

Science lessons and assessments – teacher's notes

Forces and Movement down a slope

This document has been written to guide you through the science topic of forces and motion down a slope. It is important that you work through the activities in this document, because the evaluation of the children's progress in group work is tied to this work.

The lessons are designed to encourage children to apply their understanding of forces in the particular context of movement down a slope. The lessons do not provide comprehensive understanding of forces in a full range of contexts. However, they do provide scope for children to learn more about the forces of gravity, friction and air resistance.

The lessons are relevant to science programmes of study in 'SC4 Physical Processes' and to QCA Schemes of Work '4E Friction' and '6E Forces in Action'. Appendix 1 at the end of this pack provides science background information and you may find it helpful to refer to this.

Materials

The materials consist of the lesson plans for teachers, and some worksheets for each group of pupils in your class. There are also individual **pre-test** booklets (**pink**) for children to complete before the lessons are covered and also individual race information **post-test** booklets (**white**) for children to complete 2 weeks after the final lesson.

The lesson plans are organised into sections by topic, we leave the decision on how to divide the lessons up to you

We have provided you with some resources to use with these lessons (cars, and 2 different types of surface). If you have problems finding the other resources (bricks and slopes) you could improvise with materials in your classroom e.g. instead of bricks use books to raise the height of the slope to different levels – encourage children to measure the height. For slopes you can use thick card or wood. Try to make sure that slopes are long enough for friction and air resistance to have a noticeable effect.

Which activities do we need to complete?

These lessons consist of some main activities (indicated by **!**) and some optional activities (marked as **?**). We ask that you at least do the main activities and **not to alter the delivery of these lessons** since these are designed to maximise the amount of group thinking and talking.

If you feel your class need more on a particular aspect of forces then you might find the optional activities useful. However, if you have other activities that you would rather use, then please do use these instead. All we ask is that you try to maintain the group work nature of any additional activities that you use. Use your discretion to decide whether certain activities require more or less emphasis and more or less time than set out in the plans.

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Activity 1:
Pre-test - 'Individual thinking'

Resources

PINK pre-test booklets – 1 per child

5



Group work: Problem solving

1 pen and 1 sheet of paper per group

5

2: Pushes and pulls – (10 mins approx.)

6



Activity 2: Moving the car 1

Resources

1 toy car for each group

6

3: Gravity – (Main activity 25mins, optional activities 25 & 20 minutes approx)

7



Activity 3a: Moving the car 2

Resources

3 small objects for dropping
1 toy car per group
1 slope per group
6 bricks per group
1 pen and paper per group

8



Activity 3b: Gravity on the earth and moon

1 copy of group work sheet 3b per group

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Activity 3c: Opposing gravity

1 copy of group work sheet 3c per group

10

4: Forces and the 'Great Down the Slope Car Race' – (25 mins approx.)



Activity 4: Group problem solving

Resources

1 pen and 1 sheet of paper per group

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5: Friction – (45 mins approx.)



Activity 5: Planning and carrying out a fair test of friction

Resources

3 slope surfaces – sandpaper, carpet etc.
1 toy car per group
1 slope per group
6 bricks per group
1 copy of worksheet 4b per group

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 Activity 6c: Fair testing air resistance and weight	Some plasticine to alter car weight and/or A rectangular piece of card to attach to car front to alter air resistance 1 toy car per group 1 slope per group 6 bricks per group	19

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1: Forces and the Great Down the Slope Car Race

(55 mins approx.)



Activity 1: Pre-test and Group problem solving – (55 mins approx)

Aim

To draw out children's existing understanding of forces in the context of movement down a slope.

Resources

- A toy car
- Slope and bricks to prop it up for teacher demonstration
- Slope surfaces – Sandpaper, carpet, etc.
- Pre-test 'Individual thinking booklet' (**PINK** booklets) - 1 per child

Learning objective

- that several forces may act on one object

1. Briefing – (5 mins)

Show the children a toy car running down a slope. Tell/remind them that forces are the pushes and pulls which help the car to move, speed up, slow down or even stop.)

- Tell pupils that they are going to be taking part in the 'Great Down the Slope Car Race'.
- The aim of the race will be to beat your opponents by getting your car to travel **FURTHER** than theirs. However, tell them that they will have an advantage because they are going to be able to set up the slope for themselves and then for their opponent (you) and this could help them to win.

