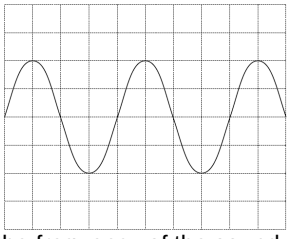
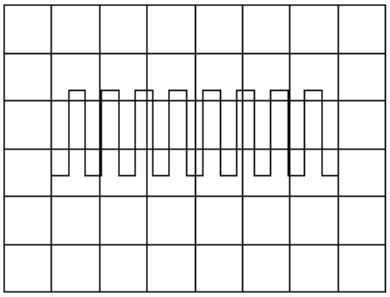
**Measurements**

1. The diagram shows a cathode-ray oscilloscope trace of a sound wave. The time-base is calibrated at 2.0ms $cm^{-1}$.



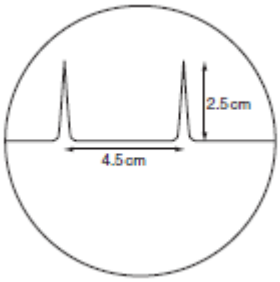
What is the frequency of the sound wave?
**A** 62.5 Hz **B** 125 Hz **C** 250 Hz **D** 500Hz

2. The diagram shows a square-wave trace on the screen of a cathode-ray oscilloscope. A grid of 1 cm squares covers the screen. The time-base setting is 10 ms $cm^{-1}$.



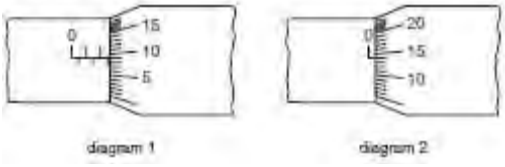
What is the approximate frequency of the square-wave?
**A** 70 Hz **B** 140 Hz **C** 280 Hz **D** 1400Hz

3. The time-base on a cathode-ray oscilloscope is set at 6ms / cm. A trace consisting of two pulses is recorded as shown in the diagram.



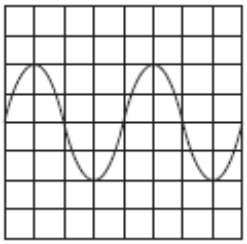

What is the time interval between the two pulses?
**A** 0.42 ms **B** 0.75 ms **C** 1.33 ms **D** 27 ms

**4.** A micrometer screw gauge is used to measure the diameter of a copper wire.
The reading with the wire in position is shown in diagram 1. The wire is removed and the jaws of the micrometer are closed. The new reading is shown in diagram 2.

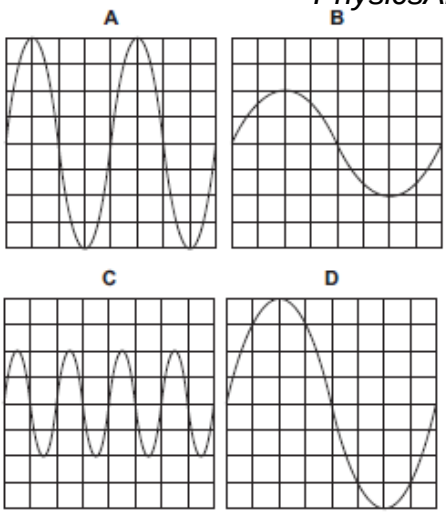



What is the diameter of the wire?
**A** 1.90 mm **B** 2.45 mm **C** 2.59 mm **D** 2.73mm

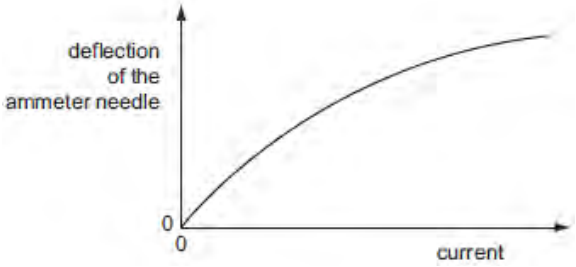
5. The following trace is seen on the screen of a cathode-ray oscilloscope.



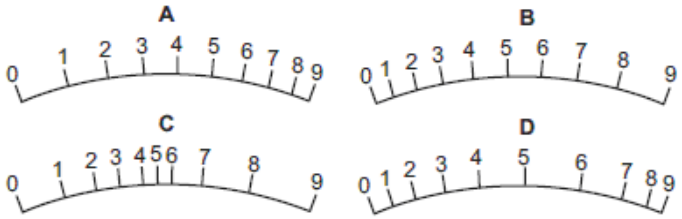
The setting of the time base is then changed from 10 ms $cm^{-1}$ to 20 ms $cm^{-1}$ and the Y-sensitivity is unaltered.
Which trace is now seen on the screen?



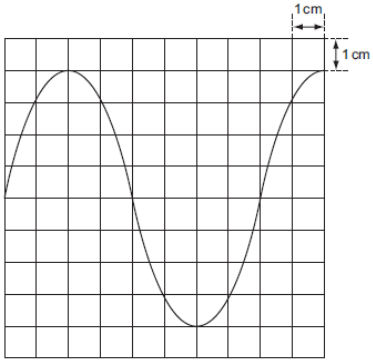

6. The deflection of the needle of an ammeter varies with the current passing through the ammeter as shown in the graph.




Which diagram could represent the appearance of the scale of this meter?

