keep it simple science

KEEP IT SIMPLE SCIENCE

KISS topic number → Topic 06.7P ← Year level designation in Nat.Curriculum

Science Understanding Strand
B = Biological Sciences
C = Chemical Sciences
E = Earth & Space Sciences
P = Physical Sciences

Forces

Year 7 Physical Sciences

WORKSHEETS

Attention Teachers

INSPECTION COPY for schools only

1.
KISS Worksheets are designed to consolidate students' knowledge & understanding and/or develop or practice a skill, such as graphing, calculating, reporting prac.work, etc. Some are suitable to issue as homework assignments. Some can be used as a "quick quiz".

2.
In both the "PhotoMaster" and "OnScreen" resources, an information box (as shown) indicates the appropriate point for each worksheet to be completed.

Please complete Worksheets 1 & 2 before going on.

3.
KISS Worksheets are formatted for photocopying so that they may be used as in-class paper exercises, quiz tests or homework assignments.

They can also be converted for use as Microsoft Word™ documents, or with software allowing annotations, (eg Microsoft OneNote™) or apps such as "Notability"™ and "iAnnotate PDF"™ in tablets & iPads. This allows KISS Worksheets to be completed by students in their computer, then submitted by email, for example.

Answer Section begins on p11

Suggested answers to the "Discussion / Activity" pages ("OnScreen" resources) are in a separate file in the folder for this topic.

keep it simple science

Make your own "Mind-Map" TITLE PAGE.
Cut out the boxes. Sort them into an appropriate lay-out on a page of your workbook, then glue them down.
Add connecting arrows and colour in.

Forces

Force of Friction

Force of Gravity

Forces & Their Effects

Magnetic Force

Electrical Charges

Orbits & Weightlessness

Magnetic Fields

Mass & Weight

Electrical Force

Forces, Machines & Work

Charging & Discharging

Make your own "Mind-Map" TITLE PAGE.
Cut out the boxes. Sort them into an appropriate lay-out on a page of your workbook, then glue them down.
Add connecting arrows and colour in.

Forces

Force of Friction

Force of Gravity

Forces & Their Effects

Magnetic Force

Electrical Charges

Orbits & Weightlessness

Magnetic Fields

Mass & Weight

Electrical Force

Forces, Machines & Work

Charging & Discharging

keep it simple science

Worksheet 1 Forces

Student Name.....

Fill in the blank spaces

A force is a a)..... or a b)..... Force is what causes things to begin to c)....., or to d)..... ..... and stop. Force can change the e)..... of something, such as in a collision. Force can also change the f)....., such as when the g)..... of a car get hot.

In a vehicle accident, huge h)..... can act on the people involved. Modern safety devices work by i)..... these forces. These safety features include j)....., ... and ..... zones.

They all work by k)..... (increasing/decreasing) the <u>time</u> of the collision. This l)..... (increases/decreases) the forces acting.

Force is measured in units called m)....., abbreviated n).....

A simple way to measure forces in the laboratory is to use a o)..... ..... These are not very p)....., but are quick and simple to use.

Worksheet 2 Machines & Work

Student Name.....

Fill in the blank spaces, then try the Calculation Problem.

A "simple machine" is a device which can make a job a)..... or b)..... by changing forces to our advantage. Simple machines include c)....., ... and .....

The photo shows a claw hammer pulling out a bent nail. This is an example of a d)..... which gives a e)..... advantage.

The chain system of a bicycle is an example of a f)..... which gives a g)..... advantage.

Even though a machine can give an advantage of h)..... or ....., it cannot give you i)..... at once. You cannot get "something for j).....". This is because the "WORK OUTPUT" by the machine cannot be k)..... than the l)..... ..... put into the machine.

In Physics, "WORK" means the amount of m)..... multiplied by the n)..... over which the force is applied.

<u>Calculation Problem</u>

Using a "block & tackle" pulley system, a mechanic is able to lift a heavy engine out of a car, so he can work on it.
The forces and distances were:
Load force = 2,500N.
Effort force = 500N
Distance moved by load = 1.5 m
Distance moved by effort = 9 m

a) Calculate the WORK OUTPUT

b) Calculate the WORK INPUT

c) Was there a "force advantage" involved? Explain.

d) Does this mean the mechanic got "something for nothing"? Explain.

keep it simple science

Worksheet 3 Friction

Fill in the blank spaces

Student Name.....

