Formula and Multiple Formulas Worksheet

1. What is the resistance of a resistor if a circuit is on for 28 minutes, used 25 000 J of energy and had 3 A?

$R = \frac{V}{I}$ $\frac{4.9}{3} = 1.7\,\Omega$ $V = \frac{E}{It}$ $\frac{25000}{(3 \times 28 \times 60)} = 4.9\,V$

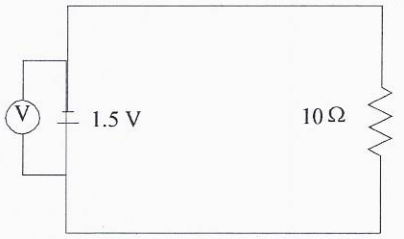
2. What is the resistance of a resistor if it used 0.9 A and 650 W of power?

$R = \frac{V}{I} = \frac{722.2}{.9} = 802.4\,\Omega$ $V = \frac{P}{I} = \frac{650}{.9} = 722.2\,V$

3. What is the power of an appliance in kW if it works on 7 A and has a 3.9 Ω resistor?

$P = IV$ $\frac{7 \times 27.3}{1000} = 0.19\,kW$ $V = RI$ $7 \times 3.9 = 27.3\,V$

4. How many joules of heat will the following circuit give off in exactly one hour of use?



$E = IVt$ $.15 \times 1.5 \times 1 \times 3600 = 810\,J$

$I = \frac{V}{R}$ $\frac{1.5}{10} = .15\,A$

5. Some of the characteristics of an MP3 player are listed below.

- Potential difference: 3 V
- Electric current intensity: 0.1 A
- Energy stored in the battery: 21 600 J

Given the energy stored in its battery, what is the maximum amount of time in minutes this MP3 player can be used?

$t = \frac{E}{IV}$ $\frac{21\,600}{(3 \times .1)} = \frac{72000}{60} = 1200\,min$

6. Julie uses her computer to do her homework. What is the power of this computer given that it consumed 1 440 000 J of energy over a period of 2 hours?

$P = \frac{E}{t}$ $\frac{1\,440\,000}{(2 \times 3600)} = 200\,W$

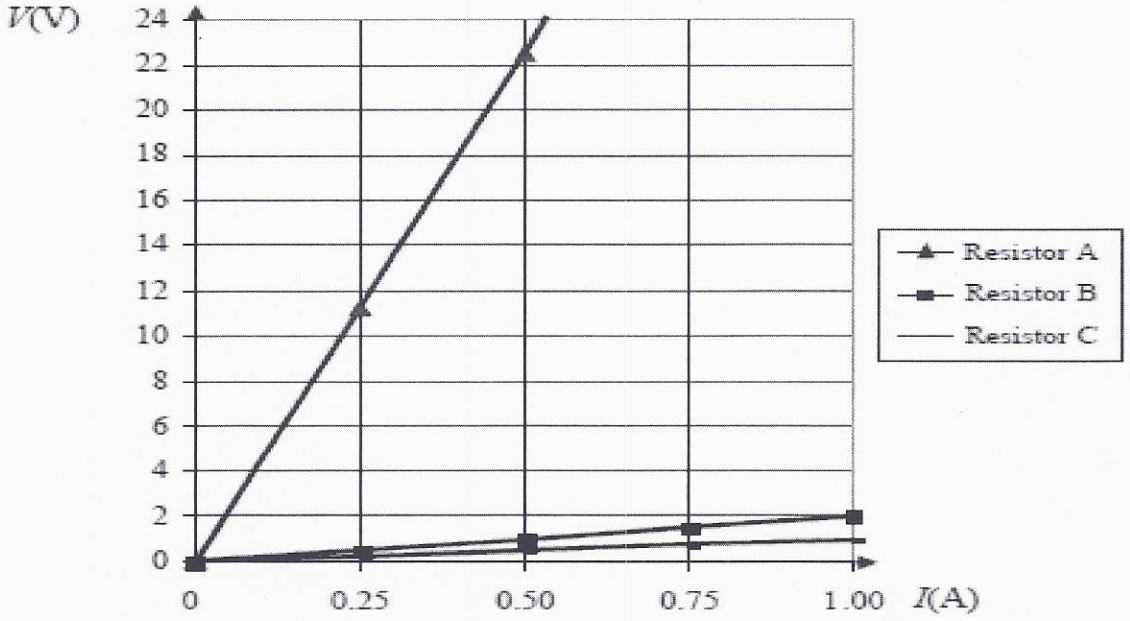
7. What was the potential difference of a computer that used 55 000 J of energy when it was on for 2 hours and had 1.2 A?

$V = \frac{E}{It}$ $\frac{55000}{(1.2 \times 2 \times 3600)} = 6.4\,V$

8. How much time passed in minutes when a computer did 700 000 J of work and had 550 W of power?

$t = \frac{700\,000}{550} = \frac{1272.7}{60} = 21.2\,min$

9. The electrical power of an anemometer is 1.8 W when it operates at a potential difference of 9 V. The following graph illustrates the potential difference as a function of the current applied across the terminals of three resistors, A, B and C.



a- Determine the resistance of the anemometer's electrical circuit.

$R = \frac{V}{I}$ $\frac{9}{.2} = 45\,\Omega$ $I = \frac{P}{V}$ $\frac{1.8}{9} = .2\,A$

b- Choose the resistor (A, B or C in the graph above), that corresponds to the resistance of the electrical circuit determined above. Justify your choice (choose closest answer)

$R = \frac{V}{I}$

A: $\frac{22}{.5} = 44\,\Omega$

B: $\frac{1}{.5} = 2\,\Omega$

C: $\frac{.8}{.5} = 1.6\,\Omega$

A matches 45 Ω resistor

10. Your parents have a swimming pool that consumes 4 500 kWh of energy during the time it is used.

- Number of days used in the year = 122 days
- Amount of time used per day = 6 hours/day

They want to replace it with a new swimming pool heater that has the following characteristics:

Voltage = 240 V Current intensity = 22 A

Will the new swimming pool heater consume less energy? Justify your answer.

$E = IVt$ $\frac{22 \times 240 \times 6 \times 3600 \times 122}{3\,600\,000}$

$= 3865$ kWh Yes will consume less energy.

11. Each of these four appliances is used for one hour. Which one of these appliances is the most expensive to use?

Appliance 1 Pt	Appliance 2 Pt	Appliance 3 IVt	Appliance 4 IVt
800 W 120 V 800×1 60 Hz = 800J	1200 W 10 A 1200×1= 120 V 1200J	2 A 2×240×1= 240 V 480J 60 Hz	12 A 12×120×1 120 V 1440J

A) Appliance 1 B) Appliance 2 C) Appliance 3 (D) Appliance 4

12. You connect a fan to a 12-V power source. The total resistance of the wires used is 10 Ω. You operate the fan for 20 min. How much energy is used by the wires during this period?

A) 4.8 J B) 288 J C) 2 400 J (D) 17 280 J

$E = IVt$ (17280J)

$1.2 \times 12 \times 20 \times 60 =$

$I = \frac{V}{R} = \frac{12}{10} = 1.2$ A

13. The rating plate below indicates the characteristics of Jasmine's hair dryer

MODEL – J45-TX2	
110 V	1200 W

Jasmine took 35 minutes to dry her hair. How much energy did Jasmine use to dry her hair?

A) 3.85 kJ B) 72 kJ (C) 2 520 kJ D) 2 520 000 kJ

$E = IVt$

$\frac{10.9 \times 110 \times 35 \times 60}{1000} =$ (2520 kJ) $I = \frac{P}{V} = \frac{1200}{110} = 10.9$A

or

Pt $\frac{1200 \times 35 \times 60}{1000} =$ (2520 kJ)

14. Light bulb X with a power of 60 W was used for 2 000 hours. Light bulb Y with a power of 15 W was used for 11 000 hours. Which of the two light bulbs consumed the greatest quantity of energy over the time it was used, and how much energy did it consume?

A) Light bulb X consumed the most energy and it consumed 33 kW•h
B) Light bulb X consumed the most energy and it consumed 120 kW•h
C) Light bulb Y consumed the most energy and it consumed 165 kW•h
D) Light bulb Y consumed the most energy and it consumed 733 kW•h

E = Pt

X

$\frac{60 \times 2000 \times 3600}{3\,600\,000} = 120\text{ kWh}$

Y

$\frac{15 \times 11000 \times 3600}{3600\,000} = 165\text{ kWh}$

15. An electrical appliance has a defective resistor with a resistance of 5 Ω. You are asked to replace this resistor. The following table provides information about four resistors you have been given.

Table I –Potential Difference across the Terminals of the Four Resistors and the Current Flowing Through Them

Resistor	Potential Difference (V)	Current (A)
1	2	0.4
2	6	0.5
3	15	2.5
4	20	2.0

R = V/I

Which one of these resistors should you use to replace the defective resistor?

A) Resistor 1 B) Resistor 2 C) Resistor 3 D) Resistor 4

$\frac{2}{4} = 5\,\Omega$

16. The rating plate of an electric oven indicates that it has a power of 2500 W. This oven was used for 40 minutes. How much energy did this oven consume in kWh for this situation?

A) 0.03 kWh B) 1.7 kWh C) 6 000 kWh D) 100 000 kWh

E = Pt

$\frac{2500 \times 40 \times 60}{3\,600\,000} = 1.7\text{ kWh}$

17. A clothes dryer operates at a potential difference of 240 V and a current intensity of 24 A for 30 minutes. How much energy in W•h, does the clothes dryer consume?

A) 300 W•h B) 2 880 W•h C) 18 000 W•h D) 172 800 W•h

E = IVt

$\frac{24 \times 240 \times 30 \times 60}{3600} = 2880\text{ Wh}$

OR

240 × 24 × 30 ÷ 60 = 2880 wh