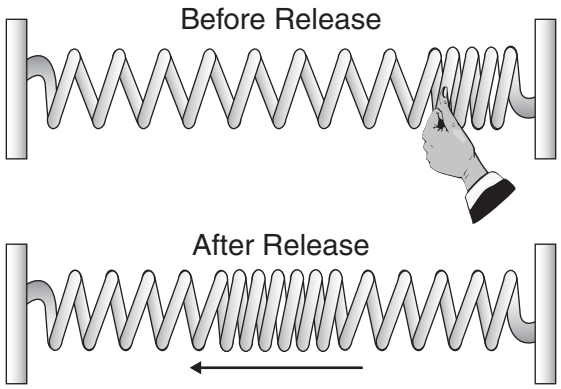
B torsional wave.

C longitudinal wave.

D transverse wave.

CSP00303

51 **A stretched spring attached to two fixed points is compressed on one end and released, as shown below.**



The resulting wave travels back and forth between the two fixed ends of the spring until it comes to a stop. This mechanical wave is an example of a

A transverse wave.

B longitudinal wave.

C superpositioned wave.

D refracted wave.

CSP10071

52 **A sound wave traveling through a solid material has a frequency of 500 hertz. The wavelength of the sound wave is 2 meters. What is the speed of sound in the material?**

A $250 \frac{m}{s}$

B $500 \frac{m}{s}$

C $1000 \frac{m}{s}$

D $250{,}000 \frac{m}{s}$

CSP00159

53 **A tuning fork is used to produce sound waves with a frequency of 440 hertz. The waves travel through the air at 344 $\frac{m}{s}$. What is the wavelength of the sound waves?**

A 0.15 m

B 0.39 m

C 0.78 m

D 1.28 m

CSP00227

54 **A student shakes the end of a rope with a frequency of 1.5 Hz, causing waves with a wavelength of 0.8 m to travel along the rope. What is the velocity of the waves?**

A $1.9 \frac{m}{s}$

B $1.6 \frac{m}{s}$

C $1.2 \frac{m}{s}$

D $0.53 \frac{m}{s}$

CSP10461

55 **What is the wavelength of a 264-Hz sound wave when the speed of sound is 345 $\frac{m}{s}$?**

A 0.77 m

B 1.31 m

C 6.09 m

D 9.11 m

CSP10247

56 **Astronauts on the Moon would *not* be able to hear a landslide because**

A the lunar dust deadens sounds.

B intensive sunlight destroys sound waves.

C the magnetic field of the Moon is too weak to carry sound.

D air molecules on the Moon are too far apart to carry sound.

CSP00069

57 **Sound waves cannot carry energy through**

A water.

B air.

C a mirror.

D a vacuum.

CSP20090

58 **Where does visible light fall on the electromagnetic spectrum?**

A between x-rays and gamma rays

B between short-wave radio and television

C between infrared and ultraviolet

D between microwaves and infrared

CSP00181

59 **Objects appear different in size and shape in a container of water due to**

A refraction of the light waves.

B interference of the water and light waves.

C polarization of the light waves.

D diffraction of the light waves.

CSP00158

60 **An engineer in a moving train blows the train's horn. The train is moving away from a person standing on the ground. Compared to the frequency of the sound that the engineer hears, the person standing on the ground hears a sound with**

A the same wavelength.

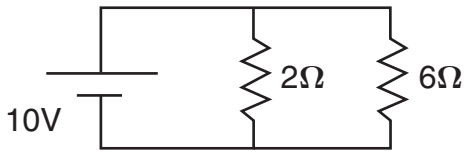
B more variation in tone.

C greater amplitude.

D a lower frequency.

CSP00146

61



In this circuit, what is the current through the 2-ohm resistor?

