This workbook is designed to accompany the Complete Physics for IGCSE student book and help you develop the physics skills you need for IGCSE. The book follows the order of the chapters in Complete Physics for IGCSE. Each page provides additional questions related to the relevant double page in the student book. The questions focus on the key areas you need to know for your exams:

- Knowledge and understanding (applying your knowledge to answer questions in different contexts).
- Analysing and interpreting data in tables and graphs
- Solving problems
- Experimental skills and investigations

Units 1-11 include a range of question types that will help you to develop your physics skills and understanding, working towards answering examination standard problems:

- Calculating physical quantities using a range of standard equations
- Selecting appropriate units for calculated physical quantities
- Describing experimental methods for standard experiments
- Drawing labelled diagrams and circuit diagrams
- Graph plotting
- Interpreting data from diagrams, graphs and tables
- Interpreting the results of unfamiliar investigations
- Explaining physical effects

Other important features of this workbook that should help you succeed in physics include:

- Each page has an extension question, which is designed to challenge you. Some will extend your understanding beyond the context of the unit. Some are more mathematically demanding. Many ask you to research using books or the internet. These questions should stimulate your interest in physics beyond the scope of IGCSE.
- A unit on practical physics, including the elements required for carrying out an investigation and examination style questions for the written alternative to the practical.
- A unit on maths skills, including those required for IGCSE and the relevant formulae
- A unit on revision tips, which offer advice on answering examination questions
- A selection of exam-style questions will give you the opportunity to practise your physics skills at the appropriate level
- Full answers to all the questions, including the extension questions
- Some suggestions for possible projects to stimulate your interest in physics and further develop your investigation skills
- A glossary to help you understand the meaning of important physics terms.
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1. a. Name the following measuring instruments:

- [Image of a stopwatch]
- [Image of a spring scale]
- [Image of a multimeter]

b. Match the following quantities with their SI units:

<table>
<thead>
<tr>
<th>Length</th>
<th>Second (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Force</td>
<td>Joule (J)</td>
</tr>
<tr>
<td>Time</td>
<td>Metre (m)</td>
</tr>
<tr>
<td>Energy</td>
<td>Newton (N)</td>
</tr>
</tbody>
</table>

c. i. Express 85.0 cm in m. .................................................................

ii. Express 8.5 mm in m. .................................................................

iii. Express 0.640 km in m. .................................................................

iv. Express 25 cm² in m². .................................................................

v. Express 345 cm³ in m³. .................................................................

d. Explain why it is important to convert all units to SI units before attempting a physics calculation. .................................................................
1. a. You are asked to find the thickness of one sheet of paper. Describe how you could do this if you had a packet of paper and a half-metre rule.

b. i. What is the reading on the metre rule shown below? [1]

   ![Metre Rule Image]

   \[ \text{Reading: } 1 \text{ cm} \]

   

   ii. What is the reading on the Vernier callipers shown below? [1]

   ![Vernier Callipers Image]

   \[ \text{Reading: } 10 \text{ mm} \]

   

   iii. What is the reading on the micrometer shown below? [1]

   ![Micrometer Image]

   \[ \text{Reading: } 20 \text{ mm} \]

   

   c. Describe how you could use a plumb line and a set square to make the measurement in a. more accurate. [3]
1. In international athletics competitions, such as the Olympics, it is essential to time races as accurately and precisely as possible.
   
a. How are the races timed?

   ... [2]

b. Why is this method of timing particularly important for short races such as the 100 metres?

   ... [2]

c. Why would it be difficult to time a 100 metres race using a stop clock?

   ... [1]

d. A student uses a sensor and data logger to measure the displacement of a simple pendulum from its central position. He obtains this graph. Explain how you could use the data to measure the time taken for one swing, and why this method of measurement is more accurate than using a stop clock. [3]
1. a. You are asked to find, as accurately as possible, the volume of a pebble with approximate volume 30 cm$^3$, using a water displacement method. Which size measuring cylinder would you choose to measure the displaced water?

<table>
<thead>
<tr>
<th>10 ml</th>
<th>50 ml</th>
<th>100 ml</th>
<th>1000 ml</th>
</tr>
</thead>
</table>

[1]

b. i. A student is given a block of wood with approximate dimensions 2 cm by 1 cm by 6 cm. Describe how he can find the volume of the block using a metre rule.

ii. Name a measuring instrument he could use to improve the precision of his measurements.

[3]

Extension

c. Explain your choice of measuring cylinder for 1. a.

[3]
1. a. Give two possible units for density. ........................................................... ........................................................... [2]
   b. Name a measuring instrument used to find the mass of an object. ........................................................... ........................................................... [1]
   c. i. Calculate the density of vegetable oil if 200 cm$^3$ of oil has a mass of 180 g.

   
   \[
   \text{density} = ........................................................... ........................................................... [2]
   \]

   ii. Will the oil float on water (density 1 g/cm$^3$)? Explain your answer.

      .........................................................................................................................................................

      .........................................................................................................................................................

      .........................................................................................................................................................[2]

   d. Calculate the mass of 25 cm$^3$ of mercury of density 13.5 g/cm$^3$.

      
      mass = ........................................................... ........................................................... [2]

2. a. Using a ruler, measure the height and radius of the cylinder shown in the diagram. Using your measurements, calculate the volume of the cylinder.

      
      Height = ........................................................... ........................................................... [1]

      Radius = ........................................................... ........................................................... [1]

      Volume = ........................................................... ........................................................... [3]

   b. If the cylinder is made of iron of density 7.9 g/cm$^3$, what is the mass of the cylinder?

      mass = ........................................................... ........................................................... [2]

   c. A capillary tube of length 2.4 cm and internal diameter 0.2 cm is weighed and its mass found to be 0.15 g. The tube is filled with mercury of density 13.5 g/cm$^3$ and weighed again. What will be the new mass of the filled tube?

      .........................................................................................................................................................

      .........................................................................................................................................................

      .........................................................................................................................................................

      ......................................................................................................................................................... [4]
1. What is the SI unit of length?
   A  mm  B  cm
   C  m  D  km

2. What is the SI unit of time?
   A  milliseconds  B  seconds
   C  minutes  D  hours

3. Which of the following is not an instrument used to measure length?
   A  Vernier callipers  B  micrometer screw gauge
   C  balance  D  metre rule

4. What is the area of a piece of paper of dimensions 11.2 cm by 15.4 cm?
   A  172.48 m²  B  172.48 cm²
   C  0.17248 m²  D  172.48 cm³

5. What is the volume in cm³ of a block of height 0.23 m, length 0.06 m, and width 0.15 m?
   A  2007  B  0.00207
   C  2070  D  0.0207

6. A toy car of volume 54 cm³ is placed into a 500 ml measuring cylinder, containing 250 ml of water. What is the new reading on the measuring cylinder?
   A  554 ml  B  446 ml
   C  304 ml  D  354 ml

7. A metal block of dimensions 1.5 cm by 2.3 cm by 4.5 cm has a mass of 42 g. What is the density of the metal?
   A  2.7 g/cm³  B  652 g/cm³
   C  3.6 g/cm³  D  3.2 g/cm³