1. A diesel engine consumes 150,000 J of energy by combusting diesel fuel, creating 25,000 J of kinetic energy for the vehicle. What is the percent efficiency of the engine?

$$\% energy efficiency= \frac{useful E}{consumed E}x100=\frac{25 000 J}{150 000 J}x 100=16.7\%$$

1. A windmill that is 38% efficient receives 50,000 J of wind energy over a 12-hour period. How much electricity will it produce over the same time period?

$$\frac{\% energy efficiency}{100}=\frac{useful E}{consumed E}$$

$$\frac{38}{100}=\frac{useful E}{50 000J}$$

 19 000 J

1. An LED has an efficiency rating of 62% and produces 5000 J of luminous energy. How much electrical energy did the LED require to produce this?

$$\frac{\% energy efficiency}{100}=\frac{useful E}{consumed E} \frac{62}{100}=\frac{5 000 J}{consumed E} consumed=8064.5 J$$

1. A motor consumes 100,000 J of energy with an efficiency of 18%. How much energy was wasted during that transformation?

$$\frac{\% energy efficiency}{100}=\frac{useful E}{consumed E} \frac{18}{100}=\frac{Useful}{100 000 J}$$

 Useful = 18 000

 Wasted= 100 000 J – 18 000 J = 82 000 J

 (or just calculate 82% of 100 000 J)

1. A 100 W incandescent light bulb is running for 3 hours, over which time it produces 75,000 J of luminous energy. What is the efficiency of the bulb?

$$E=P∆t=100W×10800s=1 080 000 J$$

$$\% energy efficiency= \frac{useful E}{consumed E}x100=\frac{75 000 J}{1 080 000 J}x 100=6.9\%$$

1. A buzzer is connected to a 9 V battery and draws 0.1 A of current. It is connected to the battery for 1 hour. If the efficiency of the buzzer 10%, then how much sound energy is produced over that time?

$$P=VI=9×0.1=0.9W$$

$$E=P∆t=0.9W×3600s=3240J$$

$$\frac{\% energy efficiency}{100}=\frac{useful E}{consumed E} \frac{10}{100}=\frac{Useful}{3240 J} useful=324J$$