Practical Skills Revision

Practicals 7-10

Practical 7: Investigate the effect of varying force on the acceleration of an object

- Benham is investigating the effect of varying the force on the acceleration of an object. He uses an air track with a pulley at the end.

1. Why does he use an air track rather than just using the table?

He sets up a puck on the track attached to a string, which he runs over the pulley. He puts a mass hanger on the other end of the string. Then he sets up two light gates with a data logger to measure the acceleration of the puck.

2. Why does Benham use light gates and a data logger rather than using a stopwatch?

Practical 7: Investigate the effect of varying force on the acceleration of an object

3. What is Benham's independent variable?

4. What is Benham's dependent variable?

When Benham varies the mass at the end of the string, he does it by moving a mass from the puck to the mass hanger.

5. Why does he do this?

Practical 7: Investigate the effect of varying force on the acceleration of an object

Force / N	Acceleration 1 / m/s^2	Acceleration 2/ m/s^2	Acceleration 3 / m/s^2	Mean acceleration / m/s^2
1	2.0	2.1	1.9	
2	4.2	3.8	4.1	
3	5.8	5.9	6.2	
4	8.4	8.3	8.1	
5	9.8	11.0	10.1	

6. Which is the anomalous result?
7. Calculate the means
8. Draw a graph of the results

Practical 7: Investigate the effect of varying force on the acceleration of an object

Benham uses the equation $Force = mass \times acceleration$

9. Rearrange the equation to make mass the subject.
10. Use your graph to find the mass of Benham's puck.
11. What conclusion can Benham draw from his results?

Practical 7: Answers

1. To reduce Friction
2. To reduce the effect of reaction time on the results
3. The force
4. The acceleration
5. To keep the total mass constant
6. Trial 2 for a force of 5N
7. 2.0, 4.1, 6.0, 8.3, 10.0
8. Graph
9. $Mass = \frac{Force}{Acceleration}$
10. Should be about 0.5
11. Force is directly proportional to acceleration

Practical 8: Make measurements to determine the speed of waves

Annie is carrying out various experiments to find the speed of waves. Her first experiment is to find the speed of water waves. She sets up a ripple tank with a lamp over it.

1. How does she measure the wavelength in this experiment?
2. How does she measure the frequency in this experiment?
3. How could she reduce the uncertainty of the experiment?

Ripple tank explanation:
https://www.youtube.com/watch?v=UNmv6H-f180

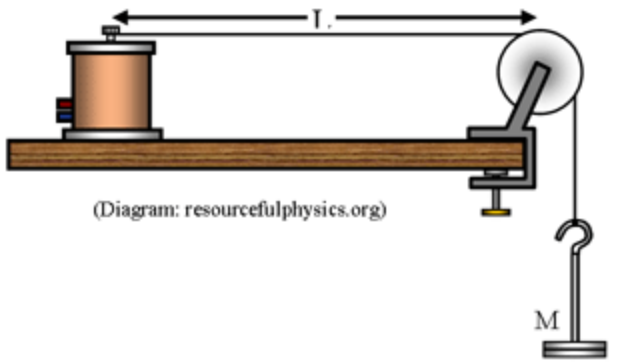
Practical 8: Make measurements to determine the speed of waves

In her second experiment, Annie sets up a stationary wave on a string using a vibration generator.

4. How should she measure the length?

She changes the frequency of the vibration generator so that one whole wavelength is seen on the string.

5. If the string is 1.2m long and the frequency is 20Hz, what is the wave speed?



(Diagram: resourcefulphysics.org)

Practical 8: Make measurements to determine the speed of waves

Annie now wants to measure the speed of sound in air. She asks Isaiah to help her.

6. Describe a method they could use.

7. Explain why their results will be very inaccurate.

Practical 8: Answers

1. Mark on paper where the shadow of the waves are and measure the distance between them.
2. By counting the number of waves in 10 seconds and dividing by 10.
3. Use a strobe light set above the tank. Adjust the frequency until the waves appear stationary – it is now easier to measure the wavelength and the strobe setting will tell you the frequency.
4. With a ruler
5. 1.2 x 20 = 24 m/s
6. Stand on opposite sides of the playground. One person makes a large movement and a sound at the same time. The other measures the time between seeing the movement and hearing the sound.
7. Because the time taken is very small so the effect of reaction time on the measurement will be very large.

Practical 9 (triple only): Investigating reflection and refraction

Andy is investigating reflection.

1. What equipment should he use?
2. What measurements should he take?
3. What is the law of reflection?

Practical 9 (triple only): Investigating reflection and refraction

Andy then investigates refraction.

He wants to find the refractive index of glass.

$$Refractive\ index = \frac{Angle\ of\ incidence}{Angle\ of\ refraction}$$

4. Draw a graph of his results and use the graph to find the refractive index of the block.

Angle of incidence (°)	Angle of refraction (°)
20	13
30	21
40	27
50	33
60	39

Practical 9: Answers

1. Mirror, ray box, power pack, protractor
2. Angle of incidence, angle of reflection
3. Angle of incidence = angle of reflection
4. RI = 1/gradient, should be about 1.5

Practical 10: Investigate how the amount of infrared radiation emitted by a surface depends on the nature of the surface.

Lily is doing practical 10. She has been given a conical flask, a thermometer, a ruler, a stopwatch, a kettle, black paper, white paper and aluminium foil.

1. Write a method for her experiment.
2. Draw a blank table for her results.

Practical 10: Investigate how the amount of infrared radiation emitted by a surface depends on the nature of the surface

These are Lily's results.

Surface	Temperature drop (°C)
Black paper	19
White paper	15
Foil	8

3. Draw an appropriate graph.

4. Why did you chose this type of graph?

5. What could Lily do to make her experiment more reliable?

Practical 10: Answers

1. Heat water in the kettle. Wrap the black paper around the conical flask. Pour 100ml of water into the flask and measure the temperature. Leave the flask for 10 minutes and measure the new temperature. Repeat with the other materials around the flask.
2. See previous slide

3. Bar chart

4. Because the independent variable is categroic

5. Repeat the experiment.