WELCOME!

Hello RUGBY!

Presented by

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short demonstrations with everyday items in a format which lend themselves to discussion and making scientific predictions about outcomes….and hopefully engage all students and make them think!

* published in Physics Education
Take a simple experiment (maybe with a discrepant outcome)

* Set it up
* Offer alternative outcomes

Two balloons (from the same packet) are blown as shown in next slide. The tube has a tap.

What happens when the tap is opened?
WHAT HAPPENS NEXT?

A. Small balloon blows up big one
B. Balloons stay as they are
C. Big balloon blows up small
D. Something else
Balloon pressure

Small radius
HIGH PRESSURE

Large radius
LOW PRESSURE

With thanks to Zuzanah Jeskova (Slovakian Science on Stage)
How to

Engage and motivate students and teachers

Involve all students in scientific thinking and discussion
Engage and motivate students and teachers by

presenting short demonstrations/experiments with everyday items in a format which lends itself to discussion and making scientific predictions about outcomes.
1. Keep students actively engaged and provide rapid feedback

2. Focus on Phenomena rather than abstractions

3. Deal explicitly with students’ alternative conceptions

4. Teach and use explicit problem solving skills and strategies

“What happens next?” ticks all these boxes!
Interactive strategy for all ages
Helps develop thinking skills
Aids group activity/involves students
Helpful insights into basic physics
Explores some misconceptions
Fun
USE IDEAS AS

SIMPLE STARTER OR END OF LESSON PLENARY
REVISION
ASSESSMENT FOR LEARNING
END OF TERM QUIZ ACTIVITY
Opportunity for OUTREACH/PARENTS EVENING
Trial University /Industrial Interviews
Fun
SET UP

DEMONSTRATION

teams
The wooden spoon is balanced on a pivot, and then taken and cut into two pieces at this same point.

Which is the heavier of the two pieces?
A  Both pieces weigh the same
B  The handle of the wooden spoon is heaviest
C  The head of the spoon is the heaviest
WHAT HAPPENS NEXT??

Mg  mg
Probing question to examine a less known area of physics

** care, don’t put students off
Here is a strong (neodymium) magnet and two small rods on a thread, One rod is aluminium, One rod is glass.

How do the rods move when they are suspended and the magnet is held close by as shown *?
ALUMINIUM

Is paramagnetic, i.e. it becomes weakly magnetised in a strong magnetic field

So one end of the rod is attracted to the magnet.
GLASS

Is diamagnetic. It is repelled by a strong magnet

So to be furthest from the magnet it arranges itself at right angles to the field
Or maybe TRY SOME EXPERIMENT THAT MAY INVOLVE SKILL or SCIENTIFIC JUDGEMENT

Can you remove the place mat and get the juggling bags into the beakers with one swipe?
What happens next ???

YES !
Some simple examples…

..start non threatening, even not much physics

A QUIZ FOR EVERYONE

Work in groups (best)

or

alone
Some simple examples...

..start non threatening, even not much physics

Two beakers ..both almost full of water

Pour one into another, will it fill right up or spill
What will happen when one beaker is emptied into the other?

A No water will spill
B About 5 ml will spill
C About 10 ml will spill
D More than 10 ml will spill
Two spoonfuls of medicine?

No just two halves of a full teaspoon
Emptying Bottles

Two identical bottles are filled with water. Each has a hole near the bottom and a stopper with a straw, one long and one short.

When the bottles are inverted the water empties through the straw, how does the time for the bottles to empty compare?

A. Both the same
B. Small straw first
C. Long straw first

Speed at which water exits depends on pressure difference $h_{dg}$
Emptying Bottles

Pressure difference due to water

\[ h \rho g \]

Pressure difference due to water

\[ H \rho g \]
An ice cube is placed on a frying pan and a plastic box. The frying pan feels cold.
A The ice blocks remain unmelted in 5 mins.

