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16th November 2026

Dear Parent/Carer,

I am writing to inform you about the upcoming Year 7 Science mid-year assessments, which will begin during the week commencing **Monday 11th January 2027**.

As your child is currently in our **Aspire Science set**, these assessments are particularly important. The results will be used to determine whether students remain in the Aspire set or move into a mixed-ability Science class. We therefore strongly encourage all students to prepare thoroughly and demonstrate their full potential.

Assessment Information

Students will complete one **60-minute Science assessment**, consisting of:

- **Biology:** 20 minutes
- **Chemistry:** 20 minutes
- **Physics:** 20 minutes

The assessment will cover the following topics:

- **7.01:** Particles, Substances and Mixtures
- **7.02:** Fundamentals of Physics
- **7.03:** Cells and Organisation

A detailed examination timetable will be emailed home shortly.

How Can Students Prepare?

We recommend that students use three key revision strategies:

1. **Knowledge Organisers and Blank Page Retrieval:** Students should use the Year 7 Knowledge Organiser on the school website. They should read one small section, close the organiser and write everything they can remember on a blank page, before checking and correcting any gaps.
2. **Core Knowledge Questions:** Students should test themselves using the question banks for all three topics in the attached revision guide. They should cover the answers, attempt each question independently and revisit anything they get wrong.
3. **Noticed:** Students can access app.noticedtechnology.com to revisit lessons they found difficult. In Resources → Science, they should choose one of the three topics, select a lesson and open its Interactive worksheet.

Detailed instructions for all three revision methods, the complete core knowledge question sets and screenshots showing how to use Noticed are attached to this letter.

Supporting Your Child

We would greatly appreciate your support in encouraging your child to begin revising early and to complete regular, focused revision sessions in the weeks leading up to the assessments. Testing your child using the core knowledge questions is a particularly effective way of supporting their preparation at home.

We have high expectations of our Year 7 Aspire students and want every student to demonstrate their knowledge, understanding and progress. With regular, focused preparation, students can approach these assessments feeling confident and well prepared.

Thank you for your continued support.

Kind regards,

Mrs T Markham

Head of Science
Stockport Academy

YEAR 10 SCIENCE

MID-YEAR EXAM & REVISION GUIDE | JANUARY 2027

EXAMS START:
Monday 4 January 2027

PAPER LENGTH
Combined Science: 45 minutes per paper
Triple Science: 60 minutes per paper

What is in your exam?

You will sit separate Biology, Chemistry and Physics papers. Combined and Triple Science students revise the same topic list. The paper duration is different, as shown above.

Subject	Topic to revise
BIOLOGY	Cells
	Organisation
	Ecology (taught in year 9)
CHEMISTRY	Atomic Structure
	Bonding
	Chemical Analysis (taught in year 9)
	Chemistry of the Atmosphere (taught in year 9)
PHYSICS	Energy
	Particle Model of Matter (taught in year 9)

Four effective ways to revise

1. Blank page retrieval using your Knowledge Organiser or CGP guide
Choose one small section, read it carefully, then close the book and write everything you remember. Finally, check and correct with a different-coloured pen.

2. Essential Knowledge Quizzes
Cover the answers in the quiz section of this guide. Say or write your answer, check it, and repeat any questions you get wrong until you can recall them accurately.

3. Noticed - Revisit lessons you found difficult by completing their interactive worksheets.

4. Exam questions - Practice AQA questions on Physics & Maths Tutor, then mark your answers using the mark schemes.

How to use each revision method

1. Blank page retrieval

Use either Stockport Academy's KS4 Science Knowledge Organiser or your free CGP Science revision guide (given to you by your Science teacher).

READ 2 MIN	COVER & RETRIEVE 4 MIN	CHECK & CORRECT 2–3 MIN
Study one small section carefully: definitions, equations and diagrams.	Close the source. On a blank page, recall everything without looking.	Reopen your source, check facts and add missing details in another colour.

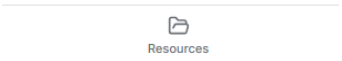
2. Essential Knowledge Quizzes

The question banks at the end of this guide are organised by topic. Cover the answer column, try the question, check the answer and return to questions you find difficult. Try asking someone at home to quiz you.

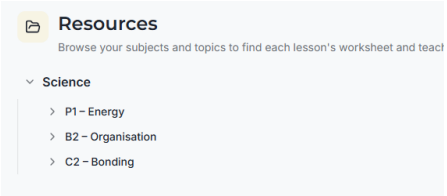
3. Noticed: revisit a difficult lesson

Go to app.noticedtechnology.com, then follow these steps:

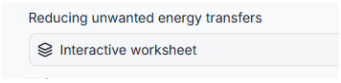
1. Open Resources



2. Choose Science → topic



3. Open a lesson worksheet



4. Practice real exam questions and mark them

- On Physics & Maths Tutor, choose GCSE → Biology / Chemistry / Physics → AQA → your exam topic → Questions by Topic.
- Complete the question paper (QP) without notes. Then use the mark scheme (MS) to give yourself marks and improve any answers you missed. Repeat similar questions later.
- **Quick links:** AQA Biology • AQA Chemistry • AQA Physics

Your revision checklist

Tick a box only when you can complete the task confidently without looking at the answer. Spread your revision across all three sciences.

