Power is measure in Watts $P = W/t = VI = V^2/R = I^2R$

Skill 41-Power Law

Units $J/s = VA = V^2/\Omega = A^2\Omega$

Watts = Watts = Watts = Watts

125. If a motor lifts a 400.-kilogram mass a vertical distance of 10. meters in 8.0 seconds, the *minimum* power generated by the motor is

A) $3.2\ 10^2$ W B) $5.0\ 10^2$ W
C) $4.9\ 10^3$ W D) $3.2\ 10^4$ W

Mechanics Review
$P = \frac{mgh}{t} = \frac{(400 kg)(9.8 m/s^2)(10 m)}{8 s} =$

126. To increase the brightness of a desk lamp, a student replaces a 50-watt incandescent lightbulb with a 100-watt incandescent lightbulb. Compared to the 50-watt lightbulb, the 100-watt lightbulb has

A) less resistance and draws more current
B) less resistance and draws less current
C) more resistance and draws more current
D) more resistance and draws less current

Same Voltage Supply
I & P direct
R & P inverse

127. A 3.6-volt battery is used to operate a cell phone for 5.0 minutes. If the cell phone dissipates 0.064 watt of power during its operation, the current that passes through the phone is

A) 0.018 A B) 5.3 A
C) 19 A D) 56 A

V = 3.6 V, t = 300 s, P = .064 W, I = ?
$P = VI$
$I = P/V = \frac{.064 W}{3.6 V} = .018 A$

128. A 150-watt lightbulb is brighter than a 60.-watt lightbulb when both are operating at a potential difference of 110 volts. Compared to the resistance of and the current drawn by the 150-watt lightbulb, the 60.-watt lightbulb has

A) less resistance and draws more current
B) less resistance and draws less current
C) more resistance and draws more current
D) more resistance and draws less current

129. An electrical appliance draws 9.0 amperes of current when connected to a 120-volt source of potential difference. What is the total amount of power dissipated by this appliance?

A) 13 W B) 110 W
C) 130 W D) 1100 W

$P = VI = (120 V)(9 A) = 1080 VA \approx 1100 W$

130. One watt is equivalent to one

A) N•m B) N/m
C) J•s D) J/s

$P = W/t = VI$

131. As the potential difference across a given resistor is increased, the power expended in moving charge through the resistor

A) decreases
B) increases
C) remains the same

$P = V^2/R$

132. An air conditioner is designed to operate at 110 volts and is rated at 2,400 watts. Is it possible to use the air conditioner in a circuit which has a 15-ampere circuit breaker (or fuse) on a 110-volt line?

A) Yes, because the current needed is less than 15 amperes.
B) No, because the voltage required is too high.
C) Yes, because the voltage is lower than that needed.
D) No, because the current needed is greater than 15 amperes.

Skill 41-Power Law

133. An electric circuit contains a variable resistor connected to a source of constant voltage. As the resistance of the variable resistor is increased, the power dissipated in the circuit

A) decreases
B) increases
C) remains the same

134. If the potential difference applied to a fixed resistance is doubled, the power dissipated by that resistance

A) remains the same
B) doubles
C) halves
D) quadruples

135. As the resistance of a constant-voltage circuit is increased, the power developed in the circuit

A) decreases
B) increases
C) remains the same

136. The potential difference across a 100.-ohm resistor is 4.0 volts. What is the power dissipated in the resistor?

A) 0.16 W
B) 25 W
C) 4.0×10^2 W
D) 4.0 W

137. How much total energy is dissipated in 10. seconds in a 4.0-ohm resistor with a current of 0.50 ampere?

A) 2.5 J
B) 5.0 J
C) 10. J
D) 20. J

138. An electric heater operating at 120. volts draws 8.00 amperes of current through its 15.0 ohms of resistance. The total amount of heat energy produced by the heater in 60.0 seconds is

A) 7.20×10^3 J
B) 5.76×10^4 J
C) 8.64×10^4 J
D) 6.91×10^6 J

139. An electric drill operating at 120. volts draws a current of 3.00 amperes. What is the total amount of electrical energy used by the drill during 1.00 minute of operation?

A) 2.16×10^4 J
B) 2.40×10^3 J
C) 3.60×10^2 J
D) 4.00×10^1 J

140. A 4.50-volt personal stereo uses 1950 joules of electrical energy in one hour. What is the electrical resistance of the personal stereo?

A) 433 Ohms
B) 96.3 Ohms
C) 37.4 Ohms
D) 0.623 Ohms

Skill 41-Power Law

141. A device operating at a potential difference of 1.5 volts draws a current of 0.20 ampere. How much energy is used by the device in 60. seconds?

A) 4.5 J B) 8.0 J
C) 12 J D) 18 J

V=1.5V
I=.2A
W=?
t=60s
W=VIt = 18J

142. How much electrical energy is required to move a 4.00-microcoulomb charge through a potential difference of 36.0 volts?

A) 9.00×10^{6} J B) 144 J
C) 1.44×10^{-4} J D) 1.11×10^{-7} J

q=4μC = 4×10^{-6}C
V=36V
W=Vq=(4×10^{-6}C)(36V) = 1.44×10^{-4} J

143. For which quantities are values needed to calculate the amount of energy supplied to an operating toaster?

A) applied voltage and resistance, only
B) applied voltage and operation time, only
C) applied voltage, current drawn, and resistance
D) applied voltage, current drawn, and operation time

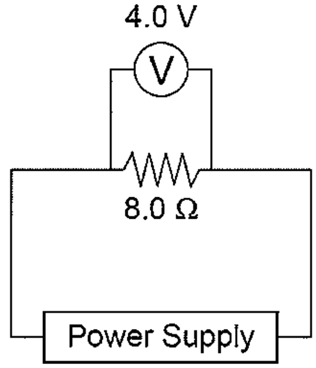
W=VIt

144. How much time is required for an operating 100-watt light bulb to dissipate 10 joules of electrical energy?

A) 1 s B) 0.1 s
C) 10 s D) 1000 s

t=?
P=100W
W=10J
P=W/t
t=W/P = 10J / 100J/s = .1s

145. The diagram below represents an electric circuit



The total amount of energy delivered to the resistor in 10. seconds is

A) 3.2 J B) 5.0 J
C) 20. J D) 320 J

V=4V
R=8Ω
t=10s
$W = V^2/R\,t$ = (4V)²(10s) / 8Ω

146. A 10-volt potential difference maintains a 2-ampere current in a resistor. The total energy expended by this resistor in 5 seconds is

A) 10 J B) 20 J
C) 50 J D) 100 J

V=10V
I=2A
W=?
t=5s
W=VIt
=(10V)(2A)(5s)
=100J

147. The electronvolt is a unit of

A) energy
B) charge
C) electric field strength
D) electric potential difference

1eV = 1.6×10^{-19}J
eV is like qV=W

148. An elementary charge is accelerated by a potential difference of 9.0 volts. The total energy acquired by the charge is

A) 9.0 eV B) 12 eV
C) 3.0 eV D) 27 eV