AS & A Level Physics (9702) Paper 1

[Multiple Choice]

Exam Series: February/March 2017 - May/June 2024

Format Type A:
Answers to all questions are provided as an appendix

E

Introduction

Each Topical Past Paper Questions Compilation contains a comprehensive collection of hundreds of questions and corresponding answer schemes, presented in worksheet format. The questions are carefully arranged according to their respective chapters and topics, which align with the latest IGCSE or AS/A Level subject content. Here are the key features of these resources:

1. The workbook covers a wide range of topics, which are organized according to the latest syllabus content for Cambridge IGCSE or AS/A Level exams.

2. Each topic includes numerous questions, allowing students to practice and reinforce their understanding of key concepts and skills.

3. The questions are accompanied by detailed answer schemes, which provide clear explanations and guidance for students to improve their performance.

4. The workbook's format is user-friendly, with worksheets that are easy to read and navigate.

5. This workbook is an ideal resource for students who want to familiarize themselves with the types of questions that may appear in their exams and to develop their problem-solving and analytical skills.

Overall, Topical Past Paper Questions Workbooks are a valuable tool for students preparing for IGCSE or AS/A level exams, providing them with the opportunity to practice and refine their knowledge and skills in a structured and comprehensive manner. To provide a clearer description of this book's specifications, here are some key details:

- Title: Cambridge AS & A Level Physics (9702) Paper 1 Topical Past Papers

- Subtitle: Exam Practice Worksheets With Answer Scheme

- Examination board: Cambridge Assessment International Education (CAIE)

- Subject code: 9702

- Years covered: February/March 2017 - May/June 2024

- Paper: 1 [Multiple Choice Questions]

- Number of pages: 1018

- Number of questions: 1991

Contents

Chapter 1

Physical quantities and units

1.1 Physical quantities

1. 9702_s24_qp_12 Q: 8

What is a reasonable estimate of the momentum of a family car travelling at 25 kilometres per hour?

A $1 \times 10^4\,\mathrm{kg\,m\,s^{-1}}$

B $1 \times 10^5\,\mathrm{kg\,m\,s^{-1}}$

C $1 \times 10^6\,\mathrm{kg\,m\,s^{-1}}$

D $1 \times 10^7\,\mathrm{kg\,m\,s^{-1}}$

_____   compiled by examinent.com   _____

2. 9702_m23_qp_12 Q: 1

What represents a physical quantity?

A   3.0

B   kilogram

C   7.0 N

D   40%

_____   compiled by examinent.com   _____

3. 9702_S23_qp_11 Q: 2

What is the best estimate of the number of atoms in a piece of metal of volume $50\,\mathrm{cm^3}$?

A 5×10^{15} **B** 5×10^{25} **C** 5×10^{29} **D** 5×10^{31}

_____   compiled by examinent.com   _____

4. 9702_S23_qp_13 Q: 1

What **must** be included in a record of a physical quantity?

A   an integer value for the quantity

B   an SI unit

C   a numerical value for the quantity

D   a unit expressed in base units

_____   compiled by examinent.com   _____

5. 9702_w23_qp_12 Q: 1

A student estimates the maximum speed of some different moving objects.

Which maximum speed is **not** a reasonable estimate?

A   container ship: $10\,\mathrm{m\,s^{-1}}$

B   Olympic sprinter: $0.1\,\mathrm{km\,s^{-1}}$

C   racing car: $9000\,\mathrm{cm\,s^{-1}}$

D   snail: $0.01\,\mathrm{km\,h^{-1}}$

_____   compiled by examinent.com   _____

6. 9702_w23_qp_13 Q: 1

What is the best estimate of the wavelength of green light?

A   260 nm   **B**   540 nm   **C**   780 nm   **D**   920 nm

_____   compiled by examinent.com   _____

7. 9702_s22_qp_11 Q: 1

Which term represents a physical quantity?

A   metre

B   percentage uncertainty

C   quark flavour

D   spring constant

_____   compiled by examinent.com   _____

8. 9702_s22_qp_12 Q: 1

Which estimate is reasonable?

A 1×10^{-3} kg for the mass of a grain of sand

B 1×10^{-2} m^3 for the volume of a tennis ball

C 1×10^{0} J for the work done lifting an apple from waist height to head height

D 1×10^{4} W for the power of a light bulb in a house

—————————— compiled by examinent.com ——————————

9. 9702_s22_qp_13 Q: 1

Which pair of quantities are physical quantities?

