Y10 Mid-Year Assessment Revision Pack

SCIENCE

Name: ____

Science Class: _____________

Science Teacher: ___________________________________

Instructions:

1. Learn each of the knowledge organiser questions and answers off by heart.

   This could be done by:

   - using 'look, cover, write, check'
   - asking a friend or family member to quiz you

2. Practice applying your knowledge by:

   - Answering the questions from the mastery matrix
   - Asking your teacher for worksheets related to the topic you are revising.
   - Asking your teacher for past exam questions.
   - Purchasing a revision guide (through school! just ask your teacher) containing lots of practice questions

3. Make a list of any bits of the knowledge that you are still struggling to remember or understand. At this point you can go and ask you teacher to explain it again, search on YouTube and attend science revision.

BIOLOGY – Knowledge Organiser

	Paper:	**B1**
	Topic:	**Types of cells (B.1)**
1	What is the main difference between a prokaryotic and eukaryotic cell?	Eukaryotic have their DNA contained within a nucleus
2	Give an example of a eukaryotic cell.	Animal and plant cells
3	Give an example of a prokaryotic cell.	Bacteria
4	Eukaryotic cells have which sub-cellular structures?	Cell membrane, cytoplasm and genetic material in a nucleus.
5	What is the function of cell wall?	Supports/ Strengthens the cell
6	What is the function of mitochondria?	Where respiration takes place
7	What is the function of the nucleus?	Controls the activities of the cell
8	What us the function of cell membrane?	Controls what enters/exits the cell
9	What is the function of the vacuole?	Store sugars and salts
10	What is the function of chloroplasts?	Absorb light for photosynthesis
11	What is the function of cytoplasm?	Where chemical reactions of the cell take place
12	What is the approximate size of a prokaryotic cell	0.1-5.0 µm
13	What is the approximate size of a eukaryote cells	10-100µm
14	Which is bigger? A prokaryotic or eukaryotic cell?	Eukaryotic
15	What is meant by "micro"	1/1,000,000th (1 millionth)
	Topic:	**Specialised cells (B.2)**
1	Define "cell differentiation"	A cell becoming specialised to perform a particular function
2	Define "cell division"	The splitting of a cell into two genetically identical daughter cells
3	Name 3 specialised cells found in the animals and 3 in plants	Animals: Muscle cell, nerve cell, sperm cell Plants: Root hair cell, phloem, xylem
4	Give the function of a muscle cell	Produce movement
5	Give one adaptation of a muscle cell	Lots of mitochondria for releasing energy
6	Give the function of a sperm cell	Fertilise the female egg
7	Give three adaptations of a sperm cell	Tail for movement Lots of mitochondria to release energy Enzymes in its head to penetrate egg
8	Give the function of a nerve cell	Carry information from one part of the body to another
9	Give two adaptations of a nerve cell	Dendrites to connect to other neurones Long axon to cover large distances
10	Give the function of a root hair cell	Absorb water and minerals from the soil
11	Give two adaptations of a root hair cell	Large surface area Thin cell wall
12	Give the function of a xylem cell	Carry water from roots to leaves
13	Give two adaptations of a xylem cell	Lignin to strengthen cells End walls broken down to form hollow tubes
14	Give the function of a phloem cell	Transport glucose within a plant
15	Give two adaptations of a phloem cell	Less sub-cellular structures End walls have sieve plates to allow glucose through
	Topic:	**Microscopy (B.3)**
1	How do you calculate the magnification?	magnification = size of image/size of object
2	Which microscope has the highest magnification?	electron microscopes
3	Which microscope has the lowest resolution?	Light microscope
4	Which microscope produces 3D images?	Scanning and transmission Electron microscope
5	Which microscope shows colours?	Light microscope

6	Which microscope allows to see inside an object?	Transmission Electron Microscope
7	Which microscope shows black and white images?	Scanning and transmission electron microscope
8	Which sub-cellular structures can you see with a higher resolution?	Mitochondria and ribosomes
9	Define "tissue"	A group of similar specialised cells working together to fulfil a function
10	Define "organ"	A group of different tissues working together to fulfil a function
11	Define "organ system"	A group of different organs working together to fulfil a function
12	Put into order of size (smallest to largest): cell, organism, nucleus, tissue, organ system, organ	nucleus, cell, tissue, organ, organ system, organism
13	What is meant by "centi"?	1/100th (1 hundredth)
14	What is meant by "milli"	1/1000th (1 thousandth)
15	What is meant by "nano"	1/1,000,000,000th (1 billionth)

	Topic:	**Cell division (mitosis) (B.4)**
1	Put in order of size (smallest to largest): genes, chromosomes, DNA, cell, nucleus	DNA, gene, chromosome, nucleus, cell
2	Name the 3 stages of the cell cycle	Interphase, Mitosis, Cytokinesis
3	Describe the three things that happen during interphase	1) The cell grows, 2) chromosomes are copied, 3) more mitochondria and ribosomes are made
4	Describe what happens during mitosis	Chromosomes pulled to opposite ends of the cell
5	Describe what happens during cytokinesis	Cell membrane and cytoplasm split in two
6	Give why the cell cycle is important	More cells are made for growth and repair
7	Give what is produced in the cell cycle	Two genetically identical daughter cells
8	Mitosis produces which type of cells?	Diploid cells
9	Define "stem cell"	An undifferentiated cell
10	Name 3 places where stem cells can be found in humans	Embryos, adult bone marrow, meristem
11	Give two conditions that stem cells can be used to treat in humans	Paralysis and type 1 diabetes
12	Give two uses of stem cells in plants	1) Clone rare species 2) produce disease resistant crops
13	Describe what is meant by "therapeutic cloning)	Using clones of a patient's own stem cells to treat them
14	Which cells are required for therapeutic cloning?	Egg cell and a normal body cell from patient
15	Give two objections to using stem cells in treatment	Potential transfer of viral infections and ethical/religious objections

	Topic:	**Introducing pathogens and types of disease (B.7)**
1	Define "health"	Give of physical and mental well being
2	What is the name for a disease that can be passed on from person to person?	Communicable (or infectious)
3	What is the name for a disease that can NOT be passed on from person to person?	Non-communicable
4	Give three factors other than disease that can have an impact on health	Diet, stress, life events
5	Give one consequence of long term physical ill health	Depression
6	What is the name given to a disease causing microorganism?	Pathogen
7	Define "risk factors"	Factors that are linked to an increased rate of disease
8	Give three risk factors for cardiovascular disease	Diet, smoking and exercise
9	Give one risk factor for type 2 diabetes	Obesity
10	Name 2 organs effected by drinking alcohol	Brain and Liver
11	Name 2 potential impacts of smoking	Lung disease and lung cancer

12	Give a risk factor for cancer	Contact with carcinogens (including ionising radiation)
13	Give two lifestyle factors that can impact an unborn baby's development	Smoking and drinking alcohol
14	Why is a sample of people used when investigating risk factors for diseases?	Too time consuming/impractical to sample whole population
	Topic:	**Detailed disease case studies (B.8)**
1	Name 4 types of pathogen	Virus, bacteria, fungi, protist
2	Name 3 viral diseases	Measles, HIV, TMV (tobacco mosaic virus)
3	Name 2 bacterial diseases	Salmonella & Gonorrhoea
4	Name 1 fungal disease	Rose black spot
5	Name 1 protist disease	Malaria
6	Give 2 symptoms of measles	Fever. Red skin rash
7	Give 2 symptoms of HIV	Flu-like symptoms. AIDS
8	Give 1 symptom of TMV	Discolouration of leaves
9	Give 4 symptoms of salmonella	Fever. Cramps. Vomiting. Diarrhoea
10	Give 2 symptoms of gonorrhoea	Thick yellow/green discharge. Pain urinating
11	Give 2 symptoms of rose black spot	Purple/black spots on leaves. Leaves turn yellow & drop off
12	How is measles spread & prevented?	Spread: Air Prevented: Vaccination
13	How is Gonorrhoea spread & prevented?	Spread: Sex Prevented: Condoms
14	How is Rose Black Spot spread & prevented?	Spread: Direct contact Prevented: Fungicide & destroying affected leaves
15	How is Salmonella spread & prevented?	Spread: Food Prevented: Cooking thoroughly & washing hands
	Topic:	**Preventing pathogens from making us unwell (B.9)**
1	Give 3 ways that pathogens can be spread	Direct contact, water, air
2	How do bacteria make us feel unwell?	Produce toxins (poisons) that damage tissues
3	How do viruses make us feel unwell?	Live & reproduce in cells causing cell damage
4	Name 4 of the body's non-specific defence systems	Skin, nose, trachea, stomach
5	How does the skin prevent pathogens from making us unwell?	Prevent them from entering body
6	How does the nose prevent pathogens from making us unwell?	Mucus to trap dirt & pathogens, ciliated cells to sweep it out
7	How does the trachea prevent pathogens from making us unwell?	Mucus to trap dirt & pathogens, ciliated cells to sweep it out
8	How does the stomach prevent pathogens from making us unwell?	Stomach acid to kill pathogens
9	Give three ways that white blood cells can help to defend us against pathogens	Phagocytosis, antibody production, antitoxin production
10	Which type of white blood cell carries out phagocytosis?	Phagocytes
11	Which type of white blood cell carries out antibody and antitoxin production?	Lymphocytes
12	Give one thing that can trigger cancers to form	Viruses in cells
13	What causes tumours to form?	Changes in cells that lead to uncontrolled growth and division
14	Define "benign tumour"	Growth of abnormal cells contained in ONE area in a membrane
15	Define "malignant tumour"	Growth of abnormal cells that SPREAD to other parts of the body in blood and INVADE other tissues.
	Topic:	**Developing new medicines (B.10)**
1	State three ways that drugs can be produced	Extracted from plants, microorganisms & synthesised
2	Where does the heart drug digitalis originate from?	Foxgloves (plant)

3	Where does the pain killer aspirin originate from?	Willow trees
4	Where does the antibiotic penicillin originate from?	Penicillium mould
5	State three things that drugs are tested and trialled for before use	1) Toxicity (safe), 2) efficacy (does it work), 3) dose (quantity)
6	What is used to test drugs during preclinical testing?	Cells, tissues & live animals
7	Who are medicines tested on in stage 1 of clinical trials?	Healthy volunteers (low doses - test for toxicity)
8	Who are medicines tested on in stage 2 of clinical trials?	Patient volunteers (low doses - test for efficacy & dose)
9	What is a double blind trial?	Neither experimenter or patient knows if they are taking medicine or placebo
10	What is a placebo?	A substance that contains no medicine (a control)
11	What is the name for the injection given to patients to prevent them from catching an infectious disease?	Vaccination
12	Describe step 1 of vaccinations	1) small quantity of dead/inactive pathogen injected
13	Describe step 2 of vaccinations	2) white blood cells produce correct antibody (slowly)
14	Describe step 3 of vaccinations	3) pathogen enters body & WBC can produce correct antibodies quickly
15	State two benefits of vaccination	Prevent illness in an individual & prevent spread to others
16	State two negatives of vaccination	Don't always work & some people experience side affects.
17	Name the group of drugs used to relive pain	Painkillers
18	Name the group of drugs used to treat bacterial infections	Antibiotics
19	Explain why antibiotics cannot treat virus infections	Viruses reproduce inside body cells so it is hard to destroy them without destroying body cells.