Friction is a a)..... which always pushes in the b)..... direction to the way anything is moving. This means that friction always causes moving things on Earth to c)..... and eventually d).....

However, in outer space there is no e)..... and no friction. A space craft with its f)..... turned off, will coast along at g)..... speed.

In a car on Earth, the only way to travel at a constant h)..... is to constantly provide a i)..... from the car's j)..... to overcome the k)..... force.

To go faster the engine must provide a force l)..... (larger/equal/smaller) than friction.

If the engine's force is less than friction, the car will m).....

The amount of friction depends on many factors. One is the amount of n)..... pressing the two surfaces together.

Another important factor is the o)..... ..... of the two surfaces in contact. Friction depends on whether the surfaces are rough or p)....., wet or q)..... and so on.

INSPECTION COPY for schools only

Worksheet 4 More on Forces

Match the Lists

For each definition, write the letter of the matching List Item.

Student Name.....

Definitions	matches with
1. Type of force which acts when things push or pull when touching.	.....
2. Units of force.	.....
3. A type of "field force".	.....
4. A change that forces can cause.	.....
5. Equipment to measure force.	.....

List Items (not all will be used)

A. spring balance
B. gravity
C. change of speed
D. volt
E. contact
F. newton
G. light

Fill in the blank spaces.

Many forces are known as "a)..... forces" because they only act when things touch. There are also some forces which push or pull without touching. These are called "b)..... forces". Examples are c)....., electrical force and d)..... force.

Our modern understanding of forces began with e)..... (person) about 300 years ago.

He figured out how forces cause things to f)..... and to stop moving. He figured out that things fall down because of the force of g).....

keep it simple science

Worksheet 5

Student Name.....

An Experiment on Mass & Weight

You will need:

spring balance 0-5 N
slotted 50g masses & mass carrier

Procedure: simple!

1. Start with (say) 100g mass. Record this mass in both grams (g) and in kilograms (kg) in a table.

2. Hang the mass on the spring balance and record its weight in newtons (N).

3. Add another 50g or 100g and repeat these measurements.

Data Table

Mass (g)	Mass (kg)	Weight (N)
100	0.1	

Analysis:

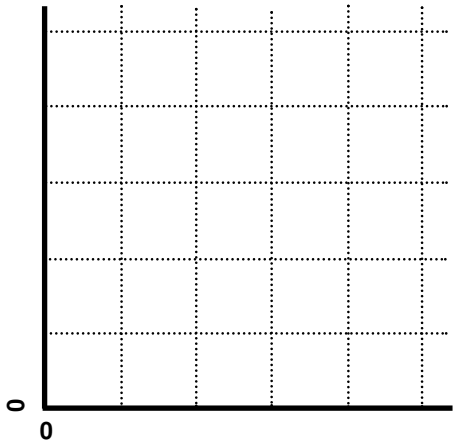
Construct a Line Graph of Mass (kg) (on horizontal) against Weight (N)(vertical).

A "line graph" means you plot points and then "join the dots". Use a ruler.

You'll need to work out a suitable number scale on each axis first.

Don't forget to write a "Title", and to label the axes.

Graph



For Discussion:

1. You may have found that the points on the graph lie almost in a perfect straight line. Why do you think they are not perfectly lined up?

2. Can you determine a mathematical way to calculate the weight (on the Earth's surface) of any given mass?

3. The ratio between Weight (N) and Mass (kg) gives a special number we call "g". On the Earth's surface g = 10. The value of "g" is different in different places. (example: on the Moon, g = 1.6)
Can you find out the values for "g" on other planets of our Solar System?

keep it simple science

Worksheet 6 Gravity

Student Name.....

Fill in the blank spaces

Gravity is a "a)..... force" which acts on objects without b)..... them. Gravitational force c)..... (attracts/repels) every object in the Universe.

