Year 11 2020-2021

Half Term 4 (Spring 2)

Includes Review of C13 due to Covid-19 school closure

GCSE Biology B11 Hormonal Control			
What are we learning?	What knowledge, understanding and skills will we gain?	What does excellence look like?	What additional resources are available?
Understanding the role of the pituitary gland in controlling our internal conditions; the role of hormones in controlling blood glucose and menstrual cycle. Learning how to control and treat diabetes and fertility using hormones.	**Knowledge** • Identify the main glands on the body • State how hormones travel in our bodies • State the 2 types of diabetes • Identify blood glucose control is by the pancreas and liver • Identify link between type 2 diabetes and obesity • State the ways in which both types of diabetes are treated • Identify one use of enzymes • Define negative feedback • Identify the role of oestrogen, progesterone, LH and FSH in menstrual cycle • Identify the organs involved in the menstrual cycle • Categorise contraception's as hormonal and non-hormonal • Identify steps in the process of IVF • State the meaning of infertility **Understanding** • Describe the role of hormones released from endocrine glands • Describe what happens when blood glucose is too high or too low – what hormones and organs are involved • Explain why type 2 diabetes can often be reversed • Describe the function of adrenaline and thyroxine. • Compare and contrast the changes to boys and girls during puberty. • Create a detailed timeline for the menstrual cycle – including hormones involved, their functions and the organs within the cycle • Explain how contraceptives work and explain advantages and disadvantages of each • Evaluate disadvantages and advantages of IVF • Analyse the impact of IVF on individuals, society and finances **Skills** • Read values from a graph • Giving examples from the data to support patterns and trends seen • Describe facts, events or processes in a logical order • Evaluate: use the information supplied, as well as their knowledge and understanding, to consider evidence for and against when making a judgment. • Writing to examine consequences (PEM: People Environment Money)	Able to write a 6 mark answer including all details of hormones and organs involved in the menstrual cycle Able to explain the use of negative feedback in humans internal systems and link these to real world scenarios Research the impact of diabetes on our NHS healthcare system Complete a leaflet detailing information regarding infertility and options available such as IVF Create a PowerPoint to show to Year 10 students giving details of contraceptives and the hormones that some use	BBC Bitesize Doddle – power points and quick quizzes You tube: 'Free science lessons' Seneca learning platform

Scheme of Work 2020-2021

Subject: GCSE Science: B11: Hormonal Control

Year Group: 10 /11

Specification: AQA Combined Science Trilogy

Skill focus: :

Lesson No	Topic & Objectives	Big Question – What will students learn?	Key Activities & Specialist Terminology (Do Now Task / Starter/Tasks/Plenary	Planned Assessment	Homework or flipped learning resources DODDLE resources	Lit Num SMSC Codes
B11.1 Principles of Hormonal Control	**Aiming for Grade 4 LOs:** • Match the pituitary gland, pancreas, thyroid, adrenal gland, ovary, and testes to their position on a diagram of the human body. Describe how hormones are chemicals secreted into the bloodstream by glands, and have an effect on a target organ. **Aiming for Grade 6 LOs:** • Explain why the pituitary gland is known as a 'master gland'. • Describe the role of hormones released by endocrine glands. **Aiming for Grade 8 LOs:** • Compare and contrast nervous and hormonal action.	Why does our heart carry on beating quickly even though danger has past? What would happen if you didn't have a pituitary gland – could you survive?	**Lesson Overview** **Starters** **Hormones** (10 min) Ask students to work alone and write down any hormones they have heard of. Then ask them to share their lists in pairs and discuss whether they know any extra information about them, for example, where in the body they are produced, or what they do. Ask pairs to share what they know with the rest of the class to build up a list on the board. **Getting nervous** (5 min) Ask students to share with the class what kinds of situations make them feel nervous, and how this affects their body. Discuss that these feelings of 'butterflies' – increased heart rate and sweaty palms – are brought about by the hormone adrenaline. **Mains**	Brainstorm on hormones Peer discussion Written task Feedback on written task	Learn the Keywords for the topic: Hormones, pituitary gland pancreases Thyroid target organs endocrine glands glucose glucagon glycogen	SO3 SO9 SP1 SP2 SP5 SP9 C2

	• Apply knowledge to suggest and explain how changes in hormone production could affect the body.		**Endocrine glands** (40 min) Supply students with an outline of the human body for them to draw on the endocrine glands, which they can label with the name and function. They can use information from the student book to do this. Then, set a series of questions looking at the hormones that these glands produce, how hormones travel to their target organs, and the differences between hormonal and nervous control. **Plenaries** **Modelling hormones** (10 min) Split the class up into groups of around five students and assign each student as either the endocrine glands, blood, or organs. The gland and organ groups should sit together at desks in separate locations. Assign each organ group a name (heart, lungs, kidneys, etc.), which should be displayed on the desk. The blood groups stand up in between the gland and organ groups. Provide the gland groups with blank cards. The 'gland' students should write simple instructions on the cards, for example, stand up, or wave your hands around. Then, they give them one at a time to a 'blood' student and tell them the name of the organ they wish to target. The blood student passes the card on and the 'organ' students carry out the instruction. Instructions should be continuously and concurrently passed from the glands to target organs. After a few minutes, stop the game and discuss how this models what happens in the body. **Glands and hormones** (5 min) Use the interactive to test understanding of the endocrine hormones and their functions		kidney live diabetes negative feedback, oestrogen progesterone LH and FSH, menstrual cycle Doddle: The endocrine system presentation	
B11.2 The Control of Blood Glucose Levels	**Aiming for Grade 4 LOs:** • State that blood glucose concentration is controlled by the pancreas. • State that there are two types of diabetes. **Aiming for Grade 6 LOs:** • Describe what happens when blood glucose levels become too high or too low.	Is sugar really that dangerous to your body? How can you continually respire even though you do	**Lesson Overview** **Starters** **Digesting sugar** (10 min) Ask students to use what they have learnt about digestion to write down what happens in their body after eating a slice of sugary cake. **'Urine' testing** (5 min) Model a 'urine' test (use two samples of diluted tea). To one sample add glucose. Use Clinistix to test the samples. Discuss that the sample with	Class discussion Q &A between students and teachers 6 mark exam question	Doddle: glucoregulation presentation	SO3 SO9 SP1 SP2 SP5

	• Describe the difference in the causes of Type 1 and Type 2 diabetes. **Aiming for Grade 8 LOs:** • Explain how glucagon interacts with insulin to control blood glucose levels. • Explain why it is important to control the level of glucose in the blood.	not continually eat? Why do we need to breathe continually but not eat continually?	no glucose is normal. The other is from a person with diabetes. **Main** **Control of blood glucose levels** (40 min) Explain to students how the body controls blood glucose levels. Explain that diabetes is a condition where a person cannot control their blood glucose levels. Measuring blood glucose levels after a sugary meal is a way of diagnosing diabetes. Supply data of the concentration of glucose in the blood following a meal for a person without diabetes and a person with Type 1 diabetes. Ask students to plot the data as graphs and analyse what they show. Students then use information in the student book to describe what causes Type 1 and Type 2 diabetes. **Plenaries** **Glucose, glycogen, and glucagon** (10 min) Ask students to write down definitions for each of these words to make sure they understand the difference. **Order the events** (5 min) Students use the interactive to put statements in the correct order to describe what happens when blood glucose levels become too high or low.			SP9 C2
B11.3 Treating Diabetes	**Aiming for Grade 4 LOs:** • State that Type 1 diabetes is normally treated with insulin injections. • State that Type 2 diabetes can be treated by changes to diet and exercise. • Describe data that shows a link between obesity and Type 2 diabetes. **Aiming for Grade 6 LOs:** • Explain why Type 1 diabetes is treated with insulin injections.	Diabetes isn't something we need to worry about because we can just change our diet – true? Why might diabetes not be taken seriously? Is genetic engineering ethical?	**Lesson Overview** **Starters** **Diabetes thought shower** (10 min) Ask students to work in small groups and give each group an A3 piece of paper. Students should write down everything they know about diabetes. **Insulin injection** (5 min) Show the class an image of a person injecting themselves with insulin. Ask them to say what it has to do with diabetes. **Main**	Brainstorm on type 1 and type 2 diabetes Written task Checking students' responses to written task	Doddle: maintaining internal condition presentation	SO3 SO9 SP1 SP2 SP5 SP9 C2

