Acceleration Questions for GCSE Physics

1. Define acceleration in words.

Acceleration is the rate of change of velocity (with time). or Acceleration is the change in velocity over time.

2. What is the unit for acceleration?

m/s^2 *(or m/s/s)*

3. What does a negative acceleration mean?

Acceleration is in the opposite direction to positive motion. (accept deceleration or slowing down)

4. A car increases its velocity from 0 m/s to 20 m/s in 5 seconds. What is its acceleration?

$a = \Delta v / t$ *= 20 / 5* = ***4 m/s²***

5. A bus goes from 15 m/s to 25 m/s in 20 seconds. Find the acceleration.

$a = \Delta v / t$ *= (25 – 15) / 20* *= 10 / 20* = ***0.5 m/s²***

6. A runner slows down from 8 m/s to 2 m/s in 3 seconds. Calculate the acceleration.

a = Δv / t = (2 – 8) / 3 = (-)6 / 3 = ***-2.0 m/s²***

7. A cyclist decelerates from 12 m/s to 6 m/s in 4 seconds. What is the acceleration?

a = Δv / t = (6 – 12) / 4 = (-)6 / 4 = ***-1.5 m/s²***

8. If a train has an acceleration of 0.5 m/s² for 30 seconds, what change in velocity does it experience?

a = Δv / t 0.5 = Δv / 30 0.5 x 30 = Δv = ***15 m/s***

9. A motorbike goes from 5 m/s to 25 m/s in 10 s. Calculate the acceleration.

a = Δv / t = (25 – 5) / 10 = 20 / 10 = ***2.0 m/s²***

10. A lorry accelerates at 0.8 m/s² from rest for 12 seconds. What is its final velocity?

a = Δv / t 0.8 = (v – 0) / 12 0.8 x 12 = v = ***9.6 m/s***

11. A plane accelerates from rest to 75 m/s with an acceleration of 2.5 m/s². Calculate the minimum runway length needed.

$v^2 - u^2 = 2\,a\,s$			
$75^2 - 0 = 2 \times 2.5 \times s$			
$5625 = 5 \times s$	$5625 / 5$	=	***1125 m***

12. A train starts from rest and accelerates at 1.2 m/s² until it reaches 24 m/s. How far does it travel in this time?

$v^2 - u^2 = 2\,a\,s$			
$24^2 - 0 = 2 \times 1.2 \times s$			
$576 = 2.4\,s$	$576 / 2.4 = s$	=	***240 m***

13. A cyclist accelerates at 0.6 m/s² for 25 seconds. What is their final speed if they started from 2m/s?

$a = (v - u) / t$	$0.6 = (v - 2) / 25$		
$0.6 \times 25 = v - 2$			
$15 = v - 2$	$15 + 2 = v$	=	***17 m/s***

14. A car's acceleration is 2 m/s². Its final speed is 26 m/s after 12 seconds. What was its initial speed?

$a = (v - u) / t$	$2 = (26 - u) / 12$		
2×12	$= 26 - u$		
$24 = 26 - u$	$24 - 26 = -u$	u =	***2.0 m/s***

15. A motorbike has an initial speed of 12 m/s and accelerates at 1.5 m/s² over 100 m. What is its final velocity?

$v^2 - u^2 = 2\,a\,s$				
$v^2 - 12^2 = 2 \times 1.5 \times 100$				
$v^2 - 144 = 300$	$v^2 = 300 + 144$	$v = \sqrt{444}$	=	***21.1 m/s***

16. A car accelerates at 3 m/s² from rest for 10 seconds. Find (a) the final velocity, and (b) the distance travelled.

a) $a = \Delta v / t$ $3 = v / 10$ $3 \times 10 = v$ $= \mathbf{30\ m/s}$

b) $v^2 - u^2 = 2\,a\,s$ $30^2 - 0 = 2 \times 3 \times s$ $900 = 6 \times s$

$900 / 6 = s$ $= \mathbf{150\ m}$

17. An object accelerates uniformly from 4 m/s to 16 m/s in 6 seconds. Find the distance travelled.

$a = \Delta v / t$ $a = (16 - 4) / 6$ $= 12 / 6$ $= 2.0\ m/s^2$

$v^2 - u^2 = 2\,a\,s$ $16^2 - 4^2 = 2 \times 2 \times s$

$240 = 4\,s$ $240 / 4 = s$ $= \mathbf{60\ m}$

18. A cyclist accelerates from 5 m/s to 15 m/s in 8 seconds. Find the distance travelled.

$a = \Delta v / t$ $a = (15 - 5) / 8$ $= 10 / 8$ $= 1.25\ m/s^2$

$v^2 - u^2 = 2\,a\,s$ $15^2 - 5^2 = 2 \times 1.25 \times s$

$200 = 2.5\,s$ $200 / 2.5 = s$ $= \mathbf{80m}$

19. A plane accelerates from 0 m/s to 80 m/s in 20 seconds. How far does it travel during this time?

$a = \Delta v / t$ $a = (80 - 0) / 20$ $= 80 / 20$ $= 4.0\ m/s^2$

$v^2 - u^2 = 2\,a\,s$ $80^2 - 0^2 = 2 \times 4 \times s$

$6400 = 8\,s$ $6400 / 8 = s$ $= \mathbf{800\ m}$

20. A ball is thrown upwards at 20 m/s. Taking acceleration due to gravity as –9.8 m/s², how high does it travel before stopping?

$v^2 - u^2 = 2\,a\,s$

$0 - 20^2 = 2 \times (-)9.8 \times s$

$(-)400 = (-)19.6\ s$

$(-)400 / (-)19.6 = s$ $= \mathbf{20.4\ m}$