

PHYSICAL QUANTITIES, UNITS, MEASUREMENT TECHNIQUES

PAPER 1 QUESTIONS

Measurement Techniques

QUESTION # 1:

- 1 A student has been asked to determine, as accurately as possible, the volume of a piece of wire. The wire is about 80 cm long and about 0.2 cm in diameter.

Which measuring instruments should the student use?

	length	diameter
✓ A	metre rule ✓	micrometer ✓
B	metre rule	✓ vernier callipers
C	micrometer	vernier callipers
D	vernier callipers	micrometer

length = 80 cm
diameter = 0.2 cm

QUESTION # 2:

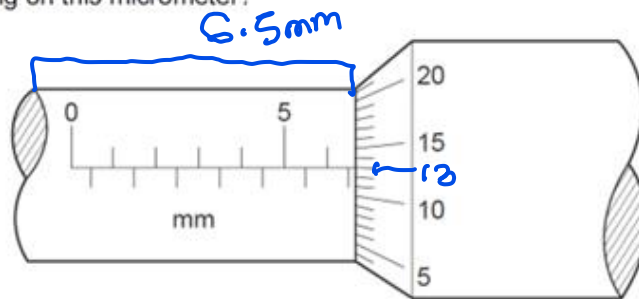
- 1 Which instrument is used to measure the internal diameter of a pipe with a single measurement?

- ✗ A manometer
✗ B measuring cylinder
✗ C micrometer
✓ D vernier calipers

✓

QUESTION # 3

- 1 What is the reading on this micrometer?



A 5.43 mm

B 6.63 mm

C 7.30 mm

D 8.13 mm

$$\frac{13}{100} = 0.13 \text{ mm}$$

$$6.5 + 0.13 \text{ mm}$$

$$\begin{array}{r} 6.50 \\ + 0.13 \\ \hline 6.63 \text{ mm} \end{array}$$

QUESTION # 4

- 2 A plumber measures, as **accurately** as possible, the length and internal diameter of a straight copper pipe.

The length is approximately 80 cm and the internal diameter is approximately 2 cm.

What is the best combination of instruments for the plumber to use?

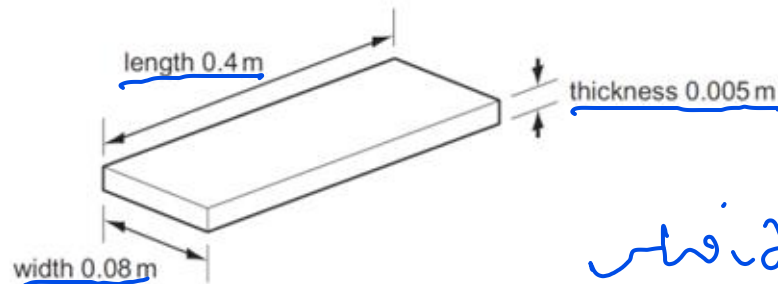
	internal diameter	length
A	x rule	rule
B	x rule	tape
C	✓ vernier calipers	rule
✓ D	vernier calipers	tape ✓

Tape is the most appropriate instrument

QUESTION # 5

- 1 A manufacturer measures accurately the dimensions of a wooden floor tile.

The approximate dimensions of the tile are shown.



$0.08 \text{ m} = 8 \text{ cm} \therefore \text{Vernier cal}$

Which instruments are used to measure accurately each of these dimensions?

	length	thickness	width
☒ A	☒ metre rule	☒ micrometer	☒ vernier calipers
B	metre rule	vernier calipers	micrometer
C	micrometer	metre rule	vernier calipers
D	vernier calipers	micrometer	metre rule

$0.4 \text{ m} = 40 \text{ cm}$
metre rule ✓

Thickness $= 0.005 \text{ m}$
 $= 5 \text{ mm} \therefore$
micrometer ✓

QUESTION # 6

- 1 A reel of copper wire is labelled 'length 30m' and 'diameter 2mm'. A student calculates the volume of the copper wire.