	• Explain how Type 2 diabetes can be treated by changes to diet and exercise. • Describe how the production of insulin for people with diabetes has developed over time. **Aiming for Grade 8 LOs:** • Evaluate different treatments for Type 1 diabetes. • Explain in detail how lifestyle choices affect the risk of developing Type 2 diabetes. • Summarise how scientists are working to find a cure for diabetes.		**Diabetes webpage** (40 min) Supply students with a template for a webpage, based on NHS Choices. They should write treatment information for people with Type 1 and Type 2 diabetes. Discuss the need to keep it simple but still informative. Their webpage should include a timeline to show how treatments for diabetes have changed over time. Students should add a date, the discovery, and how this changed the lives of people with diabetes. They can use information from the student book and other resources if available. **Plenaries** **Exam question** (10 min) Set the class the following 6-mark practice question: *Describe how insulin controls blood glucose levels and explain why a person with diabetes may need to change their insulin levels at certain times.* Go through a model answer with the class. **Lifestyle factors** (5 min) Students use the interactive to assess a series of lifestyle choices (eating lots of sugary food, taking plenty of exercise, smoking, etc.) to decide if they will increase the risk of developing Type 2 diabetes.			
B11.4 The Role of Negative Feedback	**Aiming for Grade 4 LOs:** • Recall that enzymes are proteins that are biological catalysts. • State one function of enzymes inside the body. • State the independent variable in a given investigation. **Aiming for Grade 6 LOs:** • Describe the function of adrenaline and thyroxine. • Interpret and explain diagrams of negative feedback control.	How does your body know when to stop producing hormones? What are the consequences of overactive or underactive thyroids?	**Lesson Overview** **Starters** **Start the lesson with a bang!** (5 min) During the usual start to the lesson, suddenly make a loud noise, for example, by slamming a book on a desk or turning on loud music. Invite students to comment on how they felt and write a list of the effects of a shock like this on the body. **Thermostat** (10 min) Explain to students that a thermostat works in a similar way to a negative feedback system. Students then use the interactive to complete a paragraph explaining how a thermostat is similar to a negative	Q & A between students and teachers Mini quiz	Doddle: Thermoregulation presentation How does body control temperature? Animation	SO3 SO9 SP1 SP2 SP5 SP9 C2

	Aiming for Grade 8 LOs: • Explain in detail how adrenaline prepares the body for 'fight or flight'. • Design labelled flow diagrams of negative feedback control.	Are our actions our responsibility when hormones are released automatically? (focus on fight or flight)	feedback system. They then complete sentences to describe what a negative feedback system is. **Main** **Effects of hormones** (40 min) Tell the class that adrenaline is often called the 'fight or flight' hormone. Ask them to use the information in the student book to research adrenaline and thyroxine. They should include information on the glands that produce each hormone, when the hormone is released, how the hormone is transported in the body to target organs, what the target organs are, and the effect the hormone has on them. Use the starter activity 'Thermostat' here if not already used. Then ask the students to design their own negative feedback diagram to show how the level of thyroxine is controlled. Ask students to discuss in pairs what the possible effects of an underactive or overactive thyroid gland might be. Show them the answers by searching on the NHS Choices website for the conditions. **Plenaries** **Controlling blood glucose levels** (10 min) Students consolidate their understanding from the last two lessons to explain how the control of blood glucose levels is another example of negative feedback. **Fight and flight** (5 min) Ask students to suggest situations where the level of adrenaline in their bodies would increase. For each example they should be able to explain how the changes it causes would help them in that situation.			
B11.5 Human Reproduction	**Aiming for Grade 4 LOs:** • Identify oestrogen and testosterone as reproductive hormones in women and men respectively. • Describe what happens during the menstrual cycle. **Aiming for Grade 6 LOs:** • Compare and contrast the changes to boys and girls during puberty.	Why can't you have a baby at any age? How do hormones	**Lesson Overview** **Starters** **Changes during puberty** (10 min) Ask students to write a list of changes that happen to boys and girls during puberty. **Scrambled hormones** (5 min) Write anagrams of oestrogen and testosterone on the board. Tell the class	Class discussion Q and A between students and teachers Labelling diagram of menstrual cycle	Doddle: reproductive hormones presentation	SO3 SO9 SP1 SP2 SP5

	• Name the hormones involved in the menstrual cycle. **Aiming for Grade 8 LOs:** • Explain why fertility changes with age in men and women. • Explain the role of each hormone in the menstrual cycle.	change us into teenagers?	that they are examples of the hormones they will be learning about today, and ask them to unscramble them. **Main** **Secondary sexual characteristics** (15 min) Describe primary sexual characteristics as the ones you are born with, and secondary sexual characteristics as ones that develop during puberty. If they haven't already done so, students should make a list of the changes that occur in boys and girls during puberty. Ask students to write down the secondary sexual characteristics that they all agree are correct into their notes. Then allow students to use the information in the student book to add any others that they did not originally think of, and state the hormones involved in their development. **The menstrual cycle** (25 min) Supply students with an unlabelled diagram of the female human reproductive system and ask them to label it. Go through the events of the menstrual cycle with the class using diagrams and information from the student book. Supply students with a diagram of the cycle for them to label key events. **Plenaries** **Menstrual cycle hormones** (10 min) Students use the interactive to match the key terms from the lesson to a question that could have the key term as an answer. **Fertility changes** (5 min) Tell the class that women stop being able to have children naturally when they are around 50 years of age, but men can continue to father children well into old age. Ask students to discuss why this is.	Mini quiz		SP9 C2
B11.6 Hormones and the Menstrual Cycle	**Aiming for Grade 6 LOs:** • Name the glands that produce the hormones oestrogen, progesterone, LH, and FSH. • Describe the function of the hormones that control the menstrual cycle. **Aiming for Grade 8 LOs:**	Why are twins and triples less common? What could happen to the cycle if the production of	**Lesson Overview** **Starters** **Menstrual cycle review** (10 min) Display a diagram of the menstrual cycle from Topic B5.5 and students use the interactive to answer a series of questions to check their understanding.	Brainstorm on glands and hormones Peer discussion on different type of hormones	Doddle: menstrual cycle animation	SO3 SO9 SP1 SP2 SP5

	• Suggest how to test for substrates and products in a model gut. • Make a prediction with a clearly structured scientific explanation. • Analyse results in order to evaluate a method and the validity of conclusions, explaining suggestions for possible improvements. **Aiming for Grade 4 LOs:** • Describe what contraception is and list examples. • Categorise contraceptives as hormonal and non-hormonal.	one hormone was reduced?	**Follicles** (5 min) Show the class an image of eggs developing in follicles in the ovary. Ask them what they think the image is showing. **Main** **Hormones and the menstrual cycle** (40 min) Ask students to use information from the student book to create a table to show information on each of the hormones involved in the menstrual cycle (FSH, LH, oestrogen, and progesterone). They should include the name of the gland it is secreted from, and its action on the body. Then provide students with copies of Figure 3 from the student book, which shows the changing levels of the female sex hormones throughout the menstrual cycle. Ask students to work in pairs and write questions for each other on what the diagram shows (e.g., On which day does ovulation occur? What happens to the uterus lining as levels of oestrogen increase?). **Plenaries** **Design a diagram** (10 min) Ask students to design a diagram to help them remember how the hormones involved in the menstrual cycle interact with each other. This can be in the form of boxes containing the name of the hormone with connecting arrows to show how they interact. **Which hormone?** (5 min) Provide students with cards showing the names of hormones. Ask a series of questions and ask students to hold up the hormone (or hormones) you are describing.	Exam questions Feedback on exam questions		SP9 C2
B11.7 The Artificial control of Fertility	**Aiming for Grade 4 LOs:** • Describe what contraception is and list examples. • Categorise contraceptives as hormonal and non-hormonal. **Aiming for Grade 6 LOs:** • Explain how contraceptives work.	Are we playing God by using hormones to control fertility? What could be the long term	**Lesson Overview** **Starters** **What is contraception?** (5 min) Ask students to write down their answer to this question. Ask them to share their ideas in order to come up with an agreed class definition.	Sharing ideas of use of contraception Mind map on hormonal and non-	Doddle: Controlling fertility presentation	SO3 SO9 SP1 SP2

