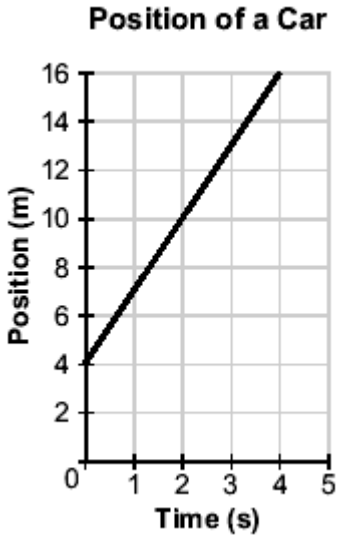
Student Name: **Grade:** 09

Test Name: Conceptual Physics CST Practice #3

1. An automobile starting from rest is given a *constant acceleration of 4 m/s^2 for 10 seconds. During these 10 seconds its average speed is*

   (a) 0.4 m/s
   (b) 2.5 m/s
   (c) 4 m/s
   (d) 20 m/s
   (e) 40 m/s

2. This graph shows the position of a moving car with respect to a wall that is located at 0 m. The car's speed was



   (a) 0.25 m/s.
   (b) 1.0 m/s.
   (c) 3.0 m/s.
   (d) 4.0 m/s.

3. A bullet traveling at 5.0×10^2 meters per second is brought to rest by an impulse of 50. newton•seconds.

What is the mass of the bullet?

(a) 1.0×10^{-2} kg

(b) 1.0×10^{-1} kg

(c) 1.0×10^{1} kg

(d) 2.5×10^{4} kg

4. A car travels 90. meters due north in 15 seconds. Then the car turns around and travels 40. meters due south in 5.0 seconds.

What is the magnitude of the average velocity of the car during this 20.-second interval?

(a) 2.5 m/s

(b) 5.0 m/s

(c) 6.5 m/s

(d) 7.0 m/s

5. What property of an object remains constant no matter where the object is located?

(a) velocity

(b) speed

(c) weight

(d) mass

6. **A ball is dropped from rest from a height 6.0 meters above the ground. The ball falls freely and reaches the ground 1.1 seconds later. What is the average speed of the ball?**

(a) 5.5 $\frac{\text{m}}{\text{s}}$

(b) 6.1 $\frac{\text{m}}{\text{s}}$

(c) 6.6 $\frac{\text{m}}{\text{s}}$

(d) 11 $\frac{\text{m}}{\text{s}}$

7. You walk from the back to the front of a train at a speed of 1 km/h. The train is travelling at a speed of 100 km/h.

Your speed *relative to the train track* is

(a) 1 km/h.
(b) 99 km/h.
(c) 100 km/h.
(d) 101 km/h.

8. A 50.-newton horizontal force is needed to keep an object weighing 500. newtons moving at a constant velocity of 2.0 meters per second across a horizontal surface.

The magnitude of the frictional force acting on the object is

(a) 500. N
(b) 450. N
(c) 50. N
(d) 0 N

9. An airplane originally at rest on a runway accelerates uniformly at 6.0 meters per second^2 for 12 seconds.

During this 12-second interval, the airplane travels a distance of approximately

(a) 72 m
(b) 220 m
(c) 430 m
(d) 860 m

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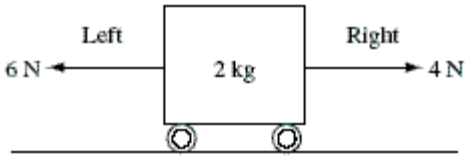
10. What is the net force acting on the box?

Two forces act on the 2 kg box shown below. A 4 N force acts to the right and a 6 N force acts to the left.