Which instruments does he use to measure accurately the length and the diameter of the wire?

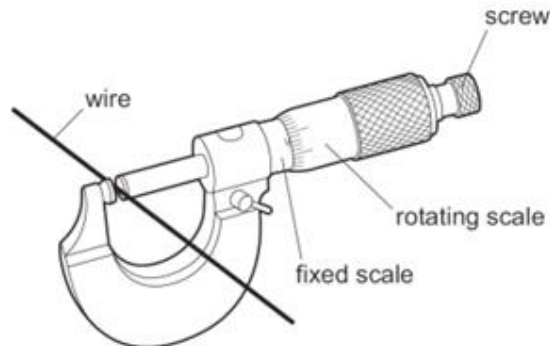
	length	diameter
A	rule	calipers
B	rule	micrometer
☒ C	tape	calipers
D	tape	micrometer

length $= 30 \text{ m}$
diameter $= 2 \text{ mm}$

tape is the most appropriate for the length because it is several meters long.

QUESTION # 7

- 2 A micrometer is used to measure the diameter of a uniform wire.



What is done to obtain an accurate answer?

- ✓ A Find the reading and add or subtract the zero error.
B Make the micrometer horizontal.
C Subtract the fixed scale reading from the rotating scale reading.
D Subtract the rotating scale reading from the fixed scale reading.

Before using
a micrometer
you must
check for
zero error
and correct it

QUESTION # 8

- 2 Before marking the finishing line on a running track, a groundsman measures out its 100m length.

Which instrument is the most appropriate for this purpose?

- ✓ A measuring tape
B metre rule
C 30 cm ruler
D micrometer

Tape measure is the most
appropriate device to
measure length of
several meters.

QUESTION # 9

- 1 A workman measures, as **accurately** as possible, the length and internal diameter of a straight copper pipe.

The length is approximately 600 cm and the internal diameter is approximately 2 cm.

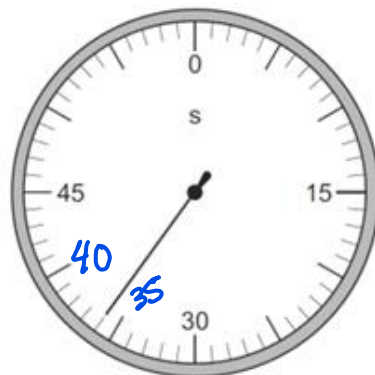
What is the best combination of instruments for the workman to use?

	internal diameter	length
A	ruler	ruler
B	ruler	tape
C	vernier calipers	ruler
✓ D	vernier calipers	tape

Length: 600 cm $\approx$ 6 m
meter rule x
Tape ✓
internal diameter = 2 cm

QUESTION # 10

- 2 The diagram shows a stopwatch.



- 36.0 s

What is the reading on the stopwatch?

- A 30.6 s B 33.0 s ✓ C 36.0 s D 36.6 s

QUESTION # 11

- 2 The diameter and the length of a thin wire, approximately 50 cm in length, are measured as precisely as possible.

What are the best instruments to use?

	diameter	length
✓ A	micrometer	rule
B	micrometer	vernier calipers
C	rule	tape
D	vernier calipers	rule

Diameter = micrometer
length = rule
rule can measure
up to 100 cm

QUESTION # 12

3 A student determines the circumference of a golf ball.

Which instrument gives a reading that is the circumference of the golf ball?

☒ A calipers

☒ B micrometer

☒ C rule

☒ D tape

= the tape can go round the ball.

QUESTION # 13

2 A student wishes to measure directly the circumference of a football.

Which is the most suitable instrument to use?

☒ A calipers

☒ B a measuring tape

☒ C a micrometer

☒ D a ruler

[the tape can go round the ball]

QUESTION # 14

4 Micrometers, metre rules, tapes and calipers are used for measuring lengths.

Which row identifies the most suitable device for accurately measuring the stated length?

	length	measuring device
☒ A	0.15 mm	micrometer
B	0.50 mm	metre rule
C	0.15 m	tape
D	0.50 m	calipers

micrometer = 0.01 mm
because micrometer measures to 2 dp in mm.

