Quiz A5

Rigid body mechanics

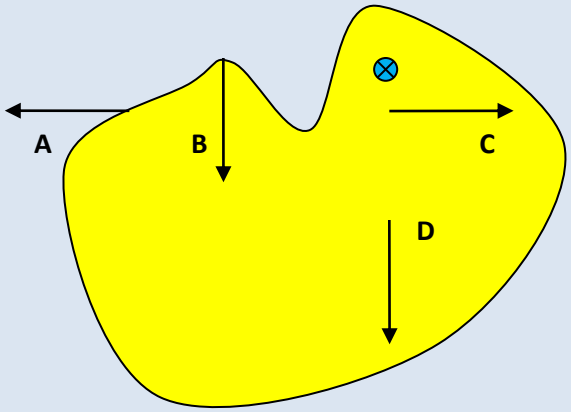
1. A wheel rotates at angular speed 40 rad s^{-1}. The wheel experiences an angular deceleration 2.0 rad s^{-2}. How many revolutions does the wheel make until it stops rotating?

A 400 **B** 200 **C** $\frac{400}{\pi}$ **D** $\frac{200}{\pi}$

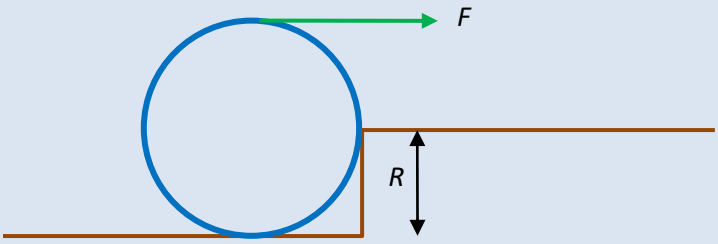
2. A wheel rotating at 2.0 rad s^{-1} accelerates to 12 rad s^{-1} in 4.0 s. By what angle, in radians, did the wheel turn during the 4.0 s?

A 14 **B** 24 **C** 28 **D** 56

3. Forces of equal magnitude act on a rigid body. In which case is the torque provided about the given axis the largest?



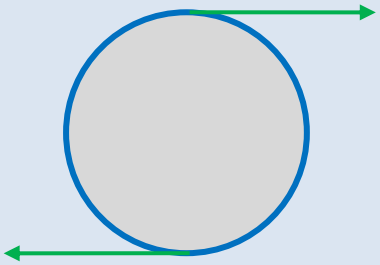
4. A horizontal force *F* acts on a wheel of mass *M* as shown, in order to move the wheel over the step. The height of the step is equal to the radius *R* of the wheel.



What is the minimum magnitude of *F* such that the sphere goes over the step?

A $\frac{Mg}{2}$ **B** Mg **C** $2Mg$ **D** $4Mg$

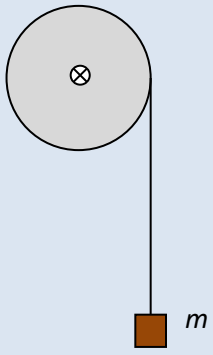
5. Two equal forces of magnitude 25 N act as shown on a ring of mass 5.0 kg and radius 0.20 m. The ring is in the vacuum of deep space.



What is the initial angular acceleration of the ring and what is the initial linear acceleration of the centre of mass of the ring?

	Angular acceleration	Linear acceleration
A	50 rad s^{-2}	0
B	50 rad s^{-2}	10 m s^{-2}
C	25 rad s^{-2}	0
D	25 rad s^{-2}	10 m s^{-2}

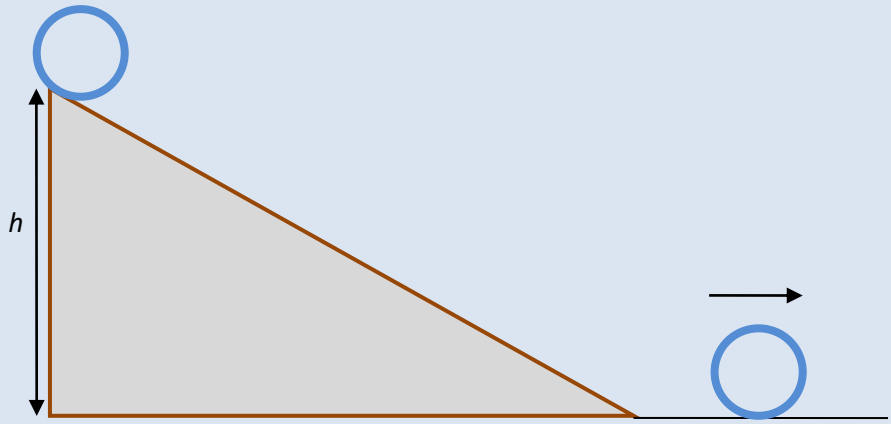
6. A block of mass *m* is attached to a string that is wrapped around a cylinder. The cylinder has mass *M*, radius *R* and moment of inertia $\frac{1}{2}MR^2$.



The hanging block is released. What is the acceleration of the block?

A $\frac{2g}{3}$ **B** $\frac{mg}{m+\frac{M}{2}}$ **C** $\frac{g}{2}$ **D** $\frac{Mg}{m+\frac{M}{2}}$

7. A ring rolls down an incline without slipping. The ring starts from rest at a height *h* above level ground.



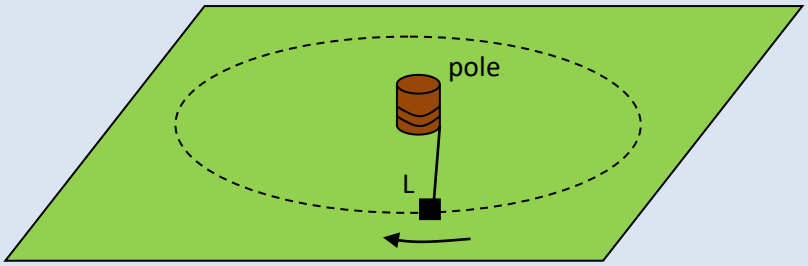
Which expression gives the speed of the ring when it comes to level ground?

A $\sqrt{2gh}$ **B** $\sqrt{\frac{2gh}{3}}$ **C** $\sqrt{gh}$ **D** $\sqrt{\frac{gh}{2}}$

8. A star rotates about its axis with angular speed ω. The star explodes leaving behind a spherical core of half the original mass and half the radius. What is the angular speed of the core? (The moment of inertia of a sphere is $\frac{2}{5}MR^2$.)

A ω **B** 2ω **C** 4ω **D** 8ω

9. A lawn mower L is attached to a horizontal string that wraps around a pole as L moves around the pole with constant linear speed.



What is correct about the angular momentum and the angular speed of L?

	Angular momentum	**Angular speed**
A	Conserved	Increases
B	Conserved	Decreases
C	Not conserved	Increases
D	Not conserved	Decreases

10. The graph shows the variation with time of the net torque on a system. The initial angular speed of the system is zero and its moment of inertia is 2.0 kg m^2.

What is the **average** power delivered to the system during the 4.0 s?

A 16 W **B** 32 W **C** 64 W **D** 128 W

Quiz A5 Answers	
1	D
2	C
3	B
4	B
5	A
6	B
7	C
8	D
9	C
10	A