

S1 Science

Gravity & Space Topic

Name: _____

Form Class: _____

Science Teacher: _____

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Success Criteria

Level	Success Criteria - Mass & Weight	
2	State the definition of mass	
2	State the units for mass	
2	Calculate changes in mass from grams to kilograms and kilograms to grams	
3	Describe what weight is	
3	State the units of weight	
3	Describe the effect of gravity on an object	
3	Explain the change in weight of an object as the mass is changed	
3	Explain why an object has weight and why it can change	
3	State the link between gravity and size of planet	
3	Calculate the weight of an object using the formula $w = mg$	
3	Calculate the mass of an object by re-arranging the formula $w = mg$	
3	Predict the effects on the weight of an object due to changes in gravity	

Level	Success Criteria - Space & Life in the Universe	
2	Name the elements the Sun is made from	
2	Give the order of the planets from the Sun	
2	Describe some of the differences between the planets in our solar system e.g. size, number of moons, temperature, atmosphere, distance from the sun etc.	
3	State the four basic needs for life	
3	Describe what you would need to survive on another planet	
3	Describe why it would be difficult to survive on other planets in our solar system	
3	State what an exoplanet is	
3	Describe the "Goldilocks Zone" and its importance for the existence of life elsewhere	
3	State the approximate number of stars in the universe and how many are likely to have planets in orbit	
3	Explain the difficulties in finding or communicating with life elsewhere in the universe	
3	Evaluate the possible existence of life elsewhere in the Universe	

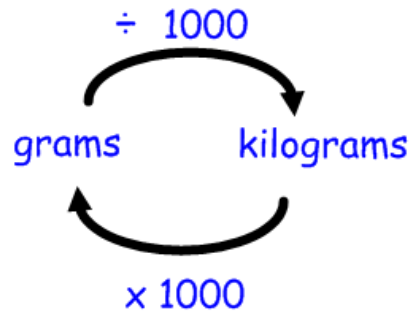
Summary Notes

Mass

☐ The **mass** of an object is how much **material** it is made of.

☐ **Mass** is measured in **kilograms**.

☐ 1 kilogram = 1000 grams



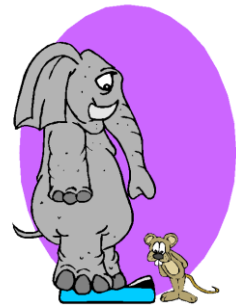
Weight and gravity

☐ **Weight** is a **force**.

☐ **Weight** is measured in **Newtons**.

☐ The **larger** the **mass** an object has the **more weight** it will have.

E.g. an elephant has more mass than a mouse so the elephant will weigh more!



☐ An object has **weight** when **gravity** acts on it.

☐ **Gravity** pulls objects **down**.

☐ The **formula** to calculate the weight of an object is
weight = mass x gravity

Example: Calculate the weight of a 65 kg boy on the earth

$$W = m \times g = 65 \times 10 = 650 \text{ Newtons}$$

- ☐ The **larger** the **gravity**, the **more weight** an object will have.

E.g. an astronaut has more weight on Jupiter and much less weight on the moon. His mass will **not** change.

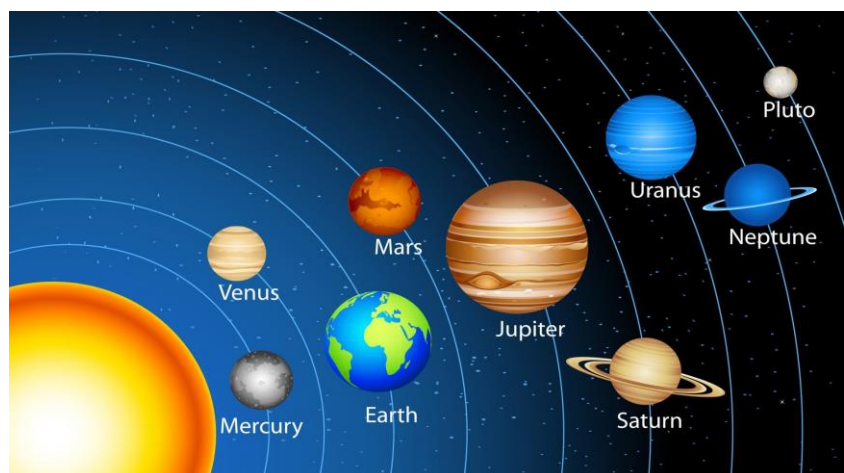


- ☐ The larger the **planet** the **larger** the value for **gravity**.
E.g. Jupiter has the largest gravity at 26.4 N/kg and Mercury has the smallest at 3.7 N/kg.