Before taking part in the race, they are going to carry out some work and investigations to help them become experts on the forces which act on the car. This will help them to set up the slope to help them win.

The 'A Team' who took part in the race last year have sent some information to help them understand how different forces act on the car going down the slope.

2. Pre-test – 'Individual thinking booklet' – (20 mins)

- First they complete the '**Individual thinking**' (**Pink**) **pre-test booklet** which focuses on factors which cause differences in motion down a slope:

- Give the booklets out and tell the children that the 'A Team' thinks they will be able to win 'The Great Down the Slope Car Race' if they think hard about what makes a car travel different distances when moving down a slope.
The 'A' Team have sent some pictures to get them thinking about **FORCES**.
- Children complete Individual Booklets. Help may be given with reading and writing.

3. Group problem solving – (15 mins)

Tell groups that they have a problem to solve. They are going to work out a **plan to make their car go as FAR as possible**. They are allowed to alter the slope/ car according to the following rules of the race.

1. They are **NOT allowed** to push the car.
2. They **can** use bricks (up to a maximum – e.g. 6) to change the height of the slope.
3. They **can** change the surface of the slope e.g. by using either sandpaper, carpet etc.
4. They **can** change the shape of the car e.g. by sticking some card to the front of it.

This is a discussion activity and the actual apparatus is not used by the children at this stage. You choose if and how the plan is recorded.

4. Debriefing – (15 mins)

Before groups feedback their plans, tell children they are to constructively question and criticise each other's plans. Make sure they explain and justify their points.

Where there is real controversy or differences in opinion you could use apparatus to demonstrate how they affect the distance travelled by the car.

Collect ideas from class about **why** they think their car will go so far (highlight any ideas relevant to forces of gravity, friction and air resistance).



Lesson break possible

2: Pushes and pulls

(10 mins approx.)



Activity 2: Moving the Car 1 – (10 mins)

Aim

This activity is done as quick revision of the fact that a force is always a push or a pull. It is preparation for examining the action of gravity in the next activity.

Resources

A toy car for each group

Learning objectives

- That a force (push or pull) is needed to move an object
-

1. Group work – (5 mins)

Give each group a toy car. Ask children to spend a couple of minutes finding as many ways as they can to move a toy car across the table. They are to discuss and agree an answer to the following question:

Can an object can be moved across the table without a push or a pull of some kind?

2. Debriefing – (5 mins)

Groups feedback the methods they used to move the car and agreed answers to the question. Get pupils to contribute feedback to other groups' methods and answers.

Try to guide any debate over differences in ideas between groups highlighting the word **FORCE** and any comments which lead to the idea that any force is really a kind of **push or pull**.

3: Gravity

(Main activity – 25 mins, Optional activities – 25 and 20 mins approx.)

Aim

To encourage groups to revise/develop understanding of the force of gravity and to think about it in the context of movement down a slope.

Resources



For Activity 3a:

- 2 or 3 unbreakable objects for dropping
- Group Worksheet 3a – ‘Moving the car’
- A slope for each group and enough bricks for each group to prop up the slope at different heights
- A toy car for each group to run down the slope



For Activity 3b:

- Group Worksheet 3b – ‘Gravity on Earth’



For Activity 3c:

- Group Worksheet 3c – ‘Stopping movement caused by gravity’

Learning objectives

- To understand that objects are pulled downwards because of the gravitational attraction between them and the Earth.
 - To understand that an opposing force can act to counteract gravity.
-



Activity 3a: Moving the car 2: the action of gravity on movement down a slope – (25 mins approx.)

Resources

- 2 or 3 unbreakable objects for dropping
- Group Worksheet 3a – ‘Moving the car 2’
- A slope for each group and enough bricks for each group to prop up the slope at different heights
- A toy car for each group to run down the slope

1. Introduction – (5-10 mins)

Collect 2 or 3 small objects which will not break if they are dropped. Tell pupils to watch what happens when you drop them.

Introduce the term **GRAVITY**. Tell children that this is the force which pulls an object downwards even though no-one is pushing or pulling it.

Now they are going to think about how the height of the slope affects the distance which the pull of gravity can make the car move down the slope.

2. Group work – (10 mins)

Give groups a slope and 5 or 6 bricks to allow them to set the slope up at different heights.