	• List the advantages and disadvantages of different contraceptives. **Aiming for Grade 8 LOs:** Apply knowledge of hormones in the menstrual cycle to suggest how • hormonal contraceptives work. • Evaluate different methods of contraception in detail.	consequences of our actions on society? Should IVF be free for everyone?	**The contraceptive pill** (10 min) Introduce the contraceptive pill as a contraceptive. Tell the class that one type contains oestrogen. Ask them to use what they have learnt about the function of oestrogen to suggest why. **Main** **Contraceptive advice** (15 min) Discuss the fact that contraception is a way of preventing pregnancy. Ask students to work in small groups to list examples of different contraceptives that they have heard about. Then, after hearing their ideas and making a class list, allow students to use the student book to add any extras that were not mentioned. Students then categorise the contraceptives as hormonal or non-hormonal, and explain what the difference is. Discuss the fact that there are many different forms of contraception. Ask students to design a leaflet, poster, or webpage on the methods of contraception listed in Main 1. This should be written for people who want general advice on contraception and the options available to them. Students should list the advantages and disadvantages of each method of contraception. **Plenaries** **Advantages and disadvantages** (5 min) Students match advantages and disadvantages to different forms of contraception. **The male pill?** (10 min) Carry out a class discussion on the male pill which may be a possibility in the future. Talk about how it could work and if the students think it is a good idea.	hormonal contraception Exam questions on IVF treatment	How does IVF treat infertility? animation	SP5 SP9 C2
B11.8 Infertility Treatments	**Aiming for Grade 6 LOs:** • Describe what is meant by infertility and suggest reasons for it. • Describe the steps used in IVF. • Outline the issues surrounding IVF. **Aiming for Grade 8 LOs:**	Are we playing God by using hormones to control fertility? What could be the long term consequences	**Lesson Overview** **Starters** **What is infertility?** (5 min) Ask pairs to discuss this question and come up with a definition that they can share with the class. **Causes of infertility** (10 min) Provide small groups with diagrams of the male and female reproductive systems. Ask them to discuss possible reasons why a man or a			SO3 SO9 SP1 SP2

	• Describe how FSH and IVF can be used to help treat infertility. • Evaluate the advantages and disadvantages of IVF. • Use different viewpoints to make an informed decision on unused IVF embryos.	of our actions on society? Should IVF be free for everyone?	woman may be infertile. Ask groups to share their ideas and list them on the board. **Main** **Solving fertility problems** (40 min) Introduce the ways in which men and women can have fertility difficulties. Ask groups to continue the discussion to come up with ways of helping couples with each of the fertility problems identified. For example, one suggestion might be that the woman does not regularly release an egg from her ovaries. One solution would be to give her FSH injections to stimulate the eggs in the ovaries to mature. Listen to the ideas of the class on solving fertility problems and introduce IVF as one method. Describe the process of IVF. Ask students to use information from the student book to write a description of what happens. They can include diagrams to help them. Ask students to display the data shown in Table 1 of the student book as a graph, and explain what it shows. **Plenaries** **IVF: advantages and disadvantages** (10 min) Ask students to work in small groups to list the benefits and drawbacks of IVF. **Fertility** (5 min) Students use the interactive to answer a series of true or false questions on fertility treatments.			SP5 SP9 C2

Scheme of Work 2020-2021

Subject: GCSE Science: C13 The Earth's Atmosphere Review

Year Group: 10 /11

Specification: AQA Combined Science Trilogy

Skill focus: 20d,21

Lesson No	Topic & Objectives	Big Question – What will students learn?	Key Activities & Specialist Terminology (Do Now Task / Starter/Tasks/Plenary	Planned Assessment	Homework or flipped learning resources DODDLE resources	Lit Num SMSC Codes
C13 Summary 1 Our Changing Atmosphere	**Aiming for Grade 4 LOs:** • Describe the Earth's early atmosphere and where the gases came from • List the names and symbols of the gases in dry air. • Describe how oxygen levels changed • State pattern of carbon dioxide levels (decreased but now increasing again)	Where would we be without cyanobacteria? What has our old atmosphere got	**Starters** **Life on Mars** provide students with information on the Atmosphere of Mars, Early Earth and Today's Earth's atmosphere and ask them to compare them **Main** **Changing Gases in the Atmosphere :** Students use the information provided to them to draw detailed storyboard explaining how gas levels have changed throughout the history of Earth's atmosphere.	QnA between teachers and students Written responses to questions Class discussion	Learn the keywords for this topic: Atmosphere Volcanic Methane Ammonia Photosynthesis Ammonia Greenhouse Infrared Radiation	So3 C3 Sp2 Sp9

	Aiming for Grade 6 LOs: • State the composition, including formulae, of the Earth's early atmosphere. • Describe a theory for the development of the Earth's atmosphere. • Explain, using word equations, how gas levels have changed. • Describe how the proportion of carbon dioxide in the early atmosphere was reduced.. **Aiming for Grade 8 LOs:** • Use a theory to explain in detail how the atmosphere developed. • Explain the limits of the theory for the development of the Earth's atmosphere and why it has changed. • Explain why the composition of the Earth's atmosphere has not changed much for 200 million years. • Use balanced symbol equations to explain how gas levels have altered	in common with Jupiter's moons? Could we alter the atmosphere of other planets until they were able to support life?	**Plenaries** **Exam Questions** Give students a 6 mark exam question on this topic to complete / alternatively give them 3 responses to this question that they then have to mark using the mark scheme		Reflected Short wavelength Absorb Molecules Global climate Fossil fuel Ecosystem Economies Carbon footprint Capture Pollution Fuels Monoxide Impurities Sulphur dioxide Acid rain Particulate Global dimming Incomplete combustion Nitrogen oxides Hydrocarbons Haemoglobin	
C13 Summary 2 Pollution	**Aiming for Grade 4 LOs:** • Describe the greenhouse effect. • Name three greenhouse gases • State some human activities that affect the proportion of greenhouse gases in the atmosphere. • State a definition for carbon footprint. • Describe how carbon monoxide and soot (carbon) can be made from the incomplete combustion of fossil fuels.	Is global warming real?	**Starters** **Climate change** (5 minutes) Show students a dot and cross diagram of water, a ball and stick diagram of methane, and the molecular formula of carbon dioxide. Ask students to identify the compounds and suggest the topic of the lesson. Students then sort statements on global warming and climate change according to whether they are true or false. **Greenhouse gases** (10 minutes) Set up the experiment to consider the effect of greenhouse gases. Ask students to predict what will happen to the temperature of each flask and to suggest why they think this.	QnA between teachers and students Written responses to questions Class discussion	Doddle: The Greenhouse Effect Presentation and Worksheet What are the products of combustion animation Doddle: The Greenhouse Effect Presentation and Worksheet	So3 C3 Sp2 Sp9

	• Complete word equations to describe how atmospheric pollutants can be made. **Aiming for Grade 6 LOs:** • Explain the greenhouse effect • Explain how greenhouse gases increase the temperature of the atmosphere. • Explain how human activity can change the proportion of greenhouse gases in the atmosphere. • Explain the possible effects of global climate change and why they are difficult to predict. • Explain possible methods to reduce greenhouse gas emissions. • Explain some of the problems in trying to reduce greenhouse gas emissions. • Explain how sulfur dioxide and nitrogen oxides are made when fossil fuels are combusted. • Describe the health impacts of atmospheric pollutants. • Use balanced symbol equations to show how atmospheric pollutants are formed. **Aiming for Grade 8 LOs:** • Justify why scientists, as well as the public, disagree about the cause of climate change. • Evaluate the scale, risk, and environmental impact of global climate change. • Justify why reducing greenhouse gas emissions can be difficult to achieve. • Evaluate the use of products, services, or events in terms of their carbon footprint. • Predict the products of combustion of a fuel given	Greenhouse gases are necessary for life– justify? How do greenhouse gases increase Earth's temperature?	**Mains** **Climate change?** (30 minutes) Scientists at the University of East Anglia's Climate Research Unit have provided data to show that climate change can be linked to human activity. However, other researchers feel that climate change may not be due to human activity. Ask students to write their conclusion which is backed up by their research. If the Internet is available students should research arguments for and against climate change affected by human activity. **Other Pollutants:** In a treasure hunt or market place style, allow students to collect information on the other atmospheric pollutants in our atmosphere, their cases and consequences. **Plenaries** Quick quiz students on the types of pollution they have learnt about Ask them to rank the pollutants they have learnt in order from most to least severe, they could consider a number of things in their rank ordering including how wide spread the effect, the ease in which the pollution is prevented etc.		What are the products of combustion animation

	appropriate information about the composition of the fuel and the conditions in which it is used. • Evaluate the negative social, economic, and environmental consequences of atmospheric pollution.					

