Efficiency Calculations Word Problems

$$\textbf{efficiency} = \frac{\text{useful output energy (J)}}{\text{total input energy (J)}} \times 100$$

Use the equation above to solve each question. Give your answer to two decimal places where it is not a whole number answer.

1. Joe is making toast for his breakfast. The toaster uses 500J energy to brown the bread. A total of 750J energy is input to the toaster. Calculate the percentage efficiency of the toaster.

2. Amaan is drying his PE kit ready for tomorrow. The dryer has a total input of 1300J energy. 650J energy is used to dry the clothes. Calculate the percentage efficiency of the tumble dryer.

3. The total input energy of Maja's hair straighteners is 1600J. 1200J are transferred usefully as heat energy. Calculate the percentage efficiency of the hair straighteners.

Don't forget to check the units carefully.

4. Steven has bought a new drill for work. The total input energy is 1.8kJ. The useful output energy is 800J. Calculate the percentage efficiency of the drill.

5. Ali has bought new speakers for his car. The output of the speakers is 550J. The total energy input is 0.85kJ. Calculate the percentage efficiency.

Rearrange the equation to change the subject.

6. Julia has bought a new freezer. The efficiency rating is E. The sticker states that the freezer uses a total energy input of 855kJ per year. It also states that it has an efficiency of 55%. Calculate the useful energy output of the freezer.

7. Huang's microwave is 65% efficient. It has a total input energy of 1.1kJ. Calculate the useful output energy, giving your answer in joules.

8. Rupert has a remote-controlled car. It is 35% efficient, transferring 90J of the total energy into useful kinetic energy. Calculate the total energy input, giving your answer in joules.

9. Susie is using a solar calculator. It is 75% efficient, transferring 12J of the total energy into useful output energy. Calculate the total energy input, giving your answer in joules.

Extension

Horace is installing a new wind turbine on his farm. The efficiency of the wind turbine is stated as 60%. The turbine requires a total input energy of 2.4kJ/hour.

a. Calculate the useful output energy of the turbine, per hour.

b. Calculate the wasted output energy of the turbine.

c. What type of energy might the wasted transfers be?

d. If the turbine runs for 16 hours in a day, calculate the total energy input to the turbine for that day.

Efficiency Calculations Word Problems Answers

Use the equation above to solve each question. Give your answer to two decimal places where it is not a whole number answer.

1. **(500 ÷ 750) × 100 = 66.67%**

2. **(650 ÷ 1300) × 100 = 50%**

3. **(1200 ÷ 1600) × 100 = 75%**

4. **Convert kJ into J: 1.8 × 1000 = 1800**
   (800 ÷ 1800) × 100 = 44.44%

5. **Convert kJ into J: 0.85 × 1000 = 850**
   (550 ÷ 850) × 100 = 64.71%

6. **useful output energy = (efficiency × total input energy) ÷ 100**
   (855 × 55) ÷ 100 = 470.25kJ/year (or 470 250J/year)

7. **Convert kJ into J: 1.1 × 1000 = 1100**
   useful output energy = (efficiency × total input energy) ÷ 100
   (1100 × 65) ÷ 100 = 715J

8. **total input energy = (useful output energy ÷ efficiency) × 100**
   (90 ÷ 35) × 100 = 257.14J

9. **total input energy = (useful output energy ÷ efficiency) × 100**
   (12 ÷ 75) × 100 = 16J

Extension

Horace is installing a new wind turbine on his farm. The efficiency of the wind turbine is stated as 60%. The turbine requires a total input energy of 2.4kJ/hour.

a. **useful output energy = (efficiency × total input energy) ÷ 100**
   (2.4 × 60) ÷ 100 = 1.44kJ or 1440J

b. **wasted output energy = total input energy – useful output energy**
   2.4 – 1.44 = 0.96kJ or 960J

c. **sound or heat (thermal)**

d. **2.4 × 16 = 38.4kJ or 38 400J**