	Topic:	**Breathing and respiration (B.14)**
1	What is the name of respiration with oxygen?	Aerobic
2	What is the name of respiration that occurs without oxygen?	Anaerobic
3	What is the word equation for aerobic respiration	Oxygen + glucose -> carbon dioxide + water
4	What is the balanced symbol equation for aerobic respiration	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
5	What is the word equation for anaerobic respiration in animals	Glucose -> Lactic acid
6	What is the balanced symbol equation for anaerobic respiration in animals	$C_6H_{12}O_6 \rightarrow 2C_3H_6O_3$
7	What is the word equation for anaerobic respiration in yeast and plant cells	Glucose -> Ethanol + carbon dioxide
8	What is anaerobic respiration in yeast cells called?	Fermentation
9	What happens to your breathing and heart rate when you exercise?	Increase
10	What is the name of the main organ in the respiratory system?	Lungs
11	What is the name of the sheet of muscle beneath the lungs?	Diaphragm
12	What is the scientific name for the windpipe?	Trachea
13	What is the scientific name for the air sac?	Alveoli

14	The windpipe divides into two tubes when it reaches the lungs. What are these tubes called?	Bronchi/bronchus
15	Give three uses of energy in organisms	1) Chemical reactions to build larger molecules 2) movement 3) 3) keeping warm
	Topic:	**The Heart (B.15)**
1	Which type of vessel leaves the heart?	Arteries
2	Which type of vessel enters the heart?	Veins
3	What is the name of the 4 chambers of the heart?	Top: Left/right Atrium Bottom: Left/right ventricle
4	Where is the body's natural pacemaker (cells that control the bodies resting heart rate)?	Right atrium
5	What is the name of the blood vessel that enters the heart from the body?	Vena Cava
6	What is the name of the blood vessel that enters the heart from the lungs?	Pulmonary vein
7	What is the name of the blood vessel that goes to the lungs from the heart?	Pulmonary artery
8	What is the name of the blood vessel that goes from the heart to the rest of your body?	Aorta
9	Which side of the heart is thicker?	Left
10	Which side of the heart pumps oxygenated blood out of it and which side pumps deoxygenated?	Oxygenated = Left Deoxygenated = Right
11	What is the name for removing a heart from one person and placing it into another person?	Transplant
12	What is the name of the drug that reduces that amount of cholesterol in a person's body?	Statins
13	Which organ does a statin effect?	Liver
14	Give 3 adaptations of a red blood cell	no nucleus, biconcave shape, small, contains haemoglobin
15	Give 2 adaptations of a white blood cell	Cytoplasm contains enzymes, flexible cell membrane
16	Give the function of haemoglobin	The chemical in red blood cells that oxygen binds to
	Topic:	**The Blood (B.16)**
1	Which type of blood vessel has thin walls but a large lumen?	Vein
2	Which type of blood vessel has thick walls but a small lumen?	Artery
3	Which type of blood vessel has valves?	Veins
4	Which type of blood vessel has a pulse?	Artery
5	Give one non-surgical intervention that can reduce the changes of heart disease/a heart attack	Exercise/diet
6	What is the name of the specialised cell that is designed to carry oxygen?	Red Blood Cell
7	What is the name of the specialised cell that is designed to fight pathogens?	White Blood Cell
8	What is the name of the specialised cell that helps to clot our blood?	Platelets
9	What is the name of the liquid part of blood that carries dissolved substances?	Plasma
10	Give one substance that is carried in the plasma of blood	Carbon dioxide/urea/glucose
11	What is the name of the substance that can block arteries?	Cholesterol

12	What is the name of a disease that occurs when the blood vessels in the muscle of the heart get blocked?	Coronary Heart Disease
13	What are the blood vessels that provide the heart with oxygen called?	Coronary arteries
14	What is the name of the piece of wire mesh put inside a blood vessel to keep it open?	Stent
15	Give the equation to calculate blood flow rate calculations	Cardiac output = heart rate x stroke volume (cm^3/min) (beats/min) (cm^3)
	Topic:	**Digestion (B.17)**
1	Which enzyme breaks down lipids, carbohydrates and proteins?	Lipids = lipase carbohydrates = amylase Proteins = protease
2	Which enzyme is produced by the salivary glands?	Amylase
3	What is the name of the leaf shaped organ that produces enzymes?	Pancreas
4	What is the name of the organ that produces bile?	Liver
5	What is the name of the organ that stores bile?	Gall bladder
6	Is bile acidic or alkaline?	Alkaline
7	What is added to the stomach to kills pathogens?	Hydrochloric acid
8	What is the name of the process that breaks down large globules of fat into smaller ones?	Emulsification
9	Write the word equation for the digestion of carbohydrates	Starch -> glucose
10	Write the word equation for the digestion of proteins	Proteins -> amino acids
11	Write the word equation for the digestion of fats	lipids -> fatty acids + glycerol
12	Which part of the digestive system are nutrients and water absorbed into the blood from?	Nutrients = small intestine Water = large intestine
13	What is the scientific name for the food pipe?	Oesophagus
14	What is the name of the process where food is pushed down the food pipe?	Peristalsis
15	Name the food group that cannot be digested in the body	Fibre
	Topic:	**Transport in cells (diffusion, active transport and osmosis) (B.19)**
1	Substances moving from a high concentration to a low concentration is called…	Diffusion
2	Two examples of diffusion in humans are:	CO_2 + O_2 in gas exchange, urea from cells to blood
3	Three factors that affect the rate of diffusion are:	Concentration gradient, temperature, surface area of the membrane
4	How are single celled organisms adapted for diffusion?	Large surface area: volume ratio
5	How is the small intestine adapted for exchanging materials?	*Villi for large S.A. *villi one cell thick *good blood supply
6	How is the lungs adapted for exchanging materials?	*Alveoli large surface area: volume ratio, surface is moist, good blood supply
7	How is the gills adapted for exchanging materials?	*large S.A. *moist *good blood flow to maintain concentration gradient
8	How is the roots adapted for exchanging materials?	*Large SA to volume ratio *lots of mitochondria for respiration -> energy for active transport
9	How is the leaves adapted for exchanging materials?	*Stomata *thin so that distance for diffusion is smaller

10	Four ways that to increase the rate of transport	*Large surface area, thin membrane, efficient blood supply (in animals), well ventilated (in animals)
11	Water moves from a dilute to concentrated solution across a partially permeable membrane via...	Diffusion
12	Pure water will move into a potato because	Of osmosis
13	(RP) How can you tell the concentration of sugar in a piece of potato?	1) Place into different concentrations of sugar solution. 2) Plot graph 3) Find concentration where mass doesn't change
14	When a substance moves against the concentration gradient, it is called.	Active transport
15	Active transport requires ________ from _________.	energy respiration

	Topic:	**Structure of a plant (B.21)**
1	What is the name of the plant tissue where new cells are made?	Meristem
2	What is the name of the specialised plant cell adapted to absorb water & nutrients from the soil?	Root Hair Cell
3	What is the name of the specialised plant cell adapted to open and close the stomata of a plant?	Guard Cell
4	Which word describes a guard cell (a) filled with water? (b) that has very little water	(a) filled = Turgid (b) lacking water = flaccid
5	What is the name of the specialised cell that is adapted to absorb lots of light energy in the leaf?	Palisade cell
6	What is the chemical in chloroplasts that allow plant cells to absorb lots of light energy?	Chlorophyll
7	Which type of plant tissue is made up of sieve cells and companion cells?	Phloem
8	What is the name for the hole in a leaf that allows gases in and water out?	Stoma/Stomata
9	What is the name of the plant tissue that is made up of a hollow tube of dead cells?	Xylem
10	Which tissue in a plant transports water?	Xylem
11	Which tissue in a plant transports glucose?	Phloem
12	In which plant organ is glucose made?	Leaf
13	What is the name for the process that converts water and carbon dioxide into glucose and oxygen?	Photosynthesis
14	Which organ of a plant is designed to absorb water?	Root
15	Which organ of a plant is designed to transport substances from the roots to the leaves and vice versa?	Stem