Gravity is what makes everything near the Earth d)..... Gravity holds the Earth in orbit around the e)..... and holds all the stars together in a f).....

Gravity pulls on everything which has g)..... This is the amount matter in an object, measured in units of h).....

Your weight is the i)..... due to j)..... pulling on your mass. The k)..... of any object stays the same, but its l)..... changes depending on where it is.

For example, an object on Earth has a certain mass and weight. If the same object was taken to the Moon, its mass would be m)....., but its weight would be n).....

All objects fall o)..... under gravity, so long as p)..... has no effect.

A satellite in q)..... around the Earth is actually r)..... under gravity. However, because of its "side-ways" speed it curves downwards at the same rate as the s)..... of the Earth, so it never reaches the surface. So long as there is no friction with the t)..... (there is none in space) it continues to u)..... around the Earth without falling down.

Anything orbit or in free-fall has no v)..... The object still has its w)....., but is weightless.

Worksheet 7 Skills Exercise - Gravity

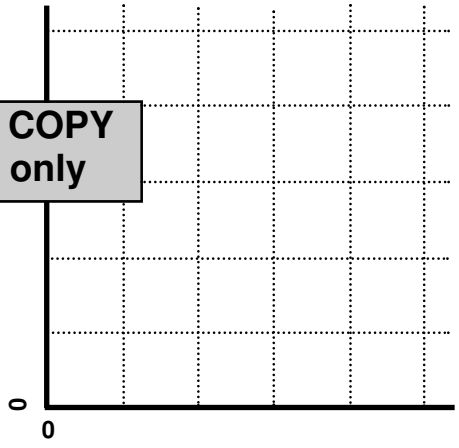
You need to have completed Worksheet 5 to be able to do this.

Student Name.....

An astronaut who landed on a planet of our Solar System did exactly the same experiment as in Worksheet 5.

Here are her results:

Mass (g)	Mass (kg)	Weight (N)
	0.1	0.4
	0.2	0.8
	0.25	1.0
	0.4	1.6
	0.5	2.0



1. Fill in the first column of the table above.

2. Graph the Mass(kg) against Weight(N). (first label the axes, work out number scales, and write a Title)

3. Your points should lie in a straight line. Find the gradient (slope) of this line. (gradient = vertical rise / horiz. run)

4. What is the value of "g" on this planet?

5. Which planet of our Solar System is the astronaut most likely visiting?

keep it simple science

Worksheet 8 Magnetism

Student Name.....

Fill in the blank spaces

Magnetism is a a)..... force (contact/field) which can both b)..... (pull towards) or c)..... (push away).

The Earth has a magnetic d)..... That is why a freely-rotating magnetic needle (called a e)".....") always points in the f)..... - ..... direction. The Earth's magnetic field also acts as a shield against dangerous g)..... from the Sun.

A magnet will attract any metal containing h)..... The magnetic field can penetrate through substances such as i)....., but is blocked by any j).....

Every magnet has two ends, or k)"....." called north & south.

Two magnets affect each other as follows: Opposite poles l)..... while m)..... poles n).....

An electromagnet can be made by wrapping o)..... around an p)..... bar and connecting it in an q)..... circuit. The magnetism can be turned on and off with the r)..... This makes electromagnets very useful in electric motors, s)..... and .....

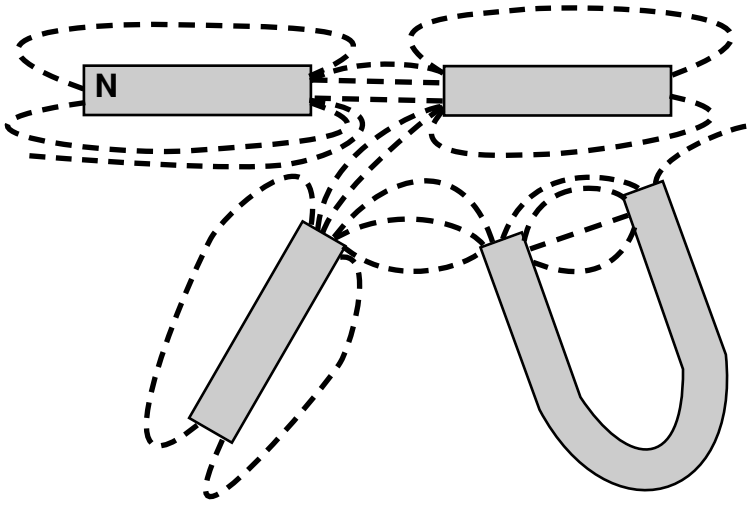
Worksheet 9 Magnetic Poles

Student Name.....