Example: Calculate the mass of a 2112 N astronaut on Jupiter
 $m = W / g = 2122 / 26.4 = 80 \text{ kg}$

The Solar System

- ☐ The **Sun** is a star and is made from mainly **hydrogen** and **helium**.
- ☐ The order of the planets from the sun in my solar system are
Mercury
Venus
Earth
Mars
Jupiter
Saturn
Uranus
Neptune



- Each planet in the solar system is different in terms of size, number of moons, temperature, atmosphere, distance from the sun etc.

Name of Planet	Diameter	Time to Orbit Sun (a year)	Gravity (Earth = 1)
Mercury	4,878 km	88 days	0.38
Venus	12,104 km	224 days	0.9
Earth	12,756 km	365.25 days	1
Mars	6,794 km	687 days	0.38
Jupiter	142,984 km	11.86 years	2.64
Saturn	120,536 km	29 years	1.16
Uranus	51,118 km	84 years	1.11
Neptune	49,532 km	164.8 years	1.21

Name of Planet	Average Temp	Contents of Atmosphere	Moons
Mercury	167 °C	Sodium, helium	None
Venus	480 °C	Carbon Dioxide, Nitrogen	None
Earth	14 °C	Nitrogen, Oxygen	1
Mars	-63 °C	Carbon Dioxide, Argon	2
Jupiter	-130 °C	Hydrogen, Helium	66
Saturn	-130 °C	Hydrogen, Helium	62
Uranus	-200 °C	Hydrogen, Helium, Methane	27
Neptune	-200 °C	Hydrogen, Helium, Methane	13

Basic Needs

- ☐ The four basic needs for life are
 - **water**
 - **air (oxygen)**
 - **food**
 - **warmth/shelter**
- ☐ To survive on another planet, humans would need resources to produce food and water and materials to make clothes, build houses and create fire (heat).
- ☐ The other planets in our solar system do not have the correct atmosphere to allow humans to breathe, very few have liquid water easily available to use and there is no other life (plants or animals) to provide food for us to eat.

Life in the Universe

- ☐ An exoplanet is a planet in orbit around a star outside our solar system.
- ☐ The "Goldilocks Zone" or habitable zone is a region around a star that is not too hot and not too cold i.e. water is in liquid form on the planet.



- ☐ Planets in the "Goldilocks Zone" where there is liquid water have the possibility that life could exist there.

☐ The "Goldilocks Zone" or habitable zone varies depending on the size and brightness of the star the planets are orbiting.

☐ Astronomers have calculated that billions of the stars in our galaxy (the Milky Way) have 1 to 3 planets in the habitable zone, where there is the potential for liquid water and where life could exist.



☐ The universe contains approximately 10 trillion galaxies. The Milky Way's has an estimated **100 billion stars**. Multiplying gives 1,000,000,000,000,000,000,000,000 stars in the universe.

☐ The distances between stars (and other galaxies) are huge. Sending a signal to the nearest discovered exoplanet would take over 10 years. Other exoplanets further away could take 1000s of years for a signal to reach them.

☐ Alien life could be very different from us. If you could send a signal would they understand it?

Homework

Homework 1 - Mass and WeightTotal /12

1. What does the phrase **mass of an object** mean?

1 mark

2. State the units mass is measured in?

1 mark

3. What causes an object to have weight?

1 mark

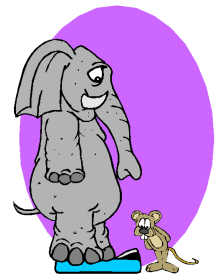
4. State the units weight is measured in.