Ask groups to look at **Group worksheet 3a (Page 2)**. They are given 3 different heights to set the slope at. They are asked to test how far each arrangement causes the car to travel.

The worksheet asks groups to think about the reasons for different distances travelled in terms of the action of gravity and opposing forces. (The higher the slope the less the push of the slope on the car opposing motion caused by gravity.)

You choose how responses are recorded.

3. Debriefing – (5 mins)

Ask groups to feedback their explanations for different distances travelled. Draw out ideas about the balance between gravity and the opposing force being altered by the slope encouraging discussion between groups as relevant.

Highlight the idea that the slope pushes back against the force of gravity and that the angle of the slope diverts the motion of the car to greater and lesser extents.



Activity 3b: Gravity on the Moon/ Earth – (25 mins approx.)

Resources

Group Worksheet 3b – ‘Gravity on Earth’

1. Introduction – (5-10 mins)

Give basic explanation to children that gravity is caused by an attraction/ pull between objects. The bigger the object, the bigger the pull it exerts.

Give the example of differences between gravity on the Moon and Earth (i.e. very, very big objects).

- The planet Earth is very big and the pull of gravity on Earth is big.
- The Moon is smaller. The pull of gravity on the moon is much weaker.

2. Group thinking – (10 minutes)

Next groups are asked to think about direction of pull of gravity on Earth.

Ask groups to look at **Group worksheet 3b (Page 3)**.

This gives a diagram of the Earth with a figure standing on top. The figure has dropped a stone and the arrow shows the direction in which it drops. Groups are asked to draw 3 other figures onto the diagram with arrows showing the direction that a stone would travel if dropped by each figure. Groups are then asked to discuss the question: ‘If everything falls **down**, why don’t people fall off the side or bottom of the Earth?’

3. Debriefing – (5 mins)

Collect ideas about how the figures should be drawn on the Earth and the direction in which stones would fall if dropped at the different points. Highlight ideas which recognise that gravity is a pull towards the centre of the Earth.

Possibly using a globe or a picture of the Earth discuss as a class what life is like in countries in the southern hemisphere (e.g. Austral-asia, parts of Africa, Antarctica etc.) and countries on the equator (e.g. Brazil, Kenya, etc.) Ask and explore further the question ‘If gravity pulls everything down why don’t people fall off the Earth?’



Activity 3c: Using another force to balance the action of gravity – (20 mins approx.)

Resources

Group Worksheet 3c – ‘Opposing movement caused by gravity’

1. Introduction – (5 mins)

Explain that the pull of gravity on Earth is always pulling down towards the centre of the earth. But you can find ways of using another force to prevent things moving downwards and to make them stay still.

2. Group thinking – (10 mins)

Ask groups to look at **Group worksheet 3c (Page 4)**. This activity is designed to help groups think about how a second upwards force can slow or prevent motion caused by gravity.

Ask the groups to look at the pictures and to **use the forces** to explain why the ball is not falling.

3. Debriefing – (5 mins)

Ask groups to feedback to class about what makes an object fall and what can make it remain still. Draw out ideas which show an understanding of a downward force (especially gravity) balanced by an upward force.

Relate ideas back to movement down slope where different angles of slope push back more or less against the pull of gravity.

4: Forces and the 'Great Down the Slope Car Race'.

(25 mins approx.)



Activity 4: Group problem solving – (25 mins approx.)

Aim

To draw out/ consolidate children's understanding of forces in the context of movement down a slope.

Resources

For teacher demonstration during debriefing (optional):

A toy car

A slope and enough bricks to prop up the slope at different heights

Different surfaces (e.g. carpet, sandpaper, etc.) to alter the friction level of the slope

A piece of card and some sellotape to alter air resistance of the car

Some plasticine to alter the weight of the car

Learning objective

- For groups to apply their current understanding of a number of forces in the context of movement of an object down a slope.

1. Introduction – (5 mins)

Groups have now thought about the height of the slope and gravity and how this affects the **distance** travelled by the car. They are now going to think about other forces that may slow the car down or even stop it.

2. Group problem solving – (10-15 mins)

Tell children they have another problem to solve. They need to come up with some ideas on how to make the car go **as SHORT A DISTANCE as possible**.

Tell them this time they will be able to alter the **weight** of the car as well as other factors. Again, they are allowed to alter the slope/ car according to the following rules of the race.

