Accelerometer

Apparatus

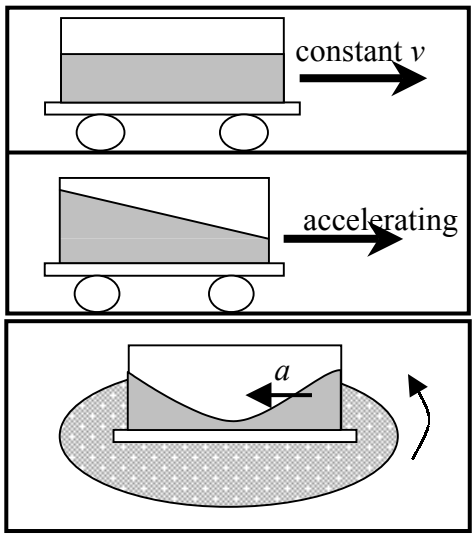
accelerometer on wheels, see diagram below

The accelerometer is a narrow Perspex tank partly filled with a coloured fluid, e.g. water with a little food colouring, with a string attached to one end so it can be pulled along. A good size is around 20 cm long by 15 cm high.

Action

The students pull the accelerometer at constant speed, and accelerate forwards and backwards.

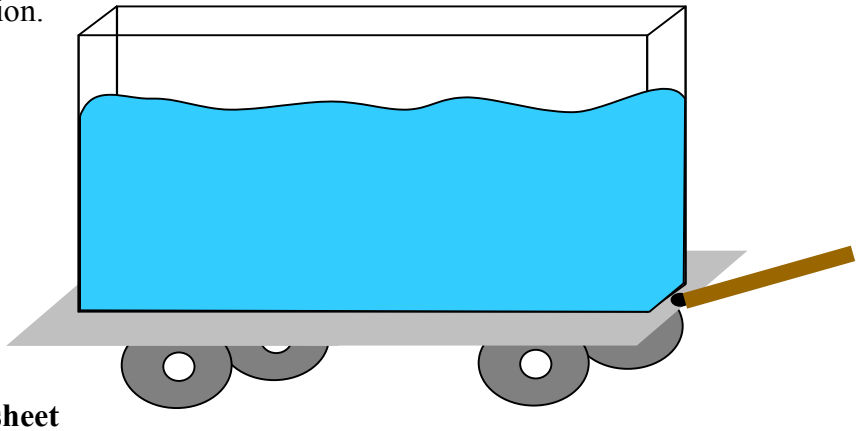
The Physics



The surface of the fluid in the accelerometer should be fairly flat and horizontal at constant speed, as there is no net force acting on the fluid, it looks just as it would if it were standing still.

When accelerated forwards, the fluid's surface will make an angle to the horizontal. The direction of the slope of the fluid shows you the direction of the acceleration. The fluid surface is at an angle because the net force on the fluid is no longer zero. The fluid collects at the back of the accelerometer when it accelerates. In general the fluid will "point" like an arrow in the direction of acceleration.

Note: this device is also handy for a relativity activity as it is impossible to tell whether you are moving at constant speed or standing still. It is also handy for circular motion – when placed on a spinning turntable the fluid collects at the two ends of the accelerometer, with the fluid pointing inwards, showing that the acceleration is towards the center of the motion.



Accompanying sheet

Accelerometer

Pull the accelerometer at a constant speed.
What does it show? Why?

Now accelerate it forwards. What do you observe?

Allow the accelerometer to roll freely on the carpet.
What does it show as it slows down?