Science KS3:

Year 7

Blended Learning Booklet

Unit 1: Forces

Name:

Form:

Stewards Academy

- *Aim to complete three lessons each week.*
- *Use the online text book to help you*
- https://www.kerboodle.com/app
- *Login using your user name (1st initial followed by surname all lower case eg Joe Blogs = jblogs)*
- *Password (initially the same as your user name) should be reset to stewards lower case*
- *Institution code is fu0*
- *Complete the work described in the four part lesson*
- Use the mark schemes provided to self assess your work and make corrections in blue pen.

Big Picture – Year 7 Overview
Science

Next Year

End of Year Assess-ment

End of Unit Test

Energy transfer

Energy and temperature

Work energy and machines

Cost of energy

Energy and Power

Energy resources

UNIT 6

Energy

I will be able to explain that there is energy in food and fuel and that it is measured in Joules. **I will be able to** explain how energy from non-renewable or renewable resources can be used to provide electricity**. I will be able to** use equations to link energy and power and to calculate the unit cost of energy. **I will be able to** state the Law of conservation of energy, describe 3 methods of heat transfer and how to prevent heat transfer using an insulator.

End of Unit Test

Plant structure and function

Photo-synthesis

Microbial Bio-technology

Respiration

Flowers and pollination

Ecosystems and competition

Food chains and webs

UNIT 5

Ecosystems

I will be able to explain that plants are able to make their own food by photosynthesis and that animals are consumers eating other organisms to take in energy. **I will be able to** explain that plants and animals are linked through food chains and webs which show the relationships between organisms in an ecosystem. **I will be able to** explain the processes and the importance of respiration and photosynthesis and how these are linked ,as well as how plants are uniquely adapted to carry out photosynthesis

End of Unit Test

The periodic table. Groups 1, 7 & 0

Compounds and chemical formulae

Atoms and elements

Separation techniques

Solutions and solubility

Pure substances and mixtures

Particle model

States of matter

UNIT 4

Matter

I will be able to use the particle model to explain how particles are arranged in solids, liquids and gases and how a substance can change between these states. **I will be able to** use the particle model to explain the process of diffusion and gas pressure. **I will be able to** recognize a pure substance and be able to describe methods for separating mixtures. **I will be able to** identify substances as elements or compounds and know that the periodic table shows how the elements are grouped together.

End of Unit Test

Pressure in solids, liquids and gases

Squashing, stretching and turning

Friction and drag

Gravity

Speed

Introduction to forces

UNIT 3

Forces

I will be able to explain that a forces are a push or a pull that can change the speed, direction or shape of an object. **I will be able to** explain how some forces such as gravity act at a distance (non-contact) and some such as friction and drag require objects to touch (contact). **I will be able to** use an equation to calculate speed and be able to represent changing speeds on a graph. Finally **I will be able to** use and equation to link force and pressure.

End of Unit Test

Digestive system

Nutrients, healthy diet and food tests

Breathing and gas exchange

Drugs, alcohol and smoking

Uni-cellular organisms

Using a microscope & Plant and animal cells

UNIT 2

Organisms

I will be able to explain How cells are the basic building blocks of life for both plants and animals. How some organisms can exist as simple single celled organisms and how in others cells are organized into tissues, organs and organ systems to create more complex multicellular organisms. **I will also be able to** explain the structure and function of some of these organ systems and how they are affected by different lifestyle choices

End of Unit Test

Evaluating data and methods

Analysing patterns in data

Collecting, recording and presenting data

Planning scientific investigations

Asking scientific questions

UNIT 1

The Enquiry Process

I will be able to plan and carry out a scientific investigation. This procedure will include being able to write a hypothesis, design a method, collect and analyse data and finally be able to critically evaluate the whole process.

Year 7

ZOOM IN...

MY LEARNING JOURNEY:

Subject: Forces Year: 7 Unit: 3

In this unit students will learn how objects interact and how forces on the speed, direction and shape of objects. This unit will provide key knowledge that forms a basis of understanding for: Contact forces, specifically friction; Pressure including atmospheric pressure and pressure within a liquid; Magnetism and also Work Done, including the elastic and inelastic behaviour of a stretching spring.

DEVELOPING COURAGE

- **C** The laws of phycics are consistant
- **O** To explore the physical world
- **U** Work together to to carry out experiments
- **R** Use of equations to explain phyical processes
- **A** How every action gets a reaction
- **G** Share our knowledge
- **E** Understanding how the physical world works

UP NEXT

Matter.

