

## Phys11 Power/Efficiency : W.S. - 30

**Definitions :**    **Power = Work/time or = Energy/time**  
                          **Efficiency = Power(out)/Power(in)x100%**

- 1) A machine does 1500 J of work in 75 s. Find the power.
- 2) An electric motor has a power rating of 4.2 kW. How much time does it take to do 150,000 J of work ?
- 3) A 60. watt light bulb is kept on for one hour. Find the energy consumed by the bulb.
- 4) A horse pulls a wagon with a force of 350 N for a distance of 55 m in 27 s. Find the power of the horse.
- 5) The average horse exerts a power of 746 W. This is one horse-power (1.0 hp). How much work can the average horse do in one hour ?
- 6) A man can lift a 72 kg box from the floor to a shelf that is 2.3 m high in 3.0 s. Find his power.
- 7) An electric motor raises a 1200 kg elevator to a height of 24 m in 14 s. Find the power.
- 8) A 920 kg car accelerates from 0.0 to 32. m/s in 7.5 s. Find the power output of the engine in Watts. Find the horse-power.
- 9) A laser produces 4.0 W of light. The electrical energy that is required is 60. W. Find the efficiency.
- 10) The efficiency of a light bulb is 17%. (This means that 17% of the energy is radiated as light) The power input is 150 W. Find the power output. What happens to the remaining 83 % of the energy that is input ? Find the cost of the electricity required to keep the light on for one day if 1.0 kW-hr of electricity costs 6.2 cents.
- 11) A 72 kg man can run up the stairs of a 12 story building in 52 s. Each story has a height of 3.0 m. Find his power.
- 12) A force of 180 N is required to push an object horizontally at a steady speed of 3.2 m/s. Find the power.

Answers : 1) 20. W, 2) 36 s, 3)  $2.2 \times 10^5$  J, 4) 710 W, 5)  $2.7 \times 10^6$  J, 6) 540 W, 7)  $2.0 \times 10^4$  W, 8)  $6.3 \times 10^4$  W, 84 hp., 9) 6.7 %, 10) 26 W, it becomes waste heat, 22  $\phi$ , 11) 490 W, 12) 580 W.