A 0.2 A

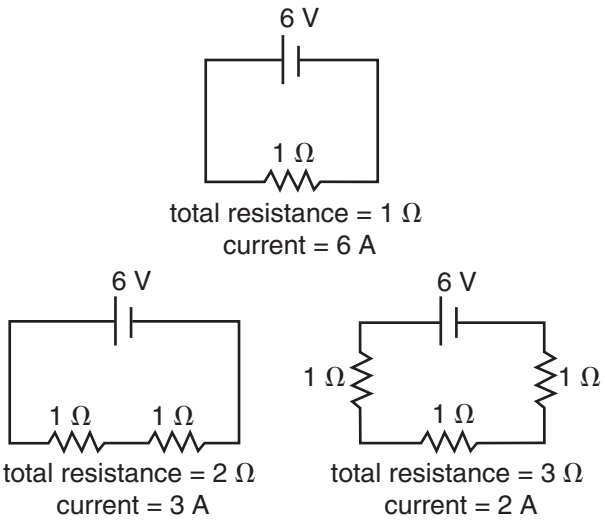
B 0.8 A

C 5.0 A

D 8.0 A

CSP00155

62



How many amperes of current will flow when four 1-ohm resistors are in this series circuit?

A 0.5 ampere

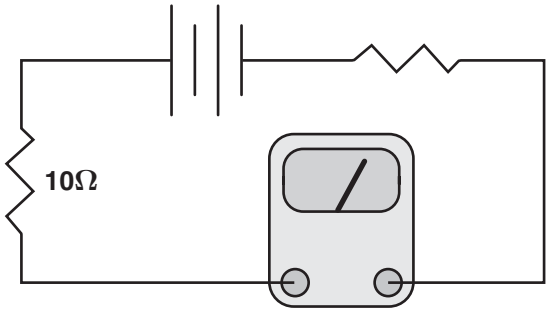
B 1.0 ampere

C 1.5 amperes

D 2.0 amperes

CSP00182

63



In the circuit shown above, the meter registers 1.5 amperes. The voltage across the 10.0-ohm resistor is about

A 1.5 V.

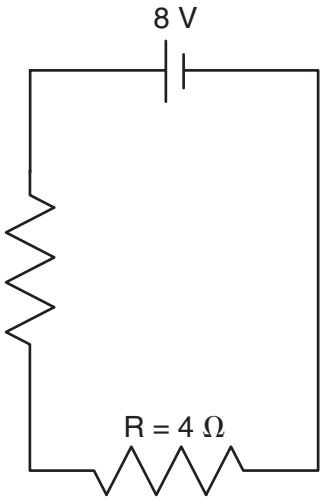
B 6.7 V.

C 8.5 V.

D 15.0 V.

CSP00185

64



What is the current through the battery?

A 1 A

B 2 A

C 4 A

D 8 A

CSP00117

65 **A 9-V battery is connected to a light bulb with a resistance of 3 Ω. What is the current in the circuit?**

A 27 A

B 3.0 A

C 1.0 A

D 0.3 A

CSP20116

66 **An electric appliance draws 1.5 amperes of current when it is connected to a 24-volt source. What is the resistance of this appliance?**

A 0.063 ohm

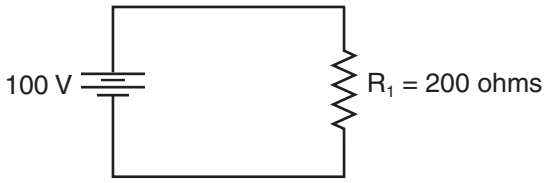
B 11 ohms

C 16 ohms

D 54 ohms

CSP10178

67



How much power is dissipated by the resistor in the circuit above?

A 25 watts

B 50 watts

C 100 watts

D 800 watts

CSP20505

68 **A transistor circuit is used as an amplifier. When a signal is applied to the input of the transistor, the output signal is**

A a smaller amplitude.

B an equal amplitude.

C a larger amplitude.

D zero amplitude.

CSP00057

69 **Two oppositely charged particles are held in place near each other. When the particles are released, they will *most* likely**

A accelerate away from each other.

B accelerate toward each other.

C rotate in a clockwise direction.

D rotate in a counterclockwise direction.

CSP20654

70 **A metal bar magnet has a magnetic field in the region of space around it. The magnetic field is due to**

A magnetic monopoles embedded in the metal.

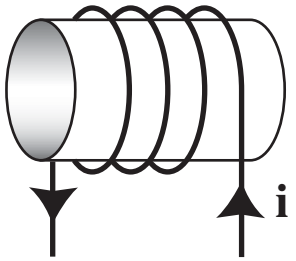
B a hidden voltage source in the metal.

C the motion of charged particles in the metal.

D an electric current that runs along the length of the magnet.

CSP00008

71



A coil with a current is shown above. In the center of the coil, a magnetic field points

A to the right.

B to the left.

C upward.

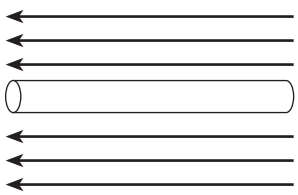
D downward.

CSP00135

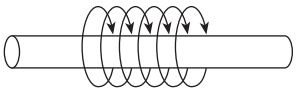
72 **The diagram below shows current flow through a wire.**

Which of the following represents the magnetic field resulting from the current?

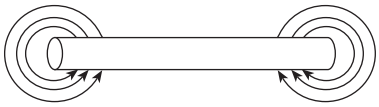
A



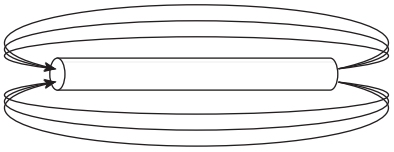
B



C



D



CSP20176

73 **In order to turn neon gas into neon plasma,**

A energy must be removed from the neon gas.

B energy must be supplied to the neon gas.

C the neon gas must be ignited with a flame.

D the neon gas must become a superconductor.

CSP00110

74 **Extremely high temperatures are needed for fusion reactors to function efficiently. What state of matter is *most* common at these temperatures?**

A plasma

B gas

C liquid

D solid

CSP10464

Physics Reference Sheet

Formulas

Average Speed: $v = \frac{\Delta x}{\Delta t}$

Uniformly Accelerated Motion: $v = v_o + at$

$$x = x_o + v_o t + \frac{1}{2} at^2$$

Newton's Second Law: $F = ma$

Centripetal Force: $F = \frac{mv^2}{r}$

Law of Universal Gravitation: $F = \frac{Gm_1m_2}{r^2}$

Force Due to Gravity: $F = w = mg$

Work: $W = Fd$

Kinetic Energy: $E = \frac{1}{2} mv^2$

Gravitational Potential Energy: $E = mgh$

Momentum: $p = mv$

Collision in One Dimension: $[m_1v_1 + m_2v_2]_{initial} = [m_1v_1 + m_2v_2]_{final}$

Heat Energy: $Q = mc\Delta T$

First Law of Thermodynamics: $\Delta U = Q + W_{(on\ the\ system)}$

$$\Delta U = Q - W_{(by\ the\ system)}$$

Work by a Heat Engine: $W = Q_H - Q_L$

Change in Entropy: $\Delta S = \frac{Q}{T}$

Wave Speed: $v = f\lambda$

Current: $I = \frac{q}{t}$

Ohm's Law: $V = IR$

Power Dissipated in a DC Circuit: $P = IV$

Power Dissipated in a Resistor: $P = I^2R$

Units

Force: $1\ \text{N} = 1\ \frac{\text{kg m}}{\text{s}^2}$

Energy: $1\ \text{J} = 1\ \text{N m}$

Power: $1\ \text{W} = 1\ \frac{\text{J}}{\text{s}}$

Constants

Gravitational Constant: $G = 6.67 \times 10^{-11}\ \frac{\text{N m}^2}{\text{kg}^2}$

Acceleration Due to Gravity: $g = 9.8\ \frac{\text{m}}{\text{s}^2}$

Speed of Light in a Vacuum: $c = 3.00 \times 10^8\ \frac{\text{m}}{\text{s}}$