QUESTION # 15

2 What is measured using a micrometer?

A area

B current

☒ C length

D mass

= Ammeter

= beam balance

QUESTION # 16

- 4 Stop-watches are used to time the runners in a race.

The stop-watches show the times recorded for the winner and another runner.



convert both time to seconds and then subtract

$$63.84s$$

$$63.84$$

$$- 57.76$$

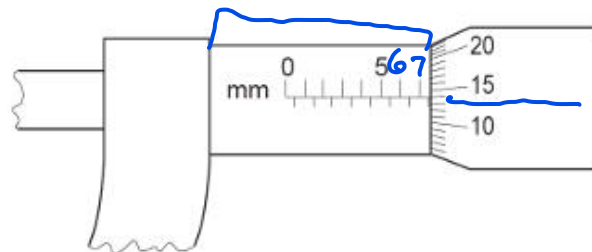
$$\hline 06.08s$$

What is the difference in time between the winner and the other runner?

- A 0.4608 s B 6.08 s C 46.08 s D 608 s

QUESTION # 17

- 1 The diagram shows a micrometer scale.



16 reference line

$$\frac{16}{100} = 0.16mm$$

Which reading is shown?

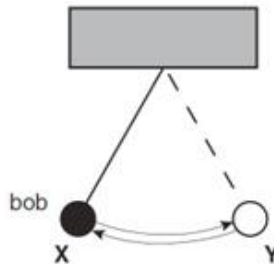
- A 5.64 mm B 7.14 mm C 7.16 mm D 7.64 mm

last reading to be added
= 7mm + 0.16mm

$$\begin{array}{r} 7.00 \\ + 0.16 \\ \hline 7.16 \end{array}$$

QUESTION # 18

- 1 One oscillation of a swinging pendulum occurs when the bob moves from X to Y and back to X again.



$X \rightarrow Y \rightarrow X$ 1 oscillation

time for one oscillation = the

$$\text{Period} = \frac{t}{n}$$

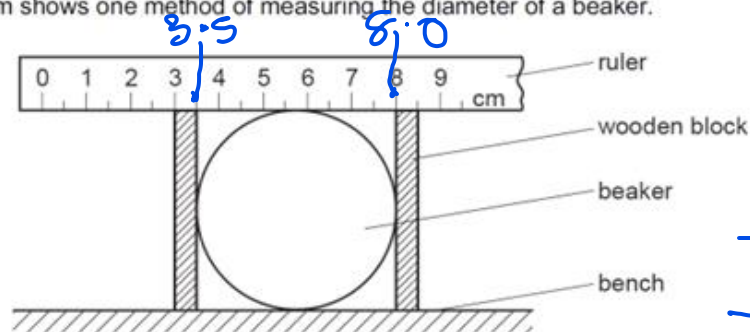
$t = \text{time}$
 $n = \text{number of oscillations}$

Using a stopwatch, which would be the most accurate way to measure the time for one oscillation of the pendulum?

- A Time 20 oscillations and multiply by 20.
✓ B Time 20 oscillations and divide by 20.
C Time one oscillation.
D Time the motion from X to Y, and double it.

QUESTION # 19

- 1 The diagram shows one method of measuring the diameter of a beaker.



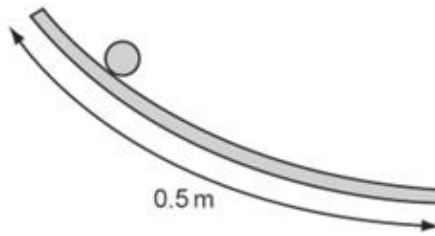
$$\begin{array}{r} 8.0 \\ - 3.5 \\ \hline 4.5 \end{array}$$

What is the diameter of the beaker?