	Topic:	**Transport in plants (B.23)**
1	Define the term "osmosis"	Movement of water from a dilute solution to a concentrated solution through a semi permeable membrane
2	How do you calculate rate of water uptake by a plant?	volume of water absorbed ÷ time taken
3	How do you calculate percentage change in mass following osmosis?	Change in mass/initial mass x 100
4	When looking at an osmosis graph (change in mass of unknown substance vs concentration of	When the line of best fix crosses the X axis

	known sucrose solution) - how can you identify the concentration of the unknown substance?	
5	Which piece of equipment is used to cut a cylindrical piece of potato?	A cork borer
6	What is the name given to a semi permeable piece of tubing?	Visking tube
7	Which substance moves into a plant by osmosis?	Water
8	How are root hair cells adapted for osmosis?	Large surface area and large vacuole
9	Define 'active transport'	Movement of substances from a dilute to a concentrated solution against the concentration gradient. Requires energy
10	Name a substance that is moved into plants by active transport	Mineral ions
11	How are root hair cells adapted for active transport?	Lots of mitochondria for respiration
12	Define "diffusion"	Movement of particles from an area of high concentration to an area of low concentration
13	Name one substance that moves into a leaf by diffusion	Carbon dioxide
14	Name two substance that moves out of a leaf by diffusion	Oxygen and water
15	Which cells open and close to control the diffusion of substances from a leaf?	Guard cells

	Topic:	**Transpiration and translocation (B.24)**
1	Name the process by which glucose is moved from a leaf to other parts of the cell	Translocation
2	What is the scientific name given to the evaporation of water from a leaf?	Transpiration
3	On which side of the leaf are there more stomata?	Underside/lower
4	What is covering the top layer of the leaf to reduce the loss of water?	Waxy Cuticle
5	Which organ in a plant does water enter through?	Root
6	Do guard cells become flaccid or turgid when it is very sunny?	Turgid
7	Do stomata open or close when it is night time?	Close
8	Describe the structure of xylem	Hollow tubes strengthened with lignin
9	Describe the structure of phloem	Elongated cells with a sieve plate and companion cell
10	How do you calculate surface area of a cuboid?	Sum of all the 2D faces
11	Give four factors that increases the rate of transpiration	1) High wind intensity 2) high light intensity 3) arid (dry) 4) high temperature
12	Why does high wind intensity increase transpiration?	Increases concentration gradient
13	Why does high light intensity increase transpiration?	Causes stomata to open
14	Why does arid conditions increase the rate of transpiration?	Increases concentration gradient
15	Why does high temperature increase the rate of transpiration?	Water particles have more kinetic energy

	Topic:	**Photosynthesis (B.25)**
1	Name the two reactants in photosynthesis	Carbon Dioxide and water

2	Name the two products formed in photosynthesis	Oxygen and glucose
3	Write the word equation for photosynthesis	Carbon dioxide + water -> oxygen and glucose
4	Write the symbol equation for photosynthesis	$CO_2 + H_2O \rightarrow O_2 + C_6H_{12}O_6$
5	Describe what happens to the rate of photosynthesis as temperature increases	Rate increases and then decreases
6	Describe what happens to the rate of photosynthesis as light intensity increases	Rate increases and then remains constant
7	Describe what happens to the rate of photosynthesis as carbon dioxide increases	Rate increases and then remains constant
8	Define limiting factor	A factor that directly affects the rate of photosynthesis on its own, regardless of the level of the other factors.
9	Name the plant used to investigate the effect of different factors on rate of photosynthesis	Elodea (pondweed)
10	How can you calculate the rate of photosynthesis of an aquatic plant?	Count the number of O_2 bubbles produced in a minute
11	How can you more accurately calculate the rate of photosynthesis of an aquatic plant?	Record volume of gas produced (using a gas syringe)
12	Which cells are adapted for increased photosynthesis?	Palisade cells
13	How are palisade cells adapted for increased rates of photosynthesis?	Lots of chloroplasts (and chlorophyll)
14	Give three limiting factors for photosynthesis	1) Carbon dioxide concentration, 2) Temperature, 3) Light intensity
15	In a variegated leaf, why do some parts appear white?	There is no chlorophyll
	Topic:	**The products of photosynthesis (B.26)**
1	Give 5 uses of glucose produced during photosynthesis	1) respiration, 2) stored as insoluble starch, 3) stored as fats/oils 4) making cellulose, 5) making amino acids
2	Give two substances required for making proteins in plants	Nitrate ions and glucose
3	Which substance is used to test for the presence of starch?	Iodine solution
4	What colour will iodine solution turn in the presence of starch?	Blue/black
5	What colour will iodine solution turn if no starch is present?	Remains orange
6	Which substance is used to test for the presence of sugar?	Benedict's solution
7	What colour will benedict's solution turn in the presence of sugar?	Red (lots of sugar), orange (some sugar), green (small amount of sugar)
8	What colour will benedict's solution turn if no glucose is present?	Remains blue
9	Which substance is used to test for the presence of protein?	Biuret's solution
10	What colour will biuret solution turn in the presence of protein?	Purple
11	What colour will biuret solution turn if no protein is present?	Remains blue
12	Which substance is used to test for the presence of lipids (fats)?	Ethanol
13	What colour will ethanol solution turn in the presence of fats?	Creamy white
14	What colour will ethanol solution turn if no fat is present?	Remains colourless
	Topic:	**Exercise and metabolism (B.40)**

1	What is the effect of exercise on heart rate during exercise?	Increase
2	What is the effect of exercise on breathing rate and breathing volume during exercise?	Increases
3	Why does heart rate, breathing rate and breathing volume increase during exercise	Supply muscles with more oxygenated blood
4	Which type of respiration occurs if there is insufficient oxygen available?	Anaerobic respiration
5	Give two effects of long periods of anaerobic respiration	Build-up of lactic acid and oxygen debt
6	Where is lactic acid broken down? **(HT only)**	The liver
7	How is lactic acid broken down?	Reacts with oxygen to convert to glucose
8	Define "oxygen debt"	Amount of O2 required to break down lactic acid
9	How would the lung capacity of an athlete compare to a non-athlete	Larger
10	How would the resting heart rate of an athlete compare to a non-athlete?	Lower
11	Define "metabolism"	Sum of all reactions in a cell/body
12	During metabolism, glucose is converted into which three substances?	1) Starch, 2) glycogen, 3) cellulose
13	During metabolism, lipids are formed from which molecules?	1 molecule glycerol, 3 molecules fatty acids
14	During metabolism, which substances are used for form amino acids?	Glucose and nitrate ions
15	Give two ongoing processes that are part of metabolism	Respiration and deamination

	Topic:	**RP: Microscopy (B1) (B.41)**
1	What is the aim of the investigation?	To investigate and view the sub-cellular structures of plant and animal cells using a microscope.
2	What type of microscope is used to view the cells?	Light microscope
3	What type of tissue is used?	A thin layer of onion skin
4	How is the slide prepared?	1) Drop of water added to glass slide 2) Thin layer of onion skin placed onto glass slide 3) Drop of iodine added onto the onion skin 4) Cover slip placed on top
5	What do we need to ensure is not present on the slide?	Air bubbles
6	Why is iodine used to prepare the slides?	To dye the sub-cellular structures and make them easier to see
7	Which magnification is used to first view the cells?	x10
8	How do you first find the cells under the microscope?	By turning the coarse-focusing wheel
9	How do you see the cell sin more detail?	By turning the fine-focusing wheel
10	Which sub-cellular structures should you be able to identify?	nucleus, cell wall, vacuole, cell membrane and cytoplasm
11	Which structures cannot be seen with a light microscope?	ribosomes, mitochondria
12	What type of microscope would you need to use to improve the resolution of the image?	electron microscope
13	What is the formula to calculate the magnification?	magnification = size of image / size of real object
14	How do you rearrange the formula to find the size of the real object?	size of real object = size of image / magnification
15	How do you convert from mm to µm?	x by 1000

	Topic:	RP: Osmosis (B3) (B.43)
1	What is the independent variable?	The concentration of the solution
2	What is the dependent variable?	The percentage change in mass
3	Name 5 control variables	1)Length of potato 2) Diameter of potato 3) Volume of solution 4) Time potato is left for 5) Temperature of solution
4	Give 3 ways to make the results accurate	1) Read the volume of the solution from the meniscus 2) Dab the potatoes dry before measuring the mass 3) Use a digital top pan balance
5	Name one risk and precaution	Risk = cutting yourself with the potato borer Precaution = push the borer down towards the desk not upwards
6	What is the purpose of the distilled water?	To act as a control to compare your results to
7	How is the concentration inside the tissue estimated?	Plot a graph of concentration against % change in mass and find where the line of best fit crosses 0%
8	How is the percentage change in mass calculated?	% change in mass = change in mass / initial mass
9	What is percentage change calculated rather than just the change?	The potato may be slightly different sizes and shapes to begin with
10	Why does the tissue increase in mass?	Water has entered the tissue by osmosis in more dilute solutions
11	How can you tell if there has been an increase in mass?	The % change in mass is +ve
12	Why does the tissue decrease in mass?	Water has left the tissue by osmosis in more concentrated solutions
13	How can you tell if there has been a decrease in mass?	The % change in mass is -ve
14	What does no change in mass mean?	The concentration of the solution is the same as the concentration inside the tissue
15	What are possible variations on this method?	1) Using any other vegetable/plant tissue 2) Using any other food substance 3) Using a salt solution

	Topic:	RP: Food tests (B4) (B.44)
1	How are the food samples prepared?	Mash up using a pestle and mortar, add distilled water, filter to make a solution.
2	What reagent is used to test for starch?	Iodine
3	What is the negative result for starch (no starch)?	orange/brown
4	What is the positive result for starch (starch is present)?	blue/black
5	What is the reagent used to test for sugars?	Benedict's
6	What conditions are needed for Benedict's?	Water bath at 80^oC for 5 min
7	What is the negative result for sugars (no sugars present)?	blue
8	What is the positive result for sugars (sugars are present)?	green --> orange –-> red
9	What reagent is used to test for lipids?	Ethanol followed by distilled water
10	What must be done to the solution when ethanol is added?	Shaken
11	What is a negative result for lipids (no lipids present)?	No white emulsion forms
12	What is a positive result for lipids (lipids present)?	A white emulsion forms

13	What reagent is used to test for proteins?	Biuret solution (copper sulphate + sodium hydroxide)
14	What is a negative result for proteins (no proteins present)?	blue
15	What is a positive result for proteins (proteins present)?	purple
	Topic:	**RP: Enzymes (B5) (B.45)**
1	What is the independent variable?	pH of buffer solution
2	What is the dependent variable?	time taken for starch to break down into simple sugars (iodine solution to turn from black to brown)
3	Name 5 control variables	1) Volume of starch solution2) Temperature of solution3) How the mixture is stirred4) Volume of amylase solution5) Time intervals
4	What piece of equipment is used to place the test solution in?	Spotting tile
5	How is the temperature controlled?	Using a water bath
6	Name one risk and precaution	Iodine is an irritant so avoid contact with skin
7	How do you know when all of the starch is broken down?	Samples of solution in the spotting tiles turn back to orange/brown
8	How can accuracy of the measurements be improved?	1) Remove the first drop of solution as soon as the amylase is added 2) Use a pipette to measure each drop accurately 3) Start the timer immediately
9	Why must the solution be constantly mixed?	To ensure that all of the amylase and starch bind to each other
10	Name one random error	Different sizes of drops of solution added to the spotting tile
11	What has happened to amylase below pH6 and above pH 7?	Amylase has denatured
12	How can the rate of reaction be calculated?	rate = 1 / time
13	How will the results be displayed?	Plotting a graph of pH against rate
14	What results should you see?	A curve with the rate reaching an optimum at approximately pH7
15	What are possible variations on this method?	1) Investigating the effect of pH on any other enzyme 2) Investigating the effect of temperature on any enzyme
	Topic:	**RP: Photosynthesis (B6) (B.46)**
1	What is the independent variable?	Distance from the light source (light intensity)
2	What is the dependent variable?	Number of bubbles per minute
3	Name 3 control variables	1) Temperature of the water 2) Carbon dioxide concentration 3) Colour of the light
4	How is the rate of photosynthesis measured?	rate = total O_2 produced / time
5	How is the volume of oxygen measured?	Counting the number of bubbles per minute
6	How is the light intensity changed?	Changing the distance of the beaker from the light
7	Name one random error	Counting the bubbles incorrectly
8	Give one way to make the results more accurate	Increase the amount of time you count the bubbles for
9	How is the concentration of carbon dioxide controlled?	Adding sodium hydrogen carbonate to the solution
10	Give an alternative way to measure the volume of gas produced?	Volume of water displaced from a measuring cylinder
11	Name one risk and precaution	The lamp may be hot so do not touch it
12	How is the temperature controlled?	Water bath
13	How is the pondweed controlled?	Same species, same age and same length
14	What results should you see?	As the light intensity increases, the rate photosynthesis increases

15	What are possible variations on this method?	1) Investigate the effect of different coloured lights 2) Investigate the effect of temperature 3) Investigate the effect of CO_2 concentration

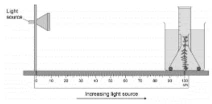
Required practical's

Name	Variables	Equipment	Method	Expected conclusion	Possible variations
B1 - Microscopy	**Big Question**: Investigate the structure of plant and animal cells using a microscope.	*A microscope *Slides of animal cells *Slides of plant cells	1) Put the slide on the stage 2) Turn the nose piece to the lowest power objective lens 3) Move the stage until it is almost touching the objective lens 4) Look through the eyepiece and turn the coarse adjustment knob so that the stage moves down. Do this until the cells come into focus. 5) Use the fine adjustment knob to bring the cells into clear focus. 6) Switch the nose piece to a higher power lens. 7) Use the fine adjustment knob to bring the cells back into focus. 8) Draw and label some of the cells. 9) Write your magnification underneath the drawing 10) Multiply the objective magnification by the eyepiece magnification.	You should be able to identify the nucleus, cell wall, vacuole, cell membrane, chloroplasts and the cytoplasm.	Given an image and asked to work out magnification or real size

B3 – Osmosis	**Big Question:** Investigate the effect of a range of concentrations of salt or sugar on the mass of plant tissue **IV** – Concentration of sugar solution **DV** – Percentage change in mass of potato **CV** – Length of potato, diameter of potato, volume of sucrose solution, duration potato is left for	*A potato *A cork borer *A ruler *A 10cm3 measuring cylinder *Labels *5 boiling tubes *A test tube rack *Paper towels *A scalpel *A white tile *A range of sugar solutions (of different concentrations) *Distilled water *A top pan balance (accurate to 0.01g).	1) Use the cork borer to cut five potato cylinders of the same diameter 2) Use the scalpel to trim the potato cylinders to the 3cm long. 3) Measure the mass of each potato cylinder using a top pan balance and record in a results table. 4) Record the mass of each cylinder 5) Measure 10cm3 of each concentration of sugar solution into 4 of the boiling tube. 6) Measure 10cm3 of distilled water and add into the fifth boiling tube 7) Add one potato cylinder into each boiling tube 8) Leave the potato cylinders in the solution for 48 hours. 9) Remove the potato cylinders using the forceps and blot them dry with paper towel. 10) Measure the new mass of each potato cylinder and record in the results table. 11) Calculate the percentage change in mass of each potato cylinder and plot a graph against concentration.	When the potato cylinder doesn't change mass, the concentration of sugar in the solution is the same as the concentration of sugar in the potato	Investigate the effect of a range of salt concentrations on a potato cylinder Investigate the effect of a range of concentrations on sugar on the size of a visking tube/raisin

B4 – Food tests	**Big Question**: Use qualitative reagents to test for carbohydrates (starch and sugars), lipids, proteins	**For all:** *Food sample *Test tube *Pipettes **Benedict's test for sugars** *Benedict's solution *Water bath *Thermometer **Iodine test for starch** *Iodine solution **Lipids – ethanol** *Ethanol *Distilled water **Biuret test for protein:** *Biuret solution A (Copper sulphate) *Biuret solution B (sodium hydroxide)	**Benedict's test for sugar** 1) Set up a waterbath. 2) Put some of the food sample into a test tube. 3) Add a few drops of Benedict's solution to the sample 4) Put the test tube in the waterbath at 80^{o}C for 5 minutes. 5) Note down any colour changes in your results table. **Iodine test for starch** 1) Put the food sample in the test tube 2) Add a few drops of iodine solution 3) Record colour changes **Ethanol test for lipids:** 1) Put a food sample into the test tube 2) Add a few drops of distilled water 3) Shake gently 4) Record any observations **Biuret test for protein** 1) Put a food sample into the test tube. 2) Add 1cm3 of bieuret solution A (copper sulphate). Add 1 cm3 of Biuret solution B (sodium hyudroxide). 3) Shake to mix 4) Record colour changes.	**Benedict's test:** No sugar: Blue Sugar: green/orange/red (most sugar!) **Iodine test:** No starch: orange/brown Starch: blue/black **Ethanol test:** If lipids present, a white milky layer of oil should form on top of the mixture **Biuret test:** No protein: Blue Protein: Purple	May also reference Sudan (III) for fats – forms a red layer on top of the mixture

B5 – Enzymes	**Big Question:** Investigate the effect of pH on the rate of reaction of amylase **IV** – pH of buffer solution **DV** – time taken for starch to break down into simple sugars (iodine solution to turn from black to brown) **CV** – Volume of starch solution, temperature of solution, whether the mixture is stirred	**Big question:** *10 test tubes *Test tube rack *Water bath *Thermometer *Spotting tile *5cm^3 measuring cylinder *Pipettes *Glass rod *Stop clock *Starch solution *Amylase solution *Iodine solution *Buffer solutions (range of pH values)	1) Heat the water bath to 35^oC. 2) Add 2cm3 of each buffer solution into individual test tubes. Label each. 3) Add 20cm3 of starch solution into test tube labelled "starch". 4) Put a thermometer in the starch to monitor the temperature. 5) Add 10cm3 of Amylase solution to another test tube. Label "amylase". 6) Put all test tubes into the water bath. 7) Allow the solutions to reach 35^oC. 8) Add one drop of iodine into each depression on the spotting tile. 9) When all solutions reach 35^oC, take one test tube of buffer solution, add the 2cm3 of starch and 2cm3 of amylase solution. Stir mixture with a glass rod. 10) Start a stop clock. 11) After 10 seconds use a pipette to add 2cm3 of the solution to one depression on the tile. 12) Continue to do every 10 seconds until the iodine solution turns from black to orange (showing the starch has been broken down into glucose).	As pH increases, rate of reaction should increase and then begin to decrease again as enzymes become denatured.	Investigate the effect of temperature/volume of amylase on rate of reaction of amylase Investigate the effect of temperature on the rate of reaction of protease/lipase (hint: Think about the indicator you would need to use!!)