B Both ice blocks melt but the one on the plastic box slowly begins to melt, before the one on the pan.

C The ice block on the pan melts, while the ice block on the box stays as ice for at least 5 minutes.

D Both ice blocks melt together.
What about drink cans? Some are made of aluminium, some of steel. What happens to the ice cubes in this case?

![Image of drink cans with ice blocks, aluminium, steel, and hot water labels]
What happens next?  

Drinks Cans

Aluminium  

Steel

Conductivity of Aluminium 6-10 times that of steel
Or you can buy special blocks..
An ice cube is placed on each of the black blocks, one is plastic, one is metal, one feels warm to touch, and another is cold to touch.

One of the blocks
In just over a minute!
The other remains as ice.
What happens next? Mystery Blocks

Plastic Block  Metal Block
Some simple examples...by topic

The orange floats in water.

Will it sink after it is peeled? *

A. SINK
B. FLOAT
The LEMON floats because ..... 

The lime sinks because ...
What about an APPLE and a PEAR?

The APPLE floats because

.....

The PEAR sinks because

...
Some sultanas are put into a newly poured glass of lemonade. What will happen to them?
Half an orange
What happens when half an orange is placed in the beaker.

A) It floats flat side up
B) It floats flat side down
The scales show a reading (235g) when a beaker of water and an orange are placed on its pan.

What happens to the reading when the orange is floated on the water?

A The balance remains unchanged  
B The balance reading increases  
C The balance reading decreases
The scales show a reading (158g) when a beaker of water is placed on its pan.

What happens to the reading when the finger is dipped in the water?
A The reading is unchanged

B The reading increases

C The reading decreases

165g
When you rotate a bucket of water in a vertical circle the water does not fall out of the bucket. An orange in the bucket will float. What happens to the orange when the bucket is rotated again?
The floating, rotating orange *

A The orange falls out
B The orange stays floating at the same level
C The orange sinks deeper in the water
The card is placed in front of a mirror.

Will you see anything unusual in the mirror?
The card is placed in front of a mirror.

Will you see anything unusual in the mirror?
BACKWARDS CLOCK
What happens in the mirror?

open ended
Mirror Edge
Eclipse of Mars Illusion

Stare at the dot in the centre of the red disc for 15 seconds. If the disc is suddenly made smaller, what will you see? (This will happen on screen but you can simply move away.)
Eclipse of Mars Illusion
9. What happens next?

On the next slide, stare at the eye of the elephant for at least 30 seconds, then look at a blank screen.
After staring at this elephant what will happen to the elephant when the screen goes blank?

A The screen stays blank
B You will see a pink elephant
C You will see a blue elephant
D You will see a white elephant
E You will see an orange elephant
F You will see more than one elephant
Stare at the eye of the elephant
CHALLENGE

How many of the important facts about the human eye and light can you teach using optical illusions ??

How many lessons for life?
The spouting bottle of water is going to be throw up in the air. What will happen to the jet? **
A The jets stops once the bottle has left the thrower
B The jet is stronger on the way up and less on the way down
C The jet stops at the top of the flight
D Something else
No Jet
WHAT HAPPENS NEXT??

Does this help?

What happens when you throw an open ended tube of water in the air?
GROAN TUBE
What happens next??

A The toilet roll unwinds as the weight falls but comes out of the weights

B The toilet roll unwinds as the weight falls as the paper stays in between the weights

C The toilet roll does not unwind
What else could you use?

Electric circuit with contacts held by gravitational force

Could students think of a way of having a circuit that was completed in free fall?

Physics Education Einstein Year: Experiments in free fall
One balloon containing polystyrene balls is blown up with a pump, the other using human breath.

**WHAT HAPPENS NEXT?**

Will there be a difference in what you observe?

**PUMP**
(Dry air)

**BREATH**
(Damp Air)
Extra ideas

Small “water bombs” give an excellent demonstration of electrostatic attraction, especially when blown up with a pump, rather than wet breath.