A   charge and ampere

B   efficiency and kilogram

C   pascal and strain

D   period and potential difference

—————————— compiled by examinent.com ——————————

10. 9702_W22_qp_11 Q: 1

What is needed to accurately represent all physical quantities?

A   a base unit and a number

B   a unit and a number expressed in standard form (scientific notation)

C   a unit and a numerical magnitude

D   an SI unit and a numerical magnitude

—————————— compiled by examinent.com ——————————

11. 9702_W22_qp_12 Q: 1

Which quantity is a physical quantity?

A   flavour

B   kelvin

C   minute

D   potential difference

12. 9702_m21_qp_12 Q: 1

What is a reasonable estimate for the density of sand?

A $2 \times 10^2 \, g \, cm^{-3}$

B $2 \times 10^3 \, g \, cm^{-3}$

C $2 \times 10^1 \, kg \, m^{-3}$

D $2 \times 10^3 \, kg \, m^{-3}$

13. 9702_S21_qp_11 Q: 1

What is a reasonable estimate of the volume of an adult person?

A $0.10 \, m^3$ **B** $0.50 \, m^3$ **C** $1.0 \, m^3$ **D** $2.0 \, m^3$

14. 9702_S21_qp_12 Q: 1

What is **not** a reasonable estimate of the physical property indicated?

A $2 \times 10^3 \, W$ for the power dissipated by the heating element of an electric kettle

B $4 \times 10^2 \, m^3$ for the volume of water in a swimming pool

C $5 \times 10^5 \, N \, s$ for the momentum of a lorry moving along a road

D $6 \times 10^2 \, N$ for the weight of a fully grown racehorse

15. 9702_S21_qp_13 Q: 1

What is a reasonable estimate of the kinetic energy of an Olympic athlete sprinting in a 100 m race?

A   40 J   **B**   400 J   **C**   4000 J   **D**   40 000 J

——————————— compiled by examinent.com ———————————

16. 9702_w21_qp_11 Q: 1

What is essential when recording a measurement of a physical quantity?

A   the measurement has an SI unit

B   the measurement has a unit and a number

C   the measurement has a unit given as a base unit

D   the measurement is from an analogue scale

——————————— compiled by examinent.com ———————————

17. 9702_w21_qp_12 Q: 1

Which row shows what all physical quantities must have?

	magnitude	direction	unit
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✗	✓

——————————— compiled by examinent.com ———————————

18. 9702_S20_qp_11 Q: 1

What is a reasonable estimate of the kinetic energy of a car travelling at a speed of 30 m s^{-1}?

A 10^2 J   **B** 10^4 J   **C** 10^6 J   **D** 10^8 J

——————————— compiled by examinent.com ———————————

19. 9702_S20_qp_12 Q: 1

What is a reasonable estimate of the mass of a raindrop?

A 10^1 kg   **B** 10^{-1} kg   **C** 10^{-3} kg   **D** 10^{-5} kg

20. 9702_S20_qp_13 Q: 1

A man is running a race in a straight line.

What is an approximate value of his kinetic energy?

A   10 J   **B**   100 J   **C**   1000 J   **D**   10 000 J

21. 9702_w20_qp_11 Q: 1

Which quantity is a physical quantity?

A   atomic number

B   efficiency

C   number density of charge carriers

D   strain

22. 9702_S19_qp_13 Q: 4

What is the approximate kinetic energy of an Olympic athlete when running at maximum speed during a 100 m race?

A   400 J   **B**   4000 J   **C**   40 000 J   **D**   400 000 J

23. 9702_w19_qp_11 Q: 1

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

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24. 9702_S18_qp_13 Q: 1

What is the best way of describing a physical quantity?

A a quantity with a magnitude and a direction but no unit

B a quantity with a magnitude and a unit

C a quantity with a magnitude but no direction

D a quantity with a unit but no magnitude

———————————   compiled by examinent.com   ———————————

25. 9702_w18_qp_13 Q: 1

Which statement is **not** a reasonable estimate?

A Atmospheric pressure at sea level is about 1×10^5 Pa.

B Light takes 5×10^2 s to reach us from the Sun.

C The frequency of ultraviolet light is 3×10^{12} Hz.

D The lifespan of a man is about 2×10^9 s.

———————————   compiled by examinent.com   ———————————

26. 9702_S17_qp_11 Q: 1

A student creates a table to show reasonable estimates of some physical quantities.

