Self-test questions

Option B (SL)

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

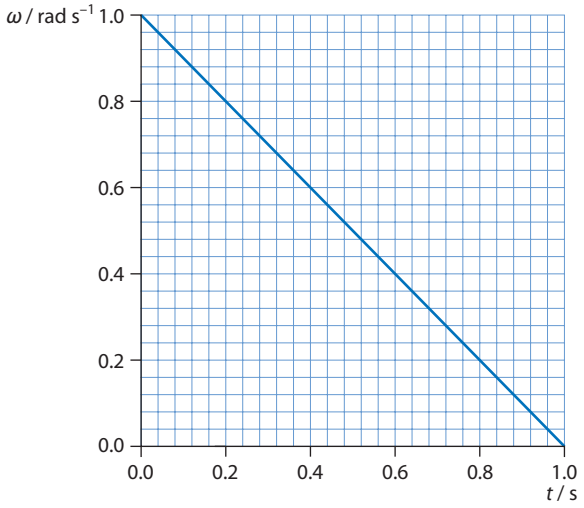
A $\frac{5}{2\pi}\,\text{rad}\,\text{s}^{-2}$

B $\frac{5}{2}\,\text{rad}\,\text{s}^{-2}$

C $5\,\text{rad}\,\text{s}^{-2}$

D $\frac{5\pi}{2}\,\text{rad}\,\text{s}^{-2}$

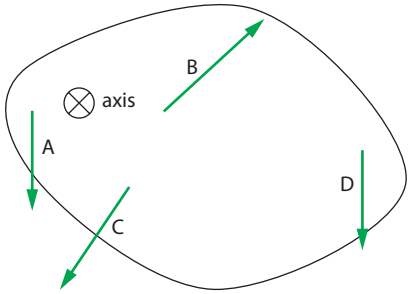
2 The graph below shows how the angular speed of a rotating body varies with time.



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?



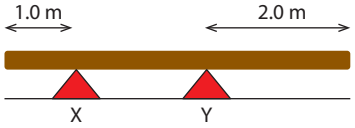
A

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?

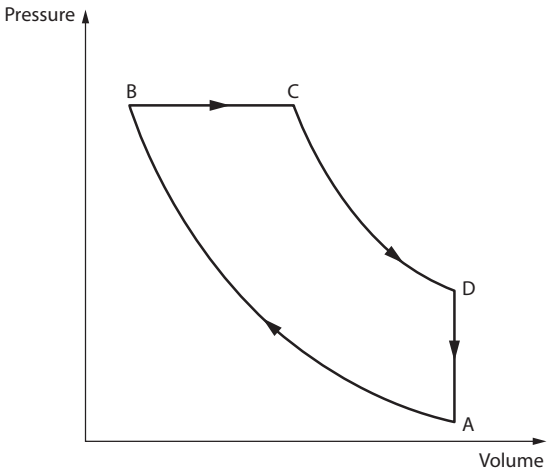
A $p\Delta V$

B $\frac{5}{2}p\Delta V$

C $\frac{3}{2}p\Delta V$

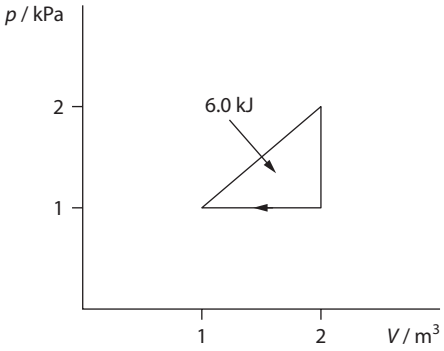
D $\frac{1}{2}p\Delta V$

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 What is the efficiency of an engine working on the cycle shown in the figure below? The heat provided to the engine is 6.0 kJ.



A $\frac{1}{12}$

B $\frac{1}{4}$

C $\frac{1}{2}$

D 1

9 Which of the following statements is correct about an adiabatic expansion of an ideal gas?

A The internal energy remains constant.

B The pressure remains constant.

C No work is being done.

D The temperature decreases.

10 A quantity of heat Q is provided to an ideal gas at constant volume. The change in temperature is $\Delta\vartheta$. The gas does work W in expanding. How much heat must be provided to the same quantity of another ideal gas at constant pressure so that the change in temperature is $\Delta\vartheta$?

A Q

B $Q+W$

C $Q-W$

D W