1 mark

*Use the equation: **weight = mass x gravity***

Gravity on Earth is 10 N/kg

Gravity on the planet Mars is 3.8 N/kg



5. Calculate the weight of a 40 kg boy on the Earth.

2 marks

6. (a) What is the mass of a 40 kg boy on Mars?

1 mark

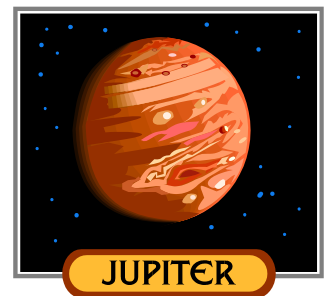
- (b) Calculate the weight of a 40 kg boy on Mars.

2 marks

7. Predict whether your weight would
increase or **decrease** on

(a) our Moon _____

(b) Jupiter? _____



2 marks

Homework 2 -The Solar SystemTotal /10

1. Which chemical elements are in the Sun?

2 marks

2. Which is the **largest** planet in our solar system?

1 mark

3. Which is the **smallest** planet in our solar system?

1 mark

4. Which planet is in orbit **closest** to the Sun?

1 mark

5. Which planet is in orbit **furthest** from the Sun?

1 mark

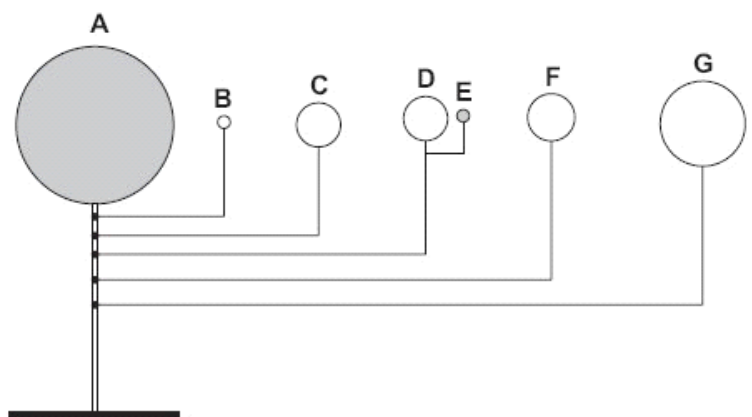
6. In this model of part of the solar system shown below,
which **letters** represent the following?

(a) the Sun _____

(b) the Earth _____

(c) the Moon _____

(d) the planet with the
largest orbit around
the Sun. _____



4 marks

Homework 3 - Basic Needs and Survival Total /14

1. Make a list of the 4 basic needs human must have to survive.

4 marks

2. Choose one planet in our solar system and explain why humans would not be able to survive there.

1 mark

3. Describe what the "Goldilocks zone" is.

1 mark

4. Do you think life exists somewhere else in the universe?
Give 2 reasons for your answer.

2 marks

5. Each planet in the solar system has different weather and the highest temperature is different.

Mercury's highest temperature is 465 °C but on Jupiter it is only -153 °C. The highest temperature on Mars is 36 °C and on Uranus it is -184 °C.

- (a) Present this information in a table with headings.

3 marks

- (b) Which planet has the highest temperature?

1 mark

- (c) Which planet has the lowest temperature?

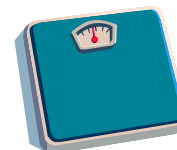
1 mark

- (d) Which planet has a similar temperature to Earth?