Which row is **not** a reasonable estimate?

	quantity	value
A	current in a fan heater	12 A
B	mass of an adult person	70 kg
C	speed of an Olympic sprint runner	$10\,\text{m s}^{-1}$
D	water pressure at the bottom of a garden pond	$10^6\,\text{Pa}$

compiled by examinent.com

27. 9702_S17_qp_12 Q: 1

What is the approximate average speed of a winning female Olympic athlete running a 100 m race?

A $6\,\text{m s}^{-1}$ **B** $9\,\text{m s}^{-1}$ **C** $12\,\text{m s}^{-1}$ **D** $15\,\text{m s}^{-1}$

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28. 9702_S17_qp_13 Q: 1

What is the best estimate of the kinetic energy of a family car travelling at $50\,\text{km h}^{-1}$?

A $1.5 \times 10^3\,\text{J}$ **B** $1.5 \times 10^5\,\text{J}$ **C** $1.5 \times 10^7\,\text{J}$ **D** $1.5 \times 10^9\,\text{J}$

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1.2   SI units

29. 9702_m24_qp_12 Q: 1

Which row shows a physical quantity and its base unit in the SI system?

	quantity	unit
A	current	A
B	force	N
C	mass	g
D	temperature	°C

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30. 9702_s24_qp_11 Q: 2

Which of the following could have the same units as force?

A $\dfrac{\text{energy}}{\text{distance}}$

B $\dfrac{\text{energy}}{\text{time}}$

C momentum × distance

D momentum × time

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31. 9702_s24_qp_13 Q: 1

What is equal to 0.000005 J?

A 5 mJ   **B** 5 MJ   **C** 5 μJ   **D** 5 nJ

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32. 9702_m23_qp_12 Q: 2

The relationship between the variables D and T is given by the equation

$$\frac{1}{T} = \frac{b}{\sqrt{D}} + c$$

where b and c are constants.

The unit of D is m^2 and the unit of T is s.

What are the units of b and c?

	unit of b	unit of c
A	m s	s
B	m s^{-1}	s^{-1}
C	m^{-1} s	s
D	m^{-1} s^{-1}	s^{-1}

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33. 9702_S23_qp_11 Q: 1

Which unit is **not** an SI base unit?

A A   **B** kg   **C** C   **D** s

34. 9702_S23_qp_12 Q: 1

A stone sinks in water.

What is a possible value for the density of the stone?

A $8 \times 10^2 \, \text{kg m}^{-3}$

B $2 \times 10^3 \, \text{kg m}^{-3}$

C $8 \times 10^3 \, \text{N m}^{-3}$

D $2 \times 10^4 \, \text{N m}^{-3}$

35. 9702_S23_qp_12 Q: 2

Gm, Tm, μm and pm are all units of length.

Which unit is the largest and which unit is the smallest?

	largest unit	smallest unit
A	Gm	μm
B	Gm	pm
C	Tm	μm
D	Tm	pm

36. 9702_S23_qp_13 Q: 2

What is the ohm expressed in SI base units?

A $\text{kg m}^2 \text{s}^{-3} \text{A}^{-2}$ **B** $\text{kg}^{-1} \text{m}^{-2} \text{s}^3 \text{A}^2$ **C** $\text{J C}^{-1} \text{A}^{-1}$ **D** W A^{-2}

37. 9702_w23_qp_11 Q: 1

What is a reasonable estimate of the cross-sectional area of the wire in a paper clip?

A $1 \times 10^{-3}\,\text{m}^2$ **B** $8 \times 10^{-5}\,\text{m}^2$ **C** $8 \times 10^{-7}\,\text{m}^2$ **D** $1 \times 10^{-9}\,\text{m}^2$

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38. 9702_w23_qp_11 Q: 2

Which quantity is **not** an SI base quantity?

A charge

B mass

C temperature

D time

——————————— compiled by examinent.com ———————————

39. 9702_w23_qp_12 Q: 2

Which quantity is an SI base quantity?

A force

B newton

C second

D time

——————————— compiled by examinent.com ———————————

40. 9702_w23_qp_13 Q: 2

In an electric circuit, an ammeter reads $2\,\mu\text{A}$.

In a second circuit, the ammeter reads $1\,\text{mA}$.

How many times larger is the current in the second circuit compared with the current in the first circuit?

