

Year 5 Science, Autumn 1, Forces

Key Vocabulary

Friction	A contact force acting between two surfaces or objects trying to move across each other.
Newtons	Unit of measure (N)
Force meter	Equipment used to measure newtons
Water resistance	A form of friction made when water pushes against an object moving in the water.
Air resistance	A form of friction made when air pushes against an object moving in the air.
Streamlined	A shape which reduces the effect of air resistance or water resistance, allowing the object to move quickly.
Acceleration	Change of speed
Gravity	An invisible, non-contact force made by the Earth.
Surface area	The amount of area covered by something
Lever	Rigid length pivoting
Pulley	A wheel that supports a moving cable or belt
Gear	Rotating wheel with cut teeth that mesh with the teeth of another gear

Evaluating reliability

Some scientists perform repeated measurements so they can identify 'dodgy data'. This means that they can evaluate if their data or results are reliable or not.

Currency: Timeliness of the information.
 Relevance: Importance of the information for your needs.
 Authority: Source of the information.
 Accuracy: Truthfulness and correctness of the information.
 Purpose: Reason the information exists



Sir Isaac Newton



Developed first theory of gravity.
 Mathematician.
 Worked on 'mass' as the *Master of Mint*, making coins.

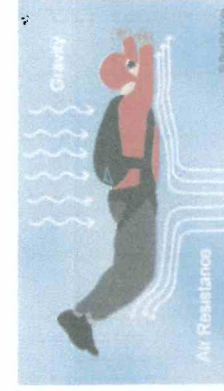
Levers, Gears and Pulleys



Water resistance



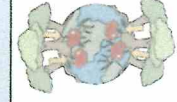
Air resistance



Gravity, mass and friction

Gravity

- Invisible non-contact force between an object and the Earth.
- Objects with different mass will fall at the same rate in free fall (where only force is gravity)
- Gravity has the same force everywhere on Earth

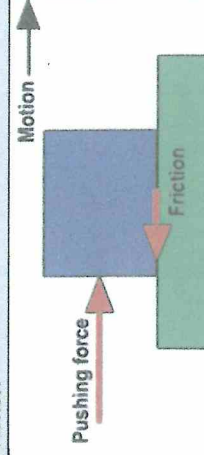


Mass

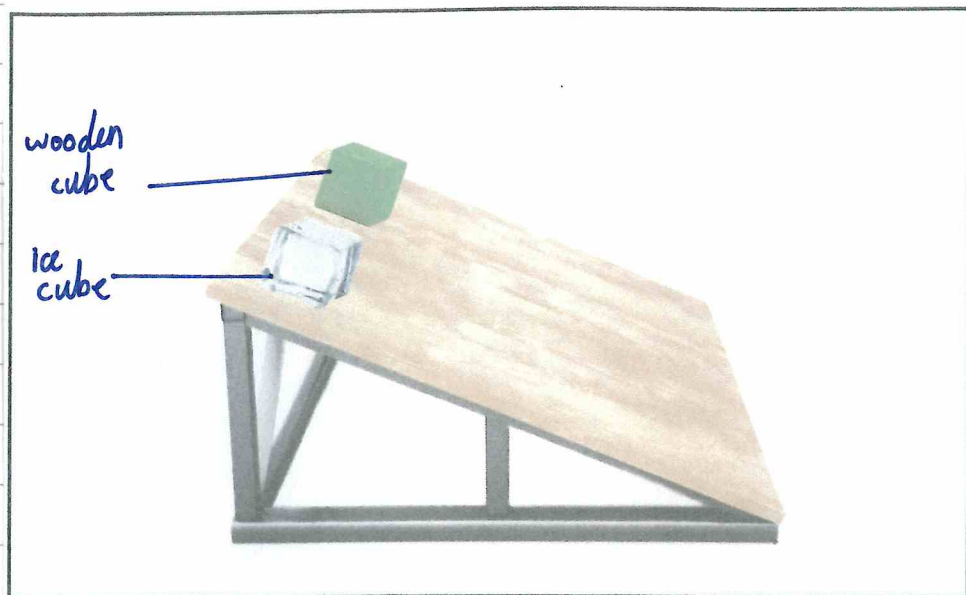
- Measured in kg/g on Earth.
- On Earth mass and weight seem to be the same.
- However, the mass of an object stays the same.