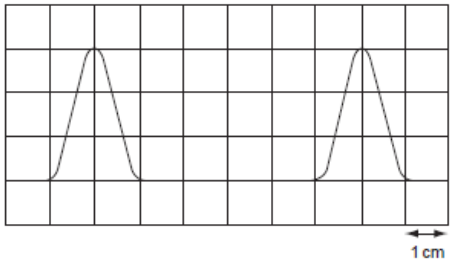



7. When a 12 V 50 Hz supply is connected to the Y-terminals of an oscilloscope, the trace in the diagram is obtained.



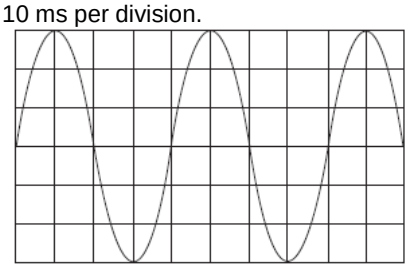

What is the setting of the time-base control?
A 2.0 ms $cm^{-1}$ B 2.5 ms $cm^{-1}$ C 5 ms $cm^{-1}$ D 20 ms $cm^{-1}$

8. The diagram shows two pulses on the screen of a cathode ray oscilloscope. A grid of 1 cm squares covers the screen. The time base setting is 1 μs $cm^{-1}$.




How long does each pulse last?
A 2 μs B 3 μs C 4 μs D 6 μs

9. The cathode-ray oscilloscope (c.r.o.) display shows the waveform produced by an electronic circuit. The c.r.o. time-base is set at 10 ms per division.

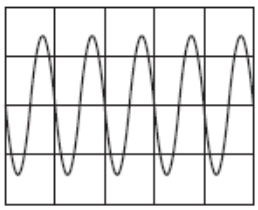


What is the period of the signal shown?

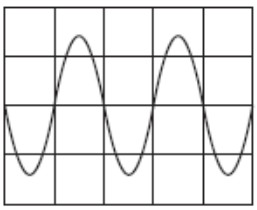
A 20 ms B 30 ms C 40 ms D 80 ms

10. The Y-input terminals of a cathode-ray oscilloscope (c.r.o.) are connected to a supply of peak value 5.0 V and of frequency 50 Hz. The time-base is set at 10 ms per division and the Y-gain at 5.0 V per division. Which trace is obtained?

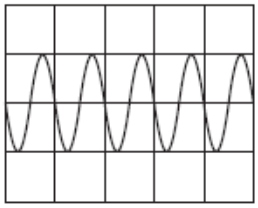
A



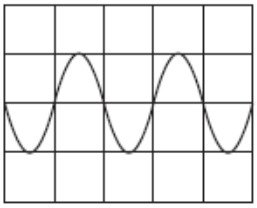
B



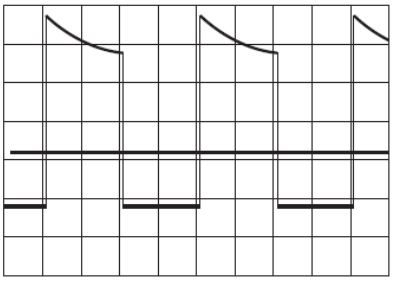
C



D



11. An oscilloscope display consists of two separate traces, a waveform and a long horizontal line.
The horizontal line may be taken as the zero level. The grid on the screen is calibrated in cm squares, the timebase setting is 2.5 ms $cm^{-1}$, and the Y-sensitivity is 5 mV $cm^{-1}$.

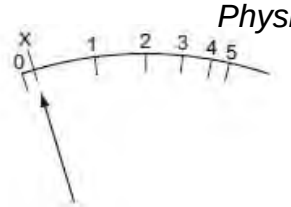


What are the period and the peak positive voltage of the waveform in the diagram?

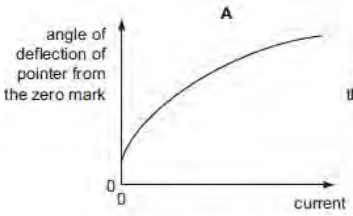
| | period / ms | peak positive voltage / mV |
|---|---|---|
| A | 5 | 17 |
| B | 5 | 25 |
| C | 10 | 17 |
| D | 10 | 25 |

12. The diagram shows the graduations of a correctly calibrated ammeter. When the current is zero, the pointer is at 0.

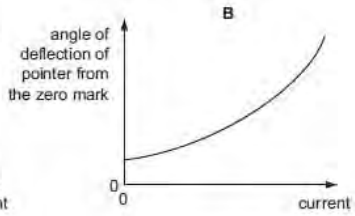

The ammeter is accidentally readjusted so that when the current is zero, the pointer is at X.



