

Solutions

Each answer shows the steps, then the **result**.

2.1

- $v = \omega r = 5 \times 0.4 = 2 \text{ m s}^{-1}$

2.2

- Zero (instantaneously at rest)

2.3

- $\frac{1}{2}mv^2$ (translational) and $\frac{1}{2}I\omega^2$ (rotational)

2.4

- $\omega = v/r = 2/0.1 = 20 \text{ rad s}^{-1}$

3.1 B

- $v = \omega r$

3.2 C

- the solid sphere (smallest rotational inertia per mr^2) wins

3.3

(a)

- The solid disc

(b)

- The hoop puts more energy into spin (larger I), leaving less for speed, so it is slower

3.4

(a)

- $\omega = v/r = 6/0.2 = 30 \text{ rad s}^{-1}$

(b)

- $v = \omega r$ no longer holds — the speeds decouple