(a) 10 N to the right
(b) 10 N to the left
(c) 2 N to the right
(d) 2 N to the left

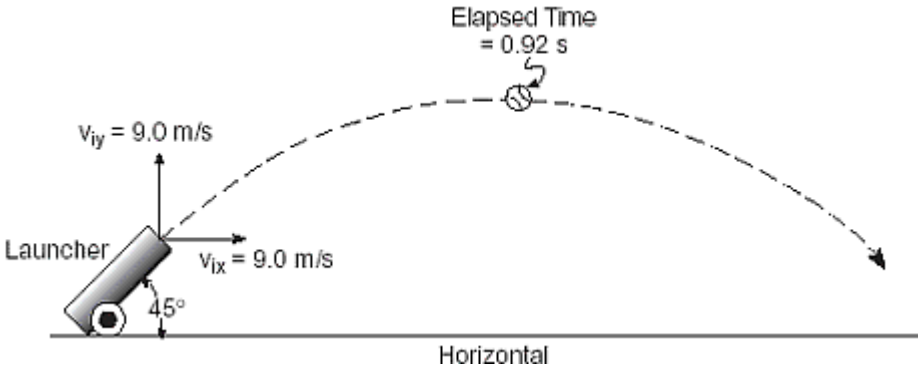
11. A 10 kg box is lifted 4 vertical meters in 10 seconds. What is the power?

(a) 4 J
(b) 4 W
(c) 39.2 J
(d) 39.2 W

Instructions for questions 12 through 14.

Look at the information in the diagram below.

A machine launches a tennis ball at an angle of 45° with the horizontal, as shown. the ball has an initial vertical velocity of 9.0 meters per second and an initial horizontal velocity of 9.0 meters per second. The ball reaches its maximum height 0.92 second after its launch. [Neglect air resistance and assume the ball lands at the same height above the ground from which it was launched.]



12.

The speed of the tennis ball as it leaves the launcher is approximately

(a) 4.5 m/s.
(b) 8.3 m/s.
(c) 13 m/s.
(d) 18 m/s.

13.

The total horizontal distance traveled by the tennis ball during the entire time it is in the air is approximately

(a) 23 m.
(b) 17 m.
(c) 8.3 m.
(d) 4.1 m.

14. **Note that this question has only three choices.**

The speed at which the launcher fires tennis balls is constant, but the angle between the launcher and the horizontal can be varied. As the angle is decreased from 45° to 30.°, the range of the tennis balls

(a) decreases
(b) increases
(c) remains the same

15.

The kinetic energy of a 980-kilogram race car traveling at 90. meters per second is approximately

(a) 4.4×10^4 J

(b) 8.8×10^4 J

(c) 4.0×10^6 J

(d) 7.9×10^6 J

16.

If the speed of a car is doubled, the kinetic energy of the car is

(a) quadrupled.
(b) quartered.
(c) doubled.
(d) halved.

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17. A 45.0-kilogram boy is riding a 15.0-kilogram bicycle with a speed of 8.00 meters per second.

What is the combined kinetic energy of the boy and the bicycle?

(a) 240. J
(b) 480. J
(c) 1440 J
(d) 1920 J

18. **A 50-kilogram firefighter is on a ladder 10 meters above the ground. When the firefighter descends to 5 meters above the ground, the firefighter's gravitational potential energy will decrease by**

(a) 0.194 joules.
(b) 5.10 joules.
(c) 490 joules.
(d) 2450 joules.

19. An object weighing 15 newtons is lifted from the ground to a height of 0.22 meter.

The increase in the object's gravitational potential energy is approximately

(a) 310 J
(b) 32 J
(c) 3.3 J
(d) 0.34 J

20. In raising an object vertically at a constant speed of 2.0 meters per second, 10. watts of power is developed.

The weight of the object is

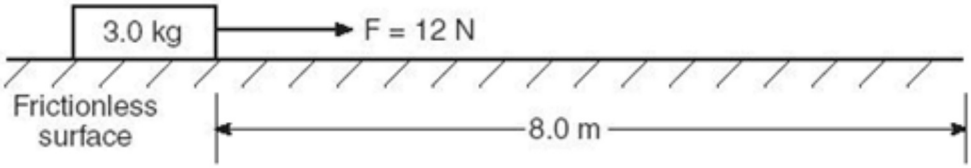
(a) 5.0 N
(b) 20. N
(c) 40. N
(d) 50. N

21. **A high diver steps off a diving platform that is 10 meters above the water. If no air resistance is present, during the fall there will be a decrease in the diver's**

(a) gravitational potential energy.
(b) total mechanical energy.
(c) kinetic energy.
(d) momentum.