1. They are **NOT allowed** to push the car.
2. They **can** use up to a maximum of 6 bricks to change the height of the slope.
3. They **can** change the surface of the slope by sticking on sandpaper, carpet or something else.
4. They **can** change the shape of the car e.g. by sticking some card to the front of it.
5. They **can** change the weight of the car e.g. by putting plasticine in the 'cockpit'. (**But** they must ensure it does not protrude and so alter the shape and air resistance of the car.)

As before, this is a discussion activity and the actual apparatus is not used by the children at this stage. You choose how the plan is recorded.

3. Debriefing – (10 mins)

Before groups feedback their plans, tell children they are to constructively question and criticise each other's plans. Make sure they explain and justify their points.

Where there is real controversy or differences in opinion you could use apparatus to demonstrate how they affect the distance travelled by the car.

Collect ideas from class about **why** they think their car will go only a short distance (highlight any ideas relevant to gravity and particularly the forces of friction and air resistance).

5: Friction

(45 minutes approx.)



Activity 5: Friction – (45 minutes approx.)

Aim

To encourage groups to revise or develop their understanding of the force of friction and to think about it in the context of opposing motion down a slope.

Resources

Each group will need:

A toy car to run down the slope

A slope with bricks to prop it up to a set height

Strips of different materials for each group e.g. sandpaper, carpet, etc. to alter the friction level of the slope

Group Worksheet 5: Slowing the Car Down

Learning objectives

- Learn about friction as a force that slows moving objects and may prevent objects from starting to move.

1. Group thinking – (5 mins)

Ask groups to quickly discuss what **friction** is and how changing the surface of the slope by using different materials (such as carpet and sandpaper etc.) will alter the amount of friction.

2. Briefing – (5 mins)

Get a quick feedback of ideas from groups. Highlight the ideas relevant to an understanding of what friction is.

Tell groups that they will now plan and/ or carry out a fair test to show how the level of friction from 2 or 3 surfaces (you decide how many) will affect the **distance** travelled by the car.

3. Group Work: Planning and carrying out a fair test – (30 mins)

You decide how much independence groups have in planning, carrying out and recording the test and also the number of surfaces they are to compare (2 or 3). You

can give them guidance/ help with the activity as you feel necessary. You can choose to ask groups to work through the **Group worksheet 5 (Page 5)**.

The test should begin with groups agreeing their own hypothesis about which surface will make the car go furthest/ least far and why. The test should end with some group discussion about how the test supports their hypothesis or not.

4. Debriefing – (5 mins)

Get groups to feedback to the class about their hypotheses and findings. Encourage discussion and constructive criticism, draw out any ideas about how a change in friction alters distance travelled by the car.

6: Air resistance and weight

(Main activity - 45 mins. Optional activities – 2x 30 mins approx.)

Aim

To encourage groups to revise or develop their understanding of the force of air resistance and to think about it in the context of opposing motion down a slope.

To develop understanding that weight is not a factor which will affect motion down a slope.

Resources



For optional activity 6a:

- 2 cotton wool balls and 1 plasticine ball for each group
- Group Worksheet 6a: Slowing down a falling object



For optional activity 6b:

- For teacher demonstration:
- 3 parachutes made from squares of paper, string attached to each corner and joined to a small weight e.g. a paperclip – one piece of paper should be small, one medium and one large.
- Group Worksheet 6b: The parachute test



For activity 6c:

For each group:

- A slope with bricks to prop it up to a set height
- A toy car to run down the slope
- A rectangular piece of card to attach to the front of the car in order to alter the level of air resistance (and sellotape).

Learning objectives

- Learn about friction, including air resistance, as a force that slows moving objects and may prevent objects from starting to move.
- Learn that weight is **not** a factor which affects the rate of downward movement of an object.



Activity 6a: Slowing down a falling object – (30 mins approx.)

Resources

For each group

- 1 plasticine ball
- 2 cotton wool balls
- Group worksheet 6a: Slowing down a falling object

1. Introduction – (2 mins)

Tell the class that you are going to look at another force which may be used to slow the movement of the car down the slope.

2. Group work: comparing the fall of 2 objects – (20 mins)

You decide how groups should record their ideas. You can choose to ask groups to do this by completing the **Group worksheet 6a (Page 6)**.