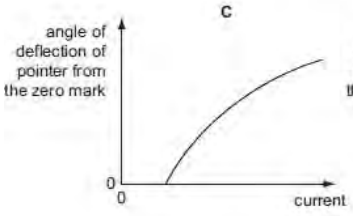

A



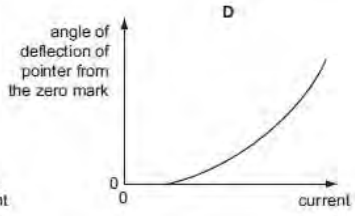

B



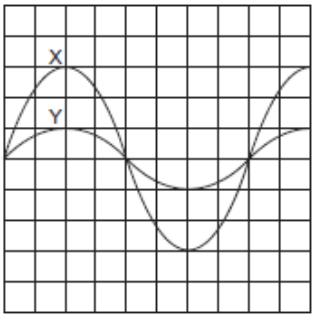

C




D




13. The diagram shows an oscilloscope screen displaying two signals.



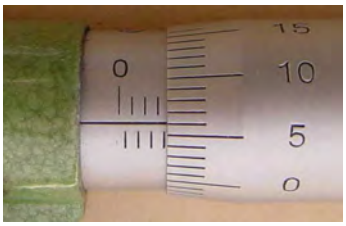

Signal X has a frequency of 50 Hz and peak voltage of 12 V.
What is the period and peak voltage of signal Y?

| | period / ms | peak voltage / V |
|---|---|---|
| A | 20 | 4 |
| B | 20 | 12 |
| C | 50 | 4 |
| D | 50 | 12 |

14. What are the readings on the instruments.


Micrometer Screw Gauge

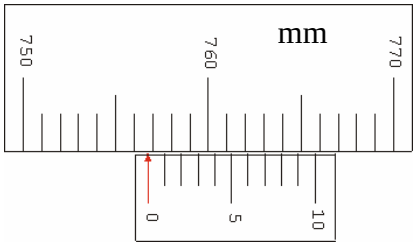
Reading_____




Micrometer Screw Gauge

Reading_____

Vernier Scale



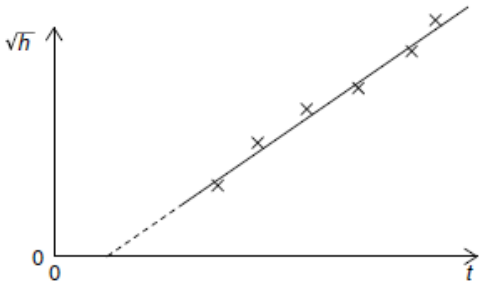

Reading_____

15. Which of the following pairs of units are both SI base units?
**A** ampere, degree Celsius **B** ampere, kelvin
**C** coulomb, degree Celsius **D** coulomb, Kelvin

16. Which formula could be correct for the speed $v$ of ocean waves in terms of the density ρ of seawater, the acceleration of free fall $g$, the depth $h$ of the ocean and the wavelength λ?

**A** $v = \sqrt{g\lambda}$ **B** $v = \sqrt{\frac{g}{h}}$ **C** $v = \sqrt{\rho g h}$ **D** $v = \sqrt{\frac{g}{\rho}}$

**17.** A student measures the time $t$ for a ball to fall from rest through a vertical distance $h$. Knowing that the equation $h = \frac{1}{2} gt^2$ applies, the student plots the graph shown.




Which of the following is an explanation for the intercept on the $t$ axis?
**A** Air resistance has not been taken into account for larger values of $h$.
**B** There is a constant delay between starting the timer and releasing the ball.
**C** There is an error in the timer that consistently makes it run fast.
**D** The student should have plotted $h$ against $t$ 2.

**18.** The power loss $P$ in a resistor is calculated using the formula $P = V^2/R$. The uncertainty in the potential difference $V$ is 3% and the uncertainty in the resistance $R$ is 2%.
What is the uncertainty in $P$?
**A** 4% **B** 7% **C** 8% **D** 11%

***Nov 02***

19. The prefix 'centi' indicates x $10^{-2}$. That is, 1 centimetre is equal to 1 x $10^{-2}$ metre.
Which line in the table correctly indicates the prefixes micro, nano and pico?

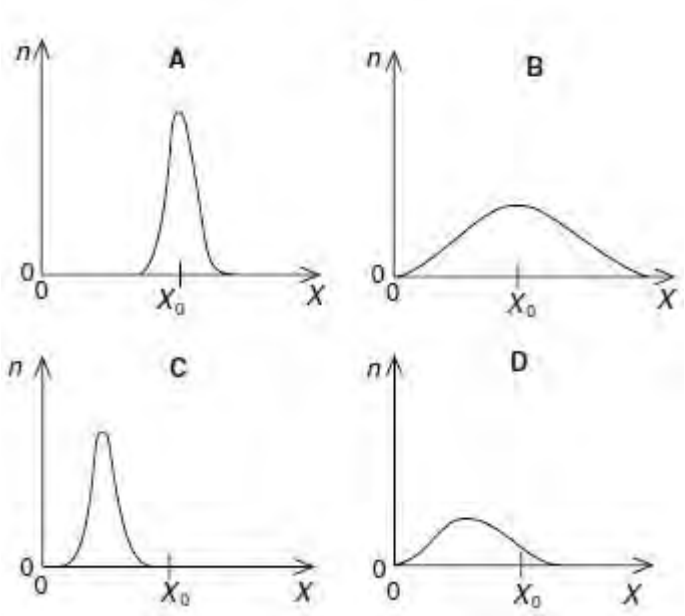
| | $\times 10^{-12}$ | $\times 10^{-9}$ | $\times 10^{-6}$ |
|---|---|---|---|
| A | nano | micro | pico |
| B | micro | pico | nano |
| C | pico | nano | micro |
| D | pico | micro | nano |