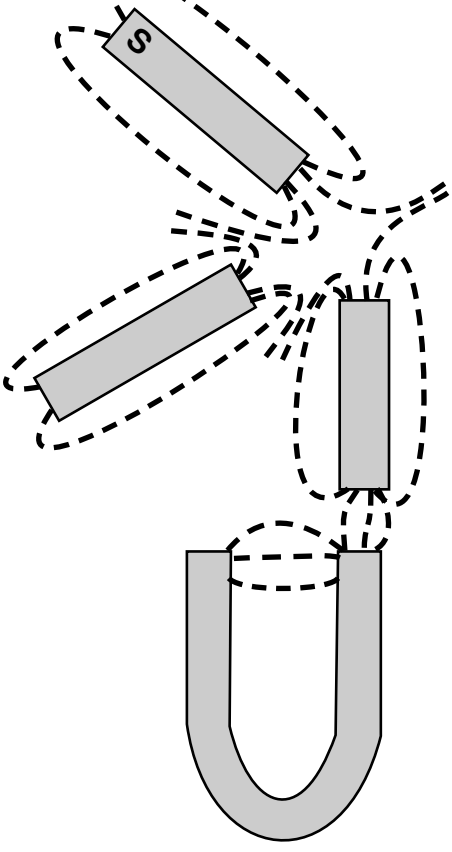
Each set of diagrams shows a number of magnets with the "field lines" made visible using iron dust.

Only one pole of one magnet is known. Identify <u>all</u> the magetic poles (write "N" or "S" on the diagrams).

1.



2.



keep it simple science

Worksheet 10 Electrical Charges & Forces

Student Name.....

Fill in the blank spaces

Electrostatic force is a a)..... (contact/field) force which acts between things that have an b)..... charge.

Electric charges are carried by particles within atoms. On the outside of every atom are the c)..... which carry d)..... charge. In the e).....(central part) of each atom are the f)..... which carry g)..... charge. (There are also h)....., which have no charge.)
Normally, the number of electrons and protons are i)..... and cancel out.

However, if two different substances are rubbed together, j)..... can be rubbed off one type of atom onto the other.

The substance which loses electrons now has a surplus of k)..... charge. That which gains electrons has an excess of l)..... charge.
If the substance is an electrical m)....., the charge cannot easily flow away.

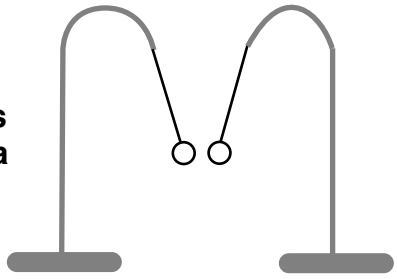
Electric charges exert a force on each other as follows: Opposite charges n)....., while o)..... charges p).....

Worksheet 11 More Electrical Charges & Forces

Student Name.....

Briefly answer the questions

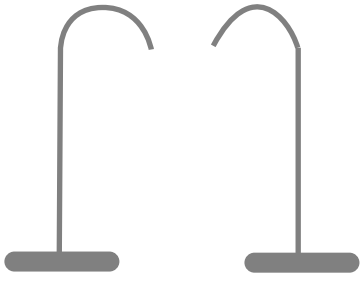
1.
Each of these electroscope balls were touched by a rod which had been rubbed with a cloth.



a) Explain the way they are hanging.

b) Were they both touched by the same rod? Explain.

c) Complete this sketch to show the effect of touching both with the same rod.



