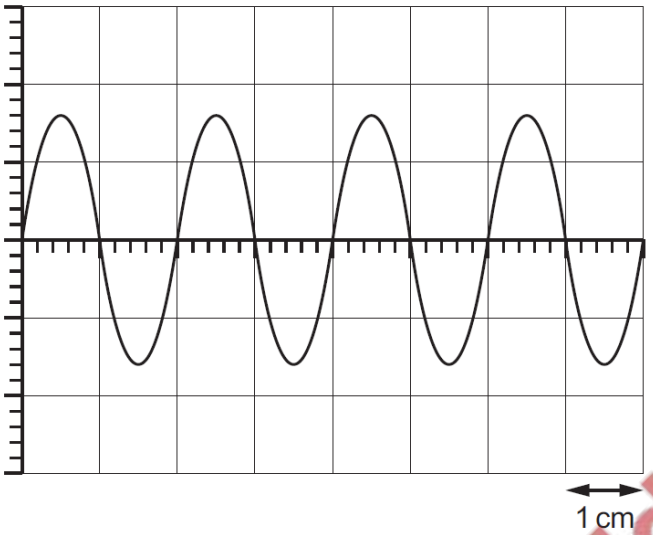
Measurement Techniques – 2021 AS

1. June/2021/Paper_11/No.4

A signal of frequency 25 Hz is displayed on the screen of a cathode-ray oscilloscope.



What is the time-base setting?

A 10 ms cm^{-1} **B** 20 ms cm^{-1} **C** 25 ms cm^{-1} **D** 40 ms cm^{-1}

2. June/2021/Paper_11/No.5

A micrometer screw gauge is used to measure the diameter of a wire.

The reading on the micrometer with the jaws closed is (–0.05 ± 0.02) mm.

The reading with the wire in position between the two jaws is (+1.03 ± 0.02) mm.

What is the diameter of the wire?

A (0.98 ± 0.02) mm

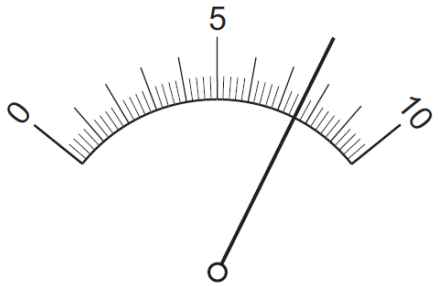
B (1.08 ± 0.02) mm

C (0.98 ± 0.04) mm

D (1.08 ± 0.04) mm

3. June/2021/Paper_12/No.4

An analogue ammeter with a range of 0–250 mA is connected into an electrical circuit. The diagram shows the ammeter's display.



What is the reading on the ammeter?

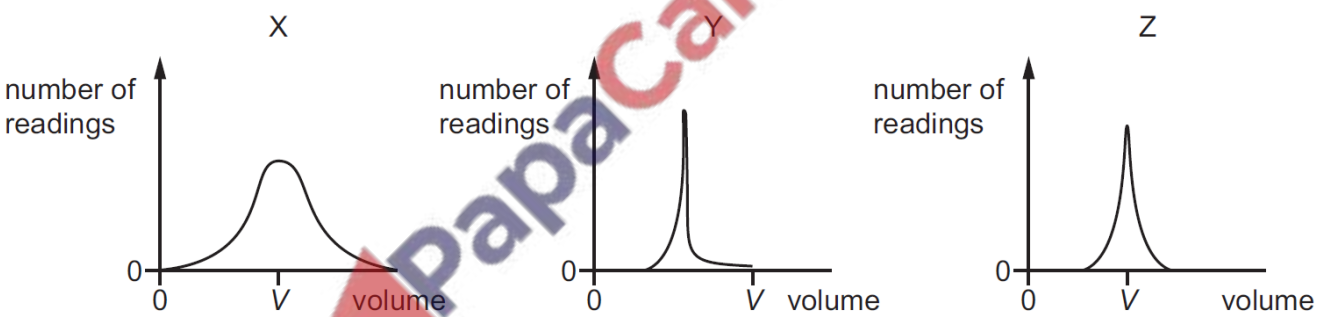
A 76 mA **B** 165 mA **C** 183 mA **D** 190 mA

4. June/2021/Paper_12/No.5

Students take readings of the volume of a liquid using three different pieces of measuring equipment X, Y and Z.

The true value of the volume of the liquid is *V*.

The students' results are shown.



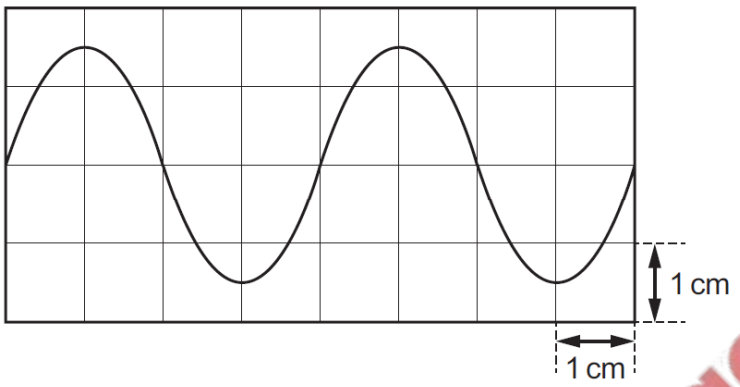
How many pieces of equipment are precise and how many are accurate?

	number of precise pieces of equipment	number of accurate pieces of equipment
A	1	1
B	1	2
C	2	1
D	2	2

5. Nov/2021/Paper_11/No.4

A cathode-ray oscilloscope (CRO) is used to display a sound wave of frequency 2000 Hz.