20. A student carries out a series of determinations of the acceleration of free fall $g$. The table shows the results.

| $g$/m s$^{-2}$ |
|---|
| 4.91 |
| 4.89 |
| 4.88 |
| 4.90 |
| 4.93 |
| 4.92 |

What can be said about this experiment?
**A** It is accurate and precise.
**B** It is accurate but not precise.
**C** It is not accurate and not precise.
**D** It is not accurate but is precise.

21. A quantity $X$ is measured many times. A graph is plotted showing the number $n$ of times a particular value of $X$ is obtained. $X$ has a true value $X_0$.
Which graph could be obtained if the measurement of $X$ has a large systematic error but a small random error?




***June 03***

22. Which of the following is a scalar quantity?
**A** acceleration **B** mass
**C** momentum **D** velocity

**23.** The unit of work, the joule, may be defined as the work done when the point of application of a force of 1 newton is moved a distance of 1 metre in the direction of the force.
Express the joule in terms of the base units of mass, length and time, the kg, m and s.
**A** kgm$^{-1}$s$^2$ **B** kgm$^2$ s$^{-2}$ **C** kgm$^2$ s$^{-1}$ **D** kg s$^{-2}$

24. Which experimental technique reduces the systematic error of the quantity being investigated?
**A** adjusting an ammeter to remove its zero error before measuring a current
**B** measuring several internodal distances on a standing wave to find the mean internodal distance
**C** measuring the diameter of a wire repeatedly and calculating the average
**D** timing a large number of oscillations to find a period

**25** A student makes measurements from which she calculates the speed of sound as 327.66ms$^{-1}$.
She estimates that her result is accurate to ±3 %.
Which of the following gives her result expressed to the appropriate number of significant figures?
**A** 327.7ms$^{-1}$ **B** 328ms$^{-1}$ **C** 330ms$^{-1}$ **D** 300ms$^{-1}$

**26.** A steel rule can be read to the nearest millimetre. It is used to measure the length of a bar whose true length is 895 mm. Repeated measurements give the following readings.

| length / mm | 892, 891, 892, 891, 891, 892 |
|---|---|

Are the readings accurate and precise to within 1mm?

| | results are accurate to within 1 mm | results are precise to within 1 mm |
|---|---|---|
| A | no | no |
| B | no | yes |
| C | yes | no |
| D | yes | yes |

***Nov 03***

27. A student measures a current as 0.5 A.
Which of the following correctly expresses this result?
**A** 50 mA **B** 50 MA **C** 500 mA **D** 500MA

28. The momentum of an object of mass *m* is *p*.
Which quantity has the same base units as ?

$$\frac{p^2}{m}$$

**A** energy **B** force **C** power **D** velocity

**29.** A thermometer can be read to an accuracy of 0.5 ℃. This thermometer is used to measure a temperature rise from 40 ℃ to 100 ℃.
What is the percentage uncertainty in the measurement of the temperature rise?
**A** 0.5 % **B** 0.8 % **C** 1.3 % **D** 1.7%

***June 04***

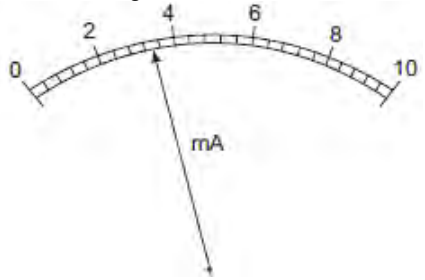
30. Which pair contains one vector and one scalar quantity?
A displacement : acceleration B force : kinetic energy
C momentum : velocity D power : speed

31. Which of the following could be measured in the same units as force?
A energy / distance B energy x distance
C energy / time D momentum x distance

32. The notation μs is used as an abbreviation for a certain unit of time.
What is the name and value of this unit?

| | name | value |
|---|---|---|
| **A** | microsecond | $10^{-6}$ s |
| **B** | microsecond | $10^{-3}$ s |
| **C** | millisecond | $10^{-6}$ s |
| **D** | millisecond | $10^{-3}$ s |

33. What is the reading shown on this milliammeter?




A 2.35 mA B 2.7 mA C 3.4 mA D 3.7 mA

34. In a simple electrical circuit, the current in a resistor is measured as (2.50 ± 0.05) mA. The resistor is marked as having a value of 4.7 Ω ± 2 %.
If these values were used to calculate the power dissipated in the resistor, what would be the percentage uncertainty in the value obtained?
A 2 % B 4 % C 6 % D 8 %

***Nov 04***

35. Which line of the table gives values that are equal to a time of 1 ps (one picosecond) and a distance of 1 Gm (one gigametre)?

| | time of 1 ps | distance of 1 Gm |
|---|---|---|
| **A** | $10^{-9}$ s | $10^{9}$ m |
| **B** | $10^{-9}$ s | $10^{12}$ m |
| **C** | $10^{-12}$ s | $10^{9}$ m |
| **D** | $10^{-12}$ s | $10^{12}$ m |

36. Which of the following definitions is correct and uses only quantities rather than units?
A Density is mass per cubic metre.
B Potential difference is energy per unit current.
C Pressure is force per unit area.
D Speed is distance travelled per second.

