OCR (A) Physics A-level
PAG 01.2 - Investigating Terminal Velocity

Practical Flashcards

What safety precautions should be taken when carrying out this experiment?

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If any spillages occur, they must be cleaned up immediately. Washing-up liquid is very slippery and so spillages lead to a risk of slipping and injury.

Suggest why light-gates shouldn't be used when carrying out this experiment.

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Light-gates rely on a clear breakage of the beam. This will not occur in this experiment since it is unlikely that the ball will cut the beam. The line of the beam may also be disturbed by the coloured liquid.

What forces act on a ball as it sinks down a tube of liquid?

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A downwards force of weight, and two upwards forces of drag and upthrust.

Describe the forces on the ball when it reaches terminal velocity.

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At terminal velocity, the downwards forces on the ball will equal the upwards forces.

Weight = Upthrust + Drag

Describe how you should take time readings in this experiment.

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Time readings should be taken at eye level to the rubber bands. The lap function should be used to record the time at each band.

How can you ensure that the time readings are accurate?

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The same person should record the time readings throughout. They should measure at eye level to the rubber bands and must ensure they stop the timer at the same relative position between the ball and the band each time.

Suggest why it may be advantageous to use a steel ball bearing in this experiment.

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Steel ball bearings are magnetic. This means that a magnet can be used to easily lift the ball from the bottom of the liquid after each run.

How should the bands be positioned on the tube?

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Each pair of bands should be positioned sufficiently far apart so that the time intervals between each are easily observable and measurable.

How can the density of the liquid in the measuring cylinder be determined?

How can the density of the liquid in the measuring cylinder be determined?

Use a mass balance to measure the mass of the empty cylinder. Add the liquid and subtract the first mass measurement from the new mass to obtain the mass of the liquid. Divide this by the volume of liquid to obtain density.

How can the average speed in each interval be calculated?

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Measure the distance between the two bands that make up the interval. Divide this by the time taken for the ball to travel between the two bands.

How can the terminal velocity be obtained from a velocity-time graph?

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When the ball reaches terminal velocity, the velocity-time graph should level off. The velocity at which it levels off at is the terminal velocity.

How should you plot the data you obtain on a graph?

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The data should be plotted on a velocity against cumulative time graph. This should result in a smooth curve.

How can the displacement of the ball be determined from a velocity-time graph?

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The displacement of the ball is given by the area under the velocity-time graph.

What equation can be used to determine the viscosity of the liquid?

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$$\eta = \frac{\left(mg - \frac{4}{3}r^3 g\rho\right)}{6\pi r v}$$

How can the radius of a small ball be measured?

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A screw gauge micrometer can be used to measure the diameter of the ball. This can then be halved to give the radius.