22. A 3.0-kilogram block is initially at rest on a frictionless, horizontal surface. The block is moved 8.0 meters in 2.0 seconds by the application of a 12-newton horizontal force, as shown in the diagram below.

What is the average power developed while moving the block?



(a) 24 W
(b) 32 W
(c) 48 W
(d) 96 W

23. A mechanic uses a block and tackle to lift an engine out of a car. The engine weighs 3,000 newtons and is lifted 2 meters.

How many newton-meters (Nm) of work are done during this process?

(a) 1,500 Nm
(b) 3,000 Nm
(c) 4,500 Nm
(d) 6,000 Nm

24. A 2000-watt motor working at full capacity can vertically lift a 400-newton weight at a constant speed of

(a) 2×10^3 m/s
(b) 50 m/s
(c) 5 m/s
(d) 0.2 m/s

25. **A temporary force acting on a 2-kg object traveling at a velocity of 5 $\frac{m}{s}$ causes the object to slow to a velocity of 2 $\frac{m}{s}$. What was the decrease in momentum of the object?**

(a) 4 kg $\frac{m}{s}$
(b) 5 kg $\frac{m}{s}$
(c) 6 kg $\frac{m}{s}$
(d) 7 kg $\frac{m}{s}$

26. A 200-pound man and a 100 pound boy face each other on frictionless rollerblades. The man pushes against the boy so that the boy moves back with a velocity of 8 ft/s. The man will be moving backward at

(a) 64 ft/s
(b) 16 ft/s
(c) 8 ft/s
(d) 4 ft/s

27. When two objects collide, which is always true?

(a) the objects will both reverse direction
(b) total energy will be conserved
(c) momentum will be conserved
(d) b and c
(e) None of the above

28.

Heat will always flow from object *A* to object *B* if object *B* has a lower

(a) mass.
(b) total energy.
(c) temperature.
(d) specific heat.

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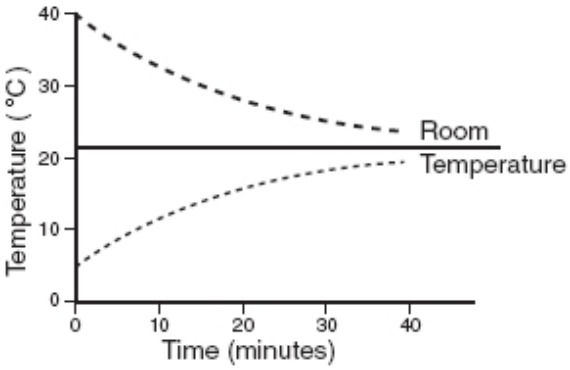
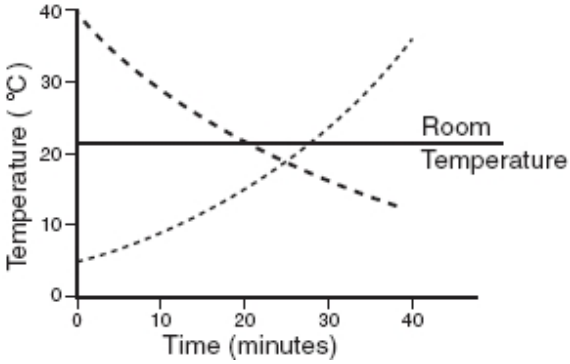
29. **A cup of water at 40°C and a cup of water at 5°C are left on a table. Which graph correctly shows the temperature of the two cups of water as time passes?**

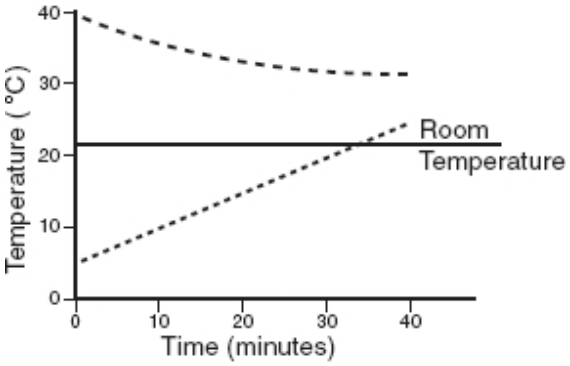
(a)