Friction

- Holds back movement of an object.
- Two surfaces in contact.
- Friction acts in opposite direction to the movement



Thursday 5th September 2024
What is friction?



I think the ice cube will go down first because ice is more slippery and ~~weak~~ the friction will slow the cube down. ✓

Which shoe provides the best grip?

Prediction:

I think the shoe with the ^{sandpaper} ~~laminated~~ sole will be the best.
The rougher the sole the more friction. ✓

1. Equipment List

1 & 2. 5 different shoes

3 & 4. 1 kg weights

5 & 6. Newton meters

7 & 8. Flat surface

Method:

1. Put 1 kg weight on the shoe.
2. Place the Newton meter on the shoe
3. Drag ~~the~~ the shoe along a surface and record the amount of newtons needed.

Recording

Shoe	Newtons (N)	Grip
Shoe 1 Sandpaper	30	Excellent
Shoe 2 Foam	13	Poor
Shoe 3 Carpet	8	Good
Shoe 4 Wood	4	Poor
Shoe 5 Laminate	9	Poor

Conclusion:

Looking at my results, the sandpaper shoe sole had the best grip. I know this because it took 30 newtons to pull it. My prediction was correct.

How much force has been measured on each Newton meter?

(The left side of the scale shows the weight Newton, and the right side shows the mass in grams)

Read both values of each picture and compare all the measurements. What do you notice?

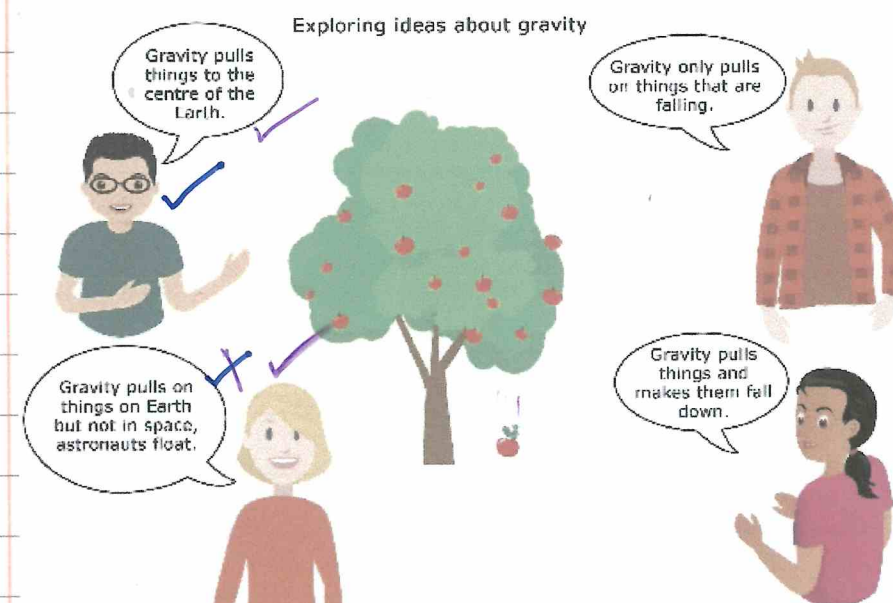


1-4 newtons ✓ 2-18 newtons 14 1/2 3-2.4 newtons 4-5.5 newtons ✓

Thursday 19th September 2024
What is gravity?

RP

1. True ✓
2. Which things are predators and prey. ✓ Where the energy is transferred
3. Incisors ✓
4. R A ✓



What if there
was no
gravity?



If there was no gravity everything would float and buildings might too. The food in your stomach would float around in you. It would be near impossible to give your family a hug. It would be harder to walk around the park and you wouldn't be able to control yourself unless you swim in the air.