GCSE Physics P10 Force and Motion			
What are we learning?	What knowledge, understanding and skills will we gain?	What does excellence look like?	What additional resources are available?
How force can alter motion of an object.	**Knowledge** • Identify forces acting on an object • Know SI units for measuring these values • Define terminal velocity • List factors that affect braking distances **Understanding** • Link acceleration, mass and force in a mathematical equation and explain the relationship • Explain the conditions in which an object changes velocity or remains stationary or in constant motion. • Explain how terminal velocity is reached in a variety of situations • Calculate breaking distances and explain the factors that interact to alter the distance • Explain the concept of conservation of momentum within closed systems **Skills** • Use scientific understanding as a foundation for predictions • Write a detailed method that includes an appropriate table for results • Apply principles of repeatability and reproducibility • Apply mathematical principles of significant figures to reporting of scientific data • Use data to develop conclusions	Confident construction and manipulation of scientific equations that demonstrates an understanding of the interaction of factors involved. Application of two or more scientific equations in order to find a missing value Analyse complex graphs which provide more than one piece of data on the breaking distances of vehicles. Apply conservation of momentum to a wide range of situations to explain the motion of objects within them.	BBC Bitesize Doddle – power points and quick quizzes You tube: 'Free science lessons' Seneca learning platform

cheme of Work 2020-2021

Subject: GCSE Science P10 Force and Motion

Year Group: 10 /11

Specification: AQA Combined Science Trilogy

Skill focus: 3,5,8, 11c and 11f, 14 and 25n

Lesson No	Topic & Objectives	Big Question – What will students learn?	Key Activities & Specialist Terminology (Do Now Task / Starter/Tasks/Plenary	Planned Assessment	Homework or flipped learning resources DODDLE resources	Lit Num SMSC Codes
P10.1 Forces and Acceleration	**Aiming for Grade 4 LOs:** • State the factors that will affect the acceleration of an object acted on by a resultant force. • Calculate the force required to cause a specified acceleration on a given mass. • Investigate a factor that affects the acceleration of a mass. **Aiming for Grade 6 LOs:** • Describe the effect of changing the mass or the force acting on an object on the acceleration of that object. • Perform calculations involving the	What should car manufactures consider when it comes to performance in acceleration? Do objects always move in the direction of the resultant force? (parachute opening/ breaking force but not going backwards)	**Lesson Overview** **Starters** **Accelerator** (5 min) Ask the students to describe the function of the accelerator in a car. **Lift off** (10 min) Interactive where students complete a description on the changes in energy stores during the launch of a chemical rocket, and link the ideas to the action of forces. **Main** **Investigating force and acceleration** (25 min) Students carry out two investigations. First they investigate the effect that changing the force on an object has on the acceleration. They then investigate the effect that changing the mass of the object has on the acceleration when a constant force is applied. Students use the investigations to reach two	Q & A, Use of mini white boards, exam style question.	Doddle Acceleration Presentation Doddle Force, mass and acceleration Interactive Doddle Investigating F...and Acceleration Animation	Sp7,Sp2

	rearrangement of the *F* = *ma* equation. • Combine separate experimental conclusions to form an overall conclusion. **Aiming for Grade 8 LOs:** • Define the inertial mass of an object in terms of force and acceleration. • Calculate the acceleration of an object acted on by several forces. • Evaluate an experiment by identifying sources of error and determining uncertainty in the resulting data.	How did Concorde break the sound barrier?	conclusions that can then be combined into a mathematical relationship. **H Inertial mass and acceleration** (15 min) Discuss the relationships a is proportional to F and a is proportional to 1 / m and combine them to reach the expression a is proportional to F / m, which leads to the more familiar F = ma. Analyse some scenarios involving resultant forces acting on objects to find the acceleration or the force required to cause particular accelerations. Focus on the idea that both the force and the acceleration are vectors in the same direction. **Plenaries** **What's wrong?** (5 min) Students consider the common misconception *Objects always move in the direction of the resultant force* and write a corrected version. **I'm snookered** (10 min) Students draw a series of diagrams showing the forces involved in getting out of a snooker. They draw each of the stages of the movements, showing the forces as the white ball is first hit and the collisions with the cushions.			
P10.2 Weight and Terminal Velocity	**Aiming for Grade 4 LOs:** • State the difference between the mass of an object and its weight. • Describe the forces acting on an object falling through a fluid. • Investigate the motion of an object when it falls. **Aiming for Grade 6 LOs:** • Calculate the weight of objects using their mass	Why is there a weight limit on parachute jumps? How would terminal velocity vary on other planets?	**Lesson Overview** **Starters** **Fluid facts** (5 min) Interactive where students match up information (including diagrams) about the physical properties of solids, liquids, and gases with explanations in terms of particle behaviour. This will help them revise the states of matter and the particle theory in particular. **Air resistance** (10 min) Students use their understanding of particles and forces to suggest what causes air and water resistance. They should	Q & A, Use of mini white boards, exam style question.	Gravity Presentation, Energy transfer terminal velocity Animation	Sp7,Sp2

	and the gravitational field strength. • Apply the concept of balanced forces to explain why an object falling through a fluid will reach a terminal velocity. • Investigate the relationship between the mass of an object and the terminal velocity. **Aiming for Grade 8 LOs:** • Apply the mathematical relationship between mass, weight, and gravitational field strength in a range of situations. • Explain the motion of an object falling through a fluid by considering the forces acting through all phases of motion. • Evaluate the repeatability of an experiment by considering the spread of each set of repeat results.	Why do cars have a top speed? Why isn't the speed at which we can travel unlimited?	sketch the movement of objects, label the forces on them, and then try to show the particles being pushed out of the way and pushing back. **Main** **Investigating falling** (40 min) Demonstrate the acceleration caused by the weight of an object when there is no supporting force by dropping some objects. Discuss the unbalanced forces acting whilst they fall and when they stop. Spend a few minutes ensuring that the students are clear on the distinction between these two with some calculations of weight for different masses. Ensure the students are aware that the weight of the objects is due to a gravitational field surrounding masses. Continue with the discussion of forces focusing on drag and how this changes as the velocity increases. Students should realise that when the drag force matches the weight, then the object stops accelerating and so reaches terminal velocity. Use the animation to describe the changes in the forces experienced by a sky diver. Then carry out the practical to investigate falling using a model parachute. Students should investigate the effect of different masses on the time for descent. If time is limited, individual groups could investigate one mass, and then collate results as a class. As there will be considerable variability in the results, the students should focus on repeat measurements to find mean values, reducing the effects of random error. **Plenaries** **Top speed** (5 min) Show the students a list of top speeds for cars along with some other information			

			such as engine power and a photograph. They can discuss why the cars have a maximum speed. **Falling forces** (10 min) The students draw a comic strip with stick figures showing the forces at various stages of a parachute jump. This should summarise the concepts and demonstrate the changing size of the forces.			
P10.3 Forces and Breaking	**Aiming for Grade 4 LOs:** • List the factors which affect the stopping distance of a car. • Calculate the thinking distance for a car from the initial speed and reaction time. • Estimate the relative effects of changing factors which affect the stopping distance of cars. **Aiming for Grade 6 LOs:** • Categorise factors which affect thinking distance, braking distance, and both. • Calculate the braking distance of a car. • Describe the relationship between speed and both thinking and braking distance. **Aiming for Grade 8 LOs:** • Calculate acceleration, mass, and braking force of vehicles. • Calculate total stopping distance, initial speed, reaction time, and acceleration. • Explain the relative effects of changes of speed on thinking and stopping distance.	Why are ABS brakes and why is it useful to have them? Does the government do enough to protect road users from car accidents?	**Lesson Overview** **Starter** **Safety first** (10 min) Use information from government safety websites about car collisions in the local area to identify accident hotspots. Link these results to the idea of speed restrictions in the area, especially around primary schools. **Stop!** (5 min) To support students in understanding the wide range of factors that can affect the stopping distance of cars, provide students with a list of factors to sort according to whether they will affect stopping distances or not. **Main** **Reaction time challenge** (40 min) Discuss the forces acting on a car whilst it is moving at constant velocity. Reinforce the idea that the forces must balance. Identify the resistive forces clearly. The students should understand the factors affecting overall stopping distance, but they need to be clear which affects the thinking distance and which affects the braking distance. For higher-tier students, the braking distance should be linked closely to the decelerating forces using $F = ma$ with a few example car masses and maximum braking forces. From this acceleration and the initial speed, the braking distance should be calculated. Formally introduce stopping distance to all students, ensuring that any misconceptions are corrected. Students then carry out the practical to investigate how distractions can affect your reaction times to demonstrate how using a mobile phone whilst driving can affect	Q & A, Use of mini white boards, exam style question.	AQA Forces and braking Mini Quiz, Reaction forces...ines and walking Interactive, Stopping Distance Presentation	C1, Sp3,C3