How many you can you attach?
An aluminium yen is floated on the surface of water.

What happens when a charged rod is brought close to the yen?
A Nothing
B The yen moves towards the rod
C The yen moves away from the rod
D Something else
The long slinky spring is held vertically. What will happen to the little man on the bottom of the spring, at the instant the top of the spring is dropped?

A) He will move upwards
B) He will move downwards
C) He will stay stationary for an instant
Marvin and Milo 86
A nail, a log and hammer.

A large log is placed gently on top of a set of plastic cups. You will attempt to hammer the large nail into the log.

the hammer has a mass of about 0.4kg and the block itself has a mass of 10.9 kilogram.
What happens to the plastic cups?

A) Nothing much  
B) Squashed on first blow  
C) Gradually squashed with subsequent blows
VARIATIONS …
Place the block in other situations
..on your head, stomach, bathroom scales.
Try cracking walnuts on your head

What happens if you drop the block onto the cups? How is the physics different?
Tissandier’s Experiment 1880
“Popular Scientific Recreations in natural Philosophy”, pub 1881 Ward Lock)
A only the horizontal stick breaks
B The stick and both eggs break
C The stick and one egg breaks
D Only both eggs break
E The egg cups break
F Something else
….Spinning Tops keep spinning…
but for how long????
Thank you for joining in. I hope you have enjoyed the session.

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Lists of experiments at www.talkphysics.com, then follow links to “What happens next?”
Physics Education

(every issue has a WHN at the moment)

www.scienceonstage2.co.uk

www.scienceinschools.org/issue7/whathappen

See also Marvin and Milo Cartoons

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TWO BALLS

….a table tennis ball and a golf ball.

Both are dropped from a height of about 1.5 m.

A Both land at the same time

B The table tennis ball arrives first

C The golf ball arrives first
TWO BALLS

….a table tennis ball and a golf ball.

Both are dropped from a height of about 1.5 m.
A Both balls arrive at the ground at the same time
B The golf ball arrives at the ground first
C The table tennis ball arrives first
Big WOOD and little WOOD

Both are dropped from a height of about 1.5 m.

Which will reach the ground first?

Try two tennis balls,
One filled with water
Big WOOD and little WOOD

Both are dropped from a height of about 1.5 m.

Which will reach the ground first?
Candle Power

What will happen to the candle flame in the jar if the jar is dropped?
NB I intend catching the jar before it hits the ground
A tennis ball on the top of a basketball. Both balls are dropped simultaneously together so that the tennis ball lands on top of the basketball as the basketball reaches the ground.
A Both balls bounce to approximately their original bounce height
B The tennis ball bounces to the combined bounce height of both balls
C The tennis ball doesn’t bounce
D Something else
AN ASTROBLASTER

This is a toy you can buy..
and uses the same idea

or use a bouncy ball
and table tennis ball
**Helium Rockets**

One balloon is filled with helium, the other with air, Which will
A move fastest
B empty quickest

and will there be any difference in the pitch heard?
Two guns: Two pellets, one with sucker, one with sucker + ball

Which one should I fire?
A table tennis ball floats on a full beaker of water.

What happens when you drop the beaker on the bench?
The two identical rods are weighted with two equal masses of plasticine, one at the end, the other at the centre. Which rod will reach the ground first when the two are dropped simultaneously?

A. The one with the plasticine at the centre
B. The one with the plasticine at the end
C. Both fall at the same time
Two identical rods are held at an angle. One rod has a mass of plasticine fixed at its centre.

