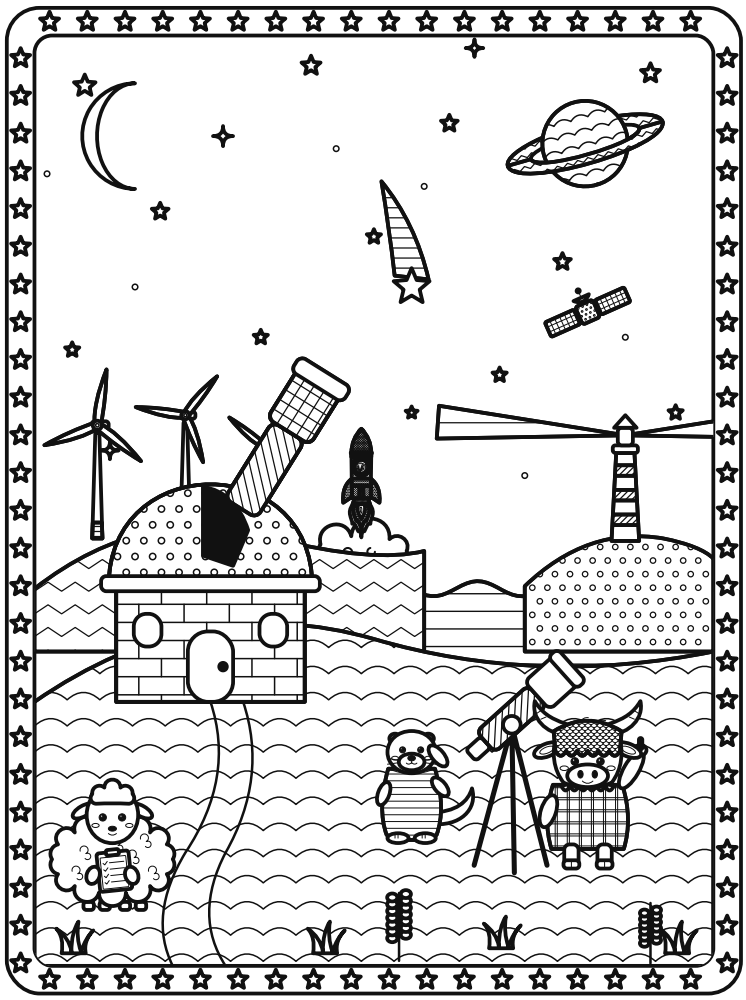
REAL-LIFE PHYSICS

National 5 Physics

Revision Guide

Notes, worked examples, exam-style questions and two practice papers, with full answers



C. Blewis

Blewis LEARNING

Contents

GETTING STARTED		
	How to use this guide	4
	The exam	5
	Exam skills	7
	Relationships	10
DYNAMICS		
1.1	Vectors and scalars	13
1.2	Velocity–time graphs	16
1.3	Acceleration	19
1.4	Newton's laws	22
1.5	Energy	26
1.6	Projectile motion	30
SPACE		
2.1	Space exploration	34
2.2	Cosmology	38
ELECTRICITY		
3.1	Electrical charge carriers	42
3.2	Potential difference (voltage)	45
3.3	Ohm's law	48
3.4	Practical electrical and electronic circuits	52
3.5	Electrical power	57
PROPERTIES OF MATTER		
4.1	Specific heat capacity	61
4.2	Specific latent heat	64
4.3	Gas laws and the kinetic model	67
WAVES		
5.1	Wave parameters and behaviours	71
5.2	Electromagnetic spectrum	74
5.3	Refraction of light	77
RADIATION		
6.1	Nuclear radiation	81
6.2	Half-life, uses, fission and fusion	85
PRACTICE AND ANSWERS		
	Practice paper 1	89
	Practice paper 2	102
	Answers	114
	Practice paper marking	127

How to use this guide

This guide covers the whole National 5 Physics course in six areas. Each key area follows the same pattern, so you always know what comes next.

