

GCSE Physics Ramped Questions on Force and Change in Momentum

1. A football with a mass of 0.40 kg is kicked from rest and reaches a speed of 15 m/s in 0.20 s. Calculate the average force exerted on the ball.
2. A tennis player hits a 0.060 kg tennis ball, increasing its speed from 5.0 m/s to 25 m/s in 0.040 s. Calculate the average force on the ball.
3. A 1200 kg car travelling at 20 m/s performs an emergency stop and comes to rest in 5.0 s. Calculate the average braking force.
4. A cyclist and bicycle have a combined mass of 90 kg. They slow from 8.0 m/s to rest in 2.0 s at a red traffic light. Calculate the average braking force.
5. A rugby player of mass 80 kg is running at 7.0 m/s when tackled and brought to rest in 0.50 s. Calculate the average force exerted during the tackle.
6. A crash-test dummy of mass 75 kg travelling at 12 m/s is brought to rest by a seat belt in 0.15 s. Calculate the average force exerted by the seat belt.
7. The same crash-test dummy is brought to rest by an airbag in 0.60 s instead of 0.15 s. Calculate the average force exerted by the airbag and explain why airbags reduce injuries.
8. A 1500 kg electric car travelling at 25 m/s collides with a barrier and comes to rest in 0.80 s. Calculate:
 - a) the change in momentum
 - b) the average force during the collision
9. A train with a mass of 200 000 kg slows from 30 m/s to 10 m/s in 40 s as it approaches a station. Calculate:
 - a) the change in momentum
 - b) the average braking force
10. A London Underground train has a mass of 250 000 kg and is travelling at 18 m/s. It comes to rest at a platform in 25 s.
 - a) Calculate the train's initial momentum.

- b) Calculate the change in momentum.
- c) Calculate the average braking force.
- d) If the stopping time were doubled, what would happen to the braking force?