Which rod will reach the ground first when they are released?
The larger test tube is half filled with water, and the smaller tube fitted inside.

a) the smaller tube rises
b) The smaller tube stays in position
c) The smaller tube falls slowly out of the larger one
Tissandier’s Experiment 1880
“Popular Scientific Recreations in natural Philosophy”, pub 1881 Ward Lock)
A only the horizontal stick breaks
B The stick and both eggs break
C The stick and one egg breaks
D Only both eggs break
E The egg cups break
F Something else
Tissandier’s Experiment
Video..\My Pictures\science videos\ROD SMASH.MP4
Vollmer
..\Downloads\Vollmer_Video_Fig_3_Karate.AVI|Karate
The bouncing ball is going to be bounced at an angle of about 45° under the table in an attempt to bounce it through.

What will happen to the ball?
Bouncy Ball

• A The ball will bounce through, on the floor, on the underside of the table, on the floor again and through
• B The ball will get stuck under the table
• C The ball will bounce back out from the table the way it came in
• D Something else
Bouncy Ball

Try giving a clue:
Use a basketball.

Bounce the ball at an angle, what happens?

The ball spins!

Vollmer Video..\Downlo ads\pe superball_Vide o_Fig_11_sup
The rope is held with three loops, large, medium and small!
When it is pulled tight
a. All close together
b. The small loop closes before the other two
c. The largest loop closes before the smaller ones
When it is pulled tight.
a. All close together.
The long slinky spring is held vertically. What will happen to the little man on the bottom of the spring, at the instant the top of the spring is dropped?

A) He will move upwards
B) He will move downwards
C) He will stay stationary for an instant
Marvin and Milo 86
Marshmallows are sugar and air! The air is in bubbles inside the sweets.

You can remove a lot of the air from the container using the pump.
MARSHMALLOWS IN THE COFFEE SAVER

Marshmallows are sugar and air! The air is in bubbles inside the sweets.

You can remove a lot of the air from the container using the pump.
What happens when you remove air from the container?

A Nothing to notice

B The marshmallows get smaller

C The marshmallows get larger
Better still, use a marshmallow teddy bear....

(It’s just a reflection in the container!!)
What happens when you remove air from the container?
• What Happens Next ….. ?

Some ideas

• Two conical beakers are both filled approximately ¾ full of water (that is 3/4 depth) (or any other liquid). What will happen when one is emptied into the other?
  (The easiest way to set this up is the fill one beaker and the pour half into the second."
  If the beakers are perfectly conical the liquid will fill each to approx 0.75 height)
  (the beaker fills exactly)
• Take a selection of bottles and/or beakers. Fill one of them. Ask whether the liquid will fill or spill from the others
  Float an orange in water. Ask what will happen once it is peeled
  (the peeled orange sinks)
• Try floating other fruits, and ask whether they will float or not, with or without skin
  (use an lemon and a lime , (lime sinks, thin skin, lemon floats, thick skin)
• Float an egg in a container of water. What will happen when a considerable amount of salt is dissolved in the water?
  (the egg floats in the salty water, compare with the dead sea or blue lagoon, Iceland)
• A new unopened can of coke and a can of diet coke are to be floated in a large tank of cold water. What will happen? (Can also be done with plastic bottles)
  (the diet coke floats higher)
• An individual sauce packet is balanced (with paperclips fixed to its bottom) so that it just floats in a 2 litre pop bottle which is almost full of water. What will happen if the top is screwed into the bottle and the bottle is squeezed? (Cartesian Diver)
  (the diver sinks)
• Sultanas in Lemonade. Get a bottle of cheap lemonade, the cheaper the better as long as it is still fizzy What will happen to some sultanas placed in the bottle?
  (the sultanas sink first then acquiring bubbles on their surface rise to the top, loose the bubbles and sink again, then acquire more bubbles and rise etc etc etc)
• What will happen when a peeled and unpeeled grape are dropped into some lemonade?
  (the peeled grape stays at the bottom, the unpeeled grapes rises and falls)
• Tea bag (cylindrical type) Unfold bag , remove staple and empty contents (tea sweepings) Stand the bag on its end as a square based cylinder, on a £10 note if you are brave. What happens when …i set fire to the tea bag cylinder?
  (the tea bag burns down to the bottom then the final ashes rise up away from the note)
• 3 Candles. Arrange 3 candles of different lengths so that they can fit inside an inverted glass jar. Light the candles, (from the longest one downwards), and place the inverted jar over them. Which candle will go out first?
  (You may also try this in 3 identical tall upturned cylinders so the candles are totally separate, in this way they don’t interfere with each other)
  (the tallest candle goes out first)
• Arrange for a toy truck with some object on the top (maybe a teddy bear) to be pushed against a barrier so that it will come to a sudden stop. What will happen to the object on the top?
  (the teddy bear keeps on going, if it isn’t wearing a seat belt)
• A hardboiled egg and a raw egg are spun horizontally on a table. They will be touched to stop each one. Does anything happen next?
  (the hard boiled egg stops, the raw egg restarts spinning)
• Arrange some (heavy) crockery and maybe a teapot on a smooth cloth without a hem. When the cloth is pulled away and off the table, (pull it downwards sharply) will the teapot and crockery stay on the table?
  (There are several similar inertia tricks, which are easily adapted as a will it /won’t it experiment. They can be repeated with students attempting the “trick”.)
  (should stay put)
• A 1 kg mass is connected to some thick string and the rope wrapped around a wooden cylinder (rolling pin, or even a wine bottle will do as substitute).
  When the rod is lifted what will happen?
  (the kilogram mass is held by the rope which doesn’t slip with a few turns)
• About 1m of string is placed over a pencil with a china cup at one end dangling over the pencil and close to it and the other longer end tied to a cork with the string held just below the horizontal. Will the cup reach the ground when released?
13 THE MATCH