B6 – Photosynthesis	**Big Question:** Investigate the effect of light intensity on the rate of photosynthesis of pondweed. **IV:** distance from light source to pondweed **DV:** volume of O_2 produced **CV:** temperature of the water, carbon dioxide concentration, colour of the light	*A beaker *A filter funnel *Plasticine *A measuring cylinder *A 10cm piece of pondweed *A light source *A metre rule *A stop clock	1) Put your 10cm piece of pond weed into a beaker of water. 2) Cover the pondweed with an inverted (upside down) filter funnel – raised off the bottom of the beaker with plasticine. 3) Fill the measuring cylinder with water and gently position as in the diagram. 4) Use the ruler to position the beaker and pondweed 100cm away from the light source. 5) Start the stop clock. 6) Count the number of bubbles released in three minutes. 7) Record the volume of gas collected in the measuring cylinder in the same three minutes. 8) Repeat with the light source at 80cm, 60cm, 40cm, 20cm away. 9) Calculate rate of CO_2 production by doing: $\frac{\text{Total } CO_2 \text{ produced}}{\text{Time}}$	The closer the light source, the more gas (O_2) will be produced in the three minutes. 	Investigate the effect of different coloured lights on rate of photosynthesis Investigate the effect of temperature on photosynthesis Investigate the effect of CO_2 tablets on photosynthesis

CHEMISTRY – Knowledge Organiser

	Paper:	**C1**
	Topic:	**The Three Gives**
1	In which Give do atoms have strong bonds between them?	Solid
2	Describe motion of particles in a solid, liquid and gas	S = Vibrating, L = Sliding, G = quick & random
3	In which Give can diffusion NOT happen?	Solid
4	In which Gives, can particles not be compressed?	Solid & liquid
5	Which Give is the least dense?	Gas
6	Which Give is the densest?	Solid
7	In which Give are there weaker forces between particles?	Gases
8	In which Give do particles remain in a fixed position?	Solid
9	What is the name for the change of Give when a solid change to a liquid?	Melted
10	What is the name for the change of Give when a liquid changes to a gas?	Evaporation
11	What is the name for the change of Give when a gas changes to a liquid?	Condensation
12	What is the name for the change of Give when a liquid changes to a solid?	Freezing/solidifying
13	What is the name for the temperature where a liquid turns into a gas?	Boiling point
14	What is the name for the temperature where a solid turns into a liquid?	Melting point
15	Why is there no overall temperature change when a substance is changing Give?	The particles are absorbing thermal energy to overcome the forces between them. The particles are absorbing thermal energy to overcome the forces between them. Particles are absorbing the thermal energy to overcome the forces between them.
	Topic:	**Elements, compounds (C.2)**
1	What is the name for substances made of only ONE type of atom?	Elements
2	What is the name for substances made of two or more types of atoms NOT chemically bonded together?	Mixtures
3	What is the name for substances made of two or more types of atoms chemically BONDED together?	Compounds
4	What is the formula for water?	H_2O
5	What is the formula for Methane?	CH_4
6	Define "alloy"	A mixture of a metal and at least one other element
7	Why are alloys harder than pure metals?	Different sized atoms distort the regular rows so that the layers can't slide over each other
8	What is the word for an element that always exists as two atoms bonded together?	Diatomic
9	Is an alloy an element, compound or mixture?	Mixture
10	What is the formula for glucose?	$C_6H_{12}O_6$
11	Which elements exist diatomically?	N_2, H_2, O_2 and all of group 7
12	How many electrons can be held in the first shell and then second and third shell of an atom?	First shell is TWO, all other shells EIGHT
13	What is the different between Ar (relative atomic mass) and Mr (relative molecular mass)	Ar = for an element Mr = for a compound

14	Define "ion"?	An electrically charged atom that has gained or lost electrons
15	How do you calculate Ar of an element	It is it's mass number
	Topic:	**Mixtures (C.3)**
1	Define "pure" substance	A single element or compound
2	What temperature is the melting point of water?	$0^{o}C$
3	What temperature is the boiling point of water?	$100^{o}C$
4	Define "formulation"	A mixture designed as a useful product
5	Give three examples of a formulation	Fuel, paint, alloys
6	Define "soluble"	Can dissolve
7	Define "insoluble"	Cannot dissolve
8	Define "solute"	A solid which can dissolve
9	Define "solvent"	A liquid in which a solid will dissolve
10	Define "solution"	A mixture of a dissolved solute and solvent
11	What is filtration used to separate?	An insoluble solid and a liquid
12	What is crystallisation used to separate?	A soluble solid and a solvent (collect solid)
13	What is simple distillation used to separate?	A soluble solid and a solvent (collect liquid)
14	What is fractional distillation used to separate?	Liquids with different boiling points
15	What is chromatography used to separate?	Different colours of ink or dye
	Topic:	**Chromatography (C.4)**
1	What are the two "phases" in chromatography?	Mobile and stationary phase
2	What is the "mobile phase" in chromatography	The solvent (that travels up the paper)
3	What is the "stationary phase" in chromatography	The paper
4	Why should the start line be drawn in pencil?	Because pencil will not dissolve and affect the results.
5	Why should the start line sit above the solvent?	So that the dots of ink or dye do not wash off the paper
6	Why do the dots of ink or dye need to be the same size?	To make it a fair test
7	How is the Rf value calculated?	Rf = distance by dye / distance by solvent
8	What does a high Rf value tell us?	The substance is more soluble and travelled further
9	What does a low Rf value tell us?	The substance is less soluble and travelled less distance
10	What should the Rf value always be?	A number between 0 - 1
11	What solvents are used in chromatography?	Water, alcohol, acetone
12	Where should the distance moved by the dye be measured from?	The same place each time (top, bottom or middle)
13	What is chromatography used for?	To separate different coloured compounds (dyes or inks)
14	How will temperature affect the rate of chromatography?	The higher the temperature, the faster the rate
15	How can chromatography be used to identify an unknown substance?	Compare with a known substance
	Topic:	**Structure of an atom (C.5)**
1	What is the charge, relative size and location of a proton?	Charge: 1+, Size = 1, Location = Nucleus
2	What is the charge, relative size and location of a neutron?	Charge: 0, Size = 1, Location = Nucleus
3	What is the charge, relative size and location of an electron?	Charge: -1, Size = 1/2000, Location = Shells
4	What is the radius of an atom?	0.1 nm (1×10^{-10}m)
5	What is the radius of a nucleus?	1×10^{-14}m
6	Define "atomic number"	No. of protons in an atom
7	Define "atomic mass number"	Sum of protons and neutrons in an atom

8	Define isotope?	Atoms of the same element that have the same number of protons but different numbers of neutrons
9	What was the Dalton model of the atom?	Atoms = tiny spheres
10	Describe Thompson's 'Plum Pudding' model of an atom.	Ball of positive charge with electrons embedded throughout
11	Describe Rutherford's model of the atom	Dense, positive mass in the centre (the nucleus)
12	Describe the Neil's Bohr model of the atom	Positive nucleus orbited by negative electrons
13	Describe Chadwick's 'Nuclear Model' of an atom	Neutrons & protons in a +ve nucleus, -ve electrons in shells
14	What is the name for the current model of the atom?	Nuclear model
15	What 3 things did the alpha scattering experiment prove?	1) Nucleus = positive (deflected & reflected +ve α particles) 2) Nucleus = dense mass in centre of atom, 3) Rest = empty space

	Topic:	**The periodic table (C.6)**
1	How are elements arranged in the periodic table?	In order of atomic number (lowest to highest)
2	What does the column (group) in the periodic table tells us?	Number of electrons in the outer shell
3	What are the rows of the periodic table called?	Periods
4	What did Mendeleev do when creating the modern periodic table?	Left gaps to make the pattern fit
5	Where are alkali metals found in the periodic table?	Group 1
6	Where are non-metals found in the periodic table?	Right
7	Name the groups in the periodic table (1, 7, 0)	1 = Alkali metals, 7 = Halogens, 0 = Noble gases
8	Give 3 properties of group 7	Non-metal, highly reactive, diatomic
9	What happens to reactivity as you move down group 7?	They become less reactive - it is harder to gain an electron
10	What is the name of the elements found in the middle of the periodic table that are not part of a group?	Transition metals
11	Give 4 properties of metals	1) High melting point, 2) Good thermal and electrical conductors, 3) Ductile, 4) Malleable
12	Give 3 properties of non-metals	1) Low melting point, 2) Poor thermal and electrical conductors, 3) Brittle
13	Give 5 properties of the alkali metals	1) Highly reactive, 2) Low melting and boiling points, 3) Low density, 4) Shiny when cut, 5) Soft
14	What is formed when alkali metals react with water?	Alkaline metal hydroxide
15	What happens to reactivity as you move down group 1?	They become more reactive - it is easier to lose their outer electron.

	Topic:	**Types of bonding (C.7)**
1	Which type of bonding occurs between metals and non-metals?	Ionic
2	Which type of bonding occurs between non-metals?	Covalent
3	Which type of bonding occurs between metals?	Metallic
4	When electrons leave the shells of an atom, they are said to be ……?	Delocalised
5	Which type of ions are formed by metals?	Positive ions
6	Which type of ions are formed by non-metals?	Negative ions
7	What is graphene?	A single layer of graphite
8	What is a fullerene?	Hollow carbon structures
9	What is Buckminster Fullerene?	Spherical carbon shape with 60 carbon atoms
10	What is an allotrope?	Two or more different physical arrangements of the same atom e.g. diamond, graphite, graphene

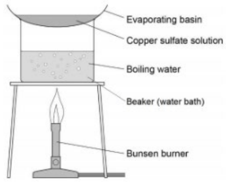
11	What is a carbon nanotube?	A cylindrical fullerene with a very high length to diameter ratio
12	Describe what happens in ionic bonding	Electrons are transferred from a metal atom to a non-metal atom = strong electrostatic attraction between oppositely charged ions
13	Describe what happens in covalent bonding	Electrons are shared between atoms = strong electrostatic attraction between electrons and nucleus
14	Describe what happens in metallic bonding	Electrons become delocalised creating a sea of negative charge = strong electrostatic attraction with positive metal ions & sea of delocalised electrons
15	Why do noble gases not form compounds?	Because they already have a full outer shell of electrons
	Topic:	**Properties of materials (C.8)**
1	Give two properties of simple covalent molecules	1) Low melting & boiling point, 2) Poor conductor of thermal & electrical energy
2	Give three properties of diamond	1) Hard, 2) Poor electrical conductor, 3) Good thermal conductor
3	Give two properties of graphite	1) Soft & slippery, 2) Conducts electricity
4	Give two properties of silicon dioxide	1) Hard, 2) Doesn't conduct electricity
5	Why do metals and graphite conduct electricity?	Delocalised electrons can move through structure carrying electrical charge
6	Why do ionic compounds, metallic compounds and giant covalent compounds have high melting and boiling points?	Strong INTRAmolecular bonds/forces = difficult to move apart
7	Why do simple compounds have low melting and boiling points?	Weak INTERmolecular bonds/forces = easy to move apart
8	Why do ionic compounds conduct electricity when molten/aqueous?	Ions are free to move carrying charge
9	Name the structure that ionic bonding forms	Giant ionic lattice
10	Give three examples of giant covalent structures	Diamond, graphite, silicon dioxide
11	Name the two types of structure that can be formed from covalent bonding	Simple covalent molecules, giant covalent structures
12	How are unreactive metals (e.g. gold) removed from their ore?	They are native (unreactive) so don't form an ore)
13	How are metals LESS reactive than carbon removed from their ore?	They are reduced (reacted with) by carbon
14	How are metals MORE reactive than carbon removed from their ore?	Electrolysis
15	What is reduction & oxidation (in terms of electrons)? (HT only)	Oxidation = Is Loss of electrons, Reduction = Is Gain electrons, (OIL RIG)
	Topic:	**Describing chemical reactions, reactions of metals and gas tests (C.9)**
1	metal + oxygen ->	metal oxide
2	metal + water ->	metal hydroxide + hydrogen gas
3	metal + acid ->	metal salt + hydrogen gas
4	Define oxidation (in terms of oxygen)	Addition of oxygen to an element
5	Define reduction (in terms of oxygen)	Removal of oxygen from a compound
6	What is the law of conservation of mass?	No atoms are lost or made during a reaction (mass of reactants = mass of products)
7	acid + alkali (or base) ->	salt + water
8	If sulphuric acid reacts with a metal, what will the salt end in?	_______ sulphate

