IB DIPLOMA Topical Past Papers

PHYSICS

HL

PAPER 1

2017 — 2023

1 – (PHYSI/11_HL_Summer_2017_Q1) – *Measurements & Uncertainties*

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

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

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

C. $\mathrm{kg\,m^2s^{-2}}$

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

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 ± 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. ± 0.2 m

B. ± 1 m

C. ± 2 m

D. ± 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. 1.60×10^{-12} μC

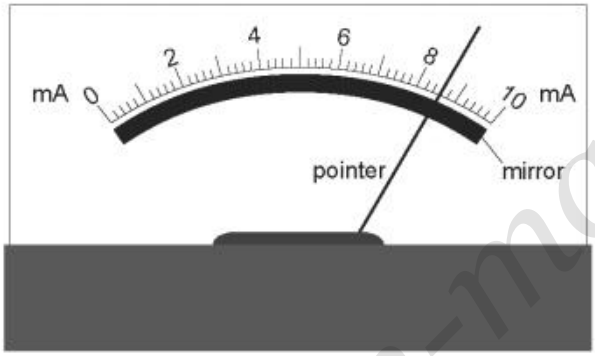
B. 1.60×10^{-15} mC

C. 1.60×10^{-22} kC

D. 1.60×10^{-24} 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 Δr. 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 cm ± 4%. The mass of the cube is 24.0 g ±8%. What is the percentage uncertainty of the density of the cube?

A. ±2%

B. ±8%

C. ±12%

D. ±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
λ	±10%
Y	±0.05%
z	±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.	$\text{kg m}^{-1}\text{s}^{-2}$	K^{-1}
C.	K	$\text{kg m}^{-1}\text{s}^{-2}\text{K}^{-1}$
D.	K	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 ΔR.

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

A. 5×10^{-25}

B. 5×10^{-15}

C. 5×10^{-5}

D. 2×10^{4}

ANSWERS

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