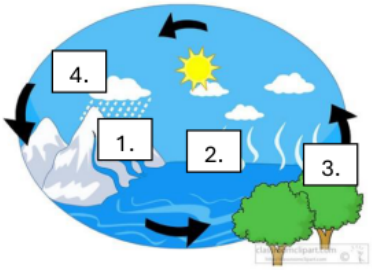
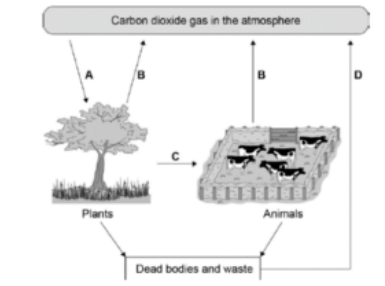
Topic	Blank page	Quiz	Exam Qs
Biology | Cells	☐	☐	☐
Biology | Organisation	☐	☐	☐
Biology | Ecology	☐	☐	☐
Chemistry | Atomic Structure	☐	☐	☐
Chemistry | Bonding	☐	☐	☐
Chemistry | Chemical Analysis	☐	☐	☐
Chemistry | Chemistry of the Atmosphere	☐	☐	☐
Physics | Energy	☐	☐	☐
Physics | Particle Model of Matter	☐	☐	☐

ESSENTIAL KNOWLEDGE QUIZ / BIOLOGY | ECOLOGY (YEAR 9)

Ecology (Paper 2) – Essential Knowledge Quiz – Combined Science

Question	Answer
1. What is a population?	A group of organisms that are the same species and live in the same area
2. What is a community?	The different organisms/species in an ecosystem that depend on each other.
3. What is meant by the term 'stable community'?	Where the species and environmental factors in a habitat are in balance, so populations remain stable
4. What is a habitat?	Habitat – The place where an organism lives.
5. What is an ecosystem?	The interaction of a community of living organisms (biotic) with the non-living (abiotic) parts of their environment.
6. What is interdependence?	Within a community, each species depends on other species for survival. If one species is removed, it can affect the whole community.
7. What do the arrows in a food chain represent?	The transfer of energy between organisms.
8. What is a producer?	A green plant that makes food for the rest of the food web by photosynthesis
9. What is a primary consumer?	An animal that eats producers.
10. What is a secondary consumer?	An animal that eats primary consumers.
11. What is a tertiary consumer?	An animal that eats secondary consumers.
12. What term is given to an animal that is hunted and eaten by others?	Prey
13. What term is given to an animal that hunts and eats another animal?	Predator
14. Name 3 biotic factors that can affect a community.	Availability of food, predators, pathogens.
14. Name 3 abiotic factors that can affect a community.	Light intensity, temperature, moisture levels, soil pH.
15. What do animals compete with each other for?	Food, mates and territory
16. What do plants compete with each other for?	Space, light, water and mineral ions.
17. What is an extremophile?	Organisms that can tolerate extreme conditions
18. Name 3 adaptations animals living in cold environments have.	Small SA:V ratio (to reduce heat loss), small ears (to reduce heat loss), thick fur (layer of insulating air, reducing heat loss)
19. Name 3 adaptations animals have to deter predators.	Horns (for defence), colouring (for camouflage/to appear poisonous) , large ears (to hear predators better)
20. Name 3 adaptations plants living in hot environments have.	Large SA:volume ratio (to reduce water loss), swollen leaves (to store water), waxy leaves (to reduce water loss)
21. Name 3 adaptations plants have to deter predators.	Thorns (likely to hurt predator), bad taste (deter predator from eating them again), warning colour (to confuse predator).
22. Describe a method for using a quadrat to estimate population of daisies in a field.	Place quadrat randomly, achieve randomness by using a random number generator to get co-ordinates, count number of species in a quadrat, repeat at least 5 times, calculate the mean number of species per quadrat, find the area of the place you are sampling, estimate the population number using the area of the quadrat.
23. Describe a method for using a transect to see whether the distribution of plants changes with distance from the river.	Measure transect at right angles to the river, place quadrat at intervals along the transect, count the different species in each quadrat, repeat for 2 or more transects.

Ecology (Paper 2) – Essential Knowledge Quiz – Combined Science

24. Label the diagram of the water cycle to show: 1. Precipitation (rain) 2. Evaporation (water in the sea → water vapour) 3. Transpiration (water evaporates through the stomata of leaves) 4. Condensation (water vapour → water) 	
25. By which process is carbon dioxide taken out of the air and turned into glucose?	Photosynthesis
26. Name three compounds which contain carbon.	Carbohydrates, lipids, proteins.
27. By which process do carbon containing compounds from plants get transferred to the bodies of animals?	Feeding
28. Which process, by all living things, releases carbon dioxide into the atmosphere?	Respiration
29. Dead plants and animals turn into fossil fuels over millions of years. How is that trapped carbon released back into the atmosphere?	Combustion (burning) fossil fuels release carbon dioxide.
30. What process takes place after all living things die that returns nutrients and carbon dioxide to the environment?	Decay by microorganisms
31. Name the processes shown by the letters 	A - photosynthesis B – respiration. C – feeding. D – Respiration by micro-organisms.
32. What is 'biodiversity'?	The variety of all the different species of organisms on earth or within an ecosystem
33. Give 3 ways that humans reduce the land available to animals and plants?	Quarrying, farming, building, dumping waste
34. Give two ways waterways can become polluted	Sewage, fertilisers / pesticides etc
35. What are peat bogs?	Areas of land with partially decayed plant material.
36. Why are peat bogs being destroyed?	To produce garden compost and to use as a fuel
37. What is released when peat is burned as a fuel?	Carbon dioxide
38. Why is large scale deforestation happening?	To provide land for cattle and rice fields, and to grow crops for biofuels
39. What are the 2 main greenhouse gases?	Carbon dioxide and methane
40. What are the potential consequences of global warming?	Melting ice caps, more extreme weather, loss of habitats, drought
41. Give examples of strategies to reduce the negative effects of humans on biodiversity	Breeding programmes for endangered species Protection and regeneration of rare habitats Reintroducing hedgerows in farmland Some governments are trying to reduce deforestation Recycling rather than sending waste to landfill