Which potato will hit the ground first?

R Prediction:

I think that the greater ~~was~~ amount of mass the quicker ^{it} it will fall.

Equipment List:

- Potatoes of different mass
- Measured height

Method:

- Measure the ~~dropping point~~ distance from the dropping point to the floor.
- Drop both potatoes at the same time.
- Observe which balls hit the floor first.

Recording:

The experiment was between a book and a glue stick and they both fell at the same time.

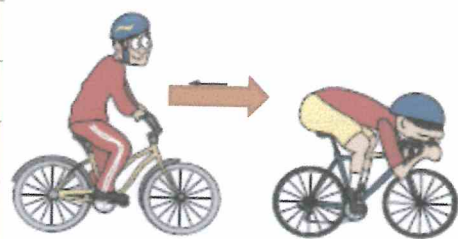
Conclusion:

Looking at the results, my prediction was incorrect and ~~was~~ the results were that both objects of different mass hit the ground at the same time.

Thursday 3rd October 2024
What is air resistance?

R.P.

1. A contact force. ✓
2. The one thing that doesn't change.
3. When people or animals travel to different countries due to certain circumstances. ✓
4. False. ✓
5. ~~Passable~~ Permissible.



It's a decrease in air resistance because as the man goes down the air pushes past him which makes him faster. ✓

How does the length of the blades on a autogyro affect how quickly it falls?

Prediction: I predict that the autogyro with the largest surface area will fall the quickest because there is more air resistance.

Equipment List:

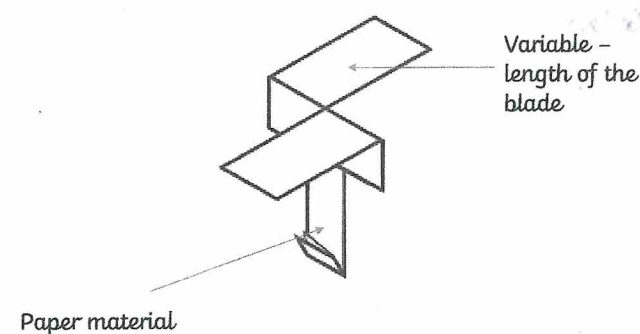
- Paper
- Scissors
- Measured height
- Timer
- Paperclip

Method:

1. Drop it from a measured height.
2. Time the amount of time it takes to hit the ground.
3. Stop the timer when it hits the ground.
4. Record the results in a table.

Recording:

Surface area of blades (cm squared)	Time taken to fall 1 (Seconds)	Time taken to fall 2 (Seconds)	Time taken to fall 3 (Seconds)	Average time taken to fall (Seconds)
10 5	1	1	1	1
20 10	2 1	2 1	3 2	2 1
30 15	2	2	2	2



Conclusion:

The 15cm autogyro hit the ground slowest and the 5cm autogyro was quickest. The time it took ~~in~~ depended on how big the blades were so the air resistance would slow it down. My prediction was correct. Make sure you reference 'surface area' in your conclusion.



Isaac Newton

Isaac Newton was a famous scientist who was born in 1642.

There is a famous story about Newton watching an apple fall from a tree.

Newton thought a force must cause the apple to fall.

Tick **ONE** box to show which force on the apple causes it to fall down from the tree.

a pulling force
towards the tree

☐

a pushing force
from the apple

☐

a pulling force
towards the Earth

☒

a pushing force
from the air

☐

Newton did different investigations to test his ideas.

Why was it important for Newton to test his ideas using investigations?

So He wouldn't think the wrong thing. so he tested all of his hypothesis.

Newton realised that the force which made the apple fall to the ground also causes the Earth to orbit the Sun.

Name the force that causes the Earth to orbit the Sun.

Gravity

How long does the Earth take to orbit the Sun once?

~~24 hours~~ 1 year.

How does the Earth move to cause day and night?

It spins and one side is towards the sun making day and the other the moon making night.

