AP PHYSICS 1 • EXERCISE SHEET

3.5 Power

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS power 功率 • watt 瓦特 • average power 平均功率 • energy 能量 • work 功

Objective

Build the skills to answer exam questions on **power**.

You must be able to:

- define **power** 功率 as $P = \dfrac{W}{\Delta t}$
- calculate **average power** 平均功率 from work done over a time interval
- relate **instantaneous power** to force and velocity, $P = Fv$
- use the SI unit **watt** 瓦特 and convert between energy and power

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ **Power is the rate of energy transfer**

$P = \dfrac{W}{\Delta t}$, measured in watts (1 W = 1 J s^{-1}). A motor that does 600 J of work in 3.0 s delivers $P = 200$ W.

■ **Power from force and speed**

For a force acting at speed v, $P = Fv$. A car engine providing 50 N of drive at 4.0 m s^{-1}: $P = 200$ W.

■ **Energy from power**

$W = P\,\Delta t$. A 100 W bulb left on for 60 s uses 6000 J.

2 Practice

2.1 A crane does 9000 J of work in 6.0 s. Find its power. [1]

2.2 A car engine pushes with 800 N at a steady 20 m s^{-1}. Find the power delivered. [2]

2.3 A 60 W device runs for 120 s. Find the energy it uses. [1]

3 Exam-style questions

3.1 One watt is equal to [1]

A B
C D

A 1 J
B 1 J s^{-1}
C 1 N
D 1 J s

3.2 A motor lifts a 200 N weight at a constant 0.50 m s^{-1}. Its power output is [1]

A B
C D

A 100 W
B 200 W
C 400 W
D zero

3.3 A 500 kg lift rises 20 m at constant speed in 10 s (take $g = 10$ m s^{-2}).

(a) Find the work done against gravity. [2]

(b) Find the power output of the motor. [1]