Edexcel Physics IGCSE

Chapter 1: Forces and Motion

Practical Notes

Investigate the Motion of Everyday Objects

Investigate the motion of everyday objects such as toy cars

Equipment

- Toy car
- String
- Bench pulley
- Mass hanger and masses
- Metre ruler
- Stop clock
- Masking tape

Method

1. Attach the bench pulley to the end of a long bench.
2. Secure the mass hanger to one end of the string and attach the other to the toy car - pass the string over the bench pulley, and pull the car back so that the mass hanger is just resting on the floor.
3. Mark the car's position with masking tape - this is the end marker.
4. Pull the car back so the mass hanger is raised and touches the pulley - mark the car's position with tape - this is the starting marker.
5. Use the tape measure to record the distance between the start and end markers.
6. Release the car from the start marker and start the stop clock - stop timing when the car reaches the end marker (this will be the same time that the mass hanger reaches the ground).
7. Repeat the experiment 5 times and calculate an average time.

Calculations

- You can calculate the average speed of the car by using the equation:
    - Average Speed = Distance / Average Time
- To develop this further you can calculate the acceleration using:
    - $s = ut + \frac{1}{2}at^2$
    - $u = 0$ since the car is starting from rest, meaning the equation can be simplified and rearranged to give:
    - $a = 2s/t^2$ (where s is the distance travelled)

Notes

- This experiment can be developed by repeating over a range of different distances and seeing how the range of average speeds change.

Safety

- Place a padded bucket underneath the mass hanger to prevent the falling masses landing on your feet and causing injury.

Investigate how Extension Varies with Applied Force

Equipment

- Clamp
- Clamp stand
- 10x 0.1kg masses
- Spring
- Ruler
- G clamp or additional weights

Method

1. Using the ruler, measure the initial length of the first spring when no force is applied.
2. Set up the spring so it is hanging securely from the clamp stand.
    - You can also secure the ruler to the clamp stand to ensure it does not move at all during the experiment.
3. Add one of the masses to the end of the spring and record the extension of the spring.
    - The extension is the difference between the new length and the initial length.
4. Continue adding masses and recording the extension each time.
5. Plot a graph of force applied against the extension of the spring.
    - Force can be calculated from mass x gravitational field strength (i.e. 10 x the mass hanging on the spring).
    - The gradient of the line of best fit will be the spring constant as $k = \frac{F}{x}$.
6. Using this value, you can calculate the work done each time the spring extends
    - Use the formula $W = \frac{1}{2}kx^2$.

Tips

- Ensure all measurements are taken from eye level in order to avoid parallax error.
- After every measurement, remove all weights and ensure that the spring has not undergone plastic deformation - it should always return to the same initial length.
- All lengths should be measured in metres.

Safety Precautions

- Ensure goggles are worn during this experiment in case the spring snaps.
- Use heavy objects or a G clamp to secure the clamp stand to the desk so that the clamp and masses do not fall over and cause injury.

Diagram: