

## Essential Pre-Uni Physics F1.4

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Please give your answer to the lowest number of significant figures given in the question. You will not get the mark unless the correct unit is given. In this question, ignore the effects of friction & drag.

A 50 g ball is travelling at  $2.0 \text{ m s}^{-1}$  when it hits a wall and rebounds at  $1.5 \text{ m s}^{-1}$ . Calculate the magnitude of the change in momentum.

## Essential Pre-Uni Physics F1.6

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Please give your answer to the lowest number of significant figures given in the question. You will not get the mark unless the correct unit is given. In this question, ignore the effects of friction & drag.

A 70 kg person jumps in the air and is travelling downwards at  $2.0 \text{ m s}^{-1}$  when their feet touch the ground. If it takes the person 0.30 s to stop, calculate the constant resultant force on them.

## Essential Pre-Uni Physics F1.3

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Please give your answer to the lowest number of significant figures given in the question. You will not get the mark unless the correct unit is given. In this question, ignore the effects of friction & drag.

If a 20000 kg bus accelerates from  $10 \text{ m s}^{-1}$  to  $25 \text{ m s}^{-1}$ , what is the change in momentum?

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## Momentum and Kinetic Energy 3.12

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A Level



A 15 g bullet hits and stops within a 1.500 kg sandbag, which then swings up by a height of 5.1 cm. Work out the initial speed of the bullet.

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Physics. *You work it out.*

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# Essential Pre-Uni Physics F1.1

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Please give your answer to the lowest number of significant figures given in the question. You will not get the mark unless the correct unit is given. In this question, ignore the effects of friction & drag.

What is the momentum of a 750 kg car going at  $31 \text{ m s}^{-1}$ ?

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# Momentum and Kinetic Energy 3.11



A 10 MeV particle in a particle detector travels on a curved path in a magnetic field. Its charge is  $1.60 \times 10^{-19}$  C. From the curvature, the momentum of the particle is calculated to be  $7.31 \times 10^{-20}$  kg m s<sup>-1</sup>.

## Part A What is the mass of the particle?

What is the mass of the particle?

## Part B What is the particle?

What is the particle?

- ☐ Electron
- ☐ Positron
- ☐ Alpha particle
- ☐ Proton
- ☐ Neutron



## Essential Pre-Uni Physics F2.3

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A neutron (mass = 1 u) is moving at  $300 \text{ m s}^{-1}$  when it smacks into a stationary  $^{235}\text{U}$  nucleus (mass = 235 u), and sticks to it. What will the velocity of the combined particle be? Give your answer to 3 significant figures.

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## Essential Pre-Uni Physics F2.2

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Charlie is driving her 20 000 kg bus. She stops at a roundabout. Percy is driving his 750 kg Corsa at  $15 \text{ m s}^{-1}$  behind her. He fails to stop and rams into the back of the bus, sticking to it. The impact releases the brakes on the bus. How fast will the combined vehicle be travelling immediately after the collision? Give your answer to 2 significant figures.

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# Launching a Rocket

A Level



A rocket with initial mass  $M_0$  and exhaust speed  $v$  is sitting on its launch pad. Its engines eject mass at a constant rate of magnitude  $\left| \frac{dM}{dt} \right| = \mu$ .

## Part A Initial acceleration

What is the initial acceleration,  $a_0$ ?

The following symbols may be useful:  $M_0$ ,  $a_0$ ,  $g$ ,  $\mu$ ,  $v$

## Part B Rate of mass ejection

Given that  $M_0 = 1.00 \times 10^6 \text{ kg}$ ,  $v = 2000 \text{ m s}^{-1}$  and we require  $a_0 = 0.500 \text{ m s}^{-2}$ , what must  $\mu$  be?

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## Momentum and Kinetic Energy 3.2

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Calculate the kinetic energy of a  $p = 23\,700 \text{ kg m s}^{-1}$ , 720 kg car.

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