2.
This girl was photographed while she was touching a van der Graaf generator.

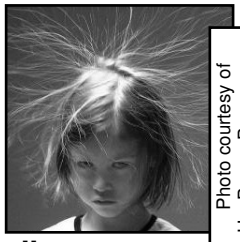


Photo courtesy of HeyBannerBanner.com

Explain why her hair is standing up.

3.
Fred discovered that if he rubbed his shoes on the nylon carpet, then touched someone who was holding the handrail or a water tap, they got an electric shock. Explain what's happening.

4.
Why is it NOT wise to shelter under a tree during a thunderstorm?

keep it simple science

Topic Test Forces

Student Name.....

Score /

Answer all questions in the spaces provided

1. (10 marks)
Match each description to an item from the list. To answer, write the letter (A,B,C, etc) of the list item beside the description.

Description	matches with	List Item
i) a field force which can attract or repel things.		.....
ii) Unit of force.		.....
iii) Contact force which always opposes the motion of an object.		.....
iv) Unit of mass.		.....
v) Constantly falling down around the Earth, but never reaching the ground.		.....
vi) Coil of wire around an iron bar.		.....
vii) Force multiplied by the distance it acts over.		.....
viii) Type of electric charge carried by an electron.		.....
ix) Device for detecting electro-static charges.		.....
x) Static discharge from sky to earth.		.....

List Items (not all will be used)

A. repel	H. newton
B. electromagnet	I. electroscope
C. gravity	J. orbit
D. negative	K. positive
E. kg	L. lightning
F. friction	M. neutrons
G. magnetism	N. work

2. (6 marks)
Give a brief explanation of each of the following.

a) On Earth, a moving object (without power) always slows down and stops, but in space things can keep going without power.

b) A compass needle always points in a north-south direction.

c) Sometimes the more you brush your hair, the more it stands up on end.

3. (5 marks)

a) List 3 types of simple machines.

b) A simple machine can give you a "force advantage". What does this mean?

c) "Force advantage" sounds like you are getting something for nothing. Are you? Explain.

keep it simple science

Topic Test Forces *(cont.)*

4. (4 marks)
True or False? Write "T" or "F" for each

a) Objects in orbit are weightless because there is no gravity up there. .....

b) Frictional force could never make something go faster. .....

c) A magnetic field can be blocked by a sheet of plastic or paper. .....

d) Objects can get a +ve charge by gaining more protons. .....

5. (5 marks)
Fill in the blank spaces in these statements.

a) To measure force in the laboratory you can use a .....

b) Compared to being on Earth, an astronaut on the Moon will have ..... mass, but ..... weight.
(Choose from "less", "the same" or "more")

c) The common metal that is attracted by all magnets is .....

d) If you rub a balloon on your woollen jumper, the wool loses electrons. This means the balloon gets a ..... charge.

6. (4 marks)
Back in the 1970's, an astronaut on the Moon carried out a famous experiment. He dropped a hammer and a feather at the same time. Both objects fell very slowly, and hit the ground at the same time.

a) Why do you think they both fell very slowly?

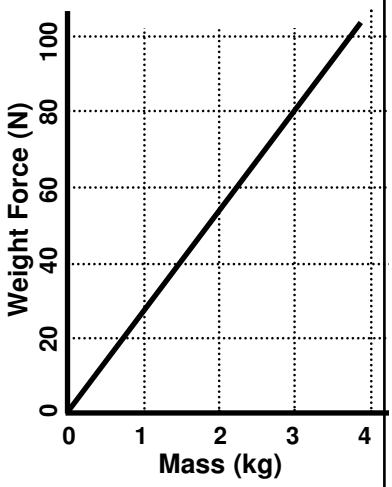
b) Why did they hit the ground at the same time?

c) Would they hit the ground at the same time on Earth? Explain your answer.

7. <u>Additional Skills Question</u> Your teacher will decide if you are to attempt this question or not. Calculator needed. (8 marks)

This graph shows the <u>weight</u> of different <u>masses</u> on the planet Jupiter.