- Particle model
- States of matter
- Pure substances
- Separating mixtures
- Atoms & Elements
- Compounds
- The periodic table

CAREERS

- Computer game engineer
- Insurance assessor
- Materials engineer

PREVIOUS LEARNING

Pupils should have some experience of the following:
Some forces need contact and some can act at a distance
Friction slows things down
Gravity is a force acting between the Earth and any object.
Forces can be used to squash, bend, stretch and object

WHAT WE KNOW/ REMEMBER

- .....
- .....
- .....
- .....
- .....

RECOMMENDED READING

1. Forces Make Things Move by Kimberly Brubaker Bradley,
2. Powerful Forces by Jon Richards & Rob Colson,
3. Gravity: Why What Goes up Must Come Down by Brian Clegg.

PERSONAL OBJECTIVES

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Lesson 1: Book 1 – Introduction to Forces (1.1.1)

Connection

Have a look at the topic overview and the zoom in.

Populate what you know and your personal objectives.

Activation

LI: State the unit of force and describe what is meant by an interaction pair.

1. Make a note of the date, title and the LI
2. https://www.youtube.com/watch?v=9kMNtZvYmqQ
3. Key words –Push, Pull, Contact Forces, Non-Contact Forces, Newton meter, Newtons
4. Read pages 14 to 15
5. Copy the diagram of the tennis ball showing force arrows
6. Answer Questions A, B, C,

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 1: Answers **1.1.1 Introduction to forces**

Connection

1. N/A

Activation & Demonstration

In-text questions	**A** Forces change the shape, speed, or direction of motion. **B** For a contact force to act the objects have to be touching (e.g., the air and a car for air resistance) but non-contact forces act at a distance. **C** newtons
Summary questions	**1** push, pull, arrows, interaction, newtonmeter (5 marks) **2** The force of the Earth on the apple AND the force of the apple on the Earth OR the force of the tree on the apple AND the force of the apple on the tree. (2 marks) **3** Extended response question. Example answers (6 marks): The Earth exerts a force on you. You exert a force on the Earth. The chair exerts a force on you. You exert a force on the chair. These are two interaction pairs. The two forces acting on you are from two different interaction pairs. This means one can be bigger than the other.

Lesson 2: Book 1 – Balanced and Unbalanced 1.1.2)

Connection

Q1. What is a contact force?

Q2. What is the unit for force?

Q3. What is the force called that pulls us to the centre of the Earth?

Activation

LI: Describe what happens he resultant force on an object is not zero.

1. Make a note of the date, title and the LI
2. Key words – Resultant Force, Balanced, Unbalanced, Equilibrium, Driving Force, Resistive Force.
3. Read pages 16 to 17
4. https://www.youtube.com/watch?v=YyJSlcIbd-s
5. Copy the Forces arrows showing resultant force on page 16
6. Answer Questions A, B, C,

Demonstration

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Consolidation

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Lesson 2: Answers **1.1.2 Balanced and Unbalanced**

Connection

1. For a contact force to act the objects have to be touching (e.g., the air and a car for air resistance)

2. Newtons

3. Gravity

Activation & Demonstration

In-text questions	**A** An object is in equilibrium of the forces on it are balanced, or if the resultant force is zero. **B** Zero **C** Balanced forces cancel out/are equal in size and opposite in direction. Unbalanced forces are not of equal size/direction/do not cancel out.
Summary questions	**1** size, opposite/opposing, equilibrium, balanced unbalanced, direction (6 marks) **2a** Force diagram with an arrow showing that the resistive force is smaller than the driving force. (1 mark) **b** Arrow pointing backwards labelled resistive, arrow pointing forwards labelled driving. (1 mark) **c** She continues to speed up but not as much, until she moves at a steady speed because the forces are balanced. (3 marks) **3** The newtonmeter reads zero. (1 mark) The resultant force on the spring inside the newtonmeter is zero. (1 mark) For the reading to be bigger than zero, the Earth and the diver have to exert forces in opposite directions. (1 mark)

Lesson 3: Book 1 – Speed 1.1.3

Connection

Q1. What is meant by the term equilibrium?

Q2. What is the resultant force?

Q3. How do unbalance forces change when an object is accelerating?

Activation

LI: State and use the formula for speed and describe the link between speed and journey time.

1. Make a note of the date, title and the LI
2. Key words – speed, average speed, relative motion
3. Read pages 18 to 19
4. https://www.youtube.com/watch?v=EGqpLug-sDk
5. Copy the equation for speed
6. Answer Questions A, B, C,

Demonstration

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In 15 mins answer as many questions as you can.
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Consolidation

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Lesson 3: Answers **1.1.3 Speed**

