

B1: Cell biology and transport

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions	Answers
1 What are two types of eukaryotic cell?	animal and plant
2 What type of cell are bacteria?	prokaryotic
3 Where is DNA found in animal and plant cells?	in the nucleus
4 What is the function of the cell membrane?	controls movement of substances in and out of the cell
5 What is the function of mitochondria?	site of respiration to transfer energy for the cell
6 What is the function of chloroplasts?	contain chlorophyll to absorb light energy for photosynthesis
7 What is the function of ribosomes?	enable production of proteins (protein synthesis)
8 What is the function of the cell wall?	strengthens and supports the cell
9 What is the structure of the main genetic material in a prokaryotic cell?	single loop of DNA
10 How are electron microscopes different to light microscopes?	electron microscopes use beams of electrons instead of light, cannot be used to view living samples, are much more expensive, and have a much higher magnification and resolution
11 What is the function of a red blood cell?	carries oxygen around the body
12 Give three adaptations of a red blood cell.	no nucleus, contains a red pigment called haemoglobin, and has a bi-concave disc shape
13 What is the function of a nerve cell?	carries electrical impulses around the body
14 Give two adaptations of a nerve cell.	branched endings, myelin sheath insulates the axon
15 What is the function of a sperm cell?	fertilises an ovum (egg)
16 Give two adaptations of a sperm cell.	tail, contains lots of mitochondria
17 What is the function of a palisade cell?	carries out photosynthesis in a leaf
18 Give two adaptations of a palisade cell.	lots of chloroplasts, located at the top surface of the leaf
19 What is the function of a root hair cell?	absorbs minerals and water from the soil
20 Give two adaptations of a root hair cell.	long projection, lots of mitochondria

21 What is diffusion?	net movement of particles from an area of high concentration to an area of low concentration along a concentration gradient – this is a passive process (does not require energy from respiration)
22 Name three factors that affect the rate of diffusion.	concentration gradient, temperature, membrane surface area
23 How are villi adapted for exchanging substances?	<ul style="list-style-type: none"> long and thin – increases surface area one-cell-thick membrane – short diffusion pathway good blood supply – maintains a steep concentration gradient
24 How are the lungs adapted for efficient gas exchange?	<ul style="list-style-type: none"> alveoli – large surface area moist membranes – increases rate of diffusion one-cell-thick membranes – short diffusion pathway good blood supply – maintains a steep concentration gradient
25 How are fish gills adapted for efficient gas exchange?	<ul style="list-style-type: none"> large surface area for gases to diffuse across thin layer of cells – short diffusion pathway good blood supply – maintains a steep concentration gradient
26 What is osmosis?	diffusion of water from a dilute solution to a concentrated solution through a partially permeable membrane
27 Give one example of osmosis in a plant.	water moves from the soil into the root hair cell
28 What is active transport?	movement of particles against a concentration gradient – from a dilute solution to a more concentrated solution – using energy from respiration
29 Why is active transport needed in plant roots?	concentration of mineral ions in the soil is lower than inside the root hair cells – the mineral ions must move against the concentration gradient to enter the root hair cells
30 What is the purpose of active transport in the small intestine?	sugars can be absorbed when the concentration of sugar in the small intestine is lower than the concentration of sugar in the blood

B1: Cell division

Retrieval questions

Learn the answers to the questions below, then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1	What is a stem cell?	undifferentiated cell that can differentiate into one or more specialised cell types
2	What are adult stem cells?	stem cells from adults that can only differentiate into certain specialised cells
3	Where can adult stem cells be found?	bone marrow
4	What are embryonic stem cells?	stem cells from embryos that can differentiate into any specialised cell
5	Where are embryonic stem cells found?	early human embryos (usually from spare embryos from fertility clinics)
6	What is therapeutic cloning?	patient's cells are used to create an early embryo clone of themselves – stem cells from the embryo can then be used to treat the patient's medical conditions
7	Give one advantage of using therapeutic cloning.	stem cells from the embryo are not rejected when transplanted because they have the same genes as the patient
8	Give one advantage of using adult stem cells.	fewer ethical issues as obtained from adults who can consent to their use
9	Give two disadvantages of using adult stem cells.	<ul style="list-style-type: none"> can take a long time for a suitable donor to be found can only differentiate into some specialised cell types, so treat fewer diseases
10	Give two advantages of using embryonic stem cells.	<ul style="list-style-type: none"> can differentiate into any specialised cell, so can be used to treat many diseases easier to obtain as they are found in spare embryos from fertility clinics
11	Give two disadvantages of using embryonic stem cells.	<ul style="list-style-type: none"> ethical issues surrounding their use, as every embryo is a potential life potential risks involved with treatments, such as transfer of viral infections
12	What are plant meristems?	area where rapid cell division occurs in the tips of roots and shoots
13	Give two advantages of using plant meristems to clone plants.	<ul style="list-style-type: none"> rare species can be cloned to protect them from extinction plants with special features (e.g., disease resistance) can be cloned to produce many copies
14	Give one disadvantage of using plant meristems to clone plants.	no genetic variation, so, for example, an entire cloned crop could be destroyed by a disease
15	What is cell division by mitosis?	body cells divide to form two identical daughter cells
16	What is the purpose of mitosis?	growth and repair of cells, asexual reproduction

17	What happens during the first stage of the cell cycle?	cell grows bigger, chromosomes duplicate, number of subcellular structures (e.g., ribosomes and mitochondria) increases
18	What happens during mitosis?	one set of chromosomes is pulled to each end of the cell and the nucleus divides
19	What happens during the third stage of the cell cycle?	the cytoplasm and cell membrane divide, forming two identical daughter cells
20	What is the term for cell division in bacteria?	Binary fission

B2: Organisation and digestive system

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1	Name the five levels of organisation.	Put paper here	cells → tissues → organs → organ systems → organisms
2	What is a tissue?	Put paper here	group of cells with similar structures and functions
3	What is an organ?	Put paper here	group of tissues working together to perform a specific function
4	What is the function of the liver in digestion?	Put paper here	produces bile, which neutralises hydrochloric acid from the stomach and emulsifies fat to form small droplets with a large surface area
5	What is the function of saliva in digestion?	Put paper here	lubrication to help swallowing – contains amylase to break down starch
6	Name three enzymes produced in the pancreas.	Put paper here	amylase, protease, lipase
7	What are enzymes?	Put paper here	protein molecules that catalyse specific reactions in organisms
8	Why are enzymes described as specific?	Put paper here	each enzyme only catalyses a specific reaction, because the active site only fits together with certain substrates (like a lock and key)
9	Describe the function of amylase.	Put paper here	to break down starch into glucose
10	Where is amylase produced?	Put paper here	salivary glands, pancreas, and small intestine
11	Describe the function of proteases.	Put paper here	to break down proteins into amino acids
12	Where are proteases produced?	Put paper here	stomach, pancreas, and small intestine
13	Describe the function of lipases.	Put paper here	to break down lipids into fatty acids and glycerol
14	Where are lipases produced?	Put paper here	pancreas and small intestine
15	What are two factors that affect the rate of activity of an enzyme?	Put paper here	temperature and pH
16	What does denatured mean?	Put paper here	shape of an enzyme's active site is changed by high temperatures or an extreme pH, so it can no longer bind with the substrate
17	Describe the effect of temperature on enzyme activity.	Put paper here	as temperature increases, rate of reaction increases until it reaches the optimum for enzyme activity – above this temperature enzyme activity decreases and eventually stops
18	Describe the effect of pH on enzyme activity.	Put paper here	different enzymes have a different optimum pH at which their activity is greatest – a pH much lower or higher than this enzyme activity decreases and stops
19	Why do different digestive enzymes have different optimum pHs?	Put paper here	different parts of the digestive system have very different pHs – the stomach is strongly acidic, and the pH in the small intestine is close to neutral
20	What is an organ system?	Put paper here	a group of organs working together to perform a specific function

B2: Organising animals and plants

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions	Answers
1 Name the four main components of blood.	red blood cells, white blood cells, plasma, platelets
2 What is the function of platelets?	form blood clots – prevent the loss of blood and stop wounds becoming infected
3 Why is the human circulatory system a double circulatory system?	blood passes through the heart twice for every circuit around the body – deoxygenated blood is pumped from the right side of the heart to the lungs, and the oxygenated blood that returns is pumped from the left side of the heart to the body
4 How does the structure of an artery relate to its function?	carries blood away from the heart under high pressure – has a small lumen and thick, elasticated walls that can stretch
5 How does the structure of a vein relate to its function?	carries blood back to the heart at low pressure – doesn't need thick, elasticated walls, but has valves to prevent blood flowing the wrong way
6 How does the structure of a capillary relate to its function?	carries blood to cells and tissues – has a one-cell-thick wall to provide a short diffusion distance
7 List the structures air passes through when breathing in.	mouth/nose → trachea → bronchi → bronchioles → alveoli
8 What is the function of the red blood cells?	Bind to oxygen and transport it around the body
9 What is the function of the white blood cells?	Defend the body against pathogens
10 What is the function of the plasma?	Transports blood cells and substances around the body
11 Why is a leaf an organ?	there are many tissues inside the leaf that work together to perform photosynthesis
12 How is the upper epidermis adapted for its function?	<ul style="list-style-type: none"> • single layer of transparent cells allow light to pass through • cells secrete a waxy substance that makes leaves waterproof
13 How is the palisade mesophyll adapted for its function?	tightly packed cells with lots of chloroplasts to absorb as much light as possible for photosynthesis
14 How is the spongy mesophyll adapted for its function?	air spaces increase the surface area and allow gases to diffuse quickly
15 What is the function of the guard cells?	control the opening and closing of the stomata
16 What is the function of the xylem?	transport water and mineral ions from the roots to the rest of the plant
17 Give three adaptations of the xylem.	<ul style="list-style-type: none"> • made of dead cells • no end wall between cells • walls strengthened by a chemical called lignin to withstand the pressure of the water
18 What is the function of the phloem?	transport dissolved sugars from the leaves to the rest of the plant
19 What is the purpose of translocation?	transport dissolved sugars from the leaves to other parts of the plant for respiration, growth, and storage
20 Define the term transpiration.	movement of water from the roots to the leaves through the xylem
21 What is the purpose of transpiration?	<ul style="list-style-type: none"> • provide water to keep cells turgid • provide water to cells for photosynthesis • transport mineral ions to leaves
22 Name four factors that affect the rate of transpiration.	temperature, light intensity, humidity, and wind speed
23 What effect does temperature have on the rate of transpiration?	higher temperatures increase the rate of transpiration
24 What effect does humidity have on the rate of transpiration?	higher levels of humidity decrease the rate of transpiration
25 Why does increased light intensity increase the rate of transpiration?	stomata open wider to let more carbon dioxide into the leaf for photosynthesis
26 What is the function of the stomata?	allow diffusion of gases into and out of the plant
27 Where are most stomata found?	underside of leaves
28 What is the advantage to the plant of having a high number of stomata at this location?	reduces the amount of water loss through evaporation

B2: Non-communicable diseases

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1 What is coronary heart disease?

layers of fatty material that build up inside the coronary arteries, narrowing them – resulting in a lack of oxygen for the heart

2 What is a stent?

a device inserted into a blocked artery to keep it open, allowing more blood and oxygen to the heart

3 What are statins?

drugs that reduce blood cholesterol levels, slowing the rate of fatty material deposit

4 What is a faulty heart valve?

heart valve that doesn't open properly or leaks

5 How can a faulty heart valve be treated?

replace with a biological or mechanical valve

6 When do heart transplants take place?

in cases of heart failure

7 What are artificial hearts used for?

keep patients alive whilst waiting for a transplant, or allow the heart to rest for recovery

8 Define health.

state of physical and mental well-being

9 What factors can affect health?

disease, diet, stress, exercise, life situations

10 What is a risk factor?

aspect of lifestyle or substance in the body that can increase the risk of a disease developing

11 Give five risk factors.

poor diet, smoking, lack of exercise, alcohol, carcinogens

12 What is cancer?

a result of changes in cells that lead to uncontrolled growth and cell division by mitosis

