

Discussion / Activity 1

Suggested Answers

Forces, Machines & Work

1.

a) What is the simplest definition of “force”?

A force is a push or a pull.

b) We know that forces can make things move, or stop moving. What are 2 other changes that can be caused by forces?

Forces can change the shape of things, or cause temperature to rise.

c) What is the unit of force? **The newton (N).**

2.

a) List 3 types of simple machines.

Levers, Pulleys & Gears.

b) Some machines give you a “force advantage”. What does this mean?

The machine reduces the force required to do a task, so it is easier.

c) Other machines can give you “distance (or speed) advantage”. What does this mean?

The machine increases the distance moved, so the load moves further or faster.

d) What is the definition of the amount of “work” done by a force?

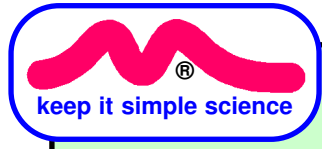
Work = Force x distance

e) Even though a machine may give you a force or speed advantage, you do not really get something for nothing. Explain why.

You either get a force advantage OR a distance/speed advantage, but NOT both.

If you calculate the work “output” it is always either equal to, or less than the “input”.

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Discussion / Activity 2

Suggested Answers

Friction

1.

a) In what direction does the force of friction always act?

In the opposite direction to the movement.

b) Explain why it takes much more force to drag a brick across the ground than to pull the same brick on a wheeled trolley.

There is much more friction between the brick and the ground, than a wheeled trolley. Wheels reduce friction by a huge amount.

2. Describe a situation where:

a) it is good to have little or no friction.

When cruising along the highway in a car.

b) it is good to have a lot of friction.

When turning a corner, or using brakes to stop.

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3.

a) How is friction affected by the amount of force pressing things together?

Friction is increased when the force pushing things together is higher.

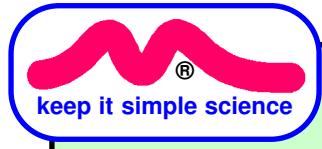
b) Friction is very much affected by the nature of the surfaces in contact.

i) Give an example of 2 substances which have a lot of friction when in contact.

Rubber tyres on a dry concrete road.

ii) Give an example of 2 substances which have very little friction when in contact.

Metal skate blades on wet ice.



Discussion / Activity 3

Suggested Answers

Gravity, Mass & Weight

1. Explain the difference between a contact-force and a field-force.

**Contact forces only act when they touch something & are in contact with it.
A field force can push or pull on something at a distance, without touching it.**

**2. Explain how the gravity of the Earth defines the directions we call “up” and “down”.
“Down” is the direction that objects fall under gravity. “Up” is the opposite.**

3.

a) In what units do we measure mass? Kilograms.

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b) What is meant by “weight”?

The weight of any object is the force due to gravity acting on its mass.

c) If you went to the Moon, how would your mass compare to here on Earth?

Mass would be exactly the same.

d) If you went to the Moon, how would your weight compare to here on Earth?

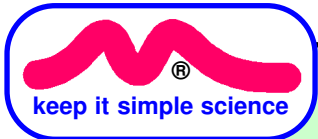
Weight would be a lot less because the Moon’s gravity is weaker.

4. A satellite in orbit is actually falling down. Explain this statement.

A satellite in orbit is falling under gravity, but also has a lot of “sideways” speed. This causes it to curve downwards (not drop straight down). At the right speed, the falling curve matches the curve of the Earth, so it never reaches the surface.

5. Is it true that there is no gravity in space? Explain.

**Not true; there IS gravity in space. Gravity keeps the planets in orbit around the Sun.
(However, in orbit things are in free-fall and have no apparent weight.)**



Discussion / Activity 4

Suggested Answers

Magnetic Forces

1. What are the “rules” about magnets attracting or repelling each other?

Opposite magnetic poles attract. Like poles repel each other.

2. Apart from other magnets, what substance(s) are affected by magnetic force?

Mainly ferrous metals (containing iron) including various types of steel.

3. One end of a laboratory magnet is always marked “N”. This end is really a magnetic south pole, so why is it marked “N”?

“N” is for “north-seeking” because this pole always points towards the Earth’s magnetic north pole, if allowed to swing freely.

4.

a) Outline a simple way to make an electromagnet.

Wrap insulated electrical wire around an iron bar, then pass electric current through the wire.

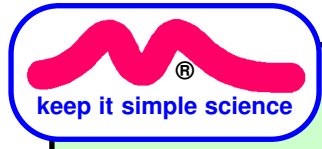
b) Why are electromagnets so important in our technology?

Electromagnets are the basis for electrical generators (for making electricity) and electric motors for many tools, appliances and machinery. They are also used in speakers for radio, etc.

5. Outline a simple way to “see” a magnetic field.

Cover a magnet with paper and sprinkle with powdered iron. The iron particles line up in the magnetic field and make it visible.

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Discussion / Activity 5

Suggested Answers

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Electrical Force

1. Name the particles within all atoms which carry electric charges. For each, state what sort of charge the particle has.

Protons, positive charge. Electrons, negative charge.

2.

a) Describe a simple way to cause an electrostatic charge to develop (say, on a plastic ruler).

Simply rubbing the ruler with a cloth may create static charge on it.

b) Outline how (in general terms) the charge is caused.

Friction may move electrons from cloth to plastic (or vice-versa) causing it to develop an imbalance of charges.

c) If it turns out that the ruler gets a positive charge, explain precisely what has happened at the atomic level.

To become positive, the ruler has lost electrons and has a slight surplus of protons in its atoms.

d) What are the “rules” for how charges attract or repel each other?

Opposite charges attract each other. Like charges repel.

3. What is an electroscope?

A device for detecting and experimenting with electrostatic charged things.

4. Briefly, what is lightning?

Lightning is a massive spark caused by charged clouds discharging to the Earth or to other clouds.