At ARHS we manage to demo these motion using Vernier data logging equipment. It could be adapted as a worksheet in which pupils fill in missing parts to graphs. Alternately watch the videos of the motion and pause before the explanation is given.

**Gr 12 Demonstrations and predictions of Graphs of motion of various motions**

For each of the following motions:

* predict what the displacement (change in position ∆x), velocity and acceleration vs time graphs look like. Sketch them on the LHS in pen
* You will then observe the motion as the Vernier equipment logs the data on the computer
* Then make annotated diagrams of the graphs on the RHS before moving to the next example. Include critical points and relationships between them e.g. the gradient of the one equals the value of the one below.

**1.** **Uniform motion** – a trolley or ball is rolled along a horizontal surface

∆x

t

∆x

t

a

t

a

t

v

t

v

t

**2.** **Accelerated motion** – a trolley or ball is rolls down a slope

∆x

t

∆x

t

a

t

a

t

v

t

v

t

**3.** **Rolling up and down a slope** – first with sensor at top, then repeat with sensor at the bottom.

∆x

t

∆x

t

v

t

v

t

a

t

a

t

**4.** **Bouncing ball** – take ground as zero reference point and up as positive

∆x

t

∆x

t

a

t

a

t

v

t

v

t

**5.** **Swinging pendulum** - for enrichment only – not CAPS

∆x

t

∆x

t

**Motion Graphs**

∆x

t

a

t

v

Constant slope means constant acceleration.

Slope of tangent equals velocity at that moment

**General points:  given if all predictions tried.**

* **Generally their predictions improved as the lesson progressed. Very obvious who understands the work well and who is uncertain.**
* **After each one teacher drew on the board what was expected. Basically giving credit for correctly copying it down and taking the trouble to understand it.**

**1.** **Uniform motion** – a trolley or ball is rolled along a horizontal surface

∆x

t

v

a

t

Straight line means

constant

velocity

Slope of ∆x graph

= ∆x/∆t is constant

= velocity

= value of the graph below

Velocity constant

Acceleration zero.

 for the relationship shown between graphs viz. the slopes

Slope of v graph

= ∆v/∆t = accel = 0

= value of the graph below

 for the relationship shown between graphs viz. the slopes

 correct shapes

 **2. Accelerated motion** – a trolley or ball is rolls down a slope

Upward curving – increasing slope means speeding up.

 correct shapes

* Negative value & increasing velocity moving downwards (neg. direction)

Downward curvature = slowing down upwards in pos direction

∆x

t

v

a

0

Downward curvature = speeding up downwards . in negative direction

Constant neg. accel. even at top of motion

∆x

t

v

a

0

- value

0

* sensor on top OR
* pushing from bottom towards sensor
* sensor on bottom
* pushing away from sensor
* Positive value & decreasing velocity moving up
* Zero vel. at top

 correct shapes & critical values lining up for either position of sensor

Top of motion

 corresponds with zero velocity

a

t

∆x

t

v

t

0

-9.8

Constant neg. slope throughout motion when in the air

 corresponds with constant negative acceleration of -9.8 when in the air

 correct shapes & critical values lining up

**3.** **Rolling up and down a slope**

**4.** **Bouncing ball** – take ground as zero reference point and up as positive

Successive bounces lower.

NOT Elastic collisions with floor

Massive positive acceleration when in contact with the ground