A 500 **B** 5000 **C** 500 000 **D** 5 000 000

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41. 9702_m22_qp_12 Q: 1

What could **not** be a measurement of a physical quantity?

A   10 K   **B**   11 J N^{-1} m^{-1} **C**   17 Pa m^3 N^{-1} **D**   25 T m

_____   compiled by examinent.com   _____

42. 9702_m22_qp_12 Q: 2

A computer memory stick is labelled as having a storage capacity of 128 GB.

The letter B stands for byte, which is a unit.

What is the equivalent storage capacity?

A 1.28×10^8 B

B 1.28×10^{11} B

C 1.28×10^{14} B

D 1.28×10^{17} B

_____   compiled by examinent.com   _____

43. 9702_s22_qp_11 Q: 2

Which two units are identical when expressed in terms of SI base units?

A   J C^{-1} and kg m^2 A^{-1} s^{-2}

B   J s and kg m^2 s^{-1}

C   N m and kg m^3 s^{-2}

D   N s and kg m s^{-3}

_____   compiled by examinent.com   _____

44. 9702_s22_qp_12 Q: 2

What is the symbol for the SI base unit of temperature?

A   C   **B**   K   **C**   °C   **D**   °K

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45. 9702_s22_qp_13 Q: 2

Which list of unit prefixes decreases in magnitude from left to right?

A centi, deci, milli

B deci, milli, centi

C pico, kilo, milli

D kilo, milli, pico

_____   compiled by examinent.com   _____

46. 9702_s22_qp_13 Q: 3

The drag coefficient C_d is a number with no units. It is used to compare the drag on different cars at different speeds. C_d is given by the equation

$$C_d = \frac{2F}{v^n \rho A}$$

where F is the drag force on the car, ρ is the density of the air, A is the cross-sectional area of the car and v is the speed of the car.

What is the value of n?

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

_____   compiled by examinent.com   _____

47. 9702_W22_qp_12 Q: 2

What is a power of 3.7 MW when expressed in kilowatts?

A $3.7 \times 10^{-3}\,\text{kW}$

B $3.7 \times 10^{-3}\,\text{KW}$

C $3.7 \times 10^{3}\,\text{kW}$

D $3.7 \times 10^{3}\,\text{KW}$

_____   compiled by examinent.com   _____

48. 9702_W22_qp_13 Q: 1

A train of mass 600 000 kg moves with a speed of 100 km h^{-1}.

What is the order of magnitude of the kinetic energy of the train?

A 10^6 J   **B** 10^8 J   **C** 10^{10} J   **D** 10^{12} J

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49. 9702_W22_qp_13 Q: 2

What are the SI base units of electromotive force (e.m.f.)?

A $kg\,m^2\,s^{-1}\,A^{-1}$

B $kg\,m^2\,s^{-3}\,A^{-1}$

C $kg\,m^2\,s^{-1}\,A$

D $kg\,m\,s^{-3}\,A^{-1}$

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50. 9702_m21_qp_12 Q: 2

Which physical quantity could have units of $N\,s^2\,m^{-1}$?

A   acceleration

B   force

C   mass

D   momentum

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51. 9702_S21_qp_11 Q: 2

Which combination of units could be used for expressing the power dissipated in a resistor?

A   newton per second (N s^{-1})

B   newton second (N s)

C   newton metre (N m)

D   newton metre per second (N m s^{-1})

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52. 9702_S21_qp_12 Q: 2

Which quantity could have units of $N\,m\,V^{-1}$?

A acceleration

B charge

C current

D resistance

53. 9702_S21_qp_13 Q: 2

What is a unit of momentum?

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

54. 9702_w21_qp_11 Q: 2

The mobility μ of electrons travelling through a metal conductor can be calculated using the equation

$$\mu = \left(\frac{e}{m}\right)\tau$$

where e is the charge on an electron and m is its mass. The average time between the collisions of an electron with the atoms in the metal is τ.

What are the SI base units of μ?

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

55. 9702_w21_qp_12 Q: 2

What is an alternative way of expressing an energy of $43\,dJ$?

A $4.3 \times 10^3\,mJ$

B $4.3 \times 10^3\,MJ$

C $4.3 \times 10^{-3}\,mJ$

D $4.3 \times 10^{-3}\,MJ$

56. 9702_w21_qp_13 Q: 2

What is the unit of resistance when expressed in SI base units?

A $kg^{-1} m^{-2} s A^2$

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

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

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

57. 9702_m20_qp_12 Q: 1

The table shows some measurable quantities.

Which row gives the correct order of magnitude of the measurable quantity in the stated unit?

	measurable quantity	order of magnitude	unit
A	mass of a coin	10^{-4}	kg
B	thickness of a sheet of paper	10^{-2}	m
C	weight of an apple	10^0	N
D	temperature of a person's body	10^1	K

58. 9702_m20_qp_12 Q: 2

A byte (b) comprises 8 bits.

How many bits are there in 1 terabyte (1Tb)?

A 1×10^9 **B** 8×10^9 **C** 1×10^{12} **D** 8×10^{12}

59. 9702_S20_qp_11 Q: 2

The frequency *f* of vibration of a mass *m* supported by a spring with spring constant *k* is given by the equation

$$f = Cm^p k^q$$

where *C* is a constant with no units.

What are the values of *p* and *q*?

	p	q
A	$-\frac{1}{2}$	$-\frac{1}{2}$
B	$-\frac{1}{2}$	$\frac{1}{2}$
C	$\frac{1}{2}$	$-\frac{1}{2}$
D	$\frac{1}{2}$	$\frac{1}{2}$

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60. 9702_S20_qp_13 Q: 2

A sample of gas has a mass of $4.8\,\mu g$ and occupies a volume of $1.2\,dm^3$.

What is the density of the sample of gas?

A $4.0 \times 10^{-3}\,kg\,m^{-3}$

B $4.0 \times 10^{-5}\,kg\,m^{-3}$

C $4.0 \times 10^{-6}\,kg\,m^{-3}$

D $4.0 \times 10^{-8}\,kg\,m^{-3}$

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61. 9702_w20_qp_11 Q: 2

Which time interval is the shortest?

A 0.05 ms   B 50 ns   C 500 000 ps   D 0.5 µs

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62. 9702_w20_qp_12 Q: 2

The speed v of waves on a stretched wire is given by the equation

$$v = T^p \mu^q$$

where T is the tension in the wire and μ is the mass per unit length of the wire.

What are the values of p and q?

	p	q
A	$-\dfrac{1}{2}$	$-\dfrac{1}{2}$
B	$-\dfrac{1}{2}$	$\dfrac{1}{2}$
C	$\dfrac{1}{2}$	$-\dfrac{1}{2}$
D	$\dfrac{1}{2}$	$\dfrac{1}{2}$

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63. 9702_w20_qp_13 Q: 2

What is **not** an SI base unit?

A   coulomb

B   kelvin

C   kilogram

D   second

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64. 9702_S19_qp_11 Q: 1

Which unit can be expressed in base units as $kg\,m^2\,s^{-2}$?

A joule

B newton

C pascal

D watt

65. 9702_S19_qp_11 Q: 2

The luminosity L of a star is given by

$$L = 4\pi r^2 \sigma T^4$$

where

      r is the radius of the star,

      T is the temperature of the star and

      σ is a constant with units $W\,m^{-2}\,K^{-4}$.

What are the SI base units of L?

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

66. 9702_S19_qp_12 Q: 1

What is equivalent to 2000 microvolts?

A $2\,\mu J\,C^{-1}$ **B** $2\,mV$ **C** $2\,pV$ **D** $2000\,mV$

67. 9702_S19_qp_13 Q: 1

Which is an SI base unit?

A current

B gram

C kelvin

D volt

68. 9702_S19_qp_13 Q: 2

Osmium, a naturally occurring element, has a density of $23\,000\,kg\,m^{-3}$.

What is also a value of the density of osmium?

A $2.3 \times 10^4 \, \mu g\,cm^{-3}$

B $2.3 \times 10^4 \, g\,cm^{-3}$

C $2.3\,kg\,cm^{-3}$

D $2.3 \times 10^{-2}\,kg\,cm^{-3}$

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69. 9702_w19_qp_11 Q: 2

The speed of a wave in deep water depends on its wavelength L and the acceleration of free fall g.

What is a possible equation for the speed v of the wave?

A $v = \sqrt{\left(\dfrac{gL}{2\pi}\right)}$ B $v = \dfrac{gL}{4\pi^2}$ C $v = 2\pi\sqrt{\left(\dfrac{g}{L}\right)}$ D $v = \dfrac{2\pi g}{L}$

_____ compiled by examinent.com _____

70. 9702_w19_qp_12 Q: 1

A cyclist has a speed of $5\,m\,s^{-1}$ and a small car has a speed of $12\,m\,s^{-1}$.

