# A-Level Physics

## Measurements and Their Errors (Multiple Choice)

### Question Paper

**Time available: 22 minutes**
**Marks available: 20 marks**

**1.** Which row only contains SI fundamental base units?

**A** A, kg, N, s ⬭

**B** A, K, mol, s ⬭

**C** C, kg, m, mol ⬭

**D** J, K, m, s ⬭

**(Total 1 mark)**

**2.** Which gives SI prefixes in descending order of magnitude?

**A** G p m ⬭

**B** M G n ⬭

**C** m n µ ⬭

**D** m µ p ⬭

**(Total 1 mark)**

**3.** A car travels at $100\ \text{km h}^{-1}$ on a motorway.

What is an estimate of its kinetic energy?

**A** $10^4$ J ⬭

**B** $10^6$ J ⬭

**C** $10^8$ J ⬭

**D** $10^{10}$ J ⬭

**(Total 1 mark)**

**4.** Which is approximately equal to 3 kW h?

**A** $3 \times 10^3$ J ⬭

**B** $1 \times 10^4$ J ⬭

**C** $2 \times 10^5$ J ⬭

**D** $1 \times 10^7$ J ⬭

**(Total 1 mark)**

**5.** Which is the shortest distance?

**A** $10^{-19}$ Gm ⬭

**B** $10^{-14}$ km ⬭

**C** $10^{-4}$ μm ⬭

**D** $10^7$ fm ⬭

**(Total 1 mark)**

**6.** Which row shows SI unit prefixes in order of smallest value to largest value?

| | **Smallest** | | | **Largest** | |
|---|---|---|---|---|---|
| **A** | p | n | c | μ | ⬭ |
| **B** | p | n | μ | c | ⬭ |
| **C** | n | p | c | μ | ⬭ |
| **D** | n | p | μ | c | ⬭ |

**(Total 1 mark)**

**7.** Mechanical power

**A** is a vector quantity. ⬭

**B** is measured in J. ⬭

**C** has base units of kg $m^2$ $s^{-3}$. ⬭

**D** can be calculated from force × distance moved. ⬭

**(Total 1 mark)**

**8.** Water waves of wavelength $\lambda$ and wave speed $v$ are related by $v = \sqrt{k\lambda}$ where $k$ is a constant.

What is a possible SI unit for $k$?

**A** m $s^{-2}$ ⬭

**B** m $s^{-1}$ ⬭

**C** $m^{\frac{3}{2}} s^{-1}$ ⬭

**D** $m^{\frac{1}{2}} s^{-1}$ ⬭

**(Total 1 mark)**

**9.** Which quantities can be written in the fundamental units kg $m^{-1}$ $s^{-2}$?

**A** Tensile stress and kinetic energy ⬭

**B** The moment of a force and kinetic energy ⬭

**C** Young modulus and the moment of a force ⬭

**D** Young modulus and tensile stress ⬭

**(Total 1 mark)**

**10.** What is the approximate average kinetic energy of a cyclist in a race?

**A** 10 J ⬭

**B** 10 kJ ⬭

**C** 10 MJ ⬭

**D** 10 TJ ⬭

**(Total 1 mark)**

**11.** Which is a correct statement about mechanical power?

**A** It is a vector quantity. ⬭

**B** It is measured in J. ⬭

**C** In fundamental units, its unit is kg $m^2$ $s^{-3}$ ⬭

**D** It can be calculated from force × distance moved. ⬭

**(Total 1 mark)**

**12.** Measurements are made to determine the tension, length and mass per unit length of a string stretched between two supports. The percentage uncertainties in these measurements are shown below.

| Quantity | Percentage uncertainty |
|---|---|
| Length | 0.80% |
| Tension | 4.0% |
| Mass per unit length | 2.0% |

A stationary wave is formed on the string.

What is the percentage uncertainty in the calculated value of the frequency of the first harmonic?

**A** 1.8% ⬭

**B** 3.8% ⬭

**C** 6.8% ⬭

**D** 13% ⬭

**(Total 1 mark)**

**13.** Which list puts the forces in order of increasing magnitude?

**A** 2 pN < 2 fN < 2 TN < 2 GN ⬭

**B** 2 pN < 2 fN < 2 GN < 2 TN ⬭

**C** 2 fN < 2 pN < 2 TN < 2 GN ⬭

**D** 2 fN < 2 pN < 2 GN < 2 TN ⬭

**(Total 1 mark)**

**14.** 1.0 kilowatt-hour (kW h) is equivalent to

**A** $6.3 \times 10^{18}$ eV ⬭

**B** $6.3 \times 10^{21}$ eV ⬭

**C** $2.3 \times 10^{22}$ eV ⬭

**D** $2.3 \times 10^{25}$ eV ⬭

**(Total 1 mark)**

**15.** Which is equivalent to the ohm?

**A** $J\ C^{-2}\ s^{-1}$ ⬭

**B** $J\ C^{-2}\ s$ ⬭

**C** $J\ s$ ⬭

**D** $J\ s^{-1}$ ⬭

**(Total 1 mark)**

**16.** A student carries out an experiment to determine the resistivity of a metal wire.
She determines the resistance from measurements of potential difference between the ends of the wire and the corresponding current. She measures the length of the wire with a ruler and the diameter of the wire using a micrometer. Each measurement is made with an uncertainty of 1%

Which measurement gives the largest uncertainty in the calculated value of the resistivity?

**A** current ⬭

**B** diameter ⬭

**C** length ⬭

**D** potential difference ⬭

**(Total 1 mark)**

**17.** What is a correct unit for the area under a force−time graph?

**A** N m ⬭

**B** $kg\ m\ s^{-1}$ ⬭

**C** $kg\ m\ s^{-2}$ ⬭

**D** $N\ s^{-1}$ ⬭

**(Total 1 mark)**

**18.** The units of physical quantities can be expressed in terms of the fundamental (base) units of the SI system. In which line in the table are the fundamental units correctly matched to the physical quantity?

| | Physical quantity | Fundamental units | |
|---|---|---|---|
| **A** | charge | A $s^{-1}$ | ⬭ |
| **B** | power | kg $m^2$ $s^{-3}$ | ⬭ |
| **C** | potential difference | kg $m^2$ s $A^{-1}$ | ⬭ |
| **D** | energy | kg $m^2$ $s^{-1}$ | ⬭ |

**(Total 1 mark)**

**19.** In which of the following do both quantities have the same unit?

**A** Electrical resistivity and electrical resistance. ⬭

**B** Work function Planck constant ⬭

**C** Pressure and the Young modulus. ⬭

**D** Acceleration and rate of change of momentum. ⬭

**(Total 1 mark)**

**20.** Which of the following is a possible unit for rate of change of momentum?

**A** N s

**B** N $s^{-1}$

**C** kg $ms^{-1}$

**D** kg $ms^{-2}$

**(Total 1 mark)**