17 Researchers have developed a new type of filament lamp with an efficiency of 40%. Old-type filament lamps have an efficiency of 5.0%. The two types of lamp produce the same useful output power.

input power to new type of lamp 2 What is the ratio input power to old type of lamp

- **A** 0.13
- **B** 0.63
- **C** 1.6
- **D** 8.0
- 18 A student attempts to derive the formula for kinetic energy $E_{\rm K}$. She begins by considering an object of mass m which is initially at rest. A constant force F applied to the object causes it to accelerate to final velocity v in displacement s. The kinetic energy gained by the object is equal to the work done on the object by the force *F*.

Which equation would the student **not** need in order to derive the formula for E_K ?

- \mathbf{A} F = ma

- **B** W = Fs **C** $E = \frac{1}{2}Fs$ **D** $v^2 = u^2 + 2as$
- **19** A metal wire obeys Hooke's law and has a Young modulus of 2.0×10^{11} Pa. The wire has an original length of 1.6 m and a diameter of 0.48×10^{-3} m.

What is the spring constant of the wire?

- **A** $7.2 \times 10^3 \, \text{N m}^{-1}$
- **B** $2.3 \times 10^4 \, \text{N m}^{-1}$
- $C = 2.9 \times 10^4 \, \text{N m}^{-1}$
- **D** $9.0 \times 10^4 \,\mathrm{N}\,\mathrm{m}^{-1}$
- **20** A wire is being stretched by a tensile force.

Which statement about the elastic limit **must** be correct?

- The deformation is plastic after the elastic limit has been reached. Α
- В The deformation is plastic until the elastic limit is reached.
- C The extension is proportional to the tensile force after the elastic limit has been reached.
- The extension is proportional to the tensile force until the elastic limit is reached. D
- 21 Which statement is correct for all types of progressive wave?
 - Α The distance from a peak to the next trough is equal to a wavelength.
 - В They can be demonstrated in ripple tanks.
 - C They consist of vibrating atoms.
 - They transfer energy from one position to another. D