

REVISION GUIDE

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Physics

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How to use this Book

Introduction

Explains the layout of each chapter, helps with navigation through the book and gives a reminder of what is important about each topic.

Introduction

The application of a pair of squeezing or stretching forces to a solid will cause a change in the shape of a solid. This chapter will deal only with solids, because for liquids and gases, changes in shape are dependent on the container holding them.

Teacher's tips

Quick suggestions to remind you about key facts and highlight important points.

Teacher's Tip

Be careful when subtracting temperatures. A temperature change from 6°C to 80°C is obviously 74°C . This could have been written $353\text{ K} - 279\text{ K} = 74\text{ K}$. The temperature interval between two temperatures must be the same whether the Celsius scale or the Kelvin scale are used. You must not add on 273 when considering temperature intervals.

Example 2

On a linear air track, a mass of 120 g is travelling to the right with a velocity of 83 cm s^{-1} . It collides elastically with a mass of 200 g travelling with velocity 47 cm s^{-1} in the opposite direction, as shown in Figure 4.9.

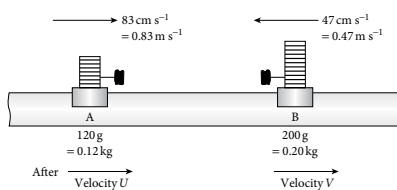


Figure 4.9

With what velocity do the masses travel after the collision?

Answer Before collision total momentum to right
 $= (0.12 \times 0.83) - (0.20 \times 0.47)$
 After the collision total momentum to right
 $= (0.12 \times U) + (0.20 \times V)$

These two terms are equal by the principle of conservation of energy, so

$$(0.0996 - 0.0940) = 0.0056 = 0.12U + 0.20V$$

Sometimes it is worthwhile multiplying both sides of an equation by a large number to get rid of all the zeroes. Multiplying through by 100 gives

$$(9.96 - 9.40) = 0.56 = 12U + 20V$$

Neither U nor V can be obtained from this equation but using the fact that the velocity of approach equals the velocity of separation gives

$$(0.83 + 0.47) = V - U$$

By substituting into the first equation we get

$$\begin{aligned} 12U + 20(1.30 + U) &= 0.56 \\ 12U + 26 + 20U &= 0.56 \quad \text{so} \quad 32U = -25.44 \text{ and} \\ U &= -0.795\text{ m s}^{-1} = -80\text{ cm s}^{-1} \text{ to 2 sig figs. and} \\ V &= 0.505\text{ m s}^{-1} = 51\text{ cm s}^{-1} \text{ to 2 sig figs.} \end{aligned}$$

Examples

A step by step approach to answering questions, guiding you through from start to finish.

How to use this Book

Progress Check

- 3.1 A car travels a distance of 720 km in moving 480 km south and 370 km west as shown in Figure 3.11. What is the displacement of the car from its starting point after completing the journey?

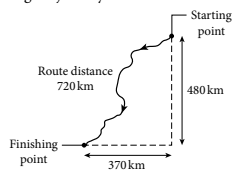


Figure 3.11

- 3.2 A plane travels 2000 km east and 150 km south on a flight. What is the displacement of the plane from its starting point at the end of the journey?

Progress check questions

Check your own knowledge and see how well you are getting on by answering regular questions. Sample answers for these are provided at the back of the book.

Examination questions

Help prepare for examination by completing the questions taken from Cambridge past-examination papers.

Examination Questions VIII

1. (a) Define *gravitational potential* at a point. [1]
 (b) The gravitational potential ϕ at distance r from point mass M is given by the expression

$$\phi = -\frac{Gm}{r}$$

where G is the gravitational constant.

Explain the significance of the negative sign in this expression. [2]

Chapter summary

At the end of each chapter so you can check off the topics as you revise them.

Chapter Summary

- ✓ Newton's first law. Every object continues in its state of rest or state of uniform motion in a straight line unless acted upon by a resultant external force.
- ✓ Newton's second law. The rate of change of momentum of a body is proportional to the resultant force acting on it.
- ✓ Newton's third law. If body A exerts a force on body B then body B exerts an equal and opposite force on body A.
- ✓ Mass is a measure of how difficult it is to accelerate a body. It is measured in kilograms.
- ✓ Weight is the force of gravitational attraction acting on a body. It is measured in newtons.
- ✓ Momentum is the product of an object's mass and velocity. It is measured in N s. To determine the time t an object takes to stop when a force F is applied, use its momentum in the equation $mv = Ft$.
- ✓ The principle of conservation of momentum states that in all collisions the total momentum is constant provided that there is no resultant external force acting.