Connection

1. When the force acting on an object is the same size.

2. Resultant Force =2N To the right

3. When accelerating, the driving force is greater than the resistive forces which makes the object accelerate.

Activation & Demonstration

In-text questions	**A** How far something travels in a particular time. **B** It is less/shorter/decreases. **C** The movement of a body compared to another.
Activity	**Marathon times** distance in a marathon = 42.2 km; time taken to run marathon = 2.5h average speed = distance ÷ time = 42.2 ÷ 2.5 = 16.88 km/h
Summary questions	**1** distance, time, total distance, total time, relative (5 marks) **2** Average speed = total distance ÷ total time = 100 m ÷ 12.5 s = 8m/s (2 marks) **3** Their relative motion is 70 km/h, either towards each either if they haven't passed yet, or away from each other if they have already passed. (2 marks) **4** Extended response question (6 marks). Example answers: Lines are painted on the road a set distance apart. The camera takes a photograph of the car on the road. The camera takes a photograph of the car a short time later. From the position of the car the camera can work out how far the car has travelled in the time between the two photographs were taken. The camera can use the time between the photographs to find the time using the equation speed = distance ÷ time. The speed camera uses the information obtained from the two photographs to calculate the speed of the car. If the car is travelling faster than the speed limit it will travel too far in the time between the photographs.

Lesson 4: Book 1 – Distance Time Graphs 1.1.4

Connection

Q1. What is speed?

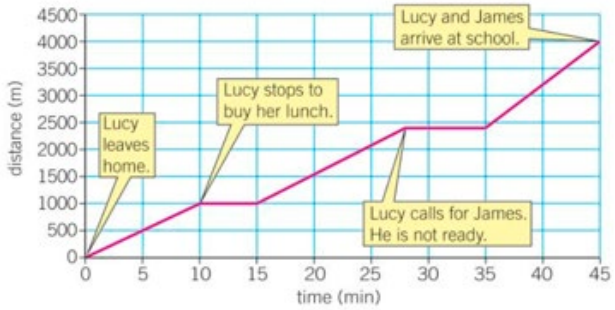
Q2. What is the equation for speed?

Q3. A runner runs 100m in 12.5 seconds. Calculate the average speed of the runner.

Activation

LI: Illustrate a journey with changing speed on a distance-time graph and label changes in motion.

1. Make a note of the date, title and the LI
2. Key words – Distance-time graph, acceleration
3. Read pages 20 to 21
4. https://www.youtube.com/watch?v=RM02SnuJ0MY
5. Use graph paper to copy the graph on page 20
6. Copy the graph on page 21 showing acceleration
7. Answer Questions A, B, C,



Demonstration

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Consolidation

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Lesson 4: Answers **1.1.4 Distance-time graphs**

Connection

1. Speed is a measure of how fast something travels in a particular time.

2. Speed = Distance/ Time

3. Speed = 100m/12.5s

Speed = 8m/s

Activation & Demonstration

In-text questions	**A** The distance that something travels in a certain time. **B** The speed of the object shown in the graph. **C** Acceleration tells you how quickly your speed increases or decreases.
Activity	**Working it out** speed = distance ÷ time = 60 ÷ 10 = 6 m/s
Summary questions	**1** distance, time, slope, stationary, changing (5 marks) **2a** (2 marks) Two from: Journey is not as far/Speed for sections of the journey are different from each other/Journey took less time/In this graph the object was only stationary once **b** (2 marks) Corresponding reason: The scale only goes up tp the 1000m, not 4500/The gradient of the graph change, but for Lucy's journey the speeds are similar/stationary/The scale only goes up to 80s not 45 minutes/There is only one horizontal section of this graph, but there are two on the graph of Lucy's journey. **3** Extended response (6 marks). Example answers: Both graphs start at a distance of zero and finish at a distance of 3 km. The graph for the car reaches 3 km faster than the graph for walking. Both graphs might have horizontal sections (e.g., the car may stop at a traffic light, or the person walking might stop at a shop). If the graph is horizontal the car or person has stopped. The slope of the graph for the car is much steeper. Cars travel faster than people walking. The car reaches school in a shorter time. The average speed of a car is much higher than that of a person. Both graphs should include curved lines. Curved lines show periods of changing speeds.

Lesson 5: Gravity 1.2.1

Connection

Q1. What does a distance – time graph show?

Q2. State the definition of acceleration.

Q3. What will happen to the line in a distance-time graph if something is moving?

Activation

LI: Use a formula to calculate your weight on different planets and explain changes in weight.

1. Make a note of the date, title and the LI
2. Key words – Mass, gravitational field strength, weight
3. Read pages 22 to 23
4. https://www.youtube.com/watch?v=PEQzAbizMYs
5. Write down the formula to work out weight of an object. Include the units
6. Answer Questions A, B, C, D

Demonstration

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Consolidation

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Lesson 5: Answers **1.2.1 Gravity**

Connection

1. Shows the journey of an object

2. Acceleration shows how quickly the speed is changing.

3. The line will be steeper.

Activation & Demonstration

In-text questions	**A** masses of both bodies, distance between the bodies **B** A field is a region in which certain objects experience a force. The object does not need to be touc hing anything to experience this force. **C** The force on 1 kg in a gravitational field. **D** The Sun exerts a gravitational force on the Earth.
Activity	**Units of mass a** 2000 g **b** 3500 g **c** 400 g **d** 4.7 kg **e** 0.25 kg
Summary questions	**1** mass, force, newtons, mass, kilograms (5 marks) **2** weight = mass x gravitational field strength (1 mark) = 60 kg x 27 N/kg (1 mark) = 1620 N (1 mark) **3a** As the distance increases the force of gravity decreases. (1 mark) **b** As the mass increases the force of gravity increases. (1 mark) **4** Example answers (6 marks): Because the gravitational field strength is less, objects will travel further before they hit the ground. As such, events that involve throwing something a distance would produce new records; such as javelin/shot put/hammer throw. Because the gravitational field strength is less, events that involve lifting things would also produce new records as mass would weigh less on the Moon than it did on Earth; such as weightlifting.

Lesson 6: Friction and Drag 1.3.1

Connection

Q1. What two factors affect the weight of an object?

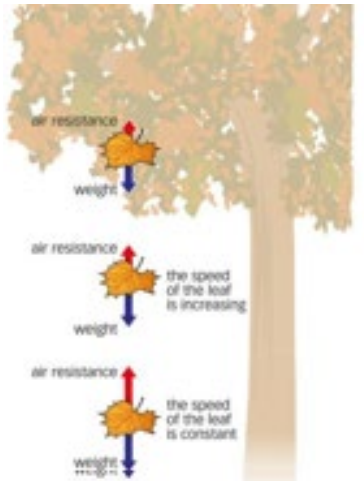
Q2. What is the equation for weight?

Q3. Work out the weight of an object with a mass of 52Kg on a planet that has GFS of 26.2N/Kg

Activation

LI: Describe the factors that affect the size of the drag forces and friction, and how friction and drag can be reduced.

1. Make a note of the date, title and the LI
2. Key words – Friction, drag force, lubrication
3. Read pages 20 to 21
4. https://www.youtube.com/watch?v=8AysbEMEv50
5. Draw and label the image showing air resistance page 21
6. Answer Questions A, B, C,



Demonstration

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Consolidation

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Lesson 9: Revision Answers **1.3.1 Friction and Drag**

Connection

1. Mass and gravitational field strength

2. Weight = Mass x Gravitational Field Strength

3. Weight = 52Kg x 26.2 N/Kg

Weight = 1362.4 N

Activation & Demonstration

In-text questions	**A** rough **B** Diagram of stone with force arrow labelled gravity going downwards, and force arrow labelled water resistance going upwards. **C** moves with a steady speed or remains stationary
Activity	**Testing a parachute** Keep these things the same: the weight of the object beneath the parachute, the area of the parachute, and the thickness of the material.
Summary questions	**1** friction, rough, force, air resistance, water resistance, air/gas, water (7 marks) **2** type of surface, weight of object (2 marks) **3a** The drag cancels out the weight of the bird. (1 mark) The bird travels at a steady speed through the water. (1 mark) **b** Diagram showing downwards force on bird, labelled weight. (1 mark) Upwards forces, labelled drag. (1 mark) **4** Example answers (6 marks): Air resistance depends on area. Bigger area means that more molecules hit the parachute. The air resistance is bigger with a bigger parachute. Air resistance depends on speed. Bigger speed means that more molecules hit the parachute. The air resistance is bigger with a bigger speed. The biggest air resistance will act on a large parachute attached to a fast car.

Lesson 7: Book 2 – Squashing and Stretching 1.3.2

Connection

Q1. What is ‘drag force’?

Q2. What is the resultant force of an object falling at steady speed?

Q3. Is Friction greater on rough or smoot surfaces?

Activation

LI: Describe how forces deform objects

1. Make a note of the date, title and the LI
2. Key words – Deformation and compression
3. Read pages 22 to 23
4. https://www.youtube.com/watch?v=RZfVYFvilLw
5. Answer Questions A, B
6. Hooke’s Law practical https://www.youtube.com/watch?v=hHOHwuGPoaI

Demonstration

Attempt Summary questions
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Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 10: Answers **1.3.2 Squashing and Stretching**

Connection

1. The force that slows an object down through air or water

2. Zero

3. Rough

Activation & Demonstration

In-text questions	**A** The shape of the tennis ball changes/is deformed. **B** It gets longer, then shorter.
Activity	**A straight-line graph** When the force is 3 N the extension is 6 cm and when the force is 6 N the extension is 12 cm. This shows that if you double the force the extension doubles. The spring obeys Hooke's Law. **How long** The extension = 6 cm – 4 cm = 2 cm If you doubled the force the extension would be 4 cm.
Summary questions	**1** deform, particles, push, support, reaction, compress, stretch (7 marks) **2** It doubles. The extension is proportional to the force. (2 marks) **3** Example answers (6 marks): The spring obeys Hooke's Law. There is a linear relationship between force and extension. If you double the force on the spring the extension will double. The relationship between force and extension for polythene is not linear. The polythene does not obey Hooke's Law. So doubling the force on the polythene means the extension may be more or less than double.

