

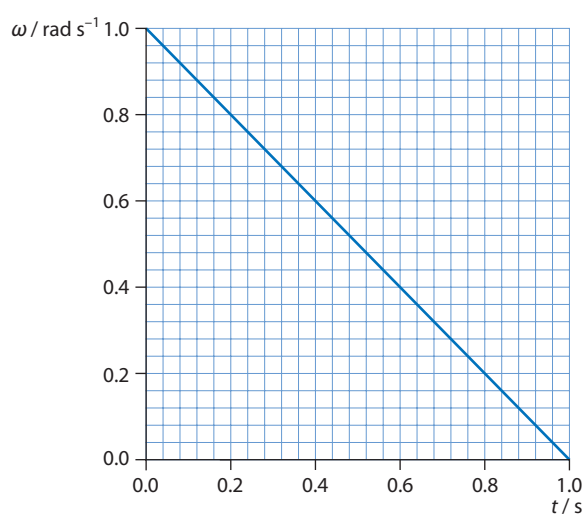
Self-test questions

Option B (HL)

- 1 A disc rotates about a vertical axis through its centre. The initial angular speed of the disc is 20 rad s^{-1} . It comes to rest after 40 revolutions. What is the angular deceleration of the disc?

- A $\frac{5}{2\pi} \text{ rad s}^{-2}$
- B $\frac{5}{2} \text{ rad s}^{-2}$
- C 5 rad s^{-2}
- D $\frac{5\pi}{2} \text{ rad s}^{-2}$

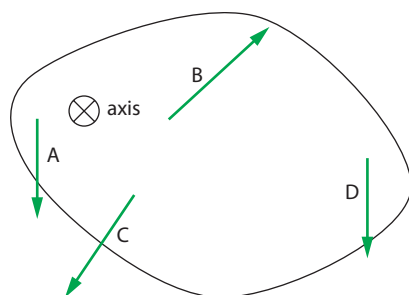
- 2 The graph below shows how the angular speed of a rotating body varies with time.



What do the slope and the area under the graph represent?

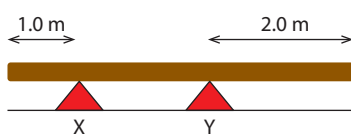
	Slope	Area
A	angular acceleration	distance travelled
B	angular acceleration	angle swept
C	linear acceleration	distance travelled
D	linear acceleration	angle swept

- 3 Which force has the greatest torque about the axis shown?



- A
- B
- C
- D

- 4 A uniform rod of length 5.0 m and weight 600 N is balanced on two supports as shown in the figure below.



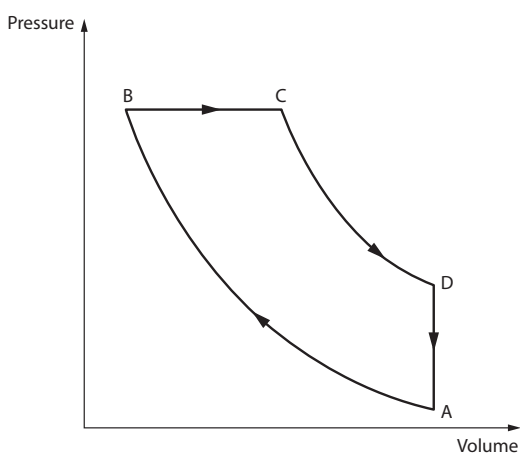
What are the forces at the two supports X and Y?

	$\frac{F_X}{N}$	$\frac{F_Y}{N}$
A	300	300
B	150	450
C	400	200
D	200	400

- 5 A sphere of mass M and radius R rolls without slipping down an inclined plane which makes an angle θ with the horizontal. (The moment of inertia of a sphere about its axis is $\frac{2}{5}MR^2$.)

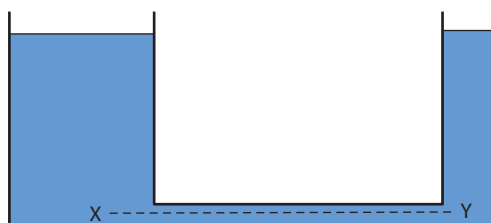
What is the linear acceleration of the sphere?

- A $g \sin \theta$
 B $\frac{2}{3}g \sin \theta$
 C $\frac{5}{7}g \sin \theta$
 D $\frac{5}{2}g \sin \theta$
- 6 A monatomic ideal gas is heated at a constant pressure of p so that the volume changes by ΔV . How much heat is provided to the gas?
- A $p\Delta V$
 B $\frac{5}{2}p\Delta V$
 C $\frac{3}{2}p\Delta V$
 D $\frac{1}{2}p\Delta V$
- 7 In the pressure–volume diagram below, AB and CD are adiabatics. In which leg(s) is heat given to or taken out of the gas?



	Heat in	Heat out
A	BC and CD	DA and AB
B	DA	BC
C	DA and AB	BC and CD
D	BC	DA

- 8 An ice cube floats in a glass of water. The ice cube melts. What will happen to the level of the water in the glass?
- A** It will stay the same.
B It will decrease.
C It will increase.
D It will increase, decrease or stay the same, depending on the volume of water in the glass.
- 9 The figure below shows two connected columns with differing cross-sectional areas, filled with an ideal fluid. The cross-sectional area of the left-hand column is 5 times greater than the cross-sectional area of the right-hand column.



How do the pressures and densities at X and Y compare?

	Pressure	Density
A	$p_X = 5 p_Y$	$\rho_X = 5 \rho_Y$
B	$p_X = 5 p_Y$	$\rho_X = \rho_Y$
C	$p_X = p_Y$	$\rho_X = 5 \rho_Y$
D	$p_X = p_Y$	$\rho_X = \rho_Y$

- 10 A system whose natural frequency of oscillations is f_0 is subjected to damping and to an externally applied periodic force of frequency f . Under what conditions will the amplitude of oscillations be the largest?

	Damping	Frequency
A	light	$f = f_0$
B	light	$f > f_0$
C	heavy	$f = f_0$
D	heavy	$f > f_0$