ESSENTIAL KNOWLEDGE QUIZ / BIOLOGY | CELLS

Cells – Essential Knowledge Quiz - Combined

Question	Answer
1. Which organelles are found in animal cells?	Cell membrane, cytoplasm, mitochondria, ribosomes, nucleus
2. Name the three organelles only found in plant cells.	Cell wall, vacuole, chloroplasts
3. Give an example of a eukaryotic cell	Plant or animal cell
4. Give an example of a prokaryotic cell	Bacteria
5. How do prokaryotic cells compare with eukaryotic cells in terms of size?	Prokaryotic cells are smaller
6. What is different about the genetic material of bacteria?	It is not contained in a nucleus – it is free floating in the cytoplasm
7. What are the additional loops of DNA in bacteria called?	Plasmids
8. What is the function of the chloroplast?	Photosynthesis takes place here
9. What is contained in the vacuole?	Sap
10. What is the function of the cell wall?	Strength and support
11. What is the cell wall made of in plants?	Cellulose
12 What is the function of the cell membrane?	Controls what enters and leaves the cell
13. What is the function of the mitochondria?	Where respiration happens which releases energy.
14. What is the function of the ribosomes?	Making proteins
15. What is the function of the cytoplasm?	Where chemical reactions happen
16. Which part of the microscope does the slide sit on?	Stage
17. Which magnification do you always start with?	Lowest
18. Why is it necessary to start with the lowest magnification?	To give the widest field of view
19. What is the name of the lens you look down?	Eyepiece lens
20. What do you do if the cells are blurry?	Turn the focusing wheel
21. How do you see more detail in the cells once you've found them?	Increase the magnification by using a higher powered objective lens
22. What is the name of the lens near the stage that rotates?	Objective lens
24. Name two differences between an electron microscope and a light microscope	Electron microscope has much greater magnification Electron microscope has much better resolution
25. What does 'resolution' mean in microscopy?	The ability to distinguish between 2 objects
26. How have electron microscopes developed the understanding of cells?	With an electron microscope, you are able to see the smallest organelles – e.g ribosomes, mitochondria.
27. Put the following into size order, smallest first: Tissue, nucleus, organ, cell, organ system	Nucleus, cell, tissue, organ, organ system
28. As an organism develops, stem cells form different types of specialised cells. What name is given to this process?	Differentiation
29. Name one way in which a sperm cell is specialised for its function	Has a tail which allows it to swim towards the egg. Contains many mitochondria, releasing energy in respiration for swimming. Contains only half genetic information (23 chromosomes)
30. What are the special features of the plant root cell that allow them to take up water efficiently?	Many root hairs given them increased surface area
31. What does the xylem transport?	Water from the roots to the leaves.
32. How is the xylem specialised for its function?	No end walls between cells, allowing continuous stream of substances to flow from the roots to the leaves. Strengthened with lignin.
33. What does the phloem transport?	Dissolved sugars around the plant.

Cells – Essential Knowledge Quiz - Combined

Question	Answer
35. How is the phloem specialised for its function?	Made from sieve tubes which have pores to allow substances to move from cell to cell. It has companion cells with lots of mitochondria, releasing energy for active transport.
36. What is diffusion?	Diffusion is the movement of particles from a high concentration to a low concentration.
37. During breathing, what gases diffuse into and out of the blood?	Oxygen diffuses from the alveoli into the blood, carbon dioxide diffuses from the blood into the alveoli.
38. In plants, what gases diffuses into and out of the leaf?	Carbon dioxide diffuses from the atmosphere into the leaf through the stomata. Oxygen diffuses out of the leaf.
39. How can the rate of diffusion be increased?	Increasing temperature, increasing surface area, reducing the diffusion distance/pathway, increasing the concentration gradient.
40. How is the small intestine adapted for efficient diffusion of food molecules?	Folded villi increase surface area. Villi are one cell thick meaning there is a short diffusion pathway. Good blood supply maintains a steep concentration gradient.
41. How are the lungs adapted for efficient diffusion of gases?	They have many alveoli, increasing surface area. Alveoli and capillary walls are one cell thick, causing a short diffusion pathway. Large capillary network maintains a steep concentration gradient.
42. How are the gill in fish adapted for efficient gas exchange?	The gills have a large surface area, a good blood supply and are thin, meaning there is a short diffusion pathway.
43. As something decreases in size, what happens to its surface area:volume ratio?	Surface area to volume ratio increases as something gets smaller.
44. What is osmosis?	Osmosis is the movement of water from a high water concentration to a low water concentration through a partially permeable membrane.
45. A concentrated solution contains 1M of sugar, a dilute solution contains 0.5M of sugar. Which one has a higher concentration of water?	Concentrated solution have a lower concentration of water. Dilute solutions have a higher concentration of water.
46. Water has moved into a plant cell by osmosis, what word describes a plant cell filled with water?	Turgid
47. What word describes a plant cell with little water?	Flaccid
48. Why do plant cells not burst when water moves in via osmosis?	The cell wall prevents bursting.
49. In the osmosis RP, the vegetable loses mass when placed in sugar solution of 1M. Why?	Water has moved out of the cell by osmosis. The solution outside the vegetable is at a higher concentration that the concentration of solution inside the cell.
50. In the osmosis RP, the vegetable gains mass when placed in sugar solution of 0.1M. Why?	Water moves into the cell by osmosis. The solution outside the vegetable is as at a lower concentration than the concentration of solution inside the cell.
51. In the osmosis RP, the change in mass is 0. Why?	If the vegetable has 0 change in mass this shows that there is no net movement of water into/out of the cell by osmosis. This happens when the concentration of solution is equal inside and outside of the cell.
52. What is active transport?	Active transport is the movement of substances from a low concentration to a high concentration. This process requires energy.

Cells – Essential Knowledge Quiz - Combined

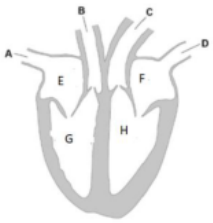
Question	Answer
53. Root hair cells absorb mineral ions via active transport. What adaptation do these cells have for this function?	They have lots of mitochondria, which release lots of energy during respiration, which can be used for active transport of mineral ions into the cell.
54. What happens in stage 1 of the cell cycle?	The cell grows – DNA replicates, the number of organelles increases.
55. What happens in stage 2 of the cell cycle?	Mitosis occurs – chromosomes are pulled to each side of the cell and 2 nuclei form.
56. What happens in stage 3 of the cell cycle?	The cytoplasm divides, forming two identical cells.
57. What is mitosis? Why is it important?	Cell division producing two identical cells. Used for growth and repair.
58. What is a stem cell?	A stem cell is an undifferentiated cell which can differentiate into a specialised cell.
59. Where can stem cells be found in humans?	Embryos contain embryonic stem cells. The bone marrow contains adult stem cells.
60. What can embryonic stem cells differentiate into?	Any kind of specialised animal cell.
61. What can adult stem cells differentiate into?	Blood cells e.g. white and red blood cells and platelets
62. What could stem cells be used to treat?	Paralysis, diabetes
63. What is therapeutic cloning?	In therapeutic cloning, an embryo is produced with the same genes as the patient. Stem cells from the embryo are therefore not rejected by the patient in medical treatment.
64. State advantages and disadvantages of therapeutic cloning?	Advantages: cells will not be rejected, cells of any type can be produced, may cure illness, many cells can be produced, may reduce waiting times for donors. Disadvantages: potential life is killed, shortage of egg donors, egg donation has risks, may transfer viral infections, poor success rate.
64. Where are stem cells found in plants?	Meristem
65. Why are plant stem cells useful?	They could be used to produce clones of plants, especially rare plants at risk of extinction and crop plants with special features e.g. disease resistance.

