

Physics 101 Rec
Quiz#5b
Chapter 7

Instructor: Dr. A. Mekki

Name:

Key

Id:

Sect:

A 1500 Kg car accelerates uniformly from rest to 40 m/s in 10 sec.

(a) What is the power delivered by the car's engine at $t = 10$ sec?

Instantaneous power $P_{inst} = Fv = ma v$

$$a = \frac{\Delta v}{\Delta t} = \frac{40 - 0}{10 - 0} = 4 \text{ m/s}^2$$

$$\Rightarrow P_{inst} = 1500 \times 4 \times 40 = 240 \text{ kWatt}$$

(b) What is the average power delivered by the car's engine during this time interval (from $t = 0$ to $t = 10$ sec)?

The average power $\bar{P} = \frac{W}{\Delta t} = \frac{Fd}{\Delta t} = \frac{mad}{\Delta t}$

$$v^2 = v_0^2 + 2ad \Rightarrow d = \frac{v^2}{2a} = 200 \text{ m}$$

$$\Rightarrow \bar{P} = \frac{1500 \times 4 \times 200}{10} = 120 \text{ kWatts}$$

$$\underline{\text{or}} \quad \bar{P} = \frac{W}{\Delta t} = \frac{\Delta K}{\Delta t} = \frac{\frac{1}{2}mv^2 - 0}{\Delta t} = \frac{\frac{1}{2} \times 1500 \times (40)^2}{10} = 120 \text{ kWatts}$$

$$\underline{\text{or}} \quad \bar{P} = \frac{P_f + P_i}{2} = \frac{240 \text{ kWatts}}{2} = 120 \text{ kWatts}$$