Thursday 17th October 2024

How can we slow down an object when it is travelling?

R.P

1. Greater Slower
2. The soil has nutrients and the roots absorb them to make food. ✓
3. Bottom. Beginning
4. They need to bite into meat. ✓
- 5.

Science Experiment Question:

How can we slow down an object when it is travelling?

Prediction:

I predict that the greater the surface area of the parachute, the slower the air resistance.

Equipment List:

- Plastic bags
- Scissors
- 12 pieces of string 30cm each
- Ruler
- 12 paperclips
- Stopwatch
- Scales
- Modelling clay to attach to a string

Method:

1. Cut 3cm squares from a plastic bag. 10cm X 10cm 20cm X 20cm and 30cm X 30cm.
2. Cut 12 pieces of string (30cm)
3. Measure the mass of modelling clay so there are 3 equal masses and shape into spheres.
4. Tie one piece of string to each paperclip.
5. Pierce the paperclips through each corner of the parachute.
6. Attach 4 pieces of string to the modelling clay sphere.
7. Repeat this process to create the second and third parachute.
8. Measure the height that the parachute will be dropped from.

9. Drop the first parachute from a chosen height and measure the time taken for it to hit the ground.

Recording:

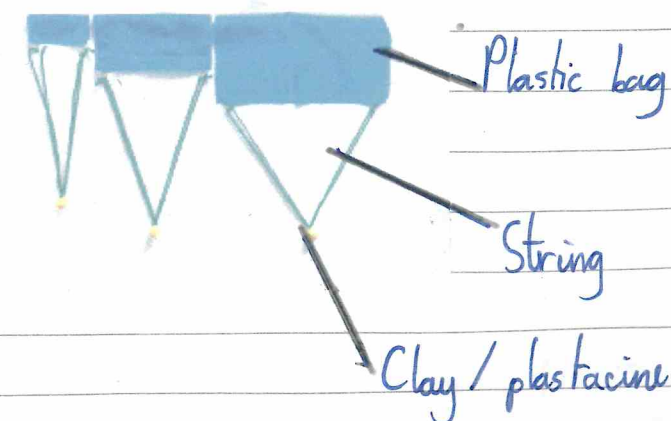
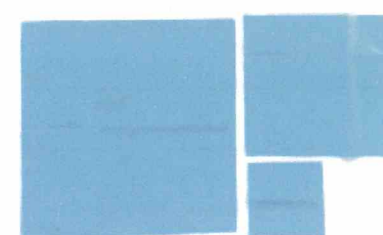
Surface area	Time taken to fall 1 (Seconds)	Time taken to fall 2 (Seconds)	Time taken to fall 3 (Seconds)	Average time taken to fall (Seconds)
10 X 10cm ²	1	1	1	1
20 X 20cm ²	3.1	4.2	3.1	3.3
30 X 30cm ²	4.2	2	2.1	2

Conclusion:

I have noticed that my prediction was correct and the parachute with a larger surface area was the slowest.

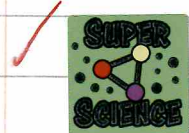
Evaluating Reliability:

The parachute that had the largest surface area travelled the slowest because there was ^{less} greater air resistance which affected the speed. ✓



Parachute length (cm)	Time taken in seconds
10	0.46
20	18.23
30	0.98

The data is unreliable because it was ~~recored~~ recorded in full seconds not milliseconds.



Thursday 24th October 2024
What is water resistance?

RP

1. Unreliable result. ✓
2. A. B
3. False. ✓
4. Saliva. ✓



The boat is the odd one out because it cannot go underwater. It is also much ~~longer~~ larger than the others.

Explain why the following pictures show high or low water resistance.

Refer to the shape of the object, the direction the object is moving and the role water resistance and up thrust will have in each scenario.



The submarine has low water resistance because it is slim. It is travelling down so the water uses upthrust to push it up. and the submarine is streamlined.