9	If nitric acid reacts with a metal, what will the salt end in?	_________ nitrate
10	metal carbonate + acid ->	metal salt + water + carbon dioxide
11	If hydrochloric acid reacts with a metal, what will the salt end in?	________ chloride
12	What is the test for hydrogen gas?	A burning splint will make a squeaky pop
13	What is the test for carbon dioxide gas?	Limewater will turn cloudy
14	What is the test for oxygen gas?	A glowing splint will relight
15	What is the test for chlorine gas?	Damp litmus paper will be bleached and turned white

	Topic:	**Acids and Alkalis (C.10)**
1	Which ions make a solution alkaline?	OH^- (hydroxide)
2	Which ions make a solution acidic?	H^+
3	Give 3 ways to measure the pH of a substance	Litmus paper, universal indicator, pH probe
4	What pH and colour is universal indicator in a strongly ACIDIC solution?	pH 1 - 3 (red)
5	What pH and colour is universal indicator in a strongly ALKALINE solution?	pH10-14 (purple)
6	What pH and colour is universal indicator in a weak ACID?	pH 4-6 (orange/yellow)
7	What pH and colour is universal indicator in a weak ALKALI?	pH8-9 (blue)
8	What colour is methyl orange in acid and alkali?	Red (acid), orange (alkali)
9	What colour is phenolphthalein in acids and alkali?	Colourless (acid), pink (alkali)
10	What is the difference between the solubility of alkalis and bases?	Alkalis are soluble and bases are insoluble
11	What is the definition of a) strong acid and b) weak acid?	a) Strong acid completely ionises (breaks down into its ions) in water, b) Weak acid partially ionises in water
12	Give 3 examples of a strong acid (H only)	Hydrochloric acid, sulphuric acid, nitric acid
13	List the steps in making a soluble salt	1) Add solid to heated acid until no more reacts (in excess), 2) Filter excess solid, 3) Leave for 24hrs for water to evaporate (crystallisation), 4) Dab dry
14	Give three examples of weak acids (H only)	Ethanoic acid, citric acid and carbonic acid
15	What does a decrease in pH by one-unit mean? (HT only)	The hydrogen ion concentration increases by a factor of 10
	Topic:	**Electrolysis (C.12)**
1	Define 'electrolysis'	A substance is decomposed (broken down) using electricity
2	Why can electrolysis only occur if an ionic substance is molten or aqueous?	The ions are free to move
3	What is the name of the negative and positive electrode?	Negative: Cathode Positive: Anode
4	Which ions are attracted to the anode and which to the cathode?	Anode = negative Cathode = positive
5	Define "electrolyte"	Ions in a solution that are free to move and can conduct electricity
6	What happens when ions get to an electrode?	Gain or lose electrons becoming neutral atoms again
7	What happens at the anode?	Electrons transferred from the ion to the anode and the non-metal forms
8	What happens at the cathode?	Electrons transferred from the cathode to the ion and a metal is formed
9	When is hydrogen formed from an aqueous solution?	If the metal is MORE reactive than hydrogen

10	When is a metal (not hydrogen) formed from an aqueous solution?	If the metal is LESS reactive than hydrogen
11	Give one use of electrolysis	Extracting a reactive metal from its ore
12	Which useful product could be removed from the solution left after electrolysis of dilute sodium chloride solution?	Sodium hydroxide (bleach)
13	What would be formed at the anode in electrolysis of dilute sodium chloride solution?	Chlorine gas
14	What would be formed at the cathode in electrolysis of dilute sodium chloride solution?	Hydrogen
15	When will oxygen be produced at the anode?	When the solution does NOT contain HALIDE ions. Otherwise the halogen is produced.
	Topic:	**Chemical calculations, volumes and concentrations (C.19)**
1	Give the 'law of conservation of mass'	No atoms are lost or made during a chemical reaction
2	The sum of the Mr of the reactants must equal	The sum of the Mr of the products

Required practical’s

C1 – Making Salts	**Big Question:** How do you prepare a pure, dry sample of a soluble salt from an insoluble salt?	*Dilute sulphuric acid *Measuring cylinder *Copper oxide powder *Spatula *Glass rod *100cm3 beaker *250cm3 beaker *Bunsen burner *Tripod *Gauze *Heatproof mat *Filter funnel and paper *Small conical flask *Evaporating basin	 1) Measure 40cm3 of sulphuric acid and add to a beaker. 2) Heat the acid gently. Turn off the Bunsen burner. 3) Add copper oxide power to the acid until it stops reacting. Stir continuously. 4) Filter the solution to remove excess insoluble copper oxide 5) Pour the filtrate into an evaporating basin and heat gently over a water bath. 6) As soon as crystals start to form, leave the evaporating dish for 24 hours. 7) Pat the crystals dry between two pieces of filter paper. Note: Evaporation is the changing of water from a liquid to a gas, crystallisation is the formatino of crystals from a concentrated subsance. Note: *Carbonates tend to be insoluble *Sulphates, nitrates, chlorides tend to be soluble	You will remove the insoluble black copper oxide from the mixture by filtering. You will remove the water through evaporation. Blue crystals of copper sulphate will form – the slower the cool, the larger they will be. These are TOXIC, do not ingest (eat).	Explain have lithium sulphate can be produced from lithium carbonate and sulphuric acid. Explain how to prepare an insoluble salt from a soluble salt - (react two soluble salts and a precipitate will form, filter, wash with water, then dry in an oven).
C3 - Electrolysis	**Big Question**: Investigate the products formed during electrolysis of an aqueous solution.	*copper chloride solution *sodium chloride solution *100cm^3 beaker *Petri dish lid *2 carbon electrodes *2 crocodile clips *low voltage power supply *blue litmus paper *forceps	1) Pour approximately 50cm^3 copper (II) chloride solution into the beaker. 2) Add the petri dish lid and insert the carbon rods through the holes. The rods must not touch each other. 3) Attach crocodile leads to the rods. Connect the rods to the dc terminals of a low voltage power supply. 4) Select 4 V on the power supply and switch on. 5) Look at both electrodes and record your observations. 6) Use forceps to hold a piece of blue litmus paper in the solution next to the anode. Record your observation. 7) Rinse the electrochemical cell apparatus and collect a new set of electrodes. 8) Repeat steps 1–8 using the other solution sodium chloride.	$CuCl_2$ solution will form copper at the cathode (-ve electrode) and chlorine at the anode (+ve electrode). This will bleach the litmus paper. NaCl will form hydrogen at the cathode (because it the metal is more reactive than hydrogen) and chlorine at the anode (positive electrode).	Investigate the products formed during electrolysis of aqueous copper sulphate. Describe how you would carry out electrolysis of molten zinc chloride.

PHYSICS – Knowledge Organiser

	Paper:	**P1**
	Topic:	**Energy Types (P.1)**
1	What type of energy do all moving objects have?	Kinetic energy
2	The law of conservation of energy Gives what three things that can happen to energy	Transferred usefully, stored or dissipated
3	Which word means 'wasted into the surroundings'?	Dissipated
4	When energy is wasted, it is usually which energy types?	Thermal and sound
5	The law of conservation of energy Gives that which two things cannot happen to energy?	Created or destroyed
6	What can be done to moving parts in a system to reduce heat loss by friction?	Lubrication (adding oil/grease)
7	What name is given to a material which does not conduct thermal energy well?	Thermal insulator
8	What name is given to a material which allows thermal energy to pass through it easily?	Thermal conductor
9	What is the unit for energy?	Joules (J)
10	What type of heat transfer travels through solids?	Conduction
11	What type of heat transfer happens only in fluids (gas and liquids)?	Convection
12	Which is the only type of thermal energy transfer can occur in a vacuum?	Radiation
13	Which dissipates less thermal energy? Thin walls or thick walls?	Thick
14	Which dissipates less thermal energy? Walls with large or small area	Small
15	Which dissipates less thermal energy? Large or small temperature difference	Small
	Topic:	**Work power and efficiency (P.2)**
1	Equation for work done.	Work done =Force x distance
2	Units for work done.	Joules (J)
3	What is work done?	Energy transferred.
4	Units for power.	Watts (W)
5	Equation for power.	Power = Energy transferred/time
6	Units for time.	seconds (s)
7	Define power.	Rate at which energy is transferred.
8	One watt is the same as…	1 joule per second.
9	Equation for efficiency in terms of energy	efficiency = useful output energy transfer/total input energy transfer
10	Equation for efficiency in terms of power	efficiency = useful output power/total input power
11	Units for efficiency	No units
12	Units for force	Newtons (N)
13	One Joule is the same as…	one Newton-metre
14	The minimum value of efficiency	0
15	The maximum value of efficiency	1
	Topic:	**Elastic objects and potential Energy (P.3)**
1	What is the equation for elastic potential energy?	Ee=1/2ke2 Elastic potential energy (J) = 1/2 x spring constant (N/m) x extension (m)
2	What is the equation for kinetic energy?	Ek = 1/2 mv2 Kinetic energy (J) = 1/2 x mass (Kg) x velocity2 (m/s)