Lesson 8: Book 2 –Turning Forces (1.3.3)

Connection

Q1. What is deformation?

Q2. What is the difference between compression and tension?

Q3. What is meant by the term ‘elastic limit’?

Activation

LI: Describe what is meant by a moment.

1. Make a note of the date, title and the LI
2. Key words –Pivot, Moment and Law of Moments
3. Read pages 24 to 25
4. https://www.youtube.com/watch?v=22VGQM1jCn8
5. Draw and label the diagram of the see-saw page 25
6. Answer Questions A, B, C

Demonstration

Attempt Summary questions
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Consolidation

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Lesson 11: Answers **1.3.3 Turning Forces**

Connection

1. Forces that change the original shape of an object.

2. Compression is a force that squashes an object and tension is the force when something is stretched.

3. When a spring can no longer return to its original form.

Activation & Demonstration

In-text questions	**A** newton metre (Nm) **B** An object is in equilibrium if the total anticlockwise moments equal the total clockwise moments. **C** The point through which all the weight of an object seems to act.
Activity	**Sitting on a see-saw** If the child sits on one end she is 1 m from the pivot. Clockwise moment = 150 N × 1 m = 150 Nm You need the anticlockwise moment to be the same: 600 N × distance from the pivot = 150 Nm Distance from the pivot = $\frac{150\ \text{Nm}}{600\ \text{N}}$ = 0.25 m
Summary questions	**1** turning, force, distance, equilibrium, law, weight, gravity (7 marks) **2** moment = force × distance, so 5 N × 0.75 m = 3.75 Nm (2 marks) **3** Example answers (6 marks): A ruler or beam that you hang things from, or something that can balance. A system of adding things to one side or the other. An explanation of what is meant by a moment. An explanation of the law of moments. A scoring system that uses the law of moments, for example, predicting where you have to put something before you add it. An element of skill in terms of the items you can hang, or where you can put them.

Lesson 9: Book 2 – Pressure in Gases (1.4.1)

Connection

Q1. What is the turning effect of a force called?

Q2. State the law of moments.

Activation

LI: Describe how fluids exert a pressure in all directions.

1. Make a note of the date, title and the LI
2. Key words – Fluid, Pressure, Gas Pressure, Atmospheric Pressure.
3. https://www.youtube.com/watch?v=NzKAJWTmlwg
4. Read pages 26 to 27
5. Copy the equation for fluid pressure
6. Copy the diagrams of the jars showing gas under less/more pressure page 26
7. Answer Questions A, B, C,

Demonstration

Attempt Summary questions
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Consolidation

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Lesson 12: Answers **1.4.1 Pressure in Gases**

Connection

1. A Moment

2. When an object is in equilibrium the sum of clockwise moments is equal to the sum of anticlockwise moments.

Activation & Demonstration

In-text questions	**A** All directions **B** force, area **C** Atmospheric pressure decreases.
Activity	**Balloon pressure** The plan should include: a method of changing temperature – by location or changing temperature of water, a method of measuring volume – by circumference of balloon, variables to control, a range of temperature, the need to repeat measurements, and a risk assessment.
Summary questions	**1** collide with, all, increases, force, area (5 marks) **2** Diagram of small marshmallow showing pockets of air with gas molecules inside and air outside. Arrows on the molecules to show collisions with the surfaces. (1 mark) Diagram of large marshmallow showing pockets of air with gas molecules inside and no air outside. Arrows on the molecules to show collisions with the surfaces. (1 mark) **3a** You need to take oxygen, which is compressed into a cylinder so that you have enough of it. (1 mark) As you go up a mountain there is less air. (1 mark) Air contains the oxygen that you need to breathe. (1 mark) **b** Fluid pressure = $\frac{\text{force}}{\text{area}} = \frac{200\ \text{N}}{0.002\ \text{m}^2} = \frac{100\ 000\ \text{N}}{\text{m}^2}$ (3 marks)

Lesson 10: Book 2 – Pressure in Liquids (1.4.2)

Connection

Q1. Which direction does gas pressure act?

Q2. What is the equation for fluid pressure?

Q3. What happens to atmospheric pressure as you increase altitude?