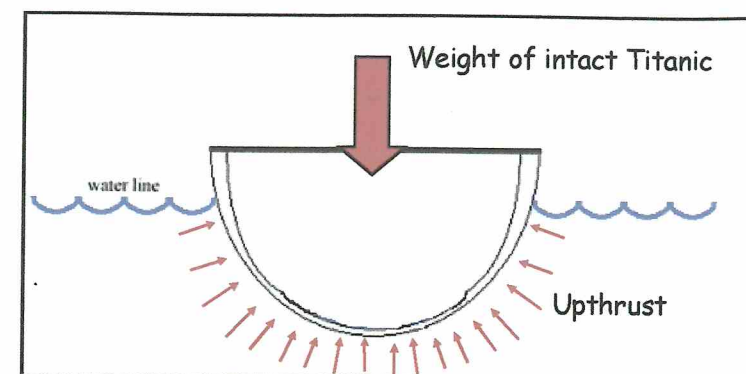
The wide man has high water resistance because he has a large surface area and is moving down so the water will push him up using upthrust. He is not streamlined.



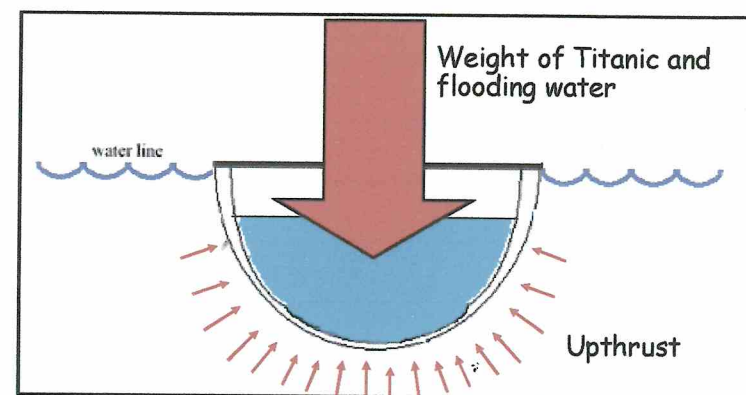
The water mill has low water resistance because it ~~has a~~ is slim and the upthrust pushes it up.

✓ well done

When the Titanic was intact the **surface area** of it's hull created enough **up-thrust** force to keep it afloat.



As Titanic began to fill up with water, the **extra weight** this water added, was pushing down more than the up-thrust could push back up. As a result the ship began to sink.

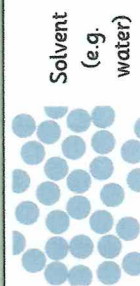


Solution	A mixture of solvent and solution (e.g. a cup of coffee)
Solvent	The liquid in which a solute is dissolved (e.g. water in a cup of coffee)
Solute	A substance that is dissolved into a solvent (e.g. coffee in a cup of coffee)
Dissolve	When a solid is mixed into a liquid without being able to be detected by eye.
Reversible change	A change that is made to a substance which can be changed back to put the substance back in its original state, e.g. melting or freezing.
Irreversible change	A change that is made to a substance which cannot be changed back to be as it was before, e.g. burning or cooking.
Chemical reaction	A change where two or more substances combine to make a new one
Filter	A method of separating substances (usually solids from liquids) using paper.
Soluble	A substance that can be dissolved in a solvent (e.g. sugar).
Insoluble	A substance that cannot be dissolved (e.g. sand).

Stem Sentences

- F- Have they kept all the variables the same apart from the one being changed?
 A-How accurate were their measurements?
 R- Were the repeated measurements very similar? Maybe they could then suggest improvements for their investigation.

Solvent and solute



The solvent is a liquid so it has gaps between the molecules making up the liquid.



The bits of coffee are each a solid. The molecules making up the coffee are tightly packed together.

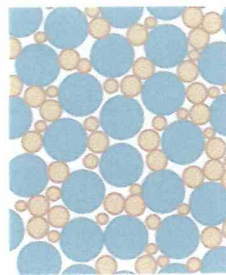
Dissolving

- When coffee is added to hot water, the heat in the water gives the coffee molecules extra energy and they begin to break up into smaller particles.
- These particles of coffee can get so small, they fit in the gaps between the water molecules.
- The solution may change colour but will no longer have any solid visible.