3	What is the equation for gravitational potential energy?	Eg=mgh Gravitational potential energy (J) = mass (kg) x gravitational field strength (N/kg) x height (m)
4	Which equation describes Hooke's Law?	F = ke Force (N) = spring constant (N/m) x extension (m)
5	What type of energy is stored in a stretched elastic band?	Elastic potential energy
6	What type of energy is stored in a squashed up tennis ball?	Elastic potential energy
7	What needs to be applied for an object to change shape?	A force
8	Define the term for an object returning to its original shape after being stretched	Elastic deformation
9	Define the term for an object not returning to its original shape after being stretched	Inelastic deformation
10	Identify the Law: "The extension of a spring is directly proportional to the force applied to it."	Hooke's Law
11	What sort of energy is stored in a bungee cord?	Elastic potential energy
12	What do you call the point at which Hooke's Law no longer applies?	The limit of proportionality
13	In a graph of Hooke's Law, what happens at the limit of proportionality?	Line no longer straight, it will curve
14	What is the equation for "gravitational potential energy"?	Eg = mgh
15	What is the equation for Kinetic Energy?	Ek=1/2mv2
	Topic:	**Waves (P.4)**
	What are the two types of waves?	Transverse and longitudinal
	What type of wave is sound?	Longitudinal
	What type of wave is visible light?	Transverse
	How do the particles that make up a wave transfer energy?	They oscillate (vibrate)
	What are the 4 properties of a wave?	Frequency, amplitude, wavelength, period
	Define "frequency"	The number of waves passing a fixed point per second (hertz, Hz)
	Define "amplitude"	Maximum displacement that any particle achieves from its undisturbed position (metres)
	Define "wavelength"	Distance from one point on a wave to the same point on the next wave (metres)
	Define "period"	Time taken for 1 complete oscillation (seconds)
	State the equation to calculate the period of a wave	T=1/f Period (s) = 1/ frequency (Hz)
	State the equation to calculate wave speed	v = f x λ wave speed (m/s) = frequency (Hz) x wavelength (m)
	State the relationship between speed and wavelength	They are directly proportional
	In a transverse wave, oscillations are _________ to the direction of energy transfer	perpendicular
	In a longitudinal wave, oscillations are ____________ to the direction of energy transfer	parallel
	What do waves transfer?	Energy (not matter)
	Topic:	**Electromagnetic waves 1 (P.5)**
	What type of waves are electromagnetic waves?	Transverse
	At what speed do all electromagnetic waves travel?	Speed of light (300,000,000m/s)
	What do the different types of electromagnetic waves vary in?	Frequency

	List the electromagnetic waves in order of frequency from lowest to highest	Radio waves, microwaves, infrared waves, visible light, ultraviolet, X-Rays, gamma rays
	Which sub-cellular structure is damaged by ionising radiation?	DNA
	Which type of wave is the most ionising?	Gamma Rays
	Which wave is used in medical imaging?	X-Rays
	Which wave is used in telecommunications?	Radio waves and microwaves
	Which wave has the longest wavelength?	Radio waves
	State 3 properties shared by all electromagnetic waves	1) All travel at the speed of light 2) All transverse 3) All travel through a vacuum
	Which wave has the shortest wavelength?	Gamma rays
	State 1 risk associated with UV rays	Skin cancer
	Which two types of waves are ionising radiation?	X-Rays and Gamma Rays
	Which wave can be detected by the human eye?	Visible light
	Which 3 rays can have hazardous effects on the human body?	UV, X-Ray and Gamma rays
	Topic:	**Electromagnetic waves 2 (P.6)**
	What is produced by oscillations in electrical circuits? (HT only)	Radio waves
	What happens when a radio wave is absorbed? (HT only)	Alternating current produced
	What causes EM waves to be generated/absorbed?	Changes in atoms/nuclei of atoms
	State two effects of UV waves	Cause skin to age prematurely, increase risk of skin cancer
	State two effects of X-rays and gamma rays	1) mutations of genes, 2) cancer
	State two uses of radio waves	TV and radio
	State 2 uses of microwaves	Satellite communication and cooking food
	State 3 uses of infrared	Electrical heaters, cooking food, infrared cameras
	State 1 use of visible light	Fibre optic communication
	State 2 uses of UV waves	Energy efficient lamps and sun tanning
	State two uses of X-rays and gamma rays	Medical imaging and treatments
	Why are radio waves used in television and radio? (HT only)	Can be reflected from atmosphere due to wavelength
	Why are microwaves used in cooking? (HT only)	Frequency matches frequency of water particles vibrating
	Why are microwaves used in satellite communication?(HT only)	Frequency allows them to pass through atmosphere
	Why are X-rays and gamma rays used in medical imaging? (HT only)	Highly ionising and penetrating
	Topic:	**Forces introduction (P.11)**
	Scalar quantities have only ________	magnitude
	Vector quantities have ____ and ___	magnitude and direction
	Magnitude is another word for______	Size
	State 3 scalar quantities	Distance, speed, time
	State 3 vector quantities	Displacement, velocity, acceleration
	How can you show the size of a vector on a diagram?	Use an arrow.
	What is the name of the type of force that occurs when the objects are physically touching?	Contact forces
	What is the name of the type of force that occurs when the objects are separated?	Non-contact
	Which type of force is magnetic force?	Non-contact
	Which type of force is weight?	Non-contact
	Which type of force is tension?	Contact
	Which type of force is upthrust?	Contact

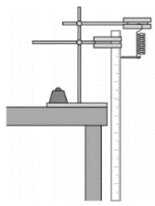
	Define "weight"	The force acting on an object due to gravity
	Define "gravitational field strength"	The pull of the Earth on an object
	What is the equation for calculating weight?	Weight (N))= Mass (Kg) X Gravitational Field Strength (N/Kg)
	Topic:	**Scalar and vector quantities (P.12)**
	A __________ force is a single force that has the same effect as all the original forces acting together.	resultant
	What two things happens to objects if the forces acting on them are balanced?	Stay still or constant speed
	State two effects on an object if the forces acting upon it are unbalanced?	Accelerate/decelerate/change direction/squash or stretch
	To calculate the resultant force in one direction you ______________ the forces acting up/down or left/right.	subtract
	What is the name given to a diagram that shows the forces acting upon an object	Free body diagram
	Weight can be measured using a ________	Newton meter or spring balance
	The point at which all the mass of an object acts is called__________	the centre of mass
	Resolve the forces means turn two forces into______	one force/resultant force
	To work out the centre of mass of a regular shape, you should _________________	draw the lines of symmetry
	To work out the centre of mass of an irregular shape, you should _________________	do the plumb line experiment
	Which type of force occurs when air pushes you back?	Air resistance
	What are the four forces acting on an accelerating boat?	Weight, thrust, upthrust, water resistance
	State the units for weight	Newtons (N)
	State the units for mass	Kilograms (kg)
	State the units for gravitational field strength	Newtons per kilogram (N/Kg)
	Topic:	**Speed and velocity (P.13)**
	What is the difference between distance and displacement?	Distance = scalar, displacement = vector
	Define "speed"	Distance covered in a given time
	What is the equation linking displacement, velocity and time?	displacement = velocity x time s (m) = v (m/s) x t (s)
	State three factors that may affect the speed a person walks	Age, terrain, fitness
	State the typical speed for a person walking	1.5m/s
	State the typical speed for a person running	3m/s
	State the typical speed for a person cycling	6m/s
	State the speed of sound in air	330m/s
	State the speed of light in air	300,000,000m/s
	Describe the motion of an object traveling in a circle	Constant speed, changing velocity
	Which piece of equipment is used to measure time?	Stopwatch
	How is speed calculated for non-uniform motion?	Average speed (m/s) = distance (m) / time (s) s = d / t
	Define "velocity"	Speed in a given direction
	Topic:	**Distance and velocity-time graphs (P.14)**
	State the axes in a distance time graph	X axis = time, Y axis = distance
	Describe what is meant by a flat horizontal line (——) on a distance-time graph?	The object is stationary

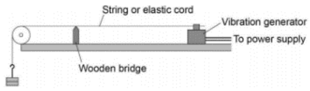
	Describe what is meant by a straight diagonal line (/) away from the x-axis on a distance-time graph?	Object is moving at a constant speed AWAY from start
	Describe what is meant by a straight diagonal line (\) towards the x-axis on a distance-time graph?	Object is moving at a constant speed back TOWARDS the start
	How do you calculate the speed of an object using a distance-time graph if the speed is constant?	Calculate gradient (ΔY/ΔX)
	If an object is not travelling at a constant speed, how will this motion be shown on a distance time graph?	A curve
	How do you calculate the speed of an object using a distance time graph if the speed is not constant (the line is a curve!)?	Draw a tangent & calculate gradient
	What does a steeper line on a distance-time graph represent?	An object moving faster
	Describe the axes on a velocity-time graph	X-axis = time, Y-axis = velocity
	Describe what is meant by a flat horizontal line (——) on a velocity-time graph?	The object is moving at a constant velocity
	Describe what is meant by a straight diagonal line (/) away from the x-axis on a velocity-time graph?	Object is accelerating
	Describe what is meant by a straight diagonal line (\) towards the x-axis on a velocity-time graph?	Object is decelerating
	What do you calculate when you calculate the area under a velocity-time graph? (HT only)	Total distance travelled
	How do you calculate acceleration (if it is constant - a straight line) from a velocity time graph?	Calculate gradient (ΔY/ΔX)
	How do you calculate acceleration (if it is changing - a curved line) from a velocity time graph?	Draw a tangent & calculate gradient
	Topic:	**Falling objects and Newton's laws (P.15)**
	State the equation to calculate uniform acceleration when given velocity and distance	(final velocity)^2 - (initial velocity)^2 = 2 x acceleration x distance v2-u2=2as
	What is the acceleration of an object free falling due to gravity close to the Earth?	$9.8 m/s^2$
	What are the two forces acting upon a falling object?	Weight and air resistance
	Describe the motion of an object as it begins to fall through a fluid	It accelerates (weight is bigger than air resistance)
	As an object continues to fall through a fluid, the weight remains the same, describe what happens to the air resistance as the object gains speed?	Air resistance increases
	What is the term that given to describe the motion of an object when it's weight and the air resistance acting upon it are equal?	Terminal velocity
	Describe what happens to the forces acting upon a parachuter when they open their parachute	Air resistance ↑, weight stays constant
	According to Newton's First Law, what will affect an object's velocity?	A resultant force
	According to Newton's First Law, if the resultant force acting upon a stationary object is zero, what will happen?	The object remains stationary
	According to Newton's First Law, if the resultant force acting upon a moving object is zero, what will happen?	Moves with at same velocity