Which statement does **not** give a reasonable estimate?

A   The kinetic energy of the cyclist is $1 \times 10^3\,J$.

B   The kinetic energy of the car is $7 \times 10^4\,J$.

C   The momentum of the cyclist is $4 \times 10^2\,kg\,m\,s^{-1}$.

D   The momentum of the car is $2 \times 10^5\,kg\,m\,s^{-1}$.

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71. 9702_w19_qp_12 Q: 2

Which expression gives an SI base quantity?

A charge per unit time

B force per unit area

C mass per unit volume

D work done per unit distance

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72. 9702_w19_qp_13 Q: 1

Which quantity with its unit is correct?

A acceleration of a bicycle = $1.4\,\text{m s}^{-1}$

B electric current in a lamp = $0.25\,\text{A s}^{-1}$

C electric potential difference across a battery = $8.0\,\text{J C}^{-1}$

D kinetic energy of a car = $4500\,\text{N m}^{-1}$

_____ compiled by examinent.com _____

73. 9702_w19_qp_13 Q: 2

Which two units are **not** equivalent to each other?

A N m and $\text{kg m}^2\,\text{s}^{-2}$

B N s and kg m s^{-1}

C J s^{-1} and $\text{kg m}^2\,\text{s}^{-3}$

D Pa and kg m s^{-2}

_____ compiled by examinent.com _____

74. 9702_m18_qp_12 Q: 2

Which row shows a quantity and an **incorrect** unit?

	quantity	unit
A	efficiency	no unit
B	moment of force	$N\,m^{-1}$
C	momentum	$N\,s$
D	work done	J

_____   compiled by examinent.com   _____

75. 9702_S18_qp_12 Q: 1

A sheet of gold leaf has a thickness of $0.125\,\mu m$. A gold atom has a radius of $174\,pm$.

Approximately how many layers of atoms are there in the sheet?

A 4   **B** 7   **C** 400   **D** 700

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76. 9702_S18_qp_12 Q: 2

The drag coefficient C_d is a number with no units. It is used to compare the drag on different cars at different speeds. C_d is given by the equation

$$C_d = \frac{2F}{v^n \rho A}$$

where F is the drag force on the car, ρ is the density of the air, A is the cross-sectional area of the car and v is the speed of the car.

What is the value of n?

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

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77. 9702_w18_qp_11 Q: 1

The radius of the Earth is approximately 6.4×10^6 m, and the radius of the Moon is approximately 1.7×10^6 m. A student wishes to build a scale model of the Solar System in the classroom, using a football of radius 0.12 m to represent the Earth.

Which object would best represent the Moon?

A basketball

B cherry

C golf ball

D tennis ball

78. 9702_w18_qp_11 Q: 2

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** $kg\,s^{-3}$

79. 9702_w18_qp_12 Q: 2

What is the unit of resistance when expressed in SI base units?

A $kg\,m^2\,s^{-2}\,A^{-1}$

B $kg\,m^2\,s^{-3}\,A^{-2}$

C $kg\,m\,s^{-2}\,A^{-1}$

D $kg\,m\,s^{-3}\,A^{-1}$

80. 9702_w18_qp_13 Q: 2

Three of these quantities have the same unit.

Which quantity has a different unit?

A $\dfrac{\text{energy}}{\text{distance}}$

B   force

C   power × time

D   rate of change of momentum

81. 9702_m17_qp_12 Q: 1

Which expression has the same SI base units as pressure?

A $\dfrac{\text{force}}{\text{length} \times \text{speed}}$

B $\dfrac{\text{force}}{\text{length} \times \text{time}}$

C $\dfrac{\text{mass}}{\text{length} \times (\text{time})^2}$

D $\dfrac{\text{mass} \times (\text{time})^2}{\text{length}}$

82. 9702_m17_qp_12 Q: 2

What is an approximate value for the speed of sound in air?

A $30\,\text{m s}^{-1}$ **B** $300\,\text{m s}^{-1}$ **C** $30\,000\,\text{m s}^{-1}$ **D** $300\,000\,000\,\text{m s}^{-1}$

83. 9702_S17_qp_11 Q: 3

The speed *v* of a liquid leaving a tube depends on the change in pressure ΔP and the density ρ of the liquid. The speed is given by the equation

$$v = k\left(\frac{\Delta P}{\rho}\right)^n$$

where *k* is a constant that has no units.