Give each group one cotton wool ball which is rolled up to be as compact as possible and also one ball of plasticine rolled up to be the same shape and size as the cotton wool ball. Each ball should be weighed and their weight noted.

Next the groups are to drop the two balls at the same time and from the same height (above their heads). They should watch carefully to see what happens. (The balls should reach the floor at the same time). This could be repeated a few times to provide a fair test.

Ask children to discuss whether they are at all surprised at their findings and to explain why the two differently weighted balls landed at the same time.

Next exchange the plasticine ball for a second cotton wool ball. If possible these should be weighed (they should both weigh approx. the same). Tell groups to leave the rolled up cotton wool as it is but fluff up the second cotton wool ball as much as possible.

Ask them to drop the balls again from a height and watch what happens now. (Air resistance should cause the fluffed up ball to fall more slowly).

Ask groups to discuss and explain what happened in this test. What makes objects fall more slowly?

3. Debriefing – (10 mins)

Get groups to report back their findings and ideas about what makes objects fall more slowly. Draw out ideas about

- lack of effect of weight on rate of fall
- air resistance slowing fall – the greater the surface area of the object the more air is in contact with the object to slow its fall.

Introduce the **term** ‘**AIR RESISTANCE**’ for appropriate ideas. (If ideas are inaccurate or incomplete then you may want to carry out the following parachute activity before using the label of air resistance).



Activity 6b – The parachute test – (30 mins approx.)

Resources

For teacher demonstration:

- 3 parachutes made from squares of paper, string attached to each corner and joined to a small weight e.g. a paperclip – one piece of paper should be small, one medium and one large.

For group work:

- Group Worksheet 6b: The parachute test

1. Class activity – (15 mins)

Children should be sitting in their groups. Carry out a demonstration of air resistance using a small, medium and large parachute (made from paper, string and a small weight such as a paper clip). The shape of the parachutes should be the same – they should only vary in terms of the size of the piece of paper used.

Explain to groups that you are going to drop these from the same height at the same time. Ask groups to agree a prediction of what will happen and why. Give them 2-3 minutes to do this. Then ask volunteers to drop the parachutes while the groups observe which falls most quickly.

2. Group thinking – (10 mins)

Ask groups to agree explanations for differences in time taken for parachutes to fall. You decide whether answers should be recorded and how. You may want them to discuss questions as laid out on **Group worksheet 6b (Page 7)**.

3. Debriefing – (5 mins)

Get groups to report back on their ideas about what made an object fall more slowly. Again draw out ideas about air resistance slowing fall – the greater the surface area of the parachute the more air is trapped and pushes up against the parachute in the opposite direction to gravity. If the term is not already in use introduce the label of ‘air resistance’ for this force.



Activity 6c: Fair testing air resistance and weight – (45 mins approx.)

Resources

Each group will need

- slope with bricks to prop it up to a set height and a toy car
- some plasticine to alter the weight of the car
- a pre-cut rectangular piece of card to attach to the front of the car in order to alter the level of air resistance (and sellotape).

1. Introduction – (10 mins)

Ask groups to discuss what air resistance is, if they have not already done so (during the optional activities), and to feed back these ideas to the class. Give them a few minutes for their discussion. During the feedback draw out the main ideas about air resistance slowing fall – the greater the surface area of the parachute the more air is trapped and pushes up against the parachute in the opposite direction to gravity.

Tell children that they are going to carry out fair tests to show how weight and air resistance will affect how **FAR** the car travels. (You may want to work through each of these tests separately.)

Show groups that they can alter the weight of the car by loading its ‘cockpit’ with plasticine. [Note – The plasticine should not stick out of the body of the car at all as otherwise the shape of the car and air resistance will also be changed.]

Show children how to alter the air resistance of the car by attaching a piece of card to the front of the car with sellotape. This can then be folded in half to change air resistance but maintain the added weight of the card.

2. Group activity– Fair testing – (30 mins)

You decide how much independence groups then have in planning, carrying out and recording the test. You can give them guidance/ help with this as you feel necessary.

Each test should begin with groups agreeing their own hypothesis about which level of weight/ air resistance will make the car travel **FURTHEST** and why. It should end with some group discussion about how the test supports their hypothesis or not.

3. Debriefing – (5 mins)

Ask groups to feedback their hypotheses and findings for each test. Draw out any ideas about how change in air resistance alters distance travelled by the car and about how weight does not.

