

# PHYSICS

HL

PAPER 1

2017 — 2024

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1 - (PHYSI/11\_HL\_Summer\_2017\_Q1) - *Measurements & Uncertainties*

What is the unit of electrical energy in fundamental SI units?

- A.  $\text{kg m}^2 \text{C}^{-1} \text{s}$
- B.  $\text{kg m s}^{-2}$
- C.  $\text{kg m}^2 \text{s}^{-2}$
- D.  $\text{kg m}^2 \text{s}^{-1} \text{A}$

2 - (PHYSI/12\_HL\_Summer\_2017\_Q1) - *Measurements & Uncertainties*

A stone falls from rest to the bottom of a water well of depth  $d$ . The time  $t$  taken to fall is  $2.0 \pm 0.2$  s.

The depth of the well is calculated to be 20 m using  $d = \frac{1}{2} at^2$ . The uncertainty in  $a$  is negligible.

What is the absolute uncertainty in  $d$ ?

- A.  $\pm 0.2$  m
- B.  $\pm 1$  m
- C.  $\pm 2$  m
- D.  $\pm 4$  m

3 - (PHYSI/12\_HL\_Summer\_2017\_Q25) - *Measurements & Uncertainties*

Which of the following leads to a paradigm shift?

- A. Multi-loop circuits
- B. Standing waves
- C. Total internal reflection
- D. Atomic spectra

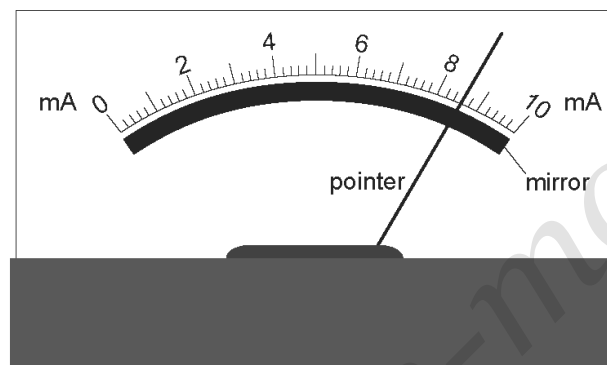
4 - (PHYSI/10\_HL\_Winter\_2017\_Q1) - *Measurements & Uncertainties*

What is a correct value for the charge on an electron?

- A.  $1.60 \times 10^{-12} \mu\text{C}$
- B.  $1.60 \times 10^{-15} \text{mC}$
- C.  $1.60 \times 10^{-22} \text{kC}$
- D.  $1.60 \times 10^{-24} \text{MC}$

5 - (PHYSI/10\_HL\_Winter\_2017\_Q2) - *Measurements & Uncertainties*

The diagram shows an analogue meter with a mirror behind the pointer.



What is the main purpose of the mirror?

- A. To provide extra light when reading the scale
- B. To reduce the risk of parallax error when reading the scale
- C. To enable the pointer to be seen from different angles
- D. To magnify the image of the pointer

6 - (PHYSI/11\_HL\_Summer\_2018\_Q1) - *Measurements & Uncertainties*

A student measures the radius  $r$  of a sphere with an absolute uncertainty  $\Delta r$ . What is the fractional uncertainty in the volume of the sphere?

- A.  $\left(\frac{\Delta r}{r}\right)^3$
- B.  $3\frac{\Delta r}{r}$
- C.  $4\pi\frac{\Delta r}{r}$
- D.  $4\pi\left(\frac{\Delta r}{r}\right)^3$

7 - (PHYSI/12\_HL\_Summer\_2018\_Q1) - *Measurements & Uncertainties*

What is the best estimate for the diameter of a helium nucleus?

- A.  $10^{-21}$  m
- B.  $10^{-18}$  m
- C.  $10^{-15}$  m
- D.  $10^{-10}$  m

8 - (PHYSI/10\_HL\_Winter\_2018\_Q1) - *Measurements & Uncertainties*

The length of the side of a cube is  $2.0 \text{ cm} \pm 4\%$ . The mass of the cube is  $24.0 \text{ g} \pm 8\%$ . What is the percentage uncertainty of the density of the cube?