			stopping distances. They should appreciate that the times improve with practice and when they are fully concentrating on the clock. In a real car situation, the driver would not be able to focus on one simple task, so the times would be significantly greater. **Plenaries** **Stopping distances and motive forces** (10 min) Interactive where students consolidate their understanding of stopping distances. Student's link together parts of sentences on braking distance, identify true and false statements on stopping distance, reaction time, and braking distance, and put a description of the forces involved as a car stops in the correct order.			
P10.4 Momentum	**Aiming for Grade 6 LOs:** • Apply the equation $p = mv$ to find the momentum, velocity or mass of an object. • Describe how the principle of conservation of momentum can be used to find the velocities of objects. • Investigate the behaviour of objects during explosions to verify the conservation of momentum. **Aiming for Grade 8 LOs:** • Fully describe the motion of objects after an explosion accounting for any frictional effects. • Apply the principle of conservation of momentum to a range of calculations involving the velocities of objects. • Evaluate the data produced from an investigation and compare this to a theoretical framework.	Does an airbag really safe your life? Why are children's playground covered in black sponge? Why does a gun recoil?	**Lesson Overview** **Starters** **Trying to stop** (5 min) Ask students to explain why it takes a container ship several kilometres to stop but a bicycle can stop in only a few metres, even when they are travelling at the same speed. **Stopping power** (10 min) Students use the interactive to put a list of sport balls (e.g., golf ball, cricket ball, rugby ball, and footabll) in order of difficulty to stop. They then complete a paragraph to explain what properties make it more difficult for the balls to stop. They should be able to link the stopability to the speed and mass of the balls. **Main** **Calculating momentum** (15 min) Introduce the concept of momentum and the equation for it by discussing a wide range of examples. The students should calculate the momentum of several objects and also the velocities of some objects when given the mass and momentum. **Investigating a controlled explosion** (25 min) The students should refine the details of the practical, explaining how it will demonstrate the conservation of momentum in explosions. This will involve an explanation of the different velocities of the trolleys after the collision and hence the distance they will travel in the same time.	Q & A, Use of mini white boards, exam style question.	Momentum Worksheet Worksheet, Changing Momentum Presentation, Conserving momentum Animation, Momentum Presentation	Sp7,Sp2

			Once the data is gathered they should compare it to their predictions and suggest explanation for any differences. **Plenaries** **The skate escape** (5 min) Two people are trapped on a perfectly friction free surface (e.g., an ice rink) just out of reach of each other. They are both 10 m from the edge and all that they have to help them escape is a tennis ball. Ask: how do they both escape? [Throw something from one to the other, this will give them momentum in opposite directions and they will slowly drift to the sides.] **Boating** (10 min) Discuss what happens when somebody steps on to or off of a boat but falls in the water because the boat moves away from the land. Ask the students to explain what happened, perhaps with diagrams. They should understand that the person is actually pushing the boat away. When they move left, the boat will always be forced to the right as a consequence of the conservation of momentum.			
P10.8 Forces and Elasticity	**Aiming for Grade 4 LOs:** • State Hooke's law. • Calculate the extension of a material using its length and original length. • Compare materials in terms of elastic and non-elastic behaviour. **Aiming for Grade 6 LOs:** • Explain the limitations of Hooke's law including the limit of proportionality. • Calculate the force required to cause a given extension in a spring using the spring constant. • Compare the behaviour of different materials under loads in terms of proportional and non-proportional behaviour. **Aiming for Grade 8 LOs:**		**Lesson Overview** **Starters** **Distortion** (5 min) Get the students to list the basic things that forces can do (cause acceleration, change the shape of the object). Concentrate on the forces in the diagrams that cause objects to compress or stretch, and use these to discuss whether these changes are permanent or can be reversed. **In proportion** (10 min) In this lesson the students will find a relationship that is proportional, so start the lesson by asking the students to use the interactive compare some graphs and the relationship between them. They then complete a description on the idea of proportionality. **Main** **Stretch tests** (40 min) Demonstrate a simple elastic band to show a material returning to its original shape showing elastic behaviour. Show the similar behaviour for a spring and then the plastic behaviour of polythene or something	Q & A, Use of mini white boards, exam style question.	The elasticity of a spring Animation, Elasticity Presentation	Sp7,Sp2

	• Find the spring constant of a spring using a graphical technique. • Apply the Hooke's law equation in a wide range of situations. • Evaluate an investigation into the extension of materials in terms of the precision of the data.		similar whilst also stretching a spring beyond the elastic limit to show permanent deformation. Students then test the behaviour of materials under load using the practical. They should focus on accurate measurement of length, well organised recording of the data, and calculation of extension. When the data for the practical has been collected, graphs can be plotted to show the relationships. Identify areas where the relationship is directly proportional, ensuring the students can identify this and the limits to the behaviour. Use the data for the spring tests to explain Hooke's law and the associated equation. The students should find the spring constant for the spring they tested. **Plenaries** **Graphical analysis** (5 min) Give the students a graph showing the extension of different springs and ask them to describe the differences. They should look at the limit of proportionality and the spring constants. **Catapult** (10 min) Students can explain how a catapult operates or plan an investigation measuring the energy stored in it.			

GCSE Biology B13: Reproduction			
What are we learning?	What knowledge, understanding and skills will we gain?	What does excellence look like?	What additional resources are available?
The inheritance of characteristics as a result of different types of reproduction	**Knowledge** • Two types of reproduction, sexual and asexual • Structure of genes as the unit of inheritance • List some genetic disorders and some key facts about them • Key terminology including, gene, DNA, heterozygous, homozygous, dominant and recessive **Understanding** • Compare the advantages and disadvantages to organisms who use either type of reproduction • How sexual reproduction, the production of gametes via meiosis gives rise to variation in offspring • Use a punnett square to consider the likelihood of a genetic illness being passed onto the offspring. • Discuss the ethical implications of embryo screening **Skills** • Evaluate the effectiveness of models in modelling DNA and inheritance	Justified statements that agree or disagree with the use of genetic screening that consider the social, moral and economical sides of the debate Interpretation of complex family genetic inheritance trees containing three or more generations to determine the genotype of ancestors. Extended study into A Level, the structure of DNA as base pairs of nucleotides connected by sugar phosphate backbone Own independent research into a genetic disorder that hasn't been studied in class.	BBC Bitesize Doddle – power points and quick quizzes You tube: 'Free science lessons' Seneca learning platform

Scheme of Work 2020-2021

Subject: GCSE Science: B13: Reproduction (Using DNA)

Year Group: 10 /11

Specification: AQA Combined Science Trilogy

Skill focus: : 17

Lesson No	Topic & Objectives	Big Question – What will students learn?	Key Activities & Specialist Terminology (Do Now Task / Starter/Tasks/Plenary	Planned Assessment	Homework or flipped learning resources DODDLE resources	Lit Num SMSC Codes
B13.1 Types of reproduction	**Aiming for Grade 4 LOs:** • Define sexual and asexual reproduction. • Name some organisms that use either sexual or asexual reproduction. • Use a model to show why variation is produced in offspring from sexual reproduction but not from asexual reproduction. **Aiming for Grade 6 LOs:** • Describe the differences between sexual reproduction. • Describe the advantages and disadvantages of sexual and asexual reproduction. • Design a model to show why variation is produced in offspring from sexual reproduction but not from asexual reproduction.	If you cut a worm in half, each half becomes a worm' How true is this statement? Are all sea stars clones of each other? Why do humans all look different to each other?	**Lesson Overview** **Starters** **Bacterial reproduction** (10 min) Ask students to write a paragraph that describes how bacteria reproduce. Discuss as a class how this compares with how animals reproduce. **DNA, genes, and chromosomes** (5 min) Ask students to draw a diagram that shows DNA, genes, and chromosomes, and how they are related. **Mains** **Sexual and asexual** (20 min) Introduce the terms sexual reproduction and asexual reproduction. Students use information in the student book to create a table comparing sexual and asexual reproduction. **Modelling reproduction** (20 min) Students work in groups to carry out a practical modelling why sexual reproduction	Mind map on sexual and A sexual reproduction Class discussion between students and teachers Designing a model to show how individual are produced	Learn the Keywords for the topic: Asexual Sexual Genetic Genetically Identical Gametes Sperm Egg Variation Meiosis Division Clone	SO3 SO9 SP1 SP2 SP5 SP9 C2