What is the value of *n*?

A $\dfrac{1}{2}$ **B** 1 **C** $\dfrac{3}{2}$ **D** 2

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84. 9702_S17_qp_12 Q: 3

What correctly expresses the volt in terms of SI base units?

A $A\,\Omega$

B $W\,A^{-1}$

C $kg\,m^2\,s^{-1}\,A^{-1}$

D $kg\,m^2\,s^{-3}\,A^{-1}$

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85. 9702_S17_qp_13 Q: 3

Which expression using SI base units is equivalent to the volt?

A $kg\,m^2\,s^{-1}\,A^{-1}$

B $kg\,m\,s^{-2}\,A$

C $kg\,m^2\,s^{-1}\,A$

D $kg\,m^2\,s^{-3}\,A^{-1}$

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86. 9702_W17_qp_11 Q: 1

Which SI unit, expressed in base units, is **not** correct?

A   unit of force, $kg\,m\,s^{-2}$

B   unit of momentum, $kg\,m\,s^{-1}$

C   unit of pressure, $kg\,m^{-2}\,s^{-2}$

D   unit of work, $kg\,m^2\,s^{-2}$

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87. 9702_W17_qp_12 Q: 1

Which pair of units are **not** the same when expressed in SI base units?

A $m\,s^{-2}$ and $N\,kg^{-1}$

B $N\,s$ and $kg\,m\,s^{-1}$

C Pa and $N\,m^{-2}$

D $V\,m^{-2}$ and $N\,C^{-1}$

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88. 9702_W17_qp_12 Q: 3

The units of specific heat capacity are $J\,kg^{-1}\,K^{-1}$.

What are the SI base units of specific heat capacity?

A $m\,s^{-2}\,K^{-1}$ **B** $m\,s^{-1}\,K^{-1}$ **C** $m^2\,s^{-2}\,K^{-1}$ **D** $m^2\,s^{-1}\,K^{-1}$

_____   compiled by examinent.com   _____

89. 9702_W17_qp_13 Q: 1

How many cubic nanometres, nm^3, are in a cubic micrometre, μm^3?

A 10^3 **B** 10^6 **C** 10^9 **D** 10^{12}

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90. 9702_W17_qp_13 Q: 2

The maximum theoretical power *P* of a wind turbine is given by the equation

$$P = k\rho Av^n$$

where ρ is the density of air, *A* is the area swept by the turbine blades, *v* is the speed of the air and *k* is a constant with no units.

What is the value of *n*?

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

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1.3   Errors and uncertainties

91. 9702_s24_qp_11 Q: 6

A thermometer can be read to an accuracy of ±0.5 °C. This thermometer is used to measure a temperature rise from 40 °C to 100 °C.

What is the percentage uncertainty in the measurement of the temperature rise?

A 0.5% **B** 0.8% **C** 1.3% **D** 1.7%

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92. 9702_s24_qp_12 Q: 2

The value of quantity *X* has a percentage uncertainty of 2%.

The value of quantity *Y* has a percentage uncertainty of 4%.

The value of a quantity *W* is calculated from the values of *X* and *Y*.

The value of *W* has a percentage uncertainty of 8%.

What could be the relationship between *W*, *X* and *Y*?

A $W = XY$ **B** $W = 2XY$ **C** $W = \dfrac{X}{Y^2}$ **D** $W = \dfrac{Y}{X^2}$

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93. 9702_s24_qp_13 Q: 2

The measurement of a physical quantity may be subject to random errors and to systematic errors.

Which statement is correct?

A   A systematic error **cannot** be reduced by adjusting the apparatus.

B   A systematic error results in a different reading each time the measurement is taken.

C   Random errors are always caused by the person taking the measurement.

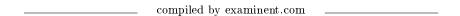**D**   Random errors can be reduced by taking the average of several measurements.

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94. 9702_s24_qp_13 Q: 3

The Young modulus of the material of a wire is to be found. The Young modulus E is given by the equation shown.

$$E = \frac{4FL}{\pi d^2 x}$$

The wire is extended by a known force and the following measurements are made.