Activation

LI: Explain why some things float and some things sink, and how area affects upthrust.

1. Make a note of the date, title and the LI
2. Key words – Liquid pressure, incompressible and upthrust
3. https://www.youtube.com/watch?v=9Gw0rlXn6ec
4. Read pages 28 to 29
5. Copy diagram of a dam page 29 to show the effect of water pressure
6. Copy the equation for pressure pg 29
7. Answer Questions A, B, C

Demonstration

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Consolidation

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Lesson 13: Answers **1.4.2 Pressure in Liquids**

Connection

1. All directions

2. Fluid pressure = Force / Area

3. Atmospheric pressure decreases.

Activation & Demonstration

In-text questions	**A** All directions **B** It gets bigger. **C** Area, pressure
Activity	**Why does it float?** The bottom of the ferry is in contact with the water. The top of the ferry is in contact with the air. The water molecules and air molecules collide with the ferry. There are more water molecules hitting the bottom of the ferry than there are air molecules hitting the top. The water pressure is higher than the air pressure. This produces upthrust that keeps the ferry afloat if the area is big enough. The ferry floats when upthrust is the same as the weight of the ferry.
Summary questions	**1** all, increases, weight, bigger, upthrust (5 marks) **2a** Water pressure from the bottom creates the force upthrust. The clay boat floats because the upthrust balances out the weight of the boat. (2 marks) **b** The area is much smaller, the difference between the force pushing down and the force pushing up is not enough for the upthrust to balance the weight. (2 marks) **c** Pressure = $\frac{\text{N}}{\text{m}^2} = \frac{\text{force (N)}}{\text{area (m}^2\text{)}} = \frac{2000\ \text{N}}{0.5\ \text{m}^2} = \frac{4000\ \text{N}}{\text{m}^2}$ (2 marks) **3** Example answers (6 marks): The ping pong ball has a small weight. When it is held at the bottom of the bucket there is the force of your hand pushing down. The force from your hand is bigger than the upthrust due to the difference in pressure. When you let the ball go the upthrust is bigger than its weight. When the ball reaches the surface it floats. The pressure on the bottom of the ball produces a (upthrust) force that depends on the area of the ball in contact with the water. **4** *P* =

Lesson 11: Book 2 – Stress on Solids (1.4.3)

Connection

Q1. Which direction does liquid pressure act in?

Q2. What happens to liquid pressure as you go deeper?

Q3. Write down the factors that affect the upthrust of an object

Activation

LI: Explain the effect of solid surfaces on each other using ideas about stress.

1. Make a note of the date, title and the LI
2. Key words – Stress
3. Read pages 30 to 31
4. Copy the equation for stress
5. https://www.youtube.com/watch?v=bYvkvA1tGr0
6. Answer Questions A, B

Demonstration

Attempt Summary questions
In 15 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Single chemistry bottle question is for all students
Double chemistry bottle question are for students looking to extend their knowledge
Triple chemistry bottle question is for students looking to challenge themselves.

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 11: Answers **1.4.3 Stress on Solids**

Connection

1. All directions

2. It gets bigger / increases

3. Area and pressure

Activation & Demonstration

In-text questions	**A** At 90°, or normal to the surface. **B** N/m^2 or N/cm^2
Activity	**Finding the force** **B** force = stress × area
Summary questions	**1** force, area, small, break, sink into (5 marks) **2** stress = force/area force = 600 N, area = 2 × 150 = 300cm^2 stress = 600 N/300 cm^2 = 2 cm^2 (3 marks) **3** Example answers (6 marks): stress =force/area small area = large stress The stress of lying on one nail =700 N/0.25 cm^2 = 2800 N/cm^2 A bed of nails consists of 4000 nails, so the total area is bigger. And the stress is much less. total area = 4000 × 0.25 cm^2 = 1000 cm^2 The stress of lying on a bed of nails = 700 N/1000 cm^2 = 0.7 N/cm^2

Lesson 13 & 14: Book 1 & 2 – Revision

Connection

Q1. State the direction that stress acts in.

Q2. Write the equation for stress.

Q3. How would you reduce the stress so your feet would not sink in snow?

Activation

LI: Practice some Big Idea questions about Forces

1. Make a note of the date, title and the LI
2. Read page 39 for Book 1 questions and page 43 for Book 2 questions
3. Use the previous pages of the book and your notes to help you answer the questions

Demonstration

Work with others on your table to answer as many of the questions as you can.