The display of the CRO is shown.



What is the time-base setting on the CRO?

A 125 $\mu s\ cm^{-1}$ **B** 250 $\mu s\ cm^{-1}$ **C** 500 $\mu s\ cm^{-1}$ **D** 1000 $\mu s\ cm^{-1}$

6. Nov/2021/Paper_11/No.5

Four possible sources of error in a series of measurements are listed.

1 an analogue meter whose scale is read from different angles

2 a meter which always measures 5% too high

3 a meter with a needle that is not frictionless, so the needle sometimes sticks slightly

4 a meter with a zero error

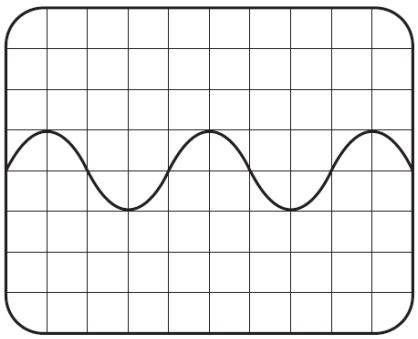
Which errors are random and which are systematic?

	random error	systematic error
A	1 and 2	3 and 4
B	1 and 3	2 and 4
C	2 and 4	1 and 3
D	3 and 4	1 and 2

7. Nov/2021/Paper_12/No.4

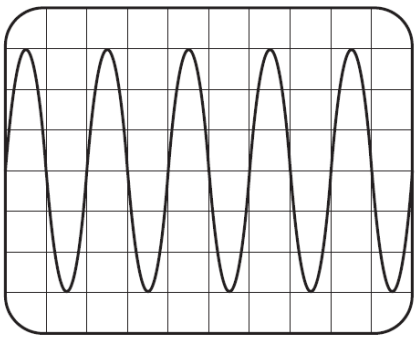
Four cathode-ray oscilloscope (CRO) screens each display a waveform. The screen and the time-base setting of each CRO is shown.

1



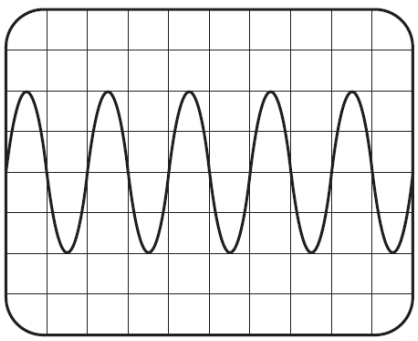
time-base setting: 0.02 s / div

2



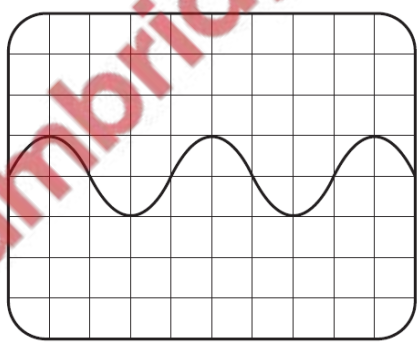
time-base setting: 0.04 s / div

3



time-base setting: 0.01 s / div

4



time-base setting: 0.08 s / div

Which screens show waveforms of the same frequency?

A 1 and 2 **B** 1 and 3 **C** 1 and 4 **D** 2 and 3

8. Nov/2021/Paper_12/No.5

A student measures the time T for one complete oscillation of a pendulum of length l.

Her results are shown in the table.

l / m	T / s
0.420 ± 0.001	1.3 ± 0.1

She uses the formula

$$T = 2\pi\sqrt{\frac{l}{g}}$$

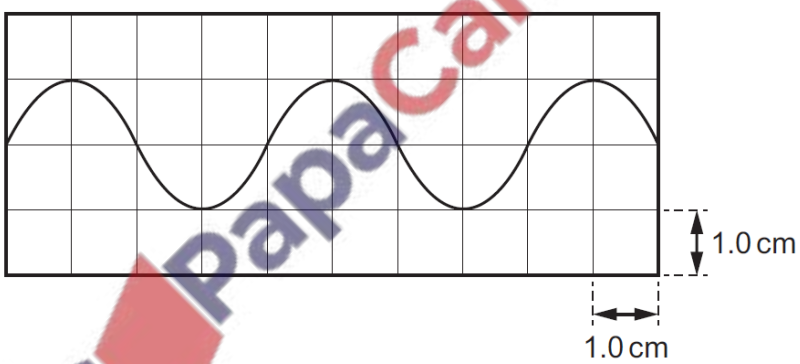
to calculate the acceleration of free fall g.

What is the best estimate of the percentage uncertainty in the value of g?

A 0.02% **B** 4% **C** 8% **D** 16%

9. Nov/2021/Paper_13/No.4

The output of a signal generator is connected to a cathode-ray oscilloscope (CRO). A trace is shown on the screen.



The time-base of the CRO is set at 2.00 ms cm^{-1}.

What is the frequency of the signal?

A 50 Hz **B** 125 Hz **C** 250 Hz **D** 500 Hz

10. Nov/2021/Paper_13/No.5

After measuring the width of a shelf to be 305 mm, it is found that the graduations on the ruler used are 1.0% further apart than they should be.

Which type of measurement error is this and what is the true width of the shelf?

	type of error	true width / mm
A	random	302
B	random	308
C	systematic	302
D	systematic	308