7: The Great Down the Slope Car Race

(45 mins approx.)



Activity 7a: The Race – (45 mins approx.)

Aim

For groups to apply their understanding of a number of forces in the context of movement of an object down a slope.

Resources

Each group will need:

- A slope and enough bricks to prop it up to different heights
- 2 different surfaces to alter the friction level of the slope
- A piece of card and some sellotape to allow groups to alter air resistance of the car
- Some plasticine to alter the weight of the car
- A toy car for each group to run down the slope

Learning objectives

- Learn how different forces may interact to alter the motion of a vehicle down an incline.

1. Introduction – (5 mins)

Tell pupils that in preparation for the race, they are going to make a final plan to show how they can use gravity, friction, air resistance and weight to help them win the race (make the car go **as far as possible**) and to make their opponent lose (make the car go as **little distance as possible**).

Repeat the ‘Rules of the Race’

1. They are **NOT allowed** to push the car.
2. They **can** use bricks (up to a maximum – e.g. 6) to change the height of the slope.
3. They **can** change the surface of the slope e.g. by using either sandpaper, carpet or something else.
4. They **can** change the shape of the car e.g. by sticking some card to the front of it.
5. They **can** change the weight of the car e.g. by loading the ‘cockpit’ with plasticine.

2. Group work: Race plans – (10 mins)

Groups work out their race plans for themselves and their opponent. You decide how their plan is recorded.

3. Class activity – The Race – (20 mins)

Each group carries out their 'Race Plan' for the class, with the teacher taking on the role of opponent. Teams score a point for winning a race, teacher scores a point if they lose the race.

4. Debriefing – (10 mins)

Review of more/ less successful race plans. Collecting ideas from groups about how gravity/slope, friction and air resistance have been used together to make cars win and lose the race.

5. Follow-up work – (15 mins)

Groups compete against each other to find the car that will go the furthest and the car that will go the shortest distance. This will help to identify the best combination of factors. It is important that groups are not encouraged to be overly competitive and that all are seen to be successful.

**Activity 7b: Forces post-test – (20 mins approx.)****Resources**

- 1 Post test: Race information booklet (**WHITE**) per child.

1. Individual activity – (20 mins)

This should be done two week after the forces lessons have been finished.

All children should complete the post-test **Race Information Booklet** individually.

Help may be given with reading and writing.

Appendix: Background Information about Forces

Gravity

All objects attract one another. This attraction causes gravitational pull. The force of attraction that objects exert depends on their mass. Between small objects the force of attraction is so small as to be negligible. The Earth has an enormous mass and so the force of attraction between it and other objects is noticeable. (The weight of an object is a measure of how much the Earth pulls on it.)

The pull of gravity decreases with height above the Earth but the difference is negligible when comparing the fall of 2 objects from different heights relatively close to the ground. (Differences observed in the speed of fall between objects dropped from different heights is due to the difference in time available for them to accelerate before reaching the ground.)

The direction of the Earth's gravity is towards its centre. This means that there is no absolute direction called down.

In the same way that gravity makes a ball fall straight downwards, gravity makes a ball move down a slope. The slope diverts part of the force sideways. As in the case of falling objects (see below), objects of different weights which are released from the same point on a ramp should reach the bottom at the same time.

Friction and air resistance

On Earth, whenever two surfaces move relative to one another – even when an object moves through the air – there is always friction. In a frictionless environment, an object would continue to move at the same speed in the same direction forever (unless some other force acted on it to change its movement).

Friction does not only occur between two solid surfaces it also exists between a moving solid and a liquid or between a moving solid and a gas such as air. This kind of friction is called air resistance.

Some misconceptions about forces

- Gravity is only present if air is present and so it does not operate in space.

This is not the case and gravity still operates in space e.g. keeping objects in orbit around the Earth.

- Gravity is caused by the Earth spinning.

In fact, gravity would still exist if the Earth stopped turning.

- Weight affects the rate of fall of objects.

In fact, if dropped from the same height, objects of different weights but of the same shape will fall at the same rate and reach the ground at the same time. If objects are very different in shape they will fall at different rates because of differences in air resistance.

- Friction cannot occur if there is no movement between surfaces

In fact a stationary object on a slope is prevented from moving by friction between the object and the surface. Gravity pulls the object downwards and without friction the object would slide down the slope.