ESSENTIAL KNOWLEDGE QUIZ / BIOLOGY | ORGANISATION

Organisation – Essential Knowledge Quiz

Question	Answer
1. What is the function of the digestive system?	The digestive system breaks down large insoluble food molecules into smaller soluble molecules which can be absorbed into the bloodstream at the small intestine.
2. In which organ does digestion begin?	The mouth
3. What is an enzyme?	Enzymes are biological catalysts that speed up reactions without being used up in the reaction.
4. What are enzymes made up of?	Enzymes are proteins made from amino acids.
5. What is the active site of an enzyme?	The specifically shaped part of an enzyme that fits with the substrate.
6. What does the carbohydrase enzyme do?	Breaks down carbohydrates into glucose.
7. What does the amylase enzyme do?	Breaks down starch into glucose.
8. What does the protease enzyme do?	Breaks down proteins into amino acids.
9. What is different about the pepsin enzyme?	It is a protease enzyme that can withstand low pH in the stomach due to hydrochloric acid.
10. What does the lipase enzyme do?	Breaks down lipids into fatty acids and glycerol.
11. Where are all digestive enzymes made?	The small intestine and the pancreas.
12. Amylase is also produced in which organ?	The salivary glands.
13. Where is bile made and stored?	Bile is made in the liver and is stored in the gall bladder.
14. Why is bile alkaline?	Bile is alkaline to neutralize food from the stomach. A neutral pH will allow lipase to work better.
15. How does bile help digest fats?	Bile emulsifies lipids into smaller droplets, increasing the surface area meaning lipase works more effectively.
16. Name 3 ways the small intestine is adapted for absorption of food molecules?	1. Folded vili increase surface area 2. Villi are one cell thick meaning there is a short diffusion pathway. 3. Villi have a good blood supply, maintaining a steep concentration gradient.
17. What is the function of stomach acid?	To kill bacteria.
18. What reagent is used to test for sugar? Describe a positive test.	Benedict's reagent. Blue → Brick red, orange, green or yellow.
19. What reagent is used to test for protein? Describe a positive test.	Biuret reagent. Blue → lilac.
20. What reagent is used to test for starch? Describe a positive test.	Iodine. Orange/brown → Blue/black
21. What reagent is used to test for fat? Describe a positive test.	Ethanol. Clear → Cloudy.
22. Explain why the rate of enzyme action decreases at low temperatures.	The enzyme has less kinetic energy meaning less enzyme-substrate complexes are formed.
23. Explain why the rate of enzyme actions decreases at high temperatures.	High temperatures denature the active site, meaning the substrate no longer fits.
24. What is breathing?	The process of inhaling and exhaling.
25. What is respiration?	A chemical reaction that happens in the mitochondria, releasing energy.
26. How are the alveoli adapted to gas exchange?	There are many alveoli, increasing the surface area. The alveoli and capillary walls are one cell thick, causing a short diffusion pathway. Large capillary network maintains a steep concentration gradient.
27. Is the blood a tissue or an organ?	A tissue because it is made up of similar cells working together to perform a function.

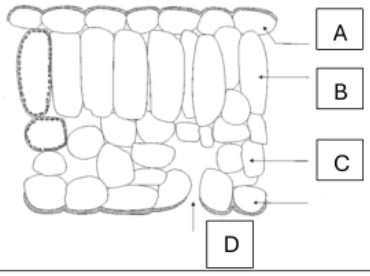
Organisation – Essential Knowledge Quiz

28. How are red blood cells adapted to their function?	They have no nucleus, creating more space to transport oxygen. They have a biconcave shape increasing their surface area. They contain a pigment called haemoglobin which oxygen binds to.
29. What is the function of platelets?	They help blood to clot.
30. What is plasma?	The liquid part of the blood which transports carbon dioxide, hormones and the products of digestion.
31. How are arteries adapted to their function?	Arteries transport blood at high pressure. To do this, they have a thick layer of muscle and elastic tissue.
32. How are veins adapted to their function?	Veins transport blood at lower pressure, they have a thinner layer of muscle and elastic tissue. They also have valves.
33. What is the function of valves?	They prevent the backflow of blood.
34. How are capillaries adapted to their function?	Substances in the blood diffuse into cells through the capillaries. They are only one cell thick, meaning there is a short distance.
35. Label A-H: 	A – Vena Cava B – Pulmonary artery C – Aorta D – Pulmonary vein E – Right atrium F – Left atrium G – Right ventricle H – Left ventricle
36. Describe the movement of blood in the right side of the heart?	Deoxygenated blood enters the vena cava, it goes into the right atrium, through the valve and into the right ventricle. The cardiac tissue contracts, causing blood to be pumped through the pulmonary artery, where blood is taken to the lungs.
37. Describe the movement of blood in the left hand side of the heart?	Oxygenated blood enters the pulmonary vein, into the left atrium, through the valve and into the left ventricle. The cardiac tissue is thicker on the left, blood is pumped with greater force out of the aorta to the rest of the body.
38. What does the term 'double circulatory system' mean?	The right side of the heart pumps blood to the lungs, the left side of the heart pumps blood to the rest of the body.
39. What are pacemaker cells and where are they found?	These cells control heart rate, they are found in the right atrium.
40. What is a non-communicable disease?	A disease that is not caused by a pathogen and can not be passed from person to person.
41. What happens in coronary heart disease?	Layers of fatty material build up inside the coronary artery, narrowing them. This reduces blood flow to the heart.
42. Explain how CHD can cause a heart attack?	If the coronary arteries become very narrow, blood flow is reduced. This means the heart receives less oxygen and less glucose and cannot respire, leading to a heart attack.
43. Name medical risk factors for CHD	High blood pressure, high cholesterol, diabetes, genetic factors.
44. Name lifestyle risk factors for CHD	Smoking, obesity, lack of exercise, high fat diet, drinking alcohol and exposure to air pollution.
45. What is a stent?	A medical device inserted into the blood vessel, keeping the artery open and restoring blood flow.
46. What are statins?	A medicine used to lower blood cholesterol.
47. What is a biological valve?	A replacement valve from a living thing e.g. cow
48. What is a mechanical valve?	A man-made replacement valve made from metal.