- A.  $\pm 2\%$
- B.  $\pm 8\%$
- C.  $\pm 12\%$
- D.  $\pm 20\%$

9 - (PHYSI/11\_HL\_Summer\_2019\_Q1) - *Measurements & Uncertainties*

A student is verifying the equation

$$x = \frac{2\lambda Y}{z}$$

The percentage uncertainties are:

Quantity	Uncertainty
$\lambda$	$\pm 10\%$
$Y$	$\pm 0.05\%$
$z$	$\pm 5\%$

What is the percentage uncertainty in  $x$ ?

- A. 5%
- B. 15%
- C. 25%
- D. 30%

10 - (PHYSI/11\_HL\_Summer\_2019\_Q2) - *Measurements & Uncertainties*

A student models the relationship between the pressure  $p$  of a gas and its temperature  $T$  as  $p = x + yT$ .

The units of  $p$  are pascal and the units of  $T$  are kelvin. What are the fundamental SI units of  $x$  and  $y$ ?

	$x$	$y$
A.	$\text{kg m}^{-1} \text{s}^{-2}$	$\text{kg m}^{-1} \text{s}^{-2} \text{K}^{-1}$
B.	$\text{kg m}^{-1} \text{s}^{-2}$	$\text{K}^{-1}$
C.	$\text{K}$	$\text{kg m}^{-1} \text{s}^{-2} \text{K}^{-1}$
D.	$\text{K}$	$\text{K}^{-1}$

11 - (PHYSI/12\_HL\_Summer\_2019\_Q1) - *Measurements & Uncertainties*

A student measures the radius  $R$  of a circular plate to determine its area. The absolute uncertainty in  $R$  is  $\Delta R$ .

What is the **fractional** uncertainty in the area of the plate?

- A.  $\frac{2\Delta R}{R}$
- B.  $\left(\frac{\Delta R}{R}\right)^2$
- C.  $\frac{2\pi\Delta R}{R}$
- D.  $\pi\left(\frac{\Delta R}{R}\right)^2$

12 - (PHYSI/12\_HL\_Summer\_2019\_Q2) - *Measurements & Uncertainties*

A proton has momentum  $10^{-20} \text{ N s}$  and the uncertainty in the position of the proton is  $10^{-10} \text{ m}$ . What is the minimum **fractional** uncertainty in the momentum of this proton?

- A.  $5 \times 10^{-25}$
- B.  $5 \times 10^{-15}$
- C.  $5 \times 10^{-5}$
- D.  $2 \times 10^4$

# ANSWERS

[www.exam-integrate.com](http://www.exam-integrate.com)

1 - (PHYSI/11\_HL\_Summer\_2017\_Q1) - *Measurements & Uncertainties*

C

2 - (PHYSI/12\_HL\_Summer\_2017\_Q1) - *Measurements & Uncertainties*

D

3 - (PHYSI/12\_HL\_Summer\_2017\_Q25) - *Measurements & Uncertainties*

D

4 - (PHYSI/10\_HL\_Winter\_2017\_Q1) - *Measurements & Uncertainties*

C

5 - (PHYSI/10\_HL\_Winter\_2017\_Q2) - *Measurements & Uncertainties*

B

6 - (PHYSI/11\_HL\_Summer\_2018\_Q1) - *Measurements & Uncertainties*

B

7 - (PHYSI/12\_HL\_Summer\_2018\_Q1) - *Measurements & Uncertainties*

C

8 - (PHYSI/10\_HL\_Winter\_2018\_Q1) - *Measurements & Uncertainties*

D

9 - (PHYSI/11\_HL\_Summer\_2019\_Q1) - *Measurements & Uncertainties*

B

10 - (PHYSI/11\_HL\_Summer\_2019\_Q2) - *Measurements & Uncertainties*

A