- ✓ A 4.5 cm B 5.0 cm C 5.5 cm D 8.0 cm

QUESTION # 20

- 1 In an experiment, a ball is rolled down a curved track that is about half a metre long.



half a meter
= 50 cm
meter rule

Which measuring device should be used to measure the length accurately?

- A metre rule
B micrometer
☒ C tape measure
D vernier calipers

can't be
used because
the track is
curved

QUESTION # 21

- 1 Vernier calipers read to one tenth of a millimetre.

Which reading is given to this precision?

- A 3.3 cm ☒ B 3.31 cm C 3.310 cm D 3.312 cm

QUESTION # 22

- 1 The level of water in a measuring cylinder is 75 cm^3 . A stone of volume 20 cm^3 is lowered into the water.

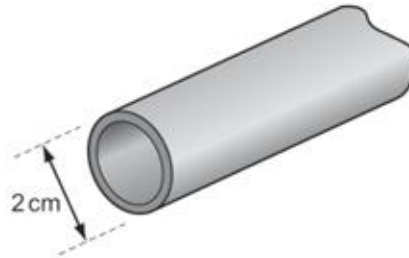
What is the new reading of the water level?

- A 20 cm^3 B 55 cm^3 C 75 cm^3 ☒ D 95 cm^3

vernier caliper measures
to 2 dp in cm
 $\frac{1}{10} \text{ of } 1 \text{ mm} = 0.1 \text{ mm} = 0.01 \text{ cm}$
initial = 75 cm^3
volume of stone = 20 cm^3
new water level = $75 + 20$
= 95 cm^3

QUESTION # 23

- 1 A length of copper pipe, of uniform cross-section and several metres long, carries water to a tap.



length is very long $\neq$ meter rule
cant be used

Measurements are taken to determine accurately the volume of copper in the pipe.

Tape $\checkmark$

Which instruments are used?

- A calipers and micrometer
- B micrometer and rule
- C rule and tape
- ☒ D tape and calipers

Jarrometer; Caliper

QUESTION # 24

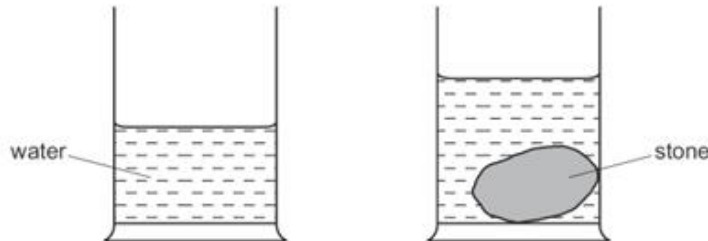
- 2 Which device can be used to measure the thickness of a single sheet of paper?

- A a metre rule
- ☒ B a micrometer
- C a plastic ruler
- D a measuring tape

a micrometer is
used to measure
very small distance

QUESTION # 25

- 2 During an experiment to find the density of a stone, the stone is lowered into a measuring cylinder partly filled with water.



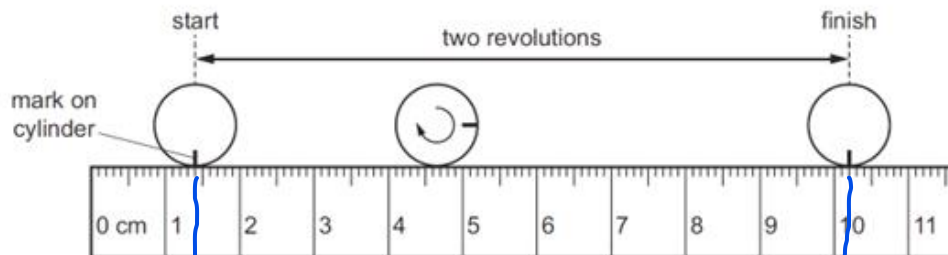
Which statement is correct?