EACH KEY AREA HAS

Notes	the ideas you need, in short sections with diagrams
Relationships	each one with its symbols and units, and a worked example set out step by step
Exam tips	common mistakes and how to pick up every mark
Quick check	short questions to test yourself straight away
Exam-style questions	longer questions with marks, like the real exam

A GOOD WAY TO REVISE

1. Read the notes and cover the worked example. Can you do it yourself?
2. Try the quick check without looking back. Mark it using the answers at the back.
3. Do the exam-style questions in your jotter, with full working. Then mark them carefully against the marking guidance.
4. Tick the key area off on the tracker at the start of each area: **1** need more work, **2** getting there, **3** confident.
5. When you have revised everything, sit the practice papers under exam conditions.

ANSWERS

All answers are at the back. For exam-style questions the marking guidance shows where each mark comes from, so you can see exactly what examiners look for.

CHECK THE COURSE

Exam arrangements and course content can change. Your teacher and the latest course documents always come first.

The exam

National 5 Physics is assessed by a question paper and an assignment. This is the current format. **Arrangements can change, so check the latest arrangements with your teacher.** Past papers from before session 2026–27 are longer (2 hours 30 minutes, 135 marks), so allow for this if you use them for practice.

	What it is	Marks
Question paper	One paper, 2 hours. A data sheet and a relationships sheet are provided.	110
Section 1	Objective test: multiple choice questions (choose A to E).	20
Section 2	Restricted and extended response questions: calculations, explanations, graphs, an open-ended question or two.	90
Assignment	A report on an experiment you carry out, with data from other sources, written up under supervision.	20 (scaled to 28)

Command words

Command word	What you need to do
State, name, give	a short answer, no explanation needed
Describe	say what happens or what something is like; give the steps or features
Explain	say **why** or **how**, using physics; link cause to effect
Calculate	use a relationship: show the relationship, substitution and answer with unit
Determine	find the value, often from a graph, a table or more than one step
Estimate	find an approximate value, e.g. by reading a graph or making a sensible assumption
Suggest	there may be more than one answer; use physics to give a sensible one
Predict	say what will happen, using a pattern or a graph
Show that	prove the given value; every step must be shown, and the final value stated
Using your knowledge of physics	an open-ended question: there is no single correct answer, so show your understanding

ON THE DAY

- Roughly **one minute per mark** (110 marks in 120 minutes leaves 10 minutes to check).
- Read the whole question, including diagrams. Underline numbers and units.
- Always show your working: there are marks for the relationship and substitution.
- Never leave a multiple choice answer blank: there is no penalty for a wrong answer.

AREA

Dynamics

Tick each key area when you have revised it. Use 1, 2 or 3 to show how confident you feel, and come back to anything that is not a 3.

	Key area	1	2	3
1.1	Vectors and scalars			
1.2	Velocity–time graphs			
1.3	Acceleration			
1.4	Newton's laws			
1.5	Energy			
1.6	Projectile motion			

MY NOTES FOR THIS AREA

1.1 Vectors and scalars

Every physical quantity is either a **scalar** or a **vector**. A scalar has size (magnitude) only. A vector has size **and** direction. Weight is a force, so it is a vector; mass is a scalar.

Scalar (size only)	Vector (size and direction)
distance	displacement
speed	velocity
time, mass, energy	acceleration, force

KEY POINTS

- A vector answer needs a direction, e.g. 500 m at 037 or 5.0 m/s north.
- Add vectors **tip to tail**. The **resultant** joins the start to the finish.
- Vectors at right angles: use Pythagoras for the size and trigonometry (tan) for the direction.

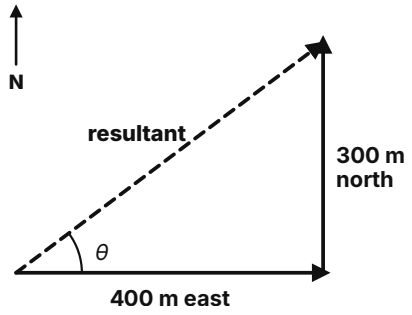
Distance and displacement, speed and velocity

Distance is the total length of the path travelled. **Displacement** is the straight-line length from start to finish, in a stated direction. **Speed** uses distance; **velocity** uses displacement.