	Aiming for Grade 8 LOs: • Compare and contrast sexual and asexual reproduction. • Explain in detail why meiosis is important for sexual reproduction. • Evaluate a model to show that variation is produced in offspring from sexual reproduction but not from asexual reproduction.		produces variation in offspring, but asexual reproduction does not. **Plenaries** **Sexual and asexual reproduction** (10 min) Students sort advantages and disadvantages of sexual and asexual reproduction into groups. **Definitions** (5 min) Keywords: Asexual Sexual Genetic Genetically Identical Gametes Sperm Egg Variation Meiosis Division Clone		Sexual reproduction Fertilisation Gametes Chromosomes Division Mitosis Embryo Differentiate Variation Fuse Offspring DNA Genome Genetic Polymer Gene Chromosome Double helix Amino acid Protein Inheritance Mitochondrial DNA gamete chromosome gene allele dominant recessive	

					homozygous heterozygous genotype phenotype. Punnett square Embryos Screening Foetuses Alleles Social Economic Ethical IVF Abortion Miscarried Inherited Doddle: Sexual and A sexual presentation	
B13.2 Cell division in sexual reproduction	**Aiming for Grade 4 LOs:** • State that gametes (sex cells) are formed by meiosis. • State that meiosis halves the number of chromosomes in gametes and fertilisation restores the full number. • Solve simple probability questions. **Aiming for Grade 6 LOs:** • Describe the processes of meiosis and mitosis.	Why do family members share characteristics but are not exactly the same? If they have the same parents, why do siblings	**Lesson Overview** **Starters** **How many?** (5 min) Ask students how many chromosomes there are in a human body cell and a human gamete (sex cell), and why they are different. Then read out the number of chromosomes in the body cells of different organisms and ask them to say the number in the corresponding gametes (or vice versa). **Passing on instructions** (5 min) Ask students to write a short answer to the question: Why do we look like our	Brainstorm on genetic variation Written task on explaining different stages of mitosis and meiosis	Doddle: Meiosis presentation, reproduction and meiosis mini quiz	SO3 SO9 SP1 SP2 SP5

	• Explain how meiosis halves the number of chromosomes in gametes and fertilisation restores the full number. • Solve simple probability questions. **Aiming for Grade 8 LOs:** • Compare and contrast mitosis and meiosis. • Explain in detail why gametes are all genetically different to each other. • Solve complex calculations to determine the number of possible gametes • formed during meiosis.	only share 50% of their DNA?	parents? Go through their answers and discuss the fact that, during fertilisation, chromosomes from both parents are paired up. **Main** **Which one?** (20 min) Show students a simple animation that shows the process of meiosis, or go through Figure 1 in the student book with them, describing what happens at each stage. Then provide them with statements about mitosis and meiosis. They use information from the student book to correctly categorise them and place them into a table. Tell students that a way of remembering the difference between mitosis and meiosis is: mitosis – **m**aking **i**dentical **t**wo, meiosis – **m**aking **e**ggs (and sperm). **Probability** (20 min) Ask students the question: If siblings have the same parents, why don't the siblings look identical? Use the Maths skills interactive to show the students how to work out how many unique gametes could be produced during meiosis, using probability. Ask the class to use this to answer the original question. **Plenaries** **Inheritance** (10 min) In this interactive activity students check their understanding by answering questions on mitosis, meiosis, and the differences between sexual and asexual reproduction. **Simple inheritance in plants and animals** (10 min) Provide students with an exam-style question on mitosis and meiosis and/or the difference in chromosome numbers between body cells and gametes. Keywords: Meiosis Sexual reproduction Fertilisation Gametes Chromosomes Division Mitosis Embryo Differentiate Variation Fuse	Quiz on mitosis and meiosis		SP9 C2

			Offspring			
B13.4 DNA and the genome	**Aiming for Grade 4 LOs:** • State that DNA contains a code to build proteins. • Describe what the Human Genome Project was. • Give one goal of the Human Genome Project. **Aiming for Grade 6 LOs:** • Describe the relationship between DNA, genes, and chromosomes. • Describe some of the benefits of studying the human genome. • Explain why genome projects are costly and take a long time. **Aiming for Grade 8 LOs:** • Explain why the cost of genome sequencing has reduced since it was started. • Explain why knowledge of the genomes of other species is useful. • Discuss possible issues surrounding genome sequencing.	Who could benefit from coding the genome? Who might be worried about scientists being able to 'read' DNA? Would like to find out about your genetic ancestors?	**Lesson Overview** **Starters** **What do I know about DNA?** (10 min) Ask students to work in pairs and write the word DNA in the middle of a sheet of paper. They should then write as much as they know about DNA around it. Ask each pair for one piece of information and collate the information from the whole class. **Order them** (5 min) Ask students to place in size order – DNA, nucleus, genes, chromosomes, organism. Ask students to present their order to the class and allow others to comment. **Main** **Why does the genome matter?** (40 min) Tell the class that the Human Genome Project took 12 years and cost around $3 billion. Some people may view this as a waste of time and money. Ask students to use the information in the Student Book to write an argument outlining why the project was important. Ask students to work in small groups and discuss if they would have their genome sequenced and analysed. Tell them that this information could help doctors to work out their risk of developing certain diseases (e.g., cancer or heart disease and possibly prescribe personalised medicines. However, some people are concerned that in the future they could be asked to reveal this information in other situations (e.g., when applying for a job). Furthermore, there is a limit to how useful the information is at the moment. Ask them to discuss these and other issues, think about the advantages and disadvantages of genome sequencing, and come to a personal decision. Share these with the rest of the class. **Plenaries** **The Human Genome Project** (10 min) Students complete the interactive about what the Human Genome Project was and what it achieved.	Mind map on human genome project Written work Q & A between students and teachers	Doddle: DNA and genome presentation	SO3 SO9 SP1 SP2 SP5 SP9 C2

			Would you sequence your genome? (5 min) Explain that it now only takes a few days to sequence a genome and the technology is getting quicker and cheaper. Ask the students to discuss in groups whether they would want their genome sequenced. Keywords: DNA Genome Genetic Polymer Gene Chromosome Double helix Amino acid Protein Inheritance Mitochondrial DNA			
B13.7 Inheritance in action	**Aiming for Grade 6 LOs:** • Recognise examples of inherited traits. • Recognise a genotype and a phenotype. • Use a simple diagram to state how offspring have inherited traits. **Aiming for Grade 8 LOs:** • Use the terms allele, dominant, recessive, homozygous, and heterozygous correctly. • Describe a phenotype when given the genotype. • **Use a Punnett square diagram to predict the outcome of a monohybrid cross using the theory of probability.**	Is it possible to predict what our children will look like?	**Lesson Overview** **Starters** **Is it inherited?** (5 min) Students use the interactive to sort a series of human traits according to whether they are inherited traits or not. **Mice inheritance** (10 min) Tell the class that two black mice have a litter of offspring. Some are brown. Ask them to discuss in pairs how they think this is possible. The answer will be revealed in Main 1. **Main** **Explaining inheritance** (20 min) Explain how two black mice could have brown offspring (referring back to Starter	Class discussion Q & A between students and teachers Group work on different types of genetic diseases	Doddle: Inherited disorders presentation, inherited disorder presentation mini quiz	SO3 SO9 SP1 SP2 SP5 SP9 C2

			2 if appropriate). Assign two alleles to the fur colour gene – dominant black (B) and recessive brown (b). Draw a simple genetic cross to show the possible genotypes and phenotypes of offspring from two heterozygous mice (Bb). As you introduce new terminology, ask students to write the words down. Then, ask them to write definitions using information from the student book. Set the class another example with parent mice of different genotypes for them to practise. **Inheritance card game** (20 min) Students play a card game using dominant and recessive cards for different snake characteristics – length, skin colour, skin pattern, eye shape. They pick cards at random to form offspring and draw the outcome. **Plenaries** **From genotype to phenotype** (5 min) Ask students to create a flow chart to show how the homozygous genotype for black fur in mice (BB) affects the phenotype, using what they know about protein synthesis. **Using a Punnett square** (10 min) Use another example of simple inheritance and demonstrate how to use a Punnett square to work out genotypes and phenotypes of offspring. However, purposely make mistakes and use incorrect terminology. Ask students to shout out when you make a mistake and correct you. Keywords: gamete chromosome gene allele dominant recessive homozygous heterozygous			

			genotype phenotype. Punnett square			
B13.8 More about genetics	**Aiming for Grade 4 LOs:** • State that in females the sex chromosomes are XX and in males they are XY. • Use a family tree to describe how people are related. **Aiming for Grade 6 LOs:** • Carry out a genetic cross to show sex inheritance. • Use direct proportion and simple ratios to express the outcome of a genetic cross. **Aiming for Grade 8 LOs:** • Explain why you only get the expected ratios in a genetic cross if there are large numbers of offspring. • Use a family tree to work out whether an individual is likely to be homozygous or heterozygous for particular alleles.	Why is having a boy or a girl a 50% chance?	**Starters** **Gender ratio** (10 min) Tell the class the number of students in the school or number of babies born in the UK in a certain year and ask them to estimate the number of boys and girls. Reveal the answer and discuss that on average the ratio will be around 1:1. State that they will be able to explain why by the end of the lesson. **Sex chromosomes** (5 min) Ask students if they have heard of the terms XX chromosomes and XY chromosomes. Collate any existing knowledge students have. **Main** **Proportion and ratio** (15 min) Remind students about the genetic cross you used last lesson to show inheritance in two heterozygous mice. Ask students for the ratio of black to brown offspring (3:1). Ask them: if the mice had a litter of four offspring would it mean that they would definitely have three black and one brown offspring? Discuss why this proportion becomes more apparent the more offspring the mice have. Use this as a springboard to discuss the idea of using proportion and ratio to express the outcome of genetic crosses. **Sex determination** (15 min) Show the class an image of human chromosomes from a man, in their pairs. Ask them to spot the pair that is different. Introduce this pair as the sex chromosomes. Prepare sets of sperm cards with either an X or a Y on the back, and egg cards all with an X on the back. Working in pairs, students choose pairs of cards at random and turn them over. They record the genotype and phenotype each time and record these in a tally table. They do this for five minutes. Discuss what their evidence shows about the ratio, and how it would change if they repeated this activity 1000 times. **Family trees** (10 min) Show students the tiger family tree from the student book (Figure 3). Ask students a series of questions designed to test their understanding of what it	Class discussion Practice questions on genetic cross Students to design their own questions and ask other students	Doddle: How is sex inherited ?animation, What do punnet square test show? Animation	SO3 SO9 SP1 SP2 SP5 SP9 C2