37. When a beam of light is incident on a surface, it delivers energy to the surface. The intensity of the beam is defined as the energy delivered per unit area per unit time.
What is the unit of intensity, expressed in SI base units?
A kg $m^{-2}$ $s^{-1}$ B kg $m^{2}$ $s^{-3}$ C kg $s^{-2}$ D kg $s^{-3}$

38. Four students each made a series of measurements of the acceleration of free fall g. The table shows the results obtained.
Which student obtained a set of results that could be described as precise but not accurate?

| student | results, $g$ / m $s^{-2}$ | | | |
|---|---|---|---|---|
| **A** | 9.81 | 9.79 | 9.84 | 9.83 |
| **B** | 9.81 | 10.12 | 9.89 | 8.94 |
| **C** | 9.45 | 9.21 | 8.99 | 8.76 |
| **D** | 8.45 | 8.46 | 8.50 | 8.41 |

***June 05***

39. Decimal sub-multiples and multiples of units are indicated using a prefix to the unit. For example, the prefix milli (m) represents $10^{-3}$.
Which of the following gives the sub-multiples or multiples represented by pico (p) and giga (G)?

| | pico (p) | giga (G) |
|---|---|---|
| **A** | $10^{-9}$ | $10^{9}$ |
| **B** | $10^{-9}$ | $10^{12}$ |
| **C** | $10^{-12}$ | $10^{9}$ |
| **D** | $10^{-12}$ | $10^{12}$ |

40. A metal sphere of radius r is dropped into a tank of water. As it sinks at speed v, it experiences a drag force F given by F = kr v, where k is a constant.
What are the SI base units of k?
A kg $m^{2}s^{-1}$ B kg $m^{-2}s^{-2}$ C kg $m^{-1}s^{-1}$ D kg m $s^{-2}$

41. An Olympic athlete of mass 80 kg competes in a 100 m race.
What is the best estimate of his mean kinetic energy during the race?
A 4 x $10^{2}$J B 4 x $10^{3}$J C 4 x $10^{4}$J D 4 x $10^{5}$J

42. In an experiment, a radio-controlled car takes 2.50 ± 0.05 s to travel 40.0 ± 0.1 m.
What is the car's average speed and the uncertainty in this value?
A 16 ± 1 m $s^{-1}$ B 16.0 ± 0.2 m $s^{-1}$
C 16.0 ± 0.4 m $s^{-1}$ D 16.00 ± 0.36 m $s^{-1}$

***Nov 05***

43. Which pair of units are both SI base units?
A ampere, degree celsius
B ampere, kelvin
C coulomb, degree celsius
D coulomb, kelvin

44. The prefix 'centi' indicates x $10^{-2}$. Which line in the table correctly indicates the prefixes micro, nano and pico?

| | x $10^{-12}$ | x $10^{-9}$ | x $10^{-6}$ |
|---|---|---|---|
| **A** | nano | micro | pico |
| **B** | nano | pico | micro |
| **C** | pico | nano | micro |
| **D** | pico | micro | nano |

45. Which expression involving base units is equivalent to the volt?
A kg $m^2s^{-1}A^{-1}$ B kg m $s^{-2}A$
C kg $m^2s^{-1}A$ D kg $m^2s^{-3}$ $A^{-1}$

46. A steel rule can be read to the nearest millimetre. It is used to measure the length of a bar whose true length is 895 mm. Repeated measurements give the following readings.
length / mm 892, 891, 892, 891, 891, 892
Are the readings accurate and precise to within 1 mm?

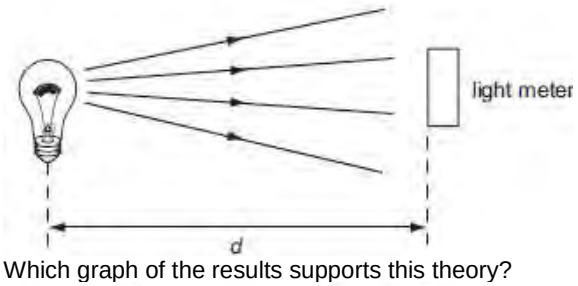
| | results are accurate to within 1 mm | results are precise to within 1 mm |
|---|---|---|
| A | no | no |
| B | no | yes |
| C | yes | no |
| D | yes | yes |

47. The density of the material of a rectangular block is determined by measuring the mass and linear dimensions of the block. The table shows the results obtained, together with their uncertainties.
mass = (25.0 + 0.1) g
length = (5.00 + 0.01) cm
breadth = (2.00 + 0.01) cm
height = (1.00 + 0.01) cm
The density is calculated to be 2.50 g $cm^{-3}$.
What is the uncertainty in this result?
A + 0.01 g $cm^{-3}$ B + 0.02 g $cm^{-3}$
C + 0.05 g $cm^{-3}$ D + 0.13 g $cm^{-3}$

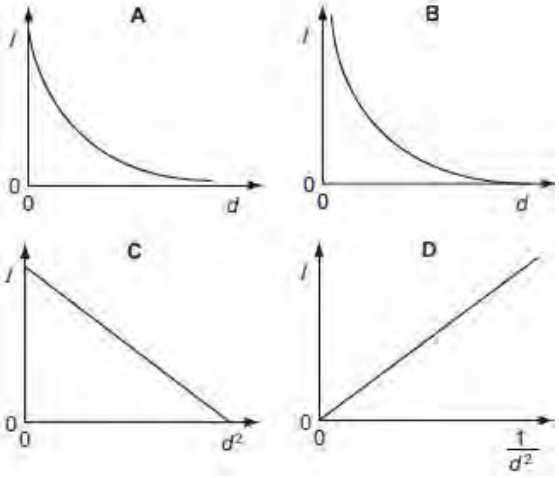
***June 06***

48. For which quantity is the magnitude a reasonable estimate?
A frequency of a radio wave 500 pHz
B mass of an atom 500 μg
C the Young modulus of a metal 500 kPa
D wavelength of green light 500 nm

49. A light meter measures the intensity I of the light falling on it. Theory suggests that this varies as the inverse square of the distance d.




Which graph of the results supports this theory?




50. The resistance R of an unknown resistor is found by measuring the potential difference V across the resistor and the current I through it and using the equation R = V/I
The voltmeter reading has a 3 % uncertainty and the ammeter reading has a 2 % uncertainty.
What is the uncertainty in the calculated resistance?
A 1.5 % B 3 % C 5 % D 6 %

***Nov 06***

51. Which product-pair of metric prefixes has the greatest magnitude?
A pico × mega B nano × kilo
C micro × giga D milli × tera

52. In the expressions below a is acceleration,
F is force, m is mass, t is time, v is velocity.
Which expression represents energy?
A $Ft$ B $Fvt$ C $\frac{2mv}{t}$ D $\frac{at^2}{2}$

53. Which row of the table shows a physical quantity and its correct unit?

| | physical quantity | unit |
|---|---|---|
| A | electric field strength | kg m $s^{-2}$ $C^{-1}$ |
| B | specific heat capacity | $kg^{-1}$ $m^2$ $s^{-2}$ $K^{-1}$ |
| C | tensile strain | kg $m^{-1}$ $s^{-2}$ |
| D | the Young modulus | kg $m^{-1}$ $s^{-3}$ |

54. The measurement of a physical quantity may be subject to random errors and to systematic errors.
Which statement is correct?
A Random errors can be reduced by taking the average of several measurements.
B Random errors are always caused by the person taking the measurement.
C A systematic error cannot be reduced.
D A systematic error results in a different reading each time the measurement is taken.

55. An experiment is done to measure the resistance of a wire. The current in the wire is 1.0 ± 0.2 A and the potential difference across the wire is 8.0 ± 0.4 V.
What is the resistance of the wire and its uncertainty?
A (8.0 ± 0.2) Ω B (8.0 ± 0.6) Ω
C (8 ± 1) Ω D (8 ± 2) Ω

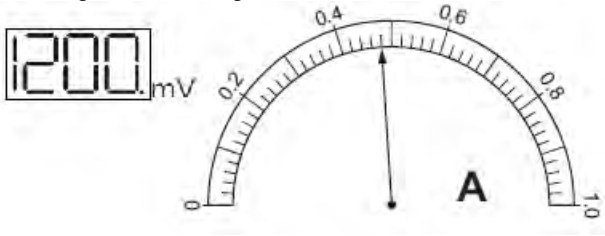
***June 07***

56. Which is a pair of SI base units?
A ampere joule B coulomb second
C kilogram Kelvin D metre newton

57. What is the ratio $\frac{1\mu m}{1Gm}$ ?
A $10^{-3}$ B $10^{-9}$ C $10^{-12}$ D $10^{-15}$

58. Which formula could be correct for the speed v of ocean waves in terms of the density ρ of seawater, the acceleration of free fall g, the depth h of the ocean and the wavelength λ?
A $v = \sqrt{g\lambda}$ B $v = \sqrt{\frac{g}{h}}$ C $v = \sqrt{\rho gh}$ D $v = \sqrt{\frac{g}{\rho}}$

59. The resistance of an electrical component is measured. The following meter readings are obtained.




What is the resistance?
A 2.5 Ω B 2.7 Ω C 2500 Ω D 2700 Ω

***Nov 07***

60. The equation relating pressure and density is p = ρgh.

How can both sides of this equation be written in terms of base units?