- ☒ A The difference between the readings gives the density of the stone.
☒ B The difference between the readings gives the volume of the stone.
☒ C The final reading gives the density of the stone.
☒ D The final reading gives the volume of the stone.

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

QUESTION # 26

- 2 A small cylinder is rolled along a ruler and completes two revolutions.



The circumference is the distance around the outside of a circle.

What is the circumference of the cylinder?

- A 4.4 cm B 5.2 cm ☒ C 8.8 cm D 10.2 cm

1.4

10.2

$$10.2 - 1.4$$

$$\begin{array}{r} 10.2 \\ - 1.4 \\ \hline \end{array}$$

8.8

QUESTION # 1:

- 1 Power is measured in watts.

What is the correct symbol for millions of watts?

- A mw B mW C Mw

million watt

1000 000 W =
mega watt

☒ D MW

~~MW~~

QUESTION # 2:

- 2 What is the correct unit for the quantity shown?

	quantity	unit
A	electromotive force (e.m.f.)	N
B	latent heat	J
C	pressure	kg/m ³
D	weight	kg

mw = milliwatt
= 10^{-3} W

QUESTION # 3

- 3 What is the name and value of the unit of power written as mW?

	name	value
A	megawatt	10^{-3} W
B	megawatt	10^6 W
☒ C	milliwatt	10^{-3} W
D	milliwatt	10^6 W

☒ milliwatt

$\frac{1}{1000}$ W = 10^{-3} W

QUESTION # 4

- 3 Which reading is given to one tenth of a millimetre?

- A 3.3 cm ☒ B 3.31 cm C 3.310 cm D 3.312 cm

$\frac{1}{10} \times 1 \text{ mm} = 0.1 \text{ mm} = 0.01 \text{ cm}$

3.31 cm = 0.01 cm because
both has same dp in
centimeter.

QUESTION # 5

- 4 The magnitudes of three different electric charges are given below.

What is the correct order of size, from largest to smallest?

- A 1 mC $\rightarrow$ 1 MC $\rightarrow$ 1 kC
 B 1 MC $\rightarrow$ 1 mC $\rightarrow$ 1 kC
 C 1 MC $\rightarrow$ 1 kC $\rightarrow$ 1 mC
 D 1 kC $\rightarrow$ 1 mC $\rightarrow$ 1 MC

$$mC - \text{milli} = \frac{1}{1000} C$$

$$MC = \text{Mega} = 1000000 C$$

$$kC = \text{Kilo} = 1000 C$$

$$1 MC \rightarrow 1 kC \rightarrow 1 mC$$

QUESTION # 6

- 2 A quantity is quoted as having a value of 6.2 ms.

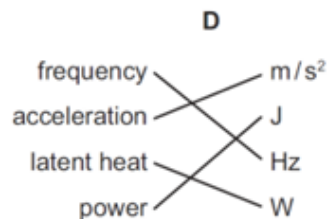
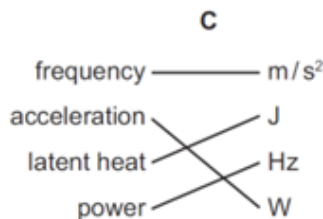
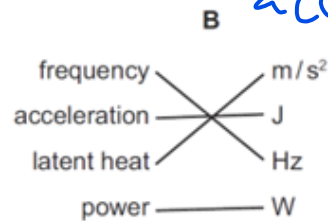
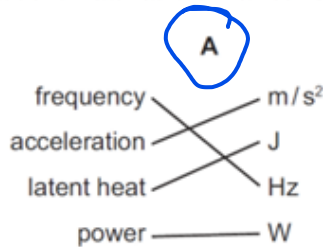
In what units is it measured?

- A metres — m
 B metres per second — m/s or ms^{-1}
 C microseconds — μs
 D milliseconds — ms

QUESTION # 7

- 3 In a test, four students linked the quantities on the left with their units on the right.

Which student matched them all correctly?



frequency = Hz
 acceleration = m/s^2
 latent = J
 power = watt