

1 Measurement and motion – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
length	长度	_____	_____	_____
time	时间	_____	_____	_____
mass	质量	_____	_____	_____
ruler	直尺	_____	_____	_____
measuring cylinder	量筒	_____	_____	_____
meniscus	弯月面	_____	_____	_____
pendulum	摆	_____	_____	_____
speed	速率	_____	_____	_____
acceleration	加速度	_____	_____	_____
distance–time 图	距离时间图	_____	_____	_____
gradient	斜率	_____	_____	_____
speed–time 图	速度时间图	_____	_____	_____

Recall

You measure things every day — length, time, how fast something moves. This sheet gets you ready for the IGCSE Physics course.

- A measurement is always a **number** with a **unit** (5 means nothing; 5 m is a length).
- We measure **length** 长度 in metres, **time** 时间 in seconds, **mass** 质量 in kilograms.

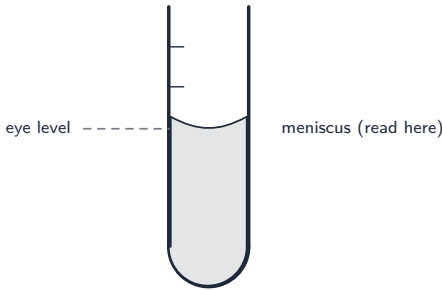
Nothing here is hard — it just lines up the basics.

New ideas

Read these first, then do the Practice.

■ 1 Measuring length and volume

- use a **ruler** 直尺 for length; put your eye straight in front of the mark.
- use a **measuring cylinder** 量筒 for the volume of a liquid; read the scale at the bottom of the curve (the **meniscus** 弯月面), with your eye level.



■ 2 Measuring small amounts

A single small length or short time is hard to measure. The trick is **measure many and divide**:

- thickness of one page → measure 100 pages, divide by 100.
- time for one swing of a **pendulum** 摆 → time 20 swings, divide by 20.

■ 3 Speed and acceleration

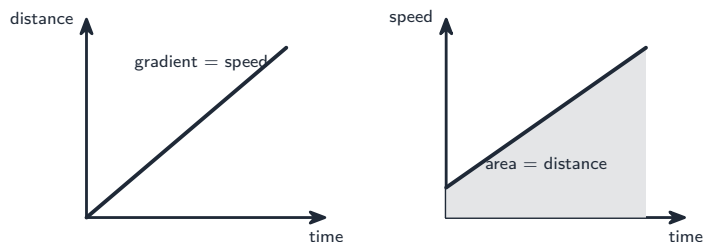
- **speed** 速率 is distance per time: $v = \frac{s}{t}$.

- **acceleration** 加速度 is the change in velocity per time: $a = \frac{\Delta v}{\Delta t}$.

Worked example. A car speeds up from 8 to 20 m/s in 4.0 s: $a = \frac{20 - 8}{4.0} = 3.0 \text{ m/s}^2$.

■ 4 Motion graphs

- **distance–time** 距离时间图: a flat line = at rest; a slope = constant speed (the **gradient** 斜率 is the speed).
- **speed–time** 速度时间图: a slope = constant acceleration; the **area under the line** is the distance.



Watch out: on a **distance–time** graph the gradient is the *speed*; on a **speed–time** graph the gradient is the *acceleration* and the *area* under the line is the distance — don't read the two graphs the same way. Always read a measuring cylinder at the bottom of the meniscus, with your eye level.

Practice

Try these in order.

- 1.1 What two parts must every measurement have? [1]

- 1.2 To find the thickness of one sheet of paper, you measure 100 sheets as 9 mm. What is the thickness of one sheet? [2]

- 1.3 Write the equation linking speed, distance and time. [1]

- 1.4 A runner travels 100 m in 20 s. Calculate the speed. [2]

- 1.5 On a distance–time graph, what does a flat (horizontal) line mean? [1]

- 1.6 A car speeds up from 5 m/s to 15 m/s in 2.0 s. Calculate its acceleration. [2]

- 1.7 **Challenge.** A cyclist rides 60 m in 5 s, rests for 3 s, then rides another 40 m in 5 s. Calculate the average speed for the **whole** journey. [2]