13 What are malignant tumours?

cancerous tumours that can spread to neighbouring tissues and other parts of the body in the blood, forming secondary tumours

14 What are benign tumours?

non-cancerous tumours that do not spread in the body

15 What two types of risk factor affect the development of cancers?

lifestyle and genetic risk factors

16 What is a carcinogen?

a substance that can cause cancers to develop

B3: Communicable diseases

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1	What is a communicable disease?	a disease that can be transmitted from one organism to another
2	What is a pathogen?	a microorganism that causes disease
3	Name four types of pathogen.	bacteria, fungi, protists, viruses
4	How can pathogens spread?	air, water, direct contact
5	How do bacteria make you ill?	produce toxins that damage tissues
6	How do viruses make you ill?	reproduce rapidly inside cells, damaging or destroying them
7	Name three examples of viral diseases.	measles, HIV, tobacco mosaic virus
8	Name two examples of bacterial diseases.	<i>Salmonella</i> , gonorrhoea
9	Name four methods of controlling the spread of communicable disease.	good hygiene, isolating infected individuals, controlling vectors, vaccination
10	Describe an example of a protist disease.	malaria – caused by a protist pathogen that is spread from person to person by mosquito bites, and causes recurrent fevers
11	Describe an example of a fungal disease in plants.	rose black spot – spread by water and wind, and affects plant growth by reducing a plant's ability to photosynthesise
12	How can the cause of a plant disease be identified?	gardening manuals and websites, laboratory testing, monoclonal antibody kits
13	What are three mechanical defences that protect plants?	thorns and hairs, leaves that droop or curl, mimicry to trick animals
14	Give three physical defences of plants.	cellulose cell walls, tough waxy cuticles, bark on trees
15	How can aphids be controlled by gardeners?	introduce ladybirds to eat the aphids
16	How can plant diseases be detected?	areas of decay, discolouration, growths, malformed stems or leaves, presence of pests, spots on leaves, and stunted growth

B3: Preventing and treating disease

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

B6 questions

Answers

1 What non-specific systems does the body use to prevent pathogens getting into it?

- skin
- cilia and mucus in the nose, trachea, and bronchi
- stomach acid

2 What three functions do white blood cells have?

phagocytosis, producing antibodies, producing antitoxins

3 What happens during phagocytosis?

phagocyte is attracted to the area of infection, engulfs a pathogen, and releases enzymes to digest the pathogen

4 What are antigens?

proteins on the surface of a pathogen

5 Why are antibodies a specific defence?

antibodies have to be the right shape for a pathogen's unique antigens, so they target a specific pathogen

6 What is the function of an antitoxin?

neutralise toxins produced by pathogens by binding to them

7 What does a vaccine contain?

small quantities of a dead or inactive form of a pathogen

8 How does vaccination protect against a specific pathogen?

vaccination stimulates the body to produce antibodies against a specific pathogen – if the same pathogen reenters the body, white blood cells rapidly produce the correct antibodies

9 What is herd immunity?

when most of a population is vaccinated against a disease, meaning it is less likely to spread

10 What is an antibiotic?

a drug that kills bacteria but not viruses

11 What do painkillers do?

treat some symptoms of diseases and relieve pain

12 What properties of new drugs are clinical trials designed to test?

toxicity, efficacy, and optimum dose

13 What happens in the pre-clinical stage of a drug trial?

drug is tested on cells, tissues, and live animals

14 What is a placebo?

medicine with no effect that is given to patients instead of the real drug in a trial

15 What is a double-blind trial?

a trial where neither patients nor doctors know who receives the real drug and who receives the placebo

16 What is a monoclonal antibody?

A monoclonal antibody is an antibody produced by a single clone of cells.

17 Give two examples in which monoclonal antibodies can be used for.

Treating cancer, in pregnancy tests

B4: Photosynthesis

Retrieval questions

Learn the answers to the questions below, then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1	Where does photosynthesis occur?	Put paper here	chloroplasts in the leaves of a plant
2	What is the name of the green pigment in the leaves?	Put paper here	chlorophyll
3	What type of reaction is photosynthesis?	Put paper here	endothermic