Force, Acceleration & Inertia Questions for GCSE Physics

1. What is meant by the term *resultant force?*

The total force acting

Or *The sum of all the forces acting*

Or *A single force that has the same effect on an object as all the individual forces combined*

2. What is meant by the term *inertia*?

An object's reluctance (or resistance) to change its state of motion/velocity

(allow 'how hard it is to change an objects velocity')

3. What is the unit of force?

The Newton (N)

4. What is Newton's Second Law of motion?

$F = m\,a$

(or 'the resultant force is directly proportional to the product of the mass and acceleration')

** Newton's second law actually defines resultant force in terms of momentum ($F = \Delta p / \Delta t$)*

5. If the resultant force on an object is zero, what happens to the motion of the object.

Nothing because the forces are balanced

(It continues with constant speed & direction or at rest if it was originally at rest)

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6. A car has a mass of 1000 kg and accelerates at 2 m/s². Calculate the resultant force.

F = m a
= 1000 x 2
= 2000 N

7. A bus with a mass of 12,000 kg accelerates at 1.5 m/s². Find the resultant force.

F = m a
= 12000 x 1.5
= 18,000 N

8. A motorbike experiences a resultant force of 1800 N and has a mass of 300 kg. Find its acceleration.

F = m a	
1800 = 300 x a	
1800 / 300 = a	***= 6 m/s²***

9. A lorry accelerates at 0.8 m/s² when a resultant force of 6400 N acts on it. What is its mass?

F = m a	
6400 = m x 0.8	
6400 / 0.8 = m	***= 8000 kg***

10. A cyclist and bicycle have a total mass of 75 kg. If they accelerate at 1.2 m/s², what is the resultant force?

F = m a
= 75 x 1.2
= 90 N

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11. A 900 kg car experiences a forward thrust of 2700 N and a resistive force of 900 N. Calculate its resultant force and acceleration.

*Resultant force = 2700 - 900 = **1800 N***

F = m a

1800 = 900 x a *a = 1800 / 900 = **2 m/s²***

12. A rocket of mass 2000 kg lifts off with a thrust of 30,000 N. The weight of the rocket is 20,000 N. Calculate its resultant force and acceleration.

*Resultant force = 2700 - 900 = **1800 N***

F = m a

1000 = 2000 x a *a = 1000 / 2000 = 5 **m/s²***

13. A ball of mass 0.5 kg is thrown horizontally with a force of 10 N. Ignoring air resistance, find its horizontal acceleration.

F = m a

10 = 0.5 x a

10 / 0.5 = a *= **20 m/s²***

14. An aircraft of mass 80,000 kg experiences a total forward thrust of 240,000 N and an air resistance of 160,000 N. Find the resultant force and the aircraft's acceleration.

*Resultant force = 24,000 - 160,000 = **80,000 N***

F = m a

80,000 = 80,000 x a *a = 80,000 / 80,000 = 1 **m/s²***

15. A car has a mass of 1500 kg. When it slows from 20 m/s to 10 m/s in 2 seconds, calculate the deceleration and then the resultant braking force.

a = Δv / t *= (10 – 20) / 2* *= (-)10 / 2 = **-5 m/s²***

F = m a

= 1500 x (-)5 *= **-7500 N***

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