			shows (e.g., Which are the youngest tigers? Which is the mother of the youngest tigers? What is the relationship between the tigers on the bottom row and the three on the middle row?). **Plenaries** **Colour vision deficiency** (0 min) Show students a family tree that shows the inheritance of colour vision deficiency. Students work in pairs to ask each other questions about what it shows. They should identify that it affects men more than women. Keywords: Genetic cross Punnett squares Sex Chromosomes Monohybrid			
B13.9 Inherited disorders	**Aiming for Grade 4 LOs:** • Describe what is meant by an inherited disorder and recognise examples. • Use secondary sources of information to describe symptoms of an • inherited disorder. **Aiming for Grade 6 LOs:** • Name examples of inherited disorders, such as cystic fibrosis and polydactyly. • Use a genetic cross to explain how inherited disorders are passed on. **Aiming for Grade 8 LOs:** • Evaluate in detail the use of genetic engineering to cure inherited disorders. • Use a genetic cross to predict the probability of a child inheriting a genetic disorder.	Is it useful to know the chances of your child inheriting a genetic disease? Could genetic engineering wipe out Huntington's Disease?	**Lesson Overview** **Starters** **Inherited disorders** (5 min) Provide students with a list of disorders –some inherited and some not, for example, colour blindness, cystic fibrosis, sickle cell disease (inherited), anaemia, measles, malaria (not inherited). Ask them to discuss in pairs and categorise the disorders. **Inheritance of colour blindness** (10 min) Remind students of how the inheritance of colour blindness is linked to the XX and XY chromosomes of women and men. Ask students to draw a genetic cross diagram of a colour blind father and unaffected mother. Ask them to interpret their diagram. (Students should find that the parents cannot have an affected child, but could have carrier daughters.) **Main** **Disorder research** (30 min) Discuss what is meant by an inherited disorder. Split the class into small groups and ask each to research and present information about the inherited disorders cystic fibrosis and polydactyly. Set students a series of questions that they need to find out about (e.g., how the condition is inherited, the symptoms, possible treatments). Allow them to use the Internet and/or books to find the answers and present them on a	Brainstorm on genetic disorder Class discussion Group work on cystic fibrosis and polydactyl	Doddle: Inherited disorder worksheet	SO3 SO9 SP1 SP2 SP5 SP9 C2

			poster, presentation, or leaflet. Towards the end of the task set each group a different question that they need to answer to the rest of the class. They then present their answers whilst presenting their findings. **Genetic engineering** (10 min) Set pairs of students the question: How could genetic engineering help cure inherited disorders in the future? Ask them to use information from the student book to find the answer. **Plenaries** **Genetic disorders and inheritance** (10 min) Set students an example of a past exam question on the inheritance of disorders. Provide the mark scheme for them to self-assess their answer. **Test your understanding** (5 min) Ask the class a series of quick questions on inherited disorders to check their understanding. Keywords: Cystic fibrosis Engineering Inherited Polydactyl Carriers Huntington's			
B13.10 Screening for genetic disorders	**Aiming for Grade 4 LOs:** • Give a reason why embryos might be screened. • Describe one concern about embryo screening. **Aiming for Grade 6 LOs:** • Outline the methods used to screen embryos. • List advantages and disadvantages of embryo screening. **Aiming for Grade 8 LOs:**	Is genetic screening ethical?	**Lesson Overview** **Starters** **Genetic disorder** (10 min) Tell students to put themselves in the role of a parent who has a child with a serious genetic disorder and who wants to have another child. Ask them to discuss in pairs why this is a big decision for the parent. **Genetic screening for all?** (5 min) Tell the class that it is possible to test embryos to see if they have an inherited disorder before they are born. Ask students if they think all parents should be offered this test. They can vote by moving to different places in the classroom or by a show of hands. Ask some students to explain their opinion.			SO3 SO9 SP1 SP2 SP5 SP9 C2

	• Explain how screening shows whether an embryo has a genetic disorder. • Make an informed judgement about embryo screening by evaluating in detail the economic, social, and ethical issues.		**Main** **Making a decision** (25 min) Ask students to use information from the student book to research the screening options for a couple who are both carriers of a recessive inherited condition and who want a healthy child. Ask students to write down the pros and cons of each screening option. **Screening techniques** (15 min) Ask students to make notes using the student book about the two embryo screening techniques amniocentesis and chorionic villus sampling, plus IVF with embryo screening. They should describe each process. **Plenaries** **What would you do?** (10 min) Ask students to put themselves into the role of the parent in Starter 1. They should write what their decision would be, with reasons why. **Screening true or false?** (5 min) Students use the interactive to answer a series of true or false questions about screening for genetic disorders. Keywords: Embryos Screening Foetuses Alleles Social Economic Ethical IVF Abortion Miscarried Inherited			

GCSE Physics P12 Wave Properties			
What are we learning?	What knowledge, understanding and skills will we gain?	What does excellence look like?	What additional resources are available?
The types of waves and how they behave.	**Knowledge** • List properties of all waves • Know the names of wave types such as transverse, longitudinal, mechanical and electromagnetic. • Identify amplitude, wavelength, compressions, rarefaction, on wave diagrams **Understanding** • Compare the similarities and differences between different types of waves • Relate structure of waves to the energy that is delivered • Apply wave equation to calculate missing values • Construct scientific diagrams to show reflection and refraction and explain these wave behaviours **Skills** • Write a detailed method which clearly identifies variables • Identify causes of uncertainty and calculate this mathematically • Use a model to represent the abstract • Apply mathematical principle of standard form to convert numbers and use standard form in multiplications and divisions.	Detailed comparison of the properties of difference waves and how these relate to their function and behaviour. Detailed topic links to radioactivity and electromagnetic wave topics – sound and light topics from KS3 Confident use of standard form to use very large and very small numbers in equations Manipulation of wave properties find solutions to unseen problems, such as reflection maze, ensuring a signal is reached in a mountainous area. Individual research on how diffraction of waves is overcome to ensure communication services across the nation	BBC Bitesize Doddle – power points and quick quizzes You tube: 'Free science lessons' Seneca learning platform

Scheme of Work 2020-2021

Subject: GCSE Science: P12 Wave Properties

Year Group: 10 /11

Specification: AQA Combined Science Trilogy

Skill focus: 2,5, 15,17 and 25f and g

Lesson No	Topic & Objectives	Big Question – What will students learn?	Key Activities & Specialist Terminology (Do Now Task / Starter/Tasks/Plenary	Planned Assessment	Homework or flipped learning resources DODDLE resources	Lit Num SMSC Codes
P12.1 The Nature Of Waves	**Aiming for Grade 4 LOs:** • State that waves can transfer energy and information without the transfer of matter. • Identify waves as either transverse or longitudinal. • Identify waves as either mechanical or electromagnetic. **Aiming for Grade 6 LOs:** • Investigate wave motion through a spring model. • Compare transverse and longitudinal waves in terms of direction of vibration and propagation. • Compare electromagnetic and mechanical waves in terms of the need for a medium. **Aiming for Grade 8 LOs:** • Explain the features of a longitudinal wave in terms of	How can we transfer information without matter? Why can we see the sun but we can't hear it? / Does the sun make a noise? What is a sonic boom?	**Lesson Overview** **Starters** **Aftershock value** (5 min) Use video clips of tsunami and recent earthquakes to demonstrate the power of an 'uncontrolled' wave. Point out the regular vibration in earthquakes – shaking buildings and so on. **Wave** (10 min) Ask students to list as many types of wave as possible. Check through a few lists with the class and then ask the students to explain what a wave actually does. Use some of the examples to get them to realise that waves transfer energy but not material. **Main** **Observing mechanical waves** (40 min) Demonstrate mechanical waves in a wire and ripples in water to discuss the movement of particles. This will lead to the students exploring waves in a slinky spring through the practical. Use a light source to discuss electromagnetic waves. The waves act as a pathway to transfer energy (e.g., they can heat surfaces), but they are not transferring material and there are no particles vibrating. Discuss particle behaviour	Q & A, Use of mini white boards, exam style question, Mexican brain wave.	Properties of waves presentation, AQA Waves Practical Quiz, Transverse and Longitudinal Waves Presentation Properties of waves worksheet, investigating waves animation	C1, Sp3,C3

