A Level Physics - Preparation 2

Transition from GCSE to A Level

Moving from GCSE Science to A Level can be a daunting leap. You'll be expected to remember a lot more facts, equations and definitions and you will need to learn new mathematics skills and develop confidence in applying what you already know to unfamiliar situations.

This worksheet aims to give you a head start by helping you:

- To pre-learn some useful knowledge from the first chapters of your A Level course
- To see how the Physics you know can be used to explain how devices work
- Consolidate Physics from GCSE

Watch this Khan Academy clip on what Physics is about:
https://www.khanacademy.org/science/physics/one-dimensional-motion/introduction-to-physics-tutorial/v/introduction-to-physics?modal=1

Learning objectives

After completing the worksheet you should be able to:

- Know when vectors are used
- Handle vectors
- Solve some simple vector problems

- Recall the key wave terms
- Be fluent with calculating wave frequencies and time periods

We look forward to seeing you in September!

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Activity

1 Vectors and scalars

Vectors have a magnitude (size) and a direction. Directions can be given as points of the compass, angles or words such as forwards, left or right. For example, 30 mph east and 50 km/h north-west are velocities. You will need to use vectors often in A Level Physics and Mathematics.

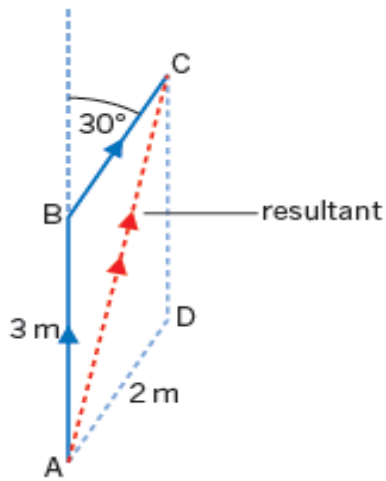
Scalars have a magnitude, but no direction. For example, 10 m/s is a speed. Watch the Khan Academy video on vectors in 1D:
https://www.khanacademy.org/science/physics/one-dimensional-motion/displacement-velocity-time/v/introduction-to-vectors-and-scalars?modal=1

Practice questions

1. State whether each of these terms is a vector quantity or a scalar quantity: density, temperature, electrical resistance, energy, velocity, force, friction, frequency, mass, momentum, power, voltage, volume, weight, work done.
2. For the following data, state whether each is of a vector or a scalar quantity: 3 ms^{-1}, +20 ms^{-1}, 100 m NE, 50 km, −5 cm, 10 km S, 30° W, 3 × 10^8 ms^{-1} upwards, 273 °C, 50 kg, 3 A.

Vectors are shown on drawings by a straight arrow. The arrow starts from the point where the vector is acting and shows its direction. The length of the vector represents the magnitude (size). When you add vectors, for example, two velocities or three forces, you must take the direction into account. The combined effect of the vectors is called the **resultant.**

This diagram shows that walking 3 m from A to B and then turning through 30° and walking 2 m to C has the same effect as walking directly from A to C. AC is the resultant vector, denoted by the double arrowhead.



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A careful drawing of a scale diagram allows us to measure these. Notice that if the vectors are combined by drawing them in the opposite order, AD and DC, these are the other two sides of the parallelogram and give the same resultant. (Read about scale drawing if you are not familiar with this.)

Practice question

3. Two tractors are pulling a log across a field. Tractor 1 is pulling north with force 1 = 5 kN and tractor 2 is pulling east with force 2 = 12 kN.

By scale drawing, determine the resultant force.

2. Waves

You will study waves in detail on the course and need to be familiar with the wave terms. View this Bitesize section on Wave properties:
https://www.bbc.co.uk/bitesize/guides/zqr7ng8/revision/1.
Watch the video and try the test.

If you have the equipment at home, see if you can measure the speed of water waves travelling in a tank or trough. Experiment to see if there is a difference in the speed with different water depth.

The speed of any wave is given by the formula speed = frequency x wavelength ($v=f\lambda$).

Practise questions

1) Complete this table to practise calculating frequencies:

Time period (milliseconds)	Time period (seconds)	Frequency (Hz)	Frequency (kHz)
100			
50			
10			
2			
1			

(Remember that frequency = 1/time period and milli = 10^{-3}, kilo = 10^{3})

2) Note the frequency of your favourite radio station in Mega-Hertz (MHz): it may be in the jingle or on the website or radio display. Use the speed of light (300 million m/s) to find the wavelength of the radio waves of your radio station.

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