Which measurement has the largest effect on the uncertainty in the value of the calculated Young modulus?

	measurement	symbol	value
A	length of wire before force applied	L	$2.043 \pm 0.002\,$m
B	diameter of wire	d	$0.54 \pm 0.02\,$mm
C	force applied	F	$19.62 \pm 0.01\,$N
D	extension of wire with force applied	x	$5.2 \pm 0.2\,$mm

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Appendix A

Answers

SN	Paper	Q. No.	Answer		SN	Paper	Q. No.	Answer
1	9702_s24_qp_12	8	A		50	9702_m21_qp_12	2	C
2	9702_m23_qp_12	1	C		51	9702_S21_qp_11	2	D
3	9702_S23_qp_11	2	B		52	9702_S21_qp_12	2	B
4	9702_S23_qp_13	1	C		53	9702_S21_qp_13	2	C
5	9702_w23_qp_12	1	B		54	9702_w21_qp_11	2	B
6	9702_w23_qp_13	1	B		55	9702_w21_qp_12	2	A
7	9702_s22_qp_11	1	D		56	9702_w21_qp_13	2	D
8	9702_s22_qp_12	1	C		57	9702_m20_qp_12	1	C
9	9702_s22_qp_13	1	D		58	9702_m20_qp_12	2	D
10	9702_W22_qp_11	1	C		59	9702_S20_qp_11	2	B
11	9702_W22_qp_12	1	D		60	9702_S20_qp_13	2	C
12	9702_m21_qp_12	1	D		61	9702_w20_qp_11	2	B
13	9702_S21_qp_11	1	A		62	9702_w20_qp_12	2	C
14	9702_S21_qp_12	1	D		63	9702_w20_qp_13	2	A
15	9702_S21_qp_13	1	C		64	9702_S19_qp_11	1	A
16	9702_w21_qp_11	1	B		65	9702_S19_qp_11	2	C
17	9702_w21_qp_12	1	C		66	9702_S19_qp_12	1	B
18	9702_S20_qp_11	1	C		67	9702_S19_qp_13	1	C
19	9702_S20_qp_12	1	D		68	9702_S19_qp_13	2	D
20	9702_S20_qp_13	1	C		69	9702_w19_qp_11	2	A
21	9702_w20_qp_11	1	C		70	9702_w19_qp_12	1	D
22	9702_S19_qp_13	4	B		71	9702_w19_qp_12	2	A
23	9702_w19_qp_11	1	D		72	9702_w19_qp_13	1	C
24	9702_S18_qp_13	1	B		73	9702_w19_qp_13	2	D
25	9702_w18_qp_13	1	C		74	9702_m18_qp_12	2	B
26	9702_S17_qp_11	1	D		75	9702_S18_qp_12	1	C
27	9702_S17_qp_12	1	B		76	9702_S18_qp_12	2	B
28	9702_S17_qp_13	1	B		77	9702_w18_qp_11	1	D
29	9702_m24_qp_12	1	A		78	9702_w18_qp_11	2	D
30	9702_s24_qp_11	2	A		79	9702_w18_qp_12	2	B
31	9702_s24_qp_13	1	C		80	9702_w18_qp_13	2	C
32	9702_m23_qp_12	2	B		81	9702_m17_qp_12	1	C
33	9702_S23_qp_11	1	C		82	9702_m17_qp_12	2	B
34	9702_S23_qp_12	1	B		83	9702_S17_qp_11	3	A
35	9702_S23_qp_12	2	D		84	9702_S17_qp_12	3	D
36	9702_S23_qp_13	2	A		85	9702_S17_qp_13	3	D
37	9702_w23_qp_11	1	C		86	9702_W17_qp_11	1	C
38	9702_w23_qp_11	2	A		87	9702_W17_qp_12	1	D
39	9702_w23_qp_12	2	D		88	9702_W17_qp_12	3	C
40	9702_w23_qp_13	2	A		89	9702_W17_qp_13	1	C
41	9702_m22_qp_12	1	B		90	9702_W17_qp_13	2	C
42	9702_m22_qp_12	2	B		91	9702_s24_qp_11	6	D
43	9702_s22_qp_11	2	B		92	9702_s24_qp_12	2	D
44	9702_s22_qp_12	2	B		93	9702_s24_qp_13	2	D
45	9702_s22_qp_13	2	D		94	9702_s24_qp_13	3	B
46	9702_s22_qp_13	3	B		95	9702_m23_qp_12	3	A
47	9702_W22_qp_12	2	C		96	9702_S23_qp_11	3	D
48	9702_W22_qp_13	1	B		97	9702_S23_qp_12	3	D
49	9702_W22_qp_13	2	B		98	9702_S23_qp_13	3	D

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