	What is the term given to the tendency of an object to continue in their state of rest or uniform motion? (HT only)	Inertia
	Which objects have a large inertia? (HT only)	Objects with a large mass
	According to Newton's 2nd Law state what is the relationship between acceleration and force?	Directly proportional
	According to Newton's 2nd Law state what is the relationship between acceleration and mass?	Inversely proportional
	Write Newton's Second Law as an equation	Resultant force (N) = mass (kg) x acceleration (m/s^2) F = ma
	Topic:	**Stopping distances (P.17)**
	Define "stopping distance"	Thinking distance + braking distance
	Define "thinking distance"	The distance travelled during the drive's reaction time
	Define "braking distance"	The distance travelled under the braking force
	What are the typical values for reaction time	0.2-0.9 seconds
	State 4 factors that effect a driver's reaction time	Tiredness, alcohol, drugs, distractions
	State 3 factors that may affect braking distance	Adverse weather conditions (ice/snow/wet), worn tyres, worn brakes
	What happens to a vehicles braking distance when a car is travelling faster?	Increases
	Which force causes a car to slow down?	Friction (between brakes and wheels)
	Describe the energy transfers that occur when a force is applied to a car's brakes	Kinetic energy of car -> thermal energy in the brakes
	Why is a car travelling at high speed stopping suddenly dangerous?	Need larger braking force -> large deceleration
	State 2 dangers of large decelerations	Overheating brakes and skidding car
	Define "adverse"	Bad
	What is 'inertial mass' (HT only)	A measure of how hard it is to change an object's velocity
	Define "inertial mass"	The ratio of force over acceleration
	What does this symbol mean? "~"	Approximately
	Topic:	**RP: Hooke's Law (P6) (P.46)**
1	Define Hooke's law	Force is directly proportional to extension of a spring
2	In this RP, you are investigating the relationship between force and extension of a spring. What would be the IV?	Force
3	In this RP, you are investigating the relationship between force and extension of a spring. What would be the DV?	Extension of the spring
4	Which piece of equipment attaches the clampstand to the work bench?	G-clamp
5	Which piece of equipment is used to hold the top of the spring?	Boss head clamp
6	State two potential hazards and give a safety precaution you could take to minimize the risk of each	1) Weights falling on your toes – clamp the clamp stand to the work bench 2) Spring scratching your eye - wear safety goggles
7	What is one common mistake during this practical?	Measuring length of spring not extension
8	What is it called when a spring no longer returns to it's original shape?	Elastic limit
9	What is meant by extension?	How much longer the spring has got
10	How could you check the results were repeatable?	Do the each reading 3 times and check you get the same results each time

11	How could you check the results were reproducible?	Someone else replicates your study and check whether they get the same results
12	Which piece of equipment is used to measure extension?	Ruler
13	Which piece of equipment is used to hold the clamp?	Clamp stand
14	Which symbol means directly proportional?	$\propto$
15	What kind of graph would you plot?	A scattergraph with line of best fit
	Topic:	**RP: Forces, mass and acceleration (P7) (P.47)**
1	Which equation links force, mass and acceleration?	F = ma
2	The first experiment is looking at the relationship between force, and acceleration. What would be the IV?	Force
3	The first experiment is looking at the relationship between force, and acceleration. What would be the DV?	Acceleration
4	The first experiment is looking at the relationship between force, and acceleration. What would be the CV?	Mass
5	What do you mark on the work bench during experiment 1?	20cm intervals
6	Which piece of equipment is used to measure the 20cm intervals?	Ruler
7	What is recorded when the car passes over each 20cm interval?	The time
8	Which piece of equipment accurately records time?	Light gates
9	How do you change the force acting on the trolley?	Add more weight to the end of the string that is pulling the trolley
10	The first experiment is looking at the relationship between mass and acceleration. What would be the IV?	Mass of the trolley
11	The first experiment is looking at the relationship between mass and acceleration. What would be the DV?	Acceleration of the trolley
12	The first experiment is looking at the relationship between mass and acceleration. What would be the CV?	Force applied to the trolley
13	How do you change the mass of the trolley?	Add a weight to the top of it
14	What is the expected relationship for mass and acceleration?	Inversely proportional
15	What is the expected relationship for force and acceleration?	Directly proportional
	Topic:	**RP: Waves (P8) (P.48)**
1	Which piece of equipment is used to investigate water waves?	Ripple tank
2	Which piece of equipment generates the waves in the water?	Motor and bar
3	How do we see the water waves when using a ripple tank?	Shine light through water and look at the shadows created
4	How do you measure the wavelength of the water waves?	Using a ruler
5	Why do you measure across multiple waves and divide by the number of waves?	Means you are measuring the mean length (more accurate)
6	How do you measure the frequency of water waves?	Count how many pass a point in 10 seconds and then divide by 10.

7	How do you calculate wave speed?	velocity = frequency / wavelength v = f / λ (m/s) (Hz) (m)
8	What is the piece of equipment that generates waves in a piece of string?	A vibration generator
9	Which piece of equipment is used to measure the length of the wave?	A meter ruler
10	How do you determine the frequency of the waves in the piece of string?	Read it from the power supply
11	What is the most common error made when measuring the wavelength?	Only measuring half of the wave
12	What is the relationship between wave speed and frequency?	Directly proportional
13	What is the unit for wavelength?	Metres (m)
14	What is the unit for frequency?	Hertz (Hz)
15	What is the unit for wave speed?	Metres per second

P6 – Hooke' s Law	**Big Question:** Investigate the relationship between force and extension and a spring IV – Force (weight) DV – Extension of spring CV - ruler is vertical, measuring from same point on the spring	*spring *metre ruler *splint (to act as pointer) *10N weight stack *clamp stand *two boss head clamps *G-clamp to clamp equipment to table *safety goggles	1) Set up the equipment as shown in the diagram  2) Make sure that the ruler is at the top of the spring. 3) Measure the length of the spring before adding any weights. 4) Add 1N of weight to the bottom of spring 5) Measure the length of the spring with the weight and use this to calculate the extension of the spring. 6) Repeat this, adding an additional 1N weight each time.	Force will be directly proportional to extension until the spring reaches its limit of proportionality.	Investigate a spring to find it's limit of proportionality. Investigate the relationship between force and extension of a rubber band.
P7 – Forces, mass and acceleration	**Big Question 1:** How does force affect acceleration when a constant mass is used? **IV** – Force **DV** - Acceleration **CV** - Mass **Big Question 2**: How does mass affect acceleration when a constant force is used? **IV** – Mass **DV** – Acceleration **CV** – Force	*trolley *metre ruler *Pencil *bench pulley *string *weight stack *stopwatch *blu-tac	**Big Question 1:** 1) Use the ruler to measure 20cm intervals on the work bench and mark with a pencil. 2) Attach the bench pulley to the end of the bench 3) Tie a length of string to the trolley 4) Pass the string over the pulley and attached the weight stack to the other end of the string 5) Hold the trolley at the start point. 6) Attached 1N of weight to the string. 7) Release the toy car and start the stop watch. 8) Record the time at each 20cm interval and at 100cm. 9) Repeat using 0.8N, 0.6N, 0.4N, 0.2N. **Big Question 2:** 1) Repeat steps 1-5 2) Place 200g of mass onto the trolley 3) Hold the trolley at the start line. 4) Add 1N of weight to the end of the string 5) Release the toy car and start the stop watch. 6) Record the time at each 20cm interval and at 100cm. 7) Repeat placing 400g, 600g, 800g and 1000g.	As force increases, acceleration should increase (directly proportional). As mass increases, acceleration should decrease (inversely proportional)	Use light gates to investigate the effect of force on acceleration when mass is kept constant. Use light gates to investigate the effect of mass on acceleration when mass is kept constant.

P8 – Waves	**Big Question 1:** Investigate the properties of water waves IV = Frequency of wave DV = Wavelength CV = Amplitude, weight on end of string **Big Question 2**: Investigate the properties of waves in solids	**Big Question 1:** *ripple tank *water *lamp *metre ruler **Big Question 2:** *vibration generator *power pack *string *set of 1N masses *table *pulley 	**Big Question 1:** **1)** Set up the ripple tank. **2)** Pour water into the tank and adjust the rod so that it touches the surface of the water. **3)** Switch on the lamp and motor. **4)** Place a meter at ruler at right angles to the waves shown on the projector. **5)** Measure across as many waves as you can and then divide by the number of waves. This gives the wavelength. **6)** Count the number of waves passing a point in 10 seconds. Then divide this by 10 to give the frequency. **7)** Use the wave speed equation to calculate wave speed. **Big Question 2:** 1) Set up the equipment as shown below. 2) Switch on the vibration generator 3) Use a metre ruler to measure the wavelength of a wave 4) Read the frequency of the waves from the power supply 5) Use the wave speed equation to calculate wave speed.		