Mass v Weight on Jupiter



a) What is the approx. weight of a 1 kg mass on Jupiter? .....

b) What is the mass of an 80N weight on Jupiter? .....

c) Calculate the gradient (slope) of the graph. Show working below.

grad. = vert/horiz = .../.....= .....

d) What is the value of "g" on Jupiter? .....

e) A 50kg person has a weight force of 500N on Earth. What is the weight force of the same person on Jupiter? .....

f) What would this same person weigh when <u>in orbit</u> around Jupiter? .....

keep it simple science

Answer Section

Worksheet 1

a) b) push or a pull
c) move
d) slow down
e) shape
f) temperature
g) brakes
h) forces
i) reducing
j) seatbelts, airbags & crumple zones
k) increasing
l) decreases
m) newtons n) N
o) spring balance
p) accurate

Worksheet 2

a) easier
b) faster (or move further)
c) levers, pulleys & gears
d) lever (or machine)
e) force
f) pulley system
g) speed
h) force or speed/distance
i) both
j) nothing
k) greater / more
l) work input
m) force
n) distance

<u>Calculation Problem</u>

a) Work Output = 2,500 x 1.5
= 3,750 units
b) Work Input = 500 x 9
= 4,500 units
c) Yes. Less effort force was required, so the job was easier.
d) No. The work output was less than input so he did not get any "free" work.
(In fact, 750 units was "lost", probably due to friction.)

Worksheet 3

a) force
b) opposite
c) slow down
d) stop
e) air
f) engines
g) constant
h) speed
i) force
j) engine
k) friction
l) larger
m) slow down
n) force
o) nature / materials
p) smooth
q) dry

Worksheet 4

1. E
2. F
3. B
4. C
5. A

a) contact
b) field
c) gravity
d) magnetic
e) Sir Isaac Newton
f) move
g) gravity

Worksheet 5

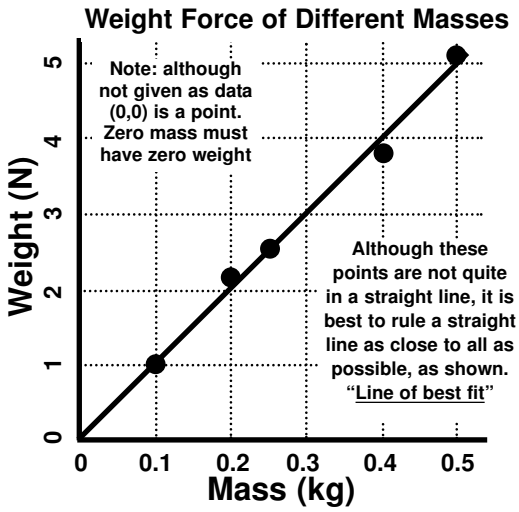
Typical Data

Mass (g)	Mass (kg)	Weight (N)
100	0.1	1.0
200	0.2	2.1
250	0.25	2.5
400	0.4	3.9
500	0.5	5.1

keep it simple science

Worksheet 5 (cont.)

Graph



Discussion Questions

1.
Probably because there is some "experimental error" in the measurements. Spring balances are often not very accurate.

2.
You can see from the data table that if the mass (kg) is multiplied by 10, you get the value for weight (N), with a little experimental error.

3. (Research)
some examples:
on Jupiter, g = 27.
on Mars, g = 4.

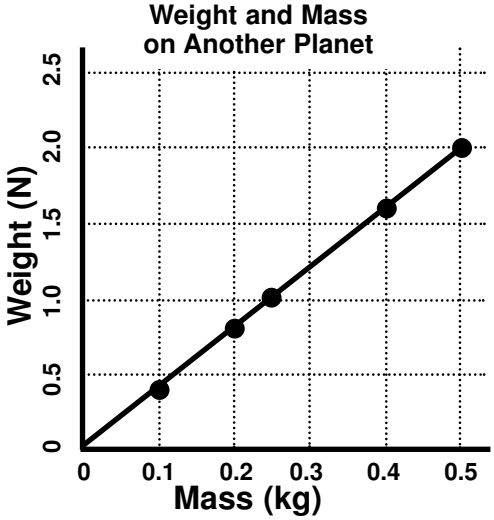
Worksheet 6

a) field
b) touching
c) attracts
d) fall down
e) Sun
f) galaxy
g) mass
h) kilograms
i) force
j) gravity
k) mass
l) weight
m) the same
n) different / less
o) at the same rate
p) air resistance
q) orbit
r) falling
s) surface
t) air
u) orbit
v) weight
w) mass

Worksheet 7

1. Masses in table
100, 200, 250, 400, 500.

2. Graph



3.
gradient = vert/horiz = 2.0 / 0.5 = 4
4.
g = 4 ("g" is the ratio weight / mass)
5.
If you researched to find the values of g on other planets, you'll know that planet Mars has a g-value close to 4.