	compressions and rarefactions by using a particle model. • Discuss the features of a transverse wave in terms of particle or field behaviour. • Compare mechanical waves and their particulate nature with electromagnetic waves and their field oscillations.		in springs, ropes, and ripples, ensuring that the students can visualise the movement of the particles clearly. Using the spring model again to discuss particle behaviour in longitudinal waves. Make sure that the students understand that forces are acting between the particles causing these vibrations. **Plenaries** **The same but different** (5 min) Interactive where students match key words from the lesson to their definitions, complete a description of longitudinal and transverse waves, then identify true and false statements about longitudinal and transverse waves. **Mexican brain wave** (10 min) Put the students into three or four rows all seated. Select one student to be the questioner in each row and give them a set of questions and answers about waves. The student asks the first person in the row a question – if they get the answer right, then all of the people who have answered correctly so far stand up, wave, sit down, and the questioner moves on.			
P12.2 The properties of Waves	**Aiming for Grade 4 LOs:** • Identify the wavelength and amplitude of a wave from a simple diagram. • Describe how the frequency of a wave is the number of waves produced each second and is measured in hertz. • Measure the speed of a water wave. **Aiming for Grade 6 LOs:** • Outline the derivation of the wave speed equation. • Calculate the period of a wave from its frequency. • Calculate the wave speed from the frequency and wavelength.	How do we know how much energy has been transferred? Why some are sounds louder than others/ some waves more dangerous than others? How do black holes and neutron stars relate to this topic?	**Lesson Overview** **Starters** **Up to speed** (5 min) Students use the interactive to perform some simple speed calculations to remind them of this work from KS3. Make sure that they are using the correct units for speed, distance, and time. **Spotlight on knowledge** (10 min) Students need to list the properties of light and any other facts that they know about it. They should be able to produce a range of facts from KS3. **Main** **Describing waves** (20 min) Remind students of the basic shape of a transverse wave through a simple demonstration with a rope, and then each of the measureable or identifiable characteristics can be discussed. Particular attention should be paid to the amplitude because this is commonly mislabelled. Continue	Q & A, Use of mini white boards, exam style question, wave taboo.	BBC Bitesize You tube: 'Free science lessons' Seneca learning	C1, Sp3,C3

	Aiming for Grade 8 LOs: • Explain how the wave speed equation can be derived from fundamental principles. • Perform calculations involving rearrangements of the period equation and the wave speed equation. • Perform multi-stage calculations linking period, frequency, wave speed, and wavelength. • Describe the features of neutron stars and black holes.		the analysis by looking at changing the frequency and showing the number of waves passing a fi xed point per second on the rope. The relationship between frequency and period needs to be discussed, and the students should perform an example calculation. **Measuring the speed of ripples** (20 min) The wave speed equation can then be introduced, ideally using a ripple tank. Demonstrate that changing the frequency has an effect on the wavelength whilst the speed stays the same. Model a calculation and then ask students to try their own. The students can then use the ripple tanks to investigate the wave equation. **Plenaries** **Wave taboo (5 min)** Split the students into groups and assign each students a key word (e.g., transverse, longitudinal, reflect, speed) and a list of words they cannot use to describe it. Students take it in turns to describe their key word. How many can the group get in a set time limit? **Kinaesthetic maths challenge (10 min)** Provide students with cards labelled 'wavelength', 'wave speed', 'frequency', '×', and '='. Each card has a number on it too. The students must form themselves into 'living equations' by standing in groups of five to make a correct equation.			
P12.3 Reflection and Refraction	**Aiming for Grade 6 LOs:** • Describe refraction at a boundary in terms of wavefronts. • Describe refraction including the reflected rays. • Explain partial absorption as a decrease in the amplitude of a wave and therefore the energy carried. **Aiming for Grade 8 LOs:** • Use a wavefront model to explain refraction and reflection.	Why do things appear in different places under the water? How to wave breakers protect beaches? Why can't we see around corners but we can hear around them?	**Lesson Overview** **Starter** **It's just a broken pencil (5 min)** Place a pencil in a beaker of water. Can the students produce an explanation of why the pencil looks broken? This is quite difficult – make sure that the students see the effect clearly (show a big photograph on the interactive whiteboard if needed). **Ray diagram (10 min)** Ask students to draw a ray diagram showing how they can see a non-luminous object such as the writing in their books. Make sure that the students are	Q & A, Use of mini white boards, exam style question, wave maze.	BBC Bitesize You tube: 'Free science lessons' Seneca learning	Sp7,Sp2

	• Describe the relationship between the angle of incidence and angle of refraction • Explain refraction in terms of changes in the speed of waves when they move between one medium and another.		using a ruler to draw rays of light and that the rays are reflecting cleanly from the surface. **Main** **Investigating reflection and refraction** (25 min) Demonstrate the operation of the ripple tank focusing on reflection. The students can then introduce the barrier during the practical and find out about the reflection of the wavefronts at different angles. Link this to the simple light reflection experiments that students will have studied in KS3. Some students can also investigate the effect of changing the depth of water in a ripple tank and note the changes in speed of the wavefronts. Students should be able to see that speed changes during the refraction whilst the frequency does not change. **Explaining reflection and refraction** (15 min) Discuss the use of wavefronts and wavelets to explain reflection using a series of diagrams or a simulation. Use simulations or the ripple tank to show the behaviour of wavefronts during refraction, altering the angle of incidence to show the changing effect. **Plenaries** **Reflect or refract?** (10 min) Interactive where students summarise the differences between reflection and refraction. They then identify correct ray diagrams showing reflection and refraction. **Mirror maze** (5 min) Check students' understanding of the law of reflection by asking them to add mirrors to a simple maze diagram so that a light ray can pass through it to the centre.			
P12.4 Move about waves	**Aiming for Grade 4 LOs:** • Measure the speed of a wave in water. • Describe how sound waves travel more quickly in solid than they do in gases.	How are blue whales able to communicate with each other	**Lesson Overview** **Starters** **Sound facts** (5 min) Give the students a set of 'facts' about sound and let them use traffic light cards to indicate	Q & A, Use of mini white boards, exam style question, wave taboo.	BBC Bitesize You tube: 'Free science lessons'	Sp7,Sp2

	• State that sound waves require a medium to travel in. **Aiming for Grade 6 LOs:** • Measure the speed of a wave in a solid (string). • Describe the effect that changing the frequency of a wave has on its wavelength in a medium. • Calculate the speed of waves using the wave speed equation. **Aiming for Grade 8 LOs:** • Evaluate the suitability of apparatus for measuring the frequency, wavelength, and speed of waves. • Explain why the wavelength of a wave in a particular medium changes as the frequency changes with reference to the wave equation. • Evaluate data from speed of sound experiments to discuss the range of possible speeds for sound.	over such great distances? How do we know how fast invisible waves are travelling? What is an ultrasound and how does it really work?	whether they agree (green), don't know (amber), or disagree (red). **Good vibrations** (10 min) How do different instruments produce sound waves? Students should describe what is going on for five different ways of producing a sound. Demonstrate a drum, guitar, flute or recorder, loudspeaker, and singing. This should show that vibrations are needed to produce sound waves. **Main** **Investigating waves** (40 min) Students should briefly examine the behaviour of sound waves in air and how a medium is required for these waves to travel. They then move on to investigate waves in solids and liquids using the two practical tasks as outlined. The practicals can be carried out simultaneously. The first practical relies on producing stationary waves which allow the wavelength to be measured. Students do not need to know the details of how these form; they only need to measure their wavelength. The second practical uses simple ripples which can be produced with a ruler or with a vibrating bar in a ripple tank. **Plenaries** **Oscilloscope solutions** (5 min) Students use the interactive to match a set of problems encountered when using the oscilloscope to appropriate solutions, for example, a trace where the waves' peaks are too close together – the solution is to reduce the time base. **Let's hear your ideas** (10 min) Students need to design a simple experiment that will show that sound travels faster in solid materials than it does in air. This could be either a basic plan or a more detailed one.	Required Practical assessments, End of module test	Seneca learning	