In 45 mins answer as many questions as you can.
Self-mark the questions you have done making any necessary corrections in blue pen

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Lesson 12: Revision Answers **1 Forces – Part 1 Checkpoint**

Connection

1. At 90°, or normal to the surface.

2. Stress = Force / Area

3. Increase the area so you reduce the stress on the snow.

Activation & Demonstration

End-of-Big Idea questions	**1** m/s; m.p.h; km/s (3 marks) **2a** B (1 mark) **b** gravity (1 mark) **3a** Diagram of cyclist with weight acting downwards (1 mark) and normal reaction acting upwards (1 mark). **b** The normal reaction force (1 mark) of the ground on the cyclist acts upwards through the bicycle seat on the cyclist (1 mark) **c** non-zero (1 mark) **4a i** B (1 mark) **ii** D (1 mark) **iii** C (1 mark) **b** 300 ÷ 60 (1 mark) = 5 (1 mark) m/s (1 mark) **5a** 20 m.p.h (2 marks) **b** 0 m.p.h (2 marks) **c** The car appears to be moving away from the lorry (1 mark) at 20 m.p.h (1 mark). **6** Extended response (maximum 6 marks) All three snails travel the same distance of 30cm. Cyril's average speed is highest, followed by Gertie, and then Harold. Cyril begins quickly then slows to a constant speed. He travels at constant speed for a time, then accelerates towards the end. Gertie travels at constant speed, then also accelerates towards the end. Harold accelerates slowly, stops for a while, then accelerates towards the end. **7** weight on Earth = 5 x 10 = 50 N (1 mark) Weight on Moon = 5 x 1.6 = 8 N (1 mark) difference = 50 – 8 = 42 N (1 mark) **8** Extended response (maximum 6 marks). The mass of the Sun is far greater than the masses of Jupiter's moons. Hence the gravitational force between Jupiter and the Sun is much stronger than the gravitational force between Jupiter and its moons. However, the distance between Jupiter and the Sun is much greater than the distance between Jupiter and its moons. This means that the force between Jupiter and the Sun is much smaller than it would be if the Sun were as close to Jupiter as its moons are.

End-of-Big Idea questions	**1** A3, B4, C1, D2 (3 marks) **2** B (1 mark) **3a** The force (weight) of the bag can be large and the area of the handles is small (1 mark) So the stress (force/area) is large (1 mark) **b** When you ride off road the surface can be soft, so you need a smaller stress (1 mark) So you have wide tyres to increase the area, which reduces the stress (1 mark) **4** Stress =force/area=500 N/0.0001 m^2 = 5 000 000 N/m^2 (3 marks) **5a** The force of the Earth on the iceberg = force of the water on the iceberg/weight = upthrust (1 mark) **b** The icebergs float. The bottom of the first iceberg is closer to the water surface than the bottom of the second iceberg. This is because the area of the first iceberg is bigger than the area of the second iceberg. (3 marks) **6a** Clockwise moment = force × distance = 1.5 N × 0.3 m = 0.45 Nm (2 marks) **b** anticlockwise moment = 0.45 Nm = force (exerted by muscle) × 0.03 m force exerted by muscle = 0.45 Nm/0.03 m = 15 N (2 marks) **c** The force is bigger because anticlockwise moment = clockwise moment (for the system to remain balanced). The distance from the pivot is much less. (2 marks) **7** Examples of correct scientific points (6 marks): The bag of crisps contains air. Air molecules collide with the inside of the bag. Air molecules in the atmosphere collide with the outside of the bag. If the pressure is the same inside and outside the bag, the bag does not get bigger. Atmospheric pressure decreases with height, because gravity pulls the air molecules down. There are fewer collisions between air molecules and objects as you go higher. The air pressure inside the plane is less than the air pressure on the ground (inside the crisp packet) so the bag gets bigger.

Lesson 15: Revision

Connection

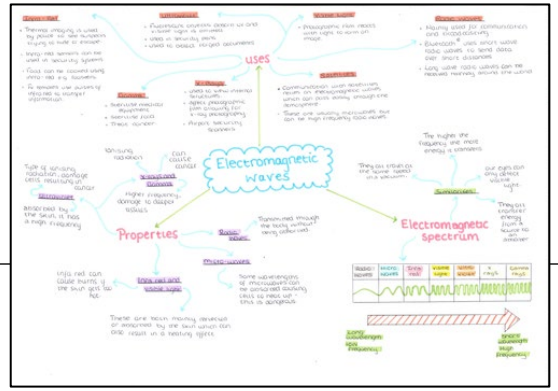
N/A

Activation

LI: Complete a piece of revision work

1. Make a summary sheet OR
2. Make flash cards OR
3. Complete the revision questions from book 1 (page 197) and 2 (page 161)

mind map



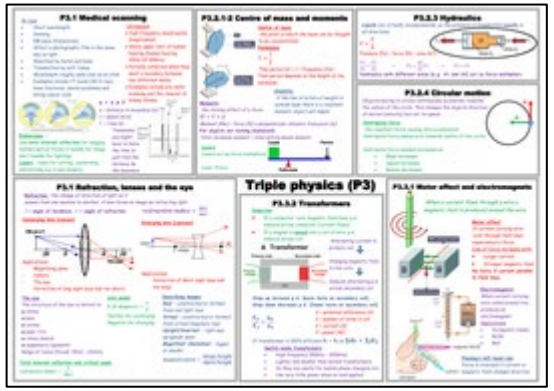
Demonstration

Use your revision work to quiz the person sat next to you OR work in a group to quiz each other.

