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	距离时间图			
gradient	斜率			
speed–time	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.

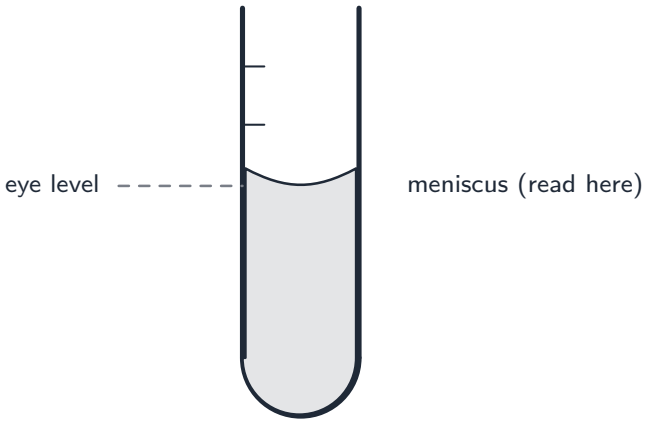
Nothing here is hard – it just lines up the basics.

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.

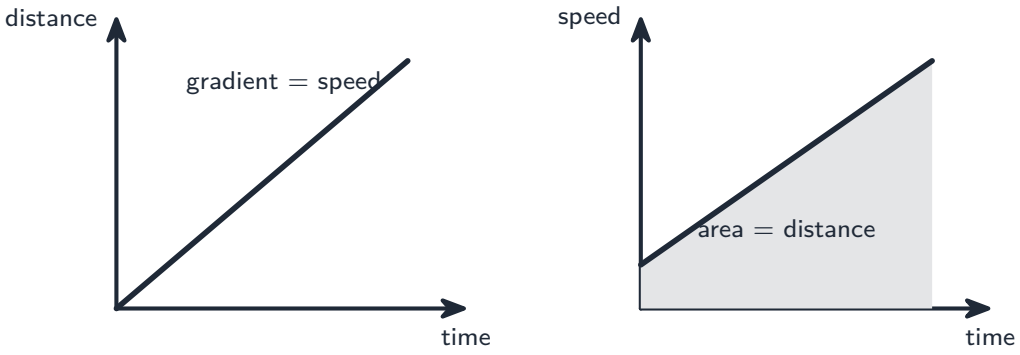
■ 3 Speed and acceleration

- **speed** 速率 is distance per time: $v = \dfrac{s}{t}$.
- **acceleration** 加速度 is the change in velocity per time: $a = \dfrac{\Delta v}{\Delta t}$.

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

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]

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