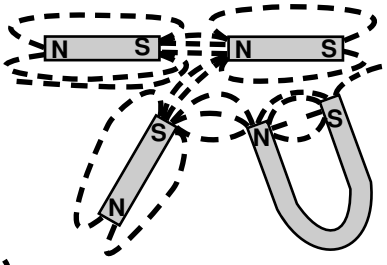
Worksheet 8

a) field
b) attract
c) repel
d) field
e) compass
f) north-south
g) radiation
h) iron
i) paper / plastic
j) metal
k) poles
l) attract
m) the same
n) repel
o) wire
p) iron
q) electrical
r) electricity
s) generators & speakers

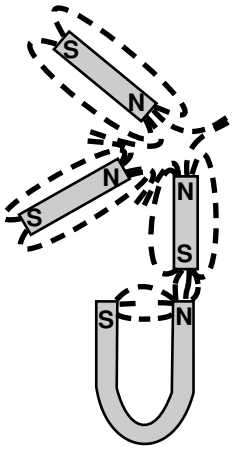
keep it simple science

Worksheet 9

1.



2.



Worksheet 10

a) field
b) electrical / electrostatic
c) electrons
d) negative
e) nucleus
f) protons
g) positive
h) neutrons
i) equal
j) electrons
k) positive
l) negative
m) insulator
n) attract
o) same
p) repel

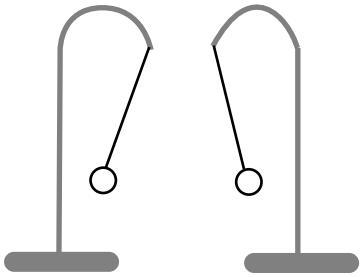
Worksheet 11

1.

a) They are attracting each other because they have opposite charges.

b) No. If they were touched by the same rod they would have the same charge and would repel each other.

c)



2.

Each hair has developed the same electrical charge, so the hairs repel each other. They all stand up trying to get away from each other.

3.

Rubbing his shoes is causing a build-up of electric charge on Fred's body. When he touches someone who has a conducting connection to the ground, the static charge discharges ("earths") through them and they get a shock.

4.

Trees are often struck by lightning because it is a shorter path to the ground. If you were under a tree when struck, you could be injured.

keep it simple science

Topic Test

1.

i) G	vi) B
ii) H	vii) N
iii) F	viii)D
iv) E	ix) I
v) J	x) L

2.

a) On Earth there is always friction and air resistance which slows things down. In space there is no air, no friction, so things keep moving.

b) The Earth has a magnetic field and the compass (a small magnet) rotates to line itself up in the Earth's field.

c) Brushing rubs the brush against the hair. This can transfer electrons one way or the other, so each hair gets a static charge. They each have the same charge, so they repel each other and stand up.

3.

a) Levers, pulleys, gears

b) It makes a task easier by requiring less force to move the load.

c) No. Although the force is less, the amount of WORK INPUT is no less.

4.

a) F
b) T
c) F
d) F

5.

a) spring balance.
b) the same mass, but less weight.
c) iron.
d) negative.

6.

a) Because the Moon's gravity is less than Earth's.

b) All objects fall at the same rate due to gravity.

c) No, because air resistance on Earth would slow the feather's fall.
(No air on the Moon!)

7.

a) approx 27 N

b) 3 kg

c) 80 / 3 = 27 (nearest whole number)

d) 27 (g is the ratio of weight / mass)

e) 1350 N (mass x g)

f) zero (weightless in orbit)