**A** $[N\,m^{-1}] = [kg\,m^{-3}]\,[m\,s^{-1}]\,[m]$

**B** $[N\,m^{-2}] = [kg\,m^{-3}]\,[m\,s^{-2}]\,[m]$

**C** $[kg\,m^{-1}\,s^{-2}] = [kg\,m^{-3}]\,[m\,s^{-2}]\,[m]$

**D** $[kg\,m^{-1}\,s^{-1}] = [kg\,m^{-1}]\,[m\,s^{-2}]\,[m]$

61. What is a reasonable estimate of the diameter of an alpha particle?
A $10^{-15}$m B $10^{-12}$m C $10^{-9}$m D $10^{-6}$m

62. A series of measurements of the acceleration of free fall g is shown in the table.
Which set of results is precise but not accurate?

| | g / m s$^{-2}$ | | | | |
|---|---|---|---|---|---|
| A | 9.81 | 9.79 | 9.84 | 9.83 | 9.79 |
| B | 9.811 | 0.12 | 9.89 | 8.94 | 9.42 |
| C | 9.45 | 9.21 | 8.99 | 8.76 | 8.51 |
| D | 8.45 | 8.46 | 8.50 | 8.41 | 8.47 |

63. A mass m has acceleration a. It moves through a distance s in time t. The power used in accelerating the mass is equal to the product of force and velocity. The percentage uncertainties are 0.1 % in m, 1 % in a, 1.5 % in s, 0.5 % in t.

What is the percentage uncertainty in the average power?
A 2.1 % B 2.6 % C 3.1 % D 4.1 %

***June 08***

64. Five energies are listed.
5 kJ 5 mJ 5 MJ 5 nJ
Starting with the smallest first, what is the order of increasing magnitude of these energies?
A 5 kJ → 5 mJ → 5 MJ → 5 nJ
B 5 nJ → 5 kJ → 5 MJ → 5 mJ
C 5 nJ → 5 mJ → 5 kJ → 5 MJ
D 5 mJ → 5 nJ → 5 kJ → 5 MJ

65. Which of the following correctly expresses the volt in terms of SI base units?
A A Ω B W $A^{-1}$ C kg $m^2$ $s^{-1}A^{-1}$ D kg $m^2s^{-3}A^{-1}$

66. What is a reasonable estimate of the average kinetic energy of an athlete during a 100 m race that takes 10 s?
A 40 J B 400 J C 4000 J D 40 000 J

66. The resistance R of a resistor is determined by measuring the potential difference V across it and the current I in it. The value of R is then calculated using the equation

R =V/I

The values measured are V = 1.00 ± 0.05 V and I = 0.50 ± 0.01 A.
What is the percentage uncertainty in the value of R ?
A 2.5 % B 3.0 % C 7.0 % D 10.0 %

67. Four students each made a series of measurements of the acceleration of free fall g. The table shows the results obtained.
Which set of results could be described as precise but not accurate?

| | g / m s$^{-2}$ | | | |
|---|---|---|---|---|
| A | 9.81 | 9.79 | 9.84 | 9.83 |
| B | 9.81 | 10.12 | 9.89 | 8.94 |
| C | 9.45 | 9.21 | 8.99 | 8.76 |
| D | 8.45 | 8.46 | 8.50 | 8.41 |

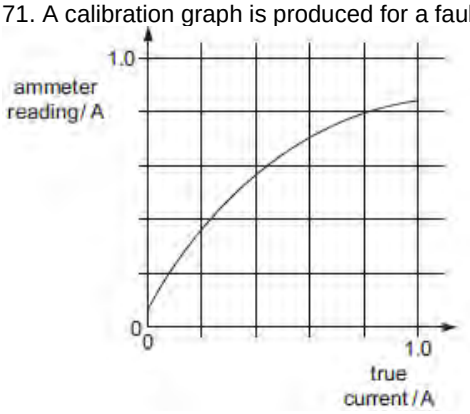
***Nov. 08***

68. A laser emits light of wavelength 600 nm.
What is the distance, expressed as a number of wavelengths, travelled by the light in one second?
A $5 \times 10^{8}$ B $5 \times 10^{11}$ C $5 \times 10^{14}$ D $5 \times 10^{17}$

69. At temperatures close to 0 K, the specific heat capacity c of a particular solid is given by $c = bT^3$, where T is the thermodynamic temperature and b is a constant characteristic of the solid.
What are the units of constant b, expressed in SI base units?
A $m^2s^{-2}K^{-3}$ B $m^2s^{-2}K^{-4}$ C kg $m^2s^{-2}K^{-3}$ D kg $m^2s^{-2}K^{-4}$

70. A student uses a digital ammeter to measure a current. The reading of the ammeter is found to fluctuate between 1.98 A and 2.02 A.
The manufacturer of the ammeter states that any reading has a systematic uncertainty of ± 1 %.
Which value of current should be quoted by the student?
A (2.00 ± 0.01) A B (2.00 ± 0.02) A
C (2.00 ± 0.03) A D (2.00 ± 0.04) A

71. A calibration graph is produced for a faulty ammeter.

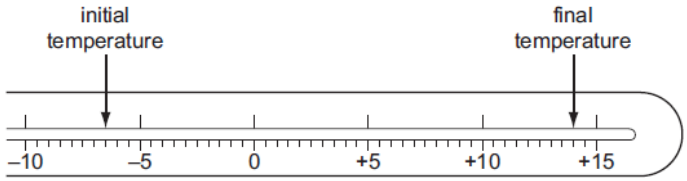



Which ammeter reading will be nearest to the correct value?
A 0.2 A B 0.4 A C 0.6 A D 0.8 A