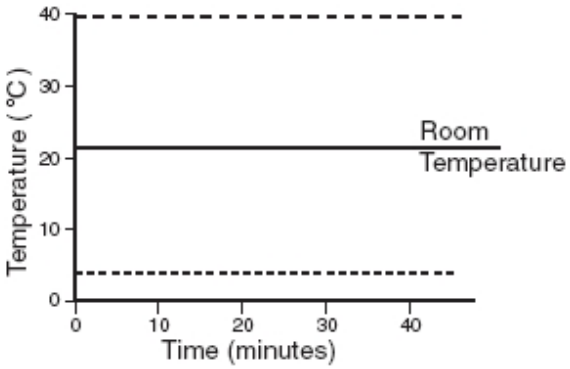
(b)



(c)



(d)



30. **When a steel block at 100 ºC is placed on top of a copper block at 20 ºC, the thermal energy of the copper begins to increase. Which of the following is the source of this increase in energy?**

(a) the work done by the molecules within the copper
(b) the work done by the interaction of the two metals
(c) heat flowing by means of conduction
(d) heat flowing by means of radiation

31. **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

32. Which will increase as a material is heated and a change in temperature occurs?

(a) the kinetic energy of its molecules
(b) the potential energy of its molecules
(c) the charge of its molecules
(d) the mass of its molecules

33. **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.

34. **Which of the following describes a system in which entropy is being increased?**

(a) Liquid water freezes to solid ice.
(b) Air is compressed into a container.
(c) Steam is condensed to a liquid.
(d) Fuel is vaporized before burning.

35.

A 1.0×10^3-kilogram block absorbs 2.4×10^3 kilojoules of heat as its temperature rises from 710.°C to 720.°C. What is the specific heat of the block?

(a) 2.4×10^5 kJ/kg × C°

(b) 0.24 × kJ/kg × C°

(c) 4.2×10^{-7} kJ/kg × C°

(d) 4.2×10^{-8} kJ/kg × C°

36. As a wave travels between two points in a medium, the wave transfers

(a) energy, only.

(b) mass, only.

(c) both energy and mass.

(d) neither energy nor mass.

37. An electric bell connected to a battery is sealed inside a large jar.

What happens as the air is removed from the jar?

(a) The electric circuit stops working because electromagnetic radiation can *not* travel through a vacuum.

(b) The bell's pitch decreases because the frequency of the sound waves is lower in a vacuum than in air.

(c) The bell's loudness increases because of decreased air resistance.

(d) The bell's loudness decreases because sound waves can *not* travel through a vacuum.

38. As a wave travels through a medium, the particles of the medium vibrate in the direction of the wave's travel.

What type of wave is traveling through the medium?

(a) longitudinal
(b) torsional
(c) transverse
(d) hyperbolic

39. A wave completes one vibration as it moves a distance of 2 meters at a speed of 20 meters per second.

What is the frequency of the wave?

(a) 10 Hz
(b) 2 Hz
(c) 20 Hz
(d) 40 Hz

40. A motor is used to produce 4.0 waves each second in a string. What is the frequency of the waves?

(a) 0.25 Hz
(b) 15 Hz
(c) 25 Hz
(d) 4.0 Hz

41. A source of sound waves approaches a stationary observer through a uniform medium.

Compared to the frequency and wavelength of the emitted sound, the observer would detect waves with a

(a) higher frequency and shorter wavelength.
(b) higher frequency and longer wavelength.
(c) lower frequency and shorter wavelength.
(d) lower frequency and longer wavelength.

