A-Level Physics: **w25 11**

Question 11 (Answer: **A**)

- The resultant force is the gradient of a momentum–time graph.
- The momentum rises by 5000 kg m s^{-1} in 10 s.
- $F = 5000/10 = 500$ N.

Question 12 (Answer: **A**)

- The rocket's mass is $m = W/g$.
- Newton's second law upwards: $F - W = ma = (W/g)a$.
- So $F = Wa/g + W$; C forgets that the engine must also hold up the weight.

A-Level Physics: **w25 12**

Question 8 (Answer: **C**)

- Weight is the force a gravitational field exerts on a mass, $W = mg$.
- A is $F = ma$ for any resultant force, not weight in particular.
- At terminal velocity the resultant is zero, so B fails, and D describes inertia – that is mass.

A-Level Physics: **w25 14**

Question 8 (Answer: **C**)

- Mass is the quantity of matter in the object and does not depend on where it is.
- Weight is mg, and g on the Moon is about one sixth of its value on Earth.
- So the mass is the same and the weight is different.

A-Level Physics: **s25 11**

Question 10 (Answer: **C**)

- A third-law pair acts on two *different* bodies, is the same type of force, and is equal and opposite.
- The firework pushes the gases down; the gases push the firework up – that push is the thrust.
- Weight and air resistance both act on the same body, so they can never be a third-law pair.

Question 11 (Answer: **C**)

- Take K's direction as positive, so L carries -0.46 kg m s^{-1} before the collision.
- L rebounds along its original path, so afterwards its momentum is $+0.12$ kg m s^{-1}.
- $F = \Delta p/\Delta t = (0.12 - (-0.46))/0.084 = 6.9$ N.

A-Level Physics: **s25 12**

Question 9 (Answer: **B**)

- Force is the rate of change of momentum, so $F = (\Delta m/\Delta t)v$.
- $F = 90 \times 190 = 17100$ N, which is 17 kN.
- No extra factor is needed – the mass ejected per second is given directly.

Question 11 (Answer: **B**)

- A third-law pair swaps the two bodies and reverses the direction.
- The wheel pushes backwards on the road, so the road pushes forwards on the wheel.
- D balances the driving force on the *same* body, which makes it a first-law balance, not a third-law pair.

A-Level Physics: **s25 13**

Question 9 (Answer: **B**)

- Newton's second law defines force as the rate of change of momentum.
- A is only the special case $F = ma$, which holds when the mass is constant.
- C defines work per unit distance, and D a moment divided by a distance.

A-Level Physics: **s25 24**

2(a)	product of mass and velocity
2(b)	change in momentum = (–1.4) – (+2.8) = (–) 4.2 kg m s^{-1}
2(c)	$F = \Delta p / (\Delta) t$ **or** F = gradient = 4.2 / 12
	= 0.35 N
2(d)	constant / uniform (rate of) decrease (of speed to zero).
2(e)	• The (resultant) force is constant / does not decrease • air resistance would vary / decrease / not constant • the force is not zero when speed / velocity is zero / at 8 s Any two of the above 3 marking points (1 mark each, max 2)
2(f)	line from origin with decreasing positive gradient
	gradient changes from positive to negative at 8.0 s
	after t = 8.0 s the line has a negative gradient of increasing magnitude and a positive value of d at t = 12 s

A-Level Physics: **m25 12**

Question 8 (Answer: **B**)

- The gravitational force on the astronaut is their weight, mg, fixed by the field alone.
- Launching changes the *contact* force from the seat, not the Earth's pull.
- They feel heavier, but that sensation is the seat pushing harder, not gravity increasing.