***June 09***

72. Which statement, involving multiples and sub-multiples of the base unit metre (m), is correct?
A 1 pm = $10^{-9}$m B 1 nm = $10^{-6}$m
C 1 mm = $10^{6}$μm D 1 km = $10^{6}$mm

73. The diagram shows the stem of a Celsius thermometer marked to show initial and final temperature values.




What is the temperature change expressed to an appropriate number of significant figures?
A 14 ℃ B 20.5 ℃ C 21 ℃ D 22.0 ℃

***Nov. 09***

74. The drag force F acting on a moving sphere obeys an equation of the form $F = kAv^2$, where A represents the sphere's frontal area and v represents its speed.
What are the base units of the constant k ?

**A** $kg\,m^5s^{-4}$ **B** $kg\,m^{-2}s^{-1}$ **C** $kg\,m^{-3}$ **D** $kg\,m^{-4}s^2$

75. The table contains some quantities, together with their symbols and units.

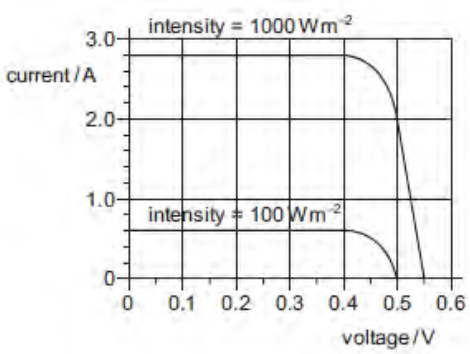
| quantity | symbol | unit |
|---|---|---|
| gravitational field strength | $g$ | $N\,kg^{-1}$ |
| density of liquid | $\rho$ | $kg\,m^{-3}$ |
| vertical height | $h$ | m |
| volume of part of liquid | $V$ | $m^3$ |

Which expression has the units of energy?

**A** $g\rho hV$ **B** $\frac{\rho hV}{g}$ **C** $\frac{\rho g}{hV}$ **D** $\rho g^2 h$

76. The graph shows two current-voltage calibration curves for a solar cell exposed to different light

intensities.




At zero voltage, what is the ratio $\frac{\text{current at } 1000\ \text{Wm}^{-2}}{\text{current at } 100\ \text{Wm}^{-2}}$ ?

A 1.1 B 4.7 C 8.0 D 10

***June 10***

77. The SI unit for potential difference (the volt) is given, in base units, by

A kg m $A^{-1}s^{-3}$ B $m^2A^{-1}s^{-2}$ C kg $m^2s^{-2}$ D kg $m^2A^{-1}s^{-3}$

78. The product of pressure and volume has the same SI base units as

A energy B force C force/area D force/length

79. A student finds the density of a liquid by measuring its mass and its volume. The following is a summary of his measurements.

mass of empty beaker = (20 ± 1) g
mass of beaker + liquid = (70 ± 1) g
volume of liquid = (10.0 ± 0.6) $cm^3$

He correctly calculates the density of the liquid as 5.0 g $cm^{-3}$.
What is the uncertainty in this value?

A 0.3 g $cm^{-3}$ B 0.5 g $cm^{-3}$ C 0.6 g $cm^{-3}$ D 2.6 g $cm^{-3}$

80. A micrometer screw gauge is used to measure the diameter of a copper wire.
The reading with the wire in position is shown in diagram 1. The wire is removed and the jaws of the micrometer are closed. The new reading is shown in diagram 2.

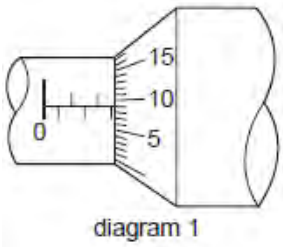


diagram 1

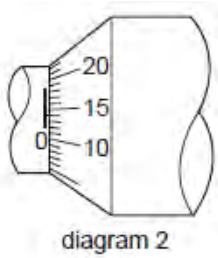


diagram 2

What is the diameter of the wire?

A 1.90 mm B 2.45 mm C 2.59 mm D 2.73mm

Answers:
1-B, 2-B, 3-D, 4-B, 5-C, 6-A, 7-B, 8-A, 9-C, 10-D, 11-C, 12-A, 13-A, 14a-(3.04mm), 14b-(3.56mm), 14c-(756.8mm), 15-B, 16-A, 17-B, 18-C, 19-C, 20-D, 21-C, 22-B, 23-B, 24-A, 25-C, 26-B, 27-C, 28-A, 29-D, 30-B, 31-A, 32-A, 33-C, 34-C, 35-C, 36-C, 37-D, 38-D, 39-C, 40-C, 41-B , 42-C, 43-B, 44-C, 45-D, 46-B, 47-C, 48-D, 49-D, 50-C, 51-D, 52-B, 53-A, 54-A, 55-D, 56-C, 57-D, 58-A, 59-A, 60-C, 61-A, 62-D, 63-C, 64-C, 65-D, 66-C, 66-C, 67-D, 68-C, 69-D, 70-D, 71-D, 72-D, 73-C, 74-C, 75-A