If you keep adding solute, the gaps between the solvent molecules will fill with solute until there is no more room.

At this point no more solute will dissolve and you will be left with undissolved solid at the bottom of the liquid.

We call the solution saturated – meaning completely filled.



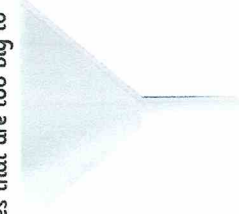
Separating by evaporation

- Solute can be removed from the solvent again by using evaporation.
- Adding more heat will provide all molecules in the solution more energy.
- If the water molecules in our coffee gets more heat, the water will evaporate.
- This will leave the coffee particles (that were dissolved) behind.



Separating by filtering

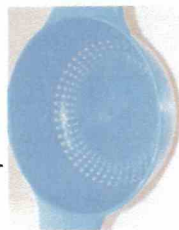
- For mixtures such as sand and water (that won't dissolve) we can use filtering to separate the water from the sand.
- Filter paper lets liquids and solutions through but anything with particles that are too big to fit between the fibres in the paper are trapped.
- We put the paper into a funnel to stop it falling over!



Separating by sieving

Sieving is a method for separating large solids from smaller solids.

- The sieve is a barrier made from mesh or plastic with holes of a certain size in.
- The holes between the mesh or in the plastic allow objects up to a certain size through.
- Any objects that are bigger than those holes or spaces are trapped behind the barrier.
- We use sieves in baking to make flour lumps smaller.
- We use sieves in the garden to remove roots and rocks from the soil.



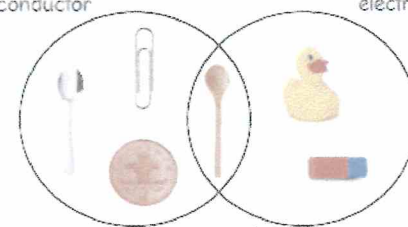
Thursday 14th November 2024
 Materials and their properties

RP

1. Dodgy data ✓
2. True ✓
3. Venus Mercury
4. Star ✓
5. Gravity ✓

Whitney has sorted some objects.

electrical conductor



electrical insulator

Do you agree with Whitney? No ✓

Explain your answer.

Wood is not a type of metal ✓
 So it is not a conductor ✓

Suggest another object that is an electrical conductor.

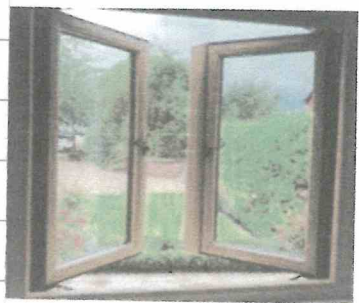
Hairpin ✓



A saucepan is created using steel, ~~and plastic and glass~~. Steel is a thermal conductor which means that it keeps things hot for a few hours or so. The plastic is used for the handles so that when you lift up the object, your hand will not burn. The plastic is also an electrical insulator. The glass is used on the lid so and is transparent so you know if your food is burning or not. ✓



A bridge is created using concrete and steel, which are both durable. The concrete is used for the floor because it's very strong and can hold the weight of cars and people. It's also an electric insulator. The steel is used for railings so cars don't drive off the edge. These two materials can withstand all types of weather. ✓



Windows are created using glass, metal and plastic because they are all durable. The glass is used because it's transparent and strong. The metal is used for handles to open and close it. The plastic is used as a thermal conductor and a electrical insulator. It is also very strong. ✓

Thursday 21st November 2024

What is a solute, solvent and solution?

R.P.

1. False ✓

2. Opaque ✓

3. Mars, Earth, Mercury, Jupiter, Venus, Saturn, Uranus, Neptune. .

4. Something that dissolves into liquid. ✓

5. Opaque, Strong, Sturdy. ✓