The match set up.

The match, cork and forks arrangement is balanced on the rim of a glass.

The match will be lit.

What will be the sequence of events following this?

The match set up.

Match lit.
THE MATCH

The match set up...
\My Pictures\science videos\match balance.MP4
THE MATCH

A The match burns to the cork and the cork ignites

B The match burns to the cork and goes out

C The match burns beyond the rim and the system collapses

D Something else

The match set up..\My Pictures\science videos\match balance.MP4

Match lit..\My Pictures\science videos\match lit.MP4
An long piece of string has a cup tied to one end (heavy), and a paperclip (not so heavy) to the other. The paperclip is held with the string almost horizontally over a pencil and the cup hangs vertically. Leave go of the string so that the cup drops
AThe mug falls to the ground and smashes
BThe mug falls but slows down sufficiently so that it doesn’t break
C The paper clip stops the mug falling to the ground
D Something else
Real Image

These pairs of concave mirrors are readily available
The real image of the pig can be easily seen.

What will happen when a laser pen is shone at the image?

*
The image of the troll can be seen in the mirror.

What happens when you aim a light beam at the “image”?

* Laser pen
Half an orange
What happens when half an orange is placed in the beaker.

A) It sinks
B) It floats flat side up
C) It floats flat side down
D) It floats on its edge
A  nothing much
B  the flame will get bigger
C  the flame will go out
D  something else
The top has very little friction and aerodynamic drag.

How long will it spin for (to the nearest second)?
TIE BREAKER 2

Who can spin a top the longest?

3 2 1 ...go
The two identical rods are weighted with two equal masses of plasticine, one at the end, the other at the centre. Which rod will reach the ground first when the two are dropped simultaneously?

A. The one with the plasticine at the centre
B. The one with the plasticine at the end
C. Both fall at the same time
Two identical rods are held at an angle.
One rod has a mass of plasticine fixed at its centre.

Which rod will reach the ground first
When they are released?
Two guns: Two pellets, one with sucker, one with sucker + ball

Which one should I fire?
A table tennis ball floats on a full beaker of water.

What happens when you drop the beaker on the bench?
Candle Power

What will happen to the candle flame in the jar if the jar is dropped?
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