flash cards

Consolidation

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher



Summary sheet

Attainment Band	Forces Knowledge and Understanding
Yellow/Yellow +	• Describe the main types of force and accurately draw force diagrams to explain the relative size (magnitude) and direction of applied forces and their effects • Provide an effective explanation of the concept of speed and independently derive the equation for speed; link their understanding of the speed equation to explain the operation of speed cameras • Explain what is represented on a more complex distance–time graph and construct a graph to represent a more complex journey • Apply the concept of relative motion to a situation with more than two objects moving at different speeds • Explain examples of balanced and unbalanced forces and correctly predict the relative motion produced by unbalanced forces; explain the concept of a reaction force using simple examples • Explain how a more complex set of opposing forces may or may not result in an object being in equilibrium • Explain how forces can cause an object to deform, link the deformation to the size of the force, and recognise that for a range of forces the amount of deformation is linear and that this can be used to design machines for measuring forces • Obtain a precise set of data by investigation, produce accurately drawn graphs to illustrate Hooke's Law, and explain the behaviour of a material at the elastic limit • Include the essential features in a plan to investigate the force of friction • Understand that frictional drag is a contact force acting in the opposite direction to movement and explain the motion of a sky diver in relation to the effects of frictional forces • Evaluate data from an investigation into streamlining and explain the findings in terms of frictional drag • Evaluate the concept of a gravitational field as a means of explaining the effects, including acceleration • Explain weight in relation to the idea of a gravitational field and apply this to deep space and different planets • Explain how the force and area can be varied to alter the pressure applied • Identify the causes and implications of pressure increase with depth in a liquid • Apply ideas of density and displacement to predict the outcome of various situations • Identify implications of differing atmospheric pressure at different heights and across the world

Stewards Academy
Science Department
ASSESSMENT FEEDBACK
Year 7 – 3

Blue	• State the main types of force and draw force diagrams to show the size and direction of forces; identify force pairs • Explain the concept of speed and demonstrate how the speed equation is derived using their understanding of speed • Construct a graph to represent a journey explain what it represents • Apply the concept of relative motion to a situation with two objects moving at different speeds • Apply an understanding of forces to explain simply the changes caused by forces of different magnitudes and directions • Explain how opposing forces may or may not result in an object being in equilibrium • State that applying a force can compress or stretch an object, and state that the bigger the force the larger the deformation • Carry out an investigation into springs and gather data to show simply the relationship between load and extension • Use their own data to state Hooke's Law and explain the elastic limit of a material • Describe the effects of friction and explain why friction is beneficial in a range of situations • Explain air and water resistance in terms of frictional drag, and recognise this as a contact force • Investigate streamlining and use scientific vocabulary to explain how streamlining reduces the forces of friction on an object moving through a fluid • Apply the concept of a gravitational field to describe the causes and effects of gravity • Explain the relationship between gravity and weight • Explain the term 'weightless' and apply understanding to explain why weight changes on different planets • Explain how the pressure on a solid surface may vary and the effects this has • Calculate the pressure applied from the force and the area • Explain why pressure increases with depth in a liquid • Explain why some objects float and others sink using concepts of density, displacement and upthrust • Explain why atmospheric pressure changes according to height
Green	• List some types of force and label diagrams to show the direction of forces • State that forces are needed to change the motion of an object, and draw force arrows in diagrams • Describe a method in simple terms to find the speed of an object • Label a distance–time graph and explain some of its features • Describe the effects of balanced and unbalanced forces, and know that an unbalanced force is needed for a change to take place • Predict relative motion produced by different forces on an object • Explain how forces can cancel each other out • Carry out an investigation into springs and gather data to show simply the relationship between load and extension • Identify the force of friction between two objects and list examples of situations that need friction • Know that objects are slowed down by drag forces • Recognise streamlined shapes and know that this helps them to move through air or water • Explain the effects of gravity and how they vary around the Earth • Describe the effect of an object being in a gravitational field • Know that objects have different weights on different planets and that in deep space objects are weightless • Describe the effects of varying pressure on a solid surface and suggest factors that affect this • Describe how pressure increases with depth in a liquid and some effects of this • Suggest why some objects float and others sink • Describe how atmospheric pressure changes according to height
White	• Some of the above elements have been achieved