1 mark

Home Experiments

Mass



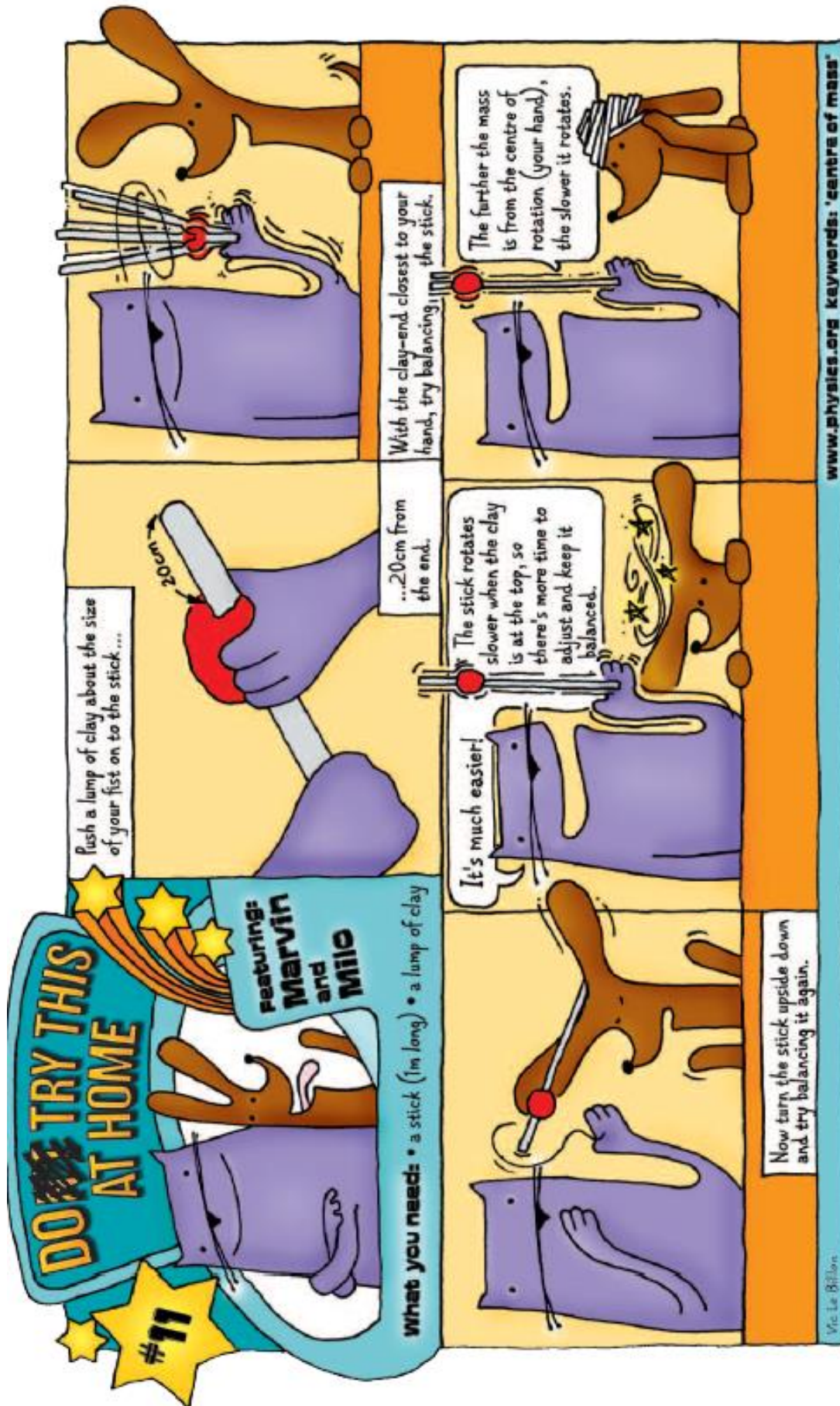
Using bathroom or kitchen scales choose 5 objects commonly found in your house to measure the mass of.

Copy and complete the table below:

Object	Predicted mass	Actual mass

(a) Predict the mass of each object first

(b) Put the object on your scales and record the mass



Useful Websites

<https://www.esa.int/esaKIDSen/Planetsandmoons.html>

<http://www.sciencekids.co.nz/sciencefacts/space.html>

<http://www.planetsforkids.org/>

<http://www.spacekids.co.uk/solarsystem/>

<https://www.nasa.gov/kidsclub/index.html>

<http://discoverykids.com/category/space/>

Videos

<https://www.youtube.com/watch?v=Qd6nLM2QIWw>

<https://www.youtube.com/watch?v=zFPnOUSdMdc>

https://www.youtube.com/watch?v=EwY6p-r_hyU

<https://www.youtube.com/watch?v=TRAbZxQHIVw>

<https://www.youtube.com/watch?v=7T1LO6nOUdw>

<https://www.youtube.com/watch?v=1Eh5BpSnBBw>