RELATIONSHIPS

$$d = \bar{v}\,t \qquad s = \bar{v}\,t$$

d, s	distance or displacement in metres (m)
$\bar{v}$	average speed or average velocity in metres per second (m/s)
t	time in seconds (s)



WORKED EXAMPLE

Ruby walks 400 m east and then 300 m north in 250 s. Find her displacement and average velocity.

Distance 400 + 300 = 700 m

Size $s = \sqrt{(400^2 + 300^2)} =$ **500 m**

Direction $\tan\theta = \frac{300}{400}$, so $\theta = 37°$ north of east (bearing 053)

Velocity $\bar{v} = \frac{s}{t} = \frac{500}{250} =$ **2.0 m/s at bearing 053**

EXAM TIP

Bearings are measured clockwise from north and written with three figures: 053, not 53. If you use an angle instead, say what it is measured from, e.g. 37° north of east.

1.1 Vectors and scalars

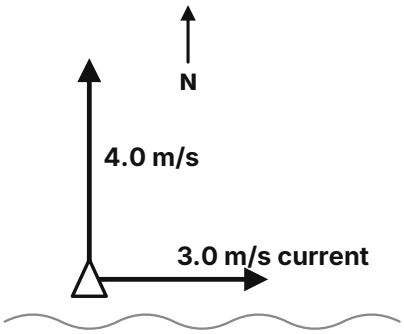
Average and instantaneous speed

Average speed is the total distance divided by the total time. **Instantaneous speed** is the speed at one moment. To measure it, time a short length (for example a card of length 5.0 cm passing through a light gate) so that the speed hardly changes while it is being timed.

EXPERIMENT: MEASURING INSTANTANEOUS SPEED

Measure the length of the card on the trolley. A light gate and timer record how long the card takes to pass through the beam. Speed = card length ÷ time. Electronic timing removes reaction time, so the result is more accurate than a stopwatch.

Forces and velocities at right angles



WORKED EXAMPLE

A boat heads north at 4.0 m/s across a river with a current of 3.0 m/s east. Find the resultant velocity.

Size $v = \sqrt{(4.0^2 + 3.0^2)} =$ **5.0 m/s**

Direction $\tan\theta = \frac{3.0}{4.0}$, $\theta = 37°$ east of north (bearing 037)

EXAM TIP

Use the same method for forces: two forces at right angles combine to give one resultant force. In one dimension, give one direction as positive and simply add, e.g. 600 N forward and 450 N backward give 150 N forward.

Quick check

1. Name two vector quantities and two scalar quantities.
2. A runner completes one lap of a 400 m track in 80 s. What is her average speed? What is her displacement at the end of the lap?
3. A cyclist travels 12 km north and then 5 km south. State the distance travelled and the displacement.
4. Two forces act on a box: 30 N east and 40 N north. Calculate the size of the resultant force.
5. Explain why a light gate gives a more accurate instantaneous speed than a stopwatch.

1.1 Vectors and scalars

Exam-style questions (15 marks)

1 A drone flies from its launch point 120 m east and then 50 m south. The whole flight takes 26 s.

(a) Calculate the distance travelled by the drone. **(1)**

(b) By calculation or scale diagram, determine the displacement of the drone from its launch point. **(3)**

(c) Calculate the average velocity of the drone. **(3)**

2 A ferry crosses a firth. Its engines drive it at 6.0 m/s due north. A tidal current flows at 2.5 m/s due west.

(a) Determine the resultant velocity of the ferry. **(3)**

(b) The crossing is 4.2 km measured due north. Calculate the time taken for the crossing. **(3)**

3 A student uses a light gate and a 4.0 cm card to measure the speed of a trolley at the bottom of a ramp.

(a) State the two measurements the student must take. **(1)**

(b) The card takes 0.032 s to pass through the light gate. Calculate the instantaneous speed of the trolley. **(1)**

> **EXAM TIP**
> Show the relationship, the substitution and the final answer with units. Most calculation questions give one mark for each. A direction is needed for full marks whenever a vector is asked for.

FREE SAMPLE

National 5 Physics Revision Guide

This sample shows a few pages. The full printed workbook is available from Amazon.

blewislearning.co.uk

Blewis
LEARNING