Organisation – Essential Knowledge Quiz

49. What is an artificial heart used for?	To keep a patient alive whilst waiting for a heart transplant.
50. What causes cancer?	Mutations in DNA which lead to uncontrolled cell growth.
51. What is a benign tumour?	A growth of abnormal cells which are contained in one area.
52. What is a malignant tumour?	These cells are cancerous. They invade neighbouring tissues and spread to different parts of the body in the blood, where they form secondary tumours.

Organisation of plants

Question	Answer
1.What is the leaf?	An organ in a plant made up of tissues working together to help it photosynthesise.
2. Label the tissues in the leaf: 	A: Upper epidermis B: Palisade mesophyll tissue C: Spongy mesophyll layer D: Stomata
3. How is the epidermis adapted to help photosynthesis?	The upper epidermis is transparent, allowing light to the palisade layer for photosynthesis.
4. How is the palisade layer adapted to photosynthesis?	The palisade cells have lots of chloroplasts for photosynthesis.
5. How is the spongy mesophyll layer adapted to photosynthesis?	It has air gaps, allowing gases to diffuse to and from the palisade layer.
6. What is the role of the guard cells?	During the day, glucose is made in the guard cells. This causes water to move into the guard cells by osmosis meaning they swell. This means the stomata opens.
7. What is the role of the stomata in photosynthesis?	Stomata allows carbon dioxide to diffuse into the leaf, and oxygen to diffuse out of the leaf.
8. What is the role of the xylem in photosynthesis?	Transports water from the roots to the leaf to be used in photosynthesis.
9. What is the role of the phloem in photosynthesis?	Transports glucose made in the leaf to the rest of the plant.
10. What is meristem tissue?	This is where plant stem cells are stored.
11. How is the xylem adapted to transport water and mineral ions?	The xylem is hollow so water flows easily. Xylem is strengthened with lignin. The xylem has no end walls so water flows upwards.
12. What is transpiration?	The evaporation of water vapour from the stomata, which triggers more water to enter the xylem from the root hair cells.
13. Why do most plants have more stomata on the lower surface compared with the upper surface?	It is cooler around the lower surface and more humid meaning less water evaporates from the stomata, less water is lost.
14. How is the phloem tissue adapted for transporting sugars around the plant?	Phloem is made from sieve tube cells and companion cells. The sieve tubes have holes in the end walls so sugars

Organisation – Essential Knowledge Quiz

	can move from cell to cell. They also have no nucleus to make more room for sugars. The companion cells have lots of mitochondria, releasing energy for the active transport of sugars.
15. What is translocation?	The movement of dissolved sugars up and down the plant through the phloem.
16. What is a potometer?	A piece of equipment used to measure the rate of transpiration.
17. What can increase the rate of transpiration?	High temperatures, windy conditions and low humidity.

ESSENTIAL KNOWLEDGE QUIZ / CHEMISTRY | ATOMIC STRUCTURE

Atomic Structure and The Periodic Table – Essential Knowledge Quiz

Question	Answer
1. What is an atom?	An atom is the smallest part of an element that can exist
2. What is an element?	Elements are made from one type of atom
3. What is a compound?	Compounds are made from two or more elements which are chemically bonded
4. How do you name a compound with 2 elements? E.g. NaCl	The first name is the metal element (if there is one) and the 'surname' is the non-metal. E.g. sodium + chlorine → sodium chloride
5. How do you name a compound with 3 elements, one of which is oxygen?	The ending is **–ate.** E.g. Sodium + Carbon + Oxygen → Sodium Carbonate
6. What is the conservation of mass?	In a chemical reaction, **no atoms are made or destroyed so the mass of reactants = mass of products.**
7. What is a mixture?	A mixture consists of two or more elements or compounds not chemically bonded together.
8. How could you separate an insoluble solid from a mixture?	By filtration
9. How could you separate a soluble solid from a mixture?	Crystallisation
10. What do the following state symbols mean: (g), (l), (s), (aq)?	(s) = solid, (l) = liquid, (g) = gas, (aq) = aqueous/formed a solution
11. What is distillation used to separate?	Two or more liquids with different boiling points
12. Name the two state changes in distillation	The liquid evaporates when heated, the gas is then cooled and condenses back into a liquid.
13. Describe the method to separate two liquids by distillation.	Heat the mixture in a round bottom flask. The liquid with the lowest boiling point will boil first. This liquid will evaporate and turn to a gas and enter the condenser. In the condenser, the gas will cool and then condense. The liquid is collected in the beaker and the other liquid will be left in the flask.
14. What is chromatography used to separate?	Chromatography is used to separate mixtures of more than one soluble substance dissolved in solution.
15. Why is the start line drawn in pencil?	Because pencil is insoluble and will not run.
16. What must the solvent be below the start line?	So that the mixture does not dissolve **into the solvent** but instead are carried up the paper.
17. Name the three subatomic particles	Electrons, protons and neutrons
18. What is found in the nucleus of the atom?	Protons and neutrons
19. Where are electrons found?	They orbit the nucleus in electron shells
20. State the charges of the subatomic particles	Protons have a +1 charge, neutrons have no charge, electrons have a -1 charge
21. State the masses of the subatomic particles	Protons and neutrons have a relative mass of 1, electrons have a mass of almost 0
22. What does the atomic number indicate?	The number of protons
23. What does the mass number indicate?	The number of protons and neutrons
24. What is the overall charge of an atom?	Atoms have no overall charge, due to equal number of protons and electrons.

