Guided Responses for TAKS Self-Exam Practice IPC TEKS 6A, 6B, 6D, and 6F
TX BDOL p TX36

1. A ball with a mass of 0.1 kg is tossed straight up. It reaches a height of 10 m and falls to the ground. What is the ball's potential energy at its highest point? **(IPC 6A)**
A) 9.8 J

Solution The ball's potential energy can be calculated from the equation

$$GPE = mgh$$

In this problem, the ball's mass, m, is 0.1 kg; the height at the ball's highest point, h, is 10 m; and g, the acceleration due to Earth's gravity, is 9.8 m/s^2. Substitute these values into the above equation:

$$GPE = (0.1 \text{ kg})(10 \text{ m})(9.8 \text{ m/s}^2)$$
$$= 9.8 \text{ kg m}^2/\text{s}^2 = 9.8 \text{ J}$$

2. Suppose the potential energy of the ball in question 1 is converted only into kinetic energy as the ball falls. What is the ball's velocity just before it hits the ground? **(IPC 6A)**
H) 14 m/s

Solution If all the ball's potential energy is converted into kinetic energy, then the kinetic energy of the ball before it hits the ground is 9.8 J. Use the equation for kinetic energy to find the ball's velocity:

$$KE = \frac{mv^2}{2}$$

$$v^2 = \frac{2KE}{m} = \frac{2(9.8 \text{ J})}{0.1 \text{ kg}} = 196 \frac{\text{m}^2}{\text{s}^2}$$

$$v = \sqrt{196} \text{ m/s} = 14 \text{ m/s}$$

3. A lizard lying on a rock gains thermal energy from the sun primarily by _____. **(IPC 6B)**
C) radiation

Solution Thermal energy is transferred from the Sun to Earth by radiation. The lizard absorbs the thermal energy carried by electromagnetic waves.

4. Which of the following energy sources is nonrenewable? **(IPC 6D)**
J) fossil fuels

Solution Fossil fuels take millions of years to form. They are nonrenewable because they are being used more quickly than they are being formed.

5. A block of glass with a mass of 1 kg and 1 kg of water are at the same temperature. Each receives 10,000.0 joules of thermal energy. If the specific heat of glass is 664 J/kg C, and the specific heat of water is 4,184 J/kg C, which of the following is true? **(IPC 6B)**

$$I = \frac{V}{R} = \frac{6 \text{ V}}{42 \ \Omega} = 0.14 \text{ A}$$

A) The glass will be about 12.7 °C warmer than the water.

Solution Calculate the change in temperature by using the equation that relates thermal energy gained or lost to specific heat:

$$Q = (m)(\Delta T)(C_p)$$

Solve this equation for the change in temperature, ΔT, by dividing both sides of the equation by m and C_p:

$$\Delta T = \frac{Q}{mC_p}$$

The mass, m, of both the water and the glass is 1 kg, and the heat absorbed, Q, is the same for both, 10,000 J. For the glass block the temperature change is:

$$\Delta T = \frac{Q}{mC_p} = \frac{10,000 \text{ J}}{(1 \text{ kg})(664 \text{ J/kg°C})} = 15.1°\text{C}$$

For the water, the temperature change is:

$$\Delta T = \frac{Q}{mC_p} = \frac{10{,}000\text{ J}}{(1\text{ kg})(4{,}184\text{ J/kg°C})} = 2.4°\text{C}$$

The glass block is 15.1°C – 2.4°C = 12.7°C warmer.

6. A battery with a voltage of 6.0 V is connected in a circuit with a lamp that has a resistance of 42 ohms. What is the current in the circuit? **(IPC 6F)**
F) 0.14 A

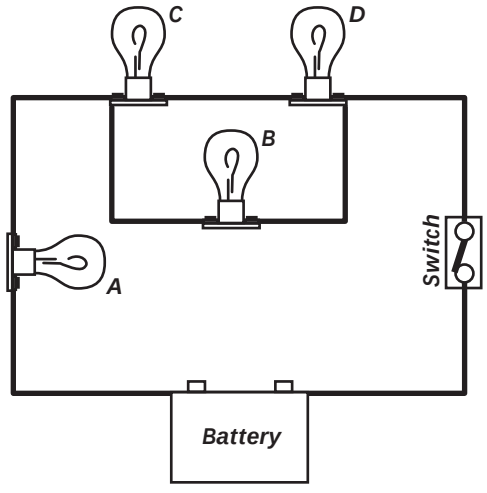
Solution Ohm's law relates the current, voltage, and resistance in a circuit. Use Ohm's law to calculate the current:

$$I = \frac{V}{R} = \frac{6\text{ V}}{42\ \Omega} = 0.14\text{ A}$$

7. The electric power used by a hairdryer is 1100 watts. If the voltage supplied to the hairdryer is 120 V, what is the electric current in the hairdryer? **(IPC 6F)**
A) 9.2 A

Solution Because you are given the electric power and the voltage, use the equation for electric power, $P = IV$, to calculate the current. Divide both sides of this equation by the voltage, V, to solve for the current I:

$$I = \frac{P}{V} = \frac{1{,}100\text{ W}}{120\text{ V}} = 9.2\text{ A}$$



8. All of the lamps in the circuit above will go out if which of the following happens? **(IPC 6F)**
F) lamp A is disconnected

Solution Only if lamp A is disconnected is there no longer a closed path for current to follow in the circuit.

9. A lightbulb has a power rating of 100.0 W. How much does it cost to light the bulb for 10.0 hours if the power company charges $0.09 per kWh? **(IPC 6F)**
D) $0.09

Solution The electrical energy used by an appliance can be calculated from the equation $E = Pt$, where P is the power used by the appliance in watts, and t is the time the appliance is used in hours. The energy used by the lightbulb is

$E = Pt$ = (100.0 W)(10.0 h) = 1,000 Wh
= 1 kWh

The cost is:

Cost = (Energy used in kWh)(cost per kWh)
= (1 kWh)($0.09/kWh) = $0.09