42. The energy of a sound wave increases with its

(a) wavelength
(b) phase
(c) amplitude
(d) velocity

43. Which part of the Sun's electromagnetic spectrum has the longest wave length?

(a) radio wave radiation
(b) infrared radiation
(c) visible light radiation
(d) x-ray radiation

44. A charge of 5.0 coulombs moves through a circuit in 0.50 second.

The current in the circuit is

(a) 2.5 A
(b) 5.0 A
(c) 7.0 A
(d) 10. A

45. While operating at 120 volts, an electric toaster has a resistance of 15 ohms.

The power used by the toaster is

(a) 8.0 W
(b) 120 W
(c) 960 W
(d) 1,800 W

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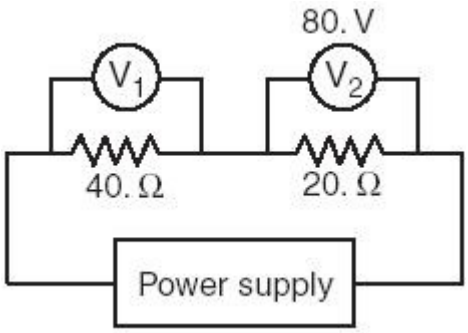
46. In the circuit shown below, voltmeter V_2 reads 80. volts.

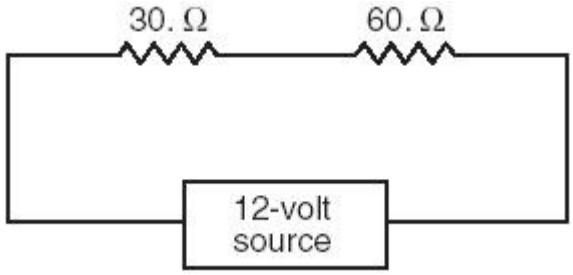
What is the reading of voltmeter V_1?



(a) 160 V
(b) 80. V
(c) 40. V
(d) 20. V

47. A 30.-ohm resistor and a 60.-ohm resistor are connected in an electric circuit as shown below.

Compared to the electric current through the 30.-ohm resistor, the electric current through the 60.-ohm resistor is



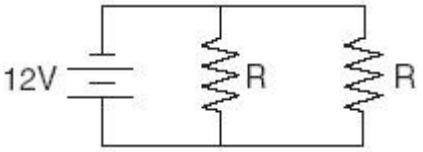
(a) smaller.
(b) larger.
(c) the same.

48. Identical resistors (R) are connected across the same 12-volt battery.

Which circuit uses the greatest power?

(a)

(b)



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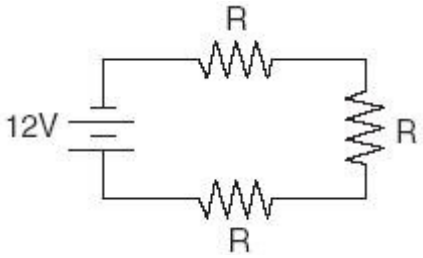
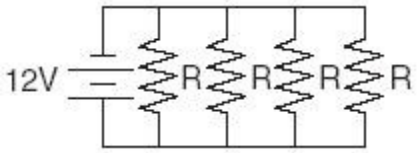
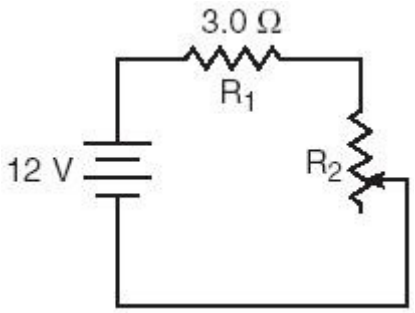


(d)



49. The diagram below represents an electric circuit consisting of a 12-volt battery, a 3.0-ohm resistor, R_1, and a variable resistor, R_2.

At what value must the variable resistor be set to produce a current of 1.0 ampere through R_1?



(a) 6.0 W

(b) 9.0 W

(c) 3.0 W

(d) 12 W

50. A 1.5-volt, AAA cell supplies 750 milliamperes of current through a flashlight bulb for 5.0 minutes, while a 1.5-volt, C cell supplies 750 milliamperes of current through the same flashlight bulb for 20. minutes.

Compared to the total charge transferred by the AAA cell through the bulb, the total charge transferred by the C cell through the bulb is

(a) half as great.

(b) twice as great.

(c) the same.

(d) four times as great.