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25. What is the radius of an atom?	0.1nm
26. What is the radius of the nucleus?	1/10,000 size of the atom (about 1 x 10-14 m)
27. How are electrons organised in their shells?	The first shell can hold a maximum of 2 electrons, all other shells can have a maximum of 8 electrons
28. Who discovered the electron?	JJ Thompson
29. What was the 'plum pudding' model	JJ Thompson came up with this – it suggests that the atom is a ball of positive charge with negative electrons embedded in it
30. Who discovered the proton?	Rutherford
31. What were the results from the alpha particle scattering experiment?	Rutherford fired positively charged alpha particles at gold foil. Some alpha particles were deflected because the nucleus of the atom is positively charged. Most particles were not deflected because the atom is mainly empty space
32. How did Neil Bohr adapt the nuclear model?	Bohr suggested that electrons orbit the nucleus at specific distances
33. Who discovered the neutron?	James Chadwick proved that the nucleus contained neutrons as well as protons
34. What is an isotope?	Isotopes of the same type of atom have the same number of protons and electrons, but a different number of neutrons
35. In the modern periodic table, how are the elements arranged?	In order of atomic number
36. What does the group number tell you about an atom?	The number of electrons on the outer shell. E.g. Group 1 elements have 1 electron on their outer shell
37. What are group 1 elements also known as?	The Alkali Metals
38. What are group 7 elements also known as?	The Halogens
39. What are group 0 elements also known as?	The Noble Gases
40. How did elements used to be organised in the early periodic table?	In order of their atomic weights
41. How did Mendeleev change the early periodic table?	Mendeleev left gaps for elements that he thought had not been discovered and in some places, changed the order based on their chemical properties instead of atomic weight
42. What is an ion?	When an atom loses or gains an electron, it becomes positively or negatively charged. It is now an ion.
43. What ions do metals form?	They lose electrons, forming positive ions.
44. What ions do non-metals form?	They gain electrons, forming negative ions.
45. Name 4 physical properties of metals	They conduct thermal energy and electricity, they are shiny, malleable and have a high melting point.
46. Where are non-metals found on the periodic table?	Towards the top right
47. In group 7 and group 0, describe the pattern in melting point as you go down the group.	As you go down group 7/0, the melting point increases.
48. Explain the pattern in melting point as you go down group 7 and 0.	Increases because the atoms get bigger in size so there are more intermolecular forces of attraction and more energy is needed to overcome the forces.
49. Describe the pattern in melting point as you go down group 1.	As you go down group 1, the melting point decreases.
50. Why are atoms in group 0 stable?	They have a full outer shell and are therefore completely inert (unreactive).

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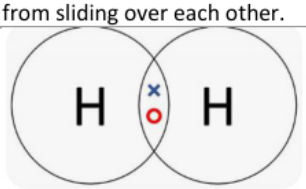
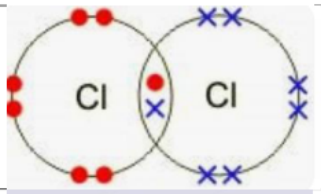
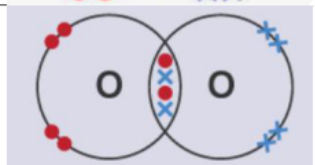
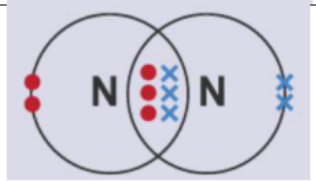
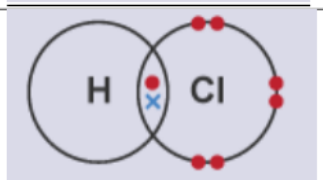
51. Describe the pattern in reactivity as you go down group 1.	As you go down group 1, the reactivity increases.
52. Explain the pattern in reactivity as you go down group 1.	Increases because the atoms get bigger and have more shells. This means the outer electron is further from the nucleus and is more shielded. There is a weaker attraction between the nucleus and outer electron so the **outer electron is more easily lost.**
53. What is the general equation for alkali metals reacting with water?	Alkali metal + water → alkali metal hydroxide + hydrogen
54. What is observed when lithium reacts with water?	Lithium doesn't melt, fizzing can be seen.
55. What is observed when sodium reacts with water?	Large amounts of heat are released causing sodium to melt. Hydrogen released catches fire and causes the ball of sodium to dash across the surface.
56. What is observed when potassium reacts with water?	Potassium melts into a shiny ball that dashes across the surface and hydrogen burns with a lilac coloured flame.
57. What happens when alkali metals react with oxygen?	They form metal oxides, producing a layer of dull oxide on the surface of the metal.
58. How is the reaction between alkali metals and oxygen prevented?	They are stored in oil to prevent them from reacting with oxygen in the air.
59. What happens when alkali metals react with chlorine?	They form chlorides which are all white crystalline solids that are soluble in water e.g. sodium + chlorine → sodium chloride.
60. Describe the pattern in reactivity as you go down group 7.	As you go down group 7, reactivity decreases.
61. Explain the pattern in reactivity as you go down group 7.	Decreases because the atoms get larger going down the group. This means that the outer shell gets further away from the nucleus and is shielded by more electron shells. The further the outer shell is from the positive attraction of the nucleus, the harder it is to attract another electron to complete the outer shell.
62. Why do the halogens often pair up together to form diatomic molecules e.g. Cl_2	Halogens have 7 electrons on their outer shell, they need one more electron to have a full outer shell. Because of this, each atom pairs up with another atom and shares an electron (covalent bond), forming a diatomic molecule.
63. What happens when halogens react with a different element (not itself?)	They gain an electron into their outer shell and become negative ions. When this happens, they are called halides. E.g. chlorine → chloride.
64. Name the physical properties of halogens.	Non-metals and do not conduct electricity. They are brittle and crumbly as solids. They are poisonous and smelly. As you move down the group, they become darker in colour.
65. At room temperature, what colour and state are fluorine, chlorine, bromine and iodine?	Fluorine is a yellow gas. Chlorine is a green gas. Bromine is a red-brown liquid. Iodine is a grey solid.
66. In solution, what colour is chlorine, bromine and iodine?	In solution, chlorine is pale green. Bromine is orange. Iodine is dark brown.
67. What would happen in this reaction: Flourine + Sodium Chloride → Sodium Flouride + Chlorine	Fluorine is the more reactive halogen, so will displace chlorine from the sodium chloride compound. The yellow colour of chlorine would be seen as it is a product.

ESSENTIAL KNOWLEDGE QUIZ / CHEMISTRY | BONDING

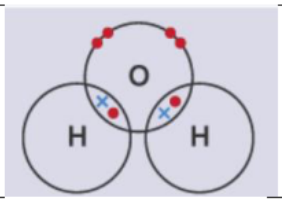
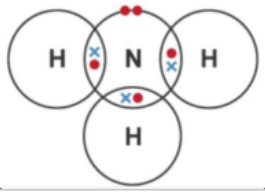
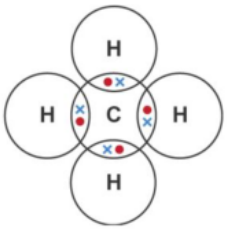
Bonding, structure and the properties of matter – Essential Knowledge Quiz

Question	Answer
1. What is an ion?	An atom that has become charged as it has gained or lost electrons
2. Which elements form ionic bonds?	Metals and non-metals
3. What are the charges do ions from groups 1 and 2 form?	Group 1 form 1+ ions, Groups 2 form 2+ ions
4. What are the charges for ions from group 6 and 7 form?	Group 6 form 2- ions, Group 7 form 1- ions
5. What is the name of the force that holds oppositely charged ions together?	Electrostatic forces
6. Describe the structure of a giant ionic lattice	Billions of alternating positive and negative ions held together by electrostatic forces of attraction acting in all directions
7. Why do ionic compounds have high melting points	Electrostatic forces of attraction between the ions is strong and requires lots of energy to break
8. Why don't ionic substances conduct electricity when a solid?	Ions are in a fixed position so cannot move, there are no delocalised electrons to carry the charge through the structure
9. Why do ionic substance conduct electricity when melted or dissolved in water	Ions are free to move and carry the charge through the structure
10. How are covalent bonds formed?	By atoms sharing electrons
Which type of atoms form covalent bonds between them	Non-metals
11. Describe the structure and bonding of a giant covalent structure	Billions of atoms bonded together by strong covalent bonds
12. Describe the structure and bonding in simple covalent molecules	Small numbers of atoms grouped together into molecules with strong covalent bonds between the atoms and weak intermolecular forces between the molecules
13. Why do giant covalent substances have high melting points?	It takes a lot of energy to break the strong covalent bonds between the atoms
14. Why do small covalent molecules have low melting points	Only a small amount of energy is needed to break the weak intermolecular forces between the molecules
15. Why do larger molecules have higher melting points than smaller molecules	The intermolecular forces are larger in large molecules
16. Why do most covalent structures do not conduct electricity	They do not have delocalised ions or electrons
17. What is a carbon allotrope?	The different physical forms that carbon can exist in.
18. Give 3 examples of carbon allotropes	Diamond, Graphite, Fullerenes
19. Describe the structure and bonding in graphite	Each carbon atom is bonded to 3 others, in hexagonal rings, arranged in layers, it has delocalised electrons and weak forces of attraction between the layers
20. Why is graphite soft?	Weak forces of attraction between the layers so they can slide over each other
21. Why can graphite conduct electricity?	Delocalised electrons can move through the structure
22. What is graphene?	A single layer of graphite
23. What is a fullerene?	Hollow cage of carbon atoms arranged as a sphere or tube
24. What was the first fullerene discovered?	Buckminster fullerene (C_{60}) that has a spherical shape
25. Give three properties of fullerenes	Lubricants, drug delivery (spheres) high tech electronics

Bonding, structure and the properties of matter – Essential Knowledge Quiz

26. What is a nano tube?	Hollow cylinder of carbon atoms
27. Describe the structure and bonding in diamond	Each carbon atom forms 4 covalent bonds with other caron atoms in a giant covalent structure
28. Give 3 properties of diamond	Very hard, very high melting point, and does not conduct electricity.
29. Describe the structure of a pure metal	Layers of positive metal ions surrounded by delocalized electrons
30. Describe the bonding in a pure metal	Strong electrostatic forces of attraction between metal ions and delocalised electrons
31. Name 4 properties of pure metals	Malleable, high melting points and boiling points, good conductor of electricity, good conductors of thermal energy
32. Explain why metals have high melting/boiling points	Lots of energy is needed to overcome the strong electrostatic attraction between the positive metal ions and delocalised electrons.
33. Why are metals good conductors of electricity	Delocalised electrons are free to move through the metal to carry the charge
34. Why are metals good conductors of thermal energy	Delocalised electrons are free to move through the metal and transfer the thermal energy
35. What is an alloy?	Mixture of a metal with atoms of another element
36. Explain why alloys are harder than pure metals	Different sized atoms disturb the layers , preventing them from sliding over each other.
37. Draw a dot and cross diagram for hydrogen	
38. Draw a dot and cross diagram for chlorine	
39. Draw a dot and cross diagram for oxygen	
40. Draw a dot and cross diagram for nitrogen	
41. Draw a dot and cross diagram for hydrogen chloride	

Bonding, structure and the properties of matter – Essential Knowledge Quiz

42. Draw a dot and cross diagram for water	
43. Draw a dot and cross diagram for ammonia	
44. Draw a dot and cross diagram for methane	

ESSENTIAL KNOWLEDGE QUIZ / CHEMISTRY | ATMOSPHERE AND CHEMICAL ANALYSIS (MIXED UNIT)

Mixed Environmental Unit– Essential Knowledge Quiz

Chemistry of the atmosphere:

Question	Answer
1. What is the atmosphere?	A layer of gases surrounding the Earth
2. What was the early atmosphere composed of ?	Mostly carbon dioxide
3. How did the oceans form?	Water vapor condensing as the Earth cooled
4. How did the amount of carbon dioxide in the atmosphere decrease to today's levels?	Dissolved in the oceans, photosynthesis, converted to fossil fuels, precipitated as metal carbonates
5. When did life start to appear?	2.7 billion years ago
6. What was the impact of plants on the atmosphere?	Oxygen levels increased due to photosynthesis
7. How has the amount of nitrogen in the atmosphere changed over time?	It has increased.
8. Why can scientists not be sure about the composition of the early atmosphere?	It was billions of years ago and the evidence is limited
9. What is the current composition of the atmosphere?	Approximately Nitrogen 80%, Oxygen 20% and trace amounts of Carbon dioxide, water vapour and Nobel gases
10. What is a greenhouse gas?	A gas that traps radiation from the sun
11. What type of radiation do green-house gases absorb	Longer wavelength infrared radiation
12. Name 3 greenhouse gases	Methane, carbon dioxide and water vapour
13. Give two ways human activities have increased atmospheric methane	Rice farming, cattle farming
14. What is global warming?	An increase in the overall global temperatures
15. What is climate change?	The change in the long term weather patterns across the planet
16. What are some of the possible side effects of climate change?	Polar ice caps melting, changes to rainfall, Sea levels rising, extreme weather events, changes to ecosystems and habitats
17. What is a carbon footprint?	The carbon footprint is the total amount of carbon dioxide and other greenhouse gases emitted over the full life cycle of a product, service or event.
18. How is carbon monoxide formed and what are the dangers associated with it?	Incomplete combustion. It is a colourless and odourless toxic gas
19. How are particulates formed and what are the dangers associated with it?	Incomplete combustion. Global dimming, respiratory problems, potential to cause cancer
20. How is sulfur dioxide formed and what are some of the dangers associated with it?	Sulfur impurities in fossil fuels react with oxygen during combustion. It can form acid rain and respiratory problems
21. How are oxides of nitrogen formed and what are some of the dangers associated with them?	Atmospheric oxygen and nitrogen react and in the heat of a combustion engine; acid rain respiratory problems
Energy sources	
22. What is a non-renewable energy resource	An energy resource that will eventually run out. It is not replaced at the same rate that it is being used
23. What is a renewable energy resource	An energy resource that will not run out, it is being replaced at the same rate as it is used
24. Name the 4 non-renewable resources	Coil, oil, gas, nuclear
25. Name the main renewable resources	Solar. Tidal, wind, geothermal, biofuel, hydroelectric
Chemical analysis	
26. In chemistry, what is a pure substance?	Something made of only one type of substance
27. What us the difference between the melting point and boiling points of a pure and impure substance	Pure – one specific temperature Impure- occurs across a range of temperatures
28. What is a formulation?	A mixture designed for a specific purpose

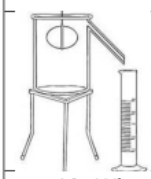
ESSENTIAL KNOWLEDGE QUIZ / CHEMISTRY | ATMOSPHERE AND CHEMICAL ANALYSIS (MIXED UNIT) (continued)

Mixed Environmental Unit– Essential Knowledge Quiz

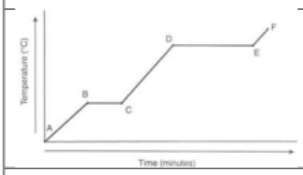
29. Name some examples of formulations	Fuels, cleaning agents, paints, medicines, alloys, fertilizers, foods
30. What is chromatography?	A process for separating coloured mixtures
31. How is Rf calculated?	Rf= distance moved by the substance/ distance moved by the solvent
32. What is the test for hydrogen?	A lit splint gives a squeaky pop
33. What is the test for oxygen?	A glowing splint re-lights
34. What is the test for carbon dioxide?	Turns limewater milky if bubbled through it
35. What is the test for chlorine?	Bleaches damp litmus paper

ESSENTIAL KNOWLEDGE QUIZ / PHYSICS | PARTICLE MODEL OF MATTER

The Particle model – Essential Knowledge Quiz

Question	Answer
1. Describe the arrangement and movement of particles in a solid	Arrangement: Particles touching, in a fixed position, held together by strong forces of attraction. Movement: vibrate around a fixed position
2. State 3 Properties of solids	High density, fixed volume, fixed shape
3. Describe the arrangement and movement of particles in a liquid	Arrangement: Particles are touching, forces of attraction are weaker than in a solid Movement: free to move randomly around each other
4. State 3 properties of liquids	Lower density, fixed volume, they can flow
5. Describe the arrangement and movement of particles in a gas	Arrangement: Particles are spread out, very weak forces of attraction between the particles Movement: move randomly at high speeds
6. State 3 properties of gases	low density, no fixed volume or shape, can be compressed, can flow
7. Why are changes of state physical changes	No new substances are produced, and the substance will have the same properties as before if the change is reversed.
8. What is the equation for calculating density?	Density kg/m^3 = mass kg ÷volume m^3
 9. What is a Eureka can?	A piece of equipment used to measure the volume of an irregularly shaped object. Fill with water just below the spout. Place the object in and measure the volume displaced.
10. What happens to the particles in a substance if its temperature is increased?	They move faster and the energy in their kinetic store increases
11. What is the internal energy of a substance?	The total kinetic and potential energy of all the particles in the substance
12. What is the name given to the energy transferred when a substance changes state?	Latent heat
13. What is the specific latent heat of a substance?	The energy needed to change the state of one kilogram of that substance with no temperature change
14. What is the specific latent heat of fusion of a substance	The energy required to change one kilogram of a substance from solid to a liquid at its melting point, without changing its temperature

The Particle model – Essential Knowledge Quiz

15. What is the specific latent heat of vaporisation of a substance?	The energy required to change one kilogram of a substance from liquid to gas at its boiling point without changing its temperature
 16. What do the flat sections of this graph represent?	Where a substance is changing state B-C melting/freezing D-E Evaporation/condensing
17. What is the equation to calculate the thermal energy needed for a change in state?	Energy (J) = mass(kg) x specific latent heat(J/kg)
18. What causes the pressure of gas on a surface?	The force of particles hitting the surface
19. Explain why the pressure of a gas in a sealed container increases.	Molecules move faster so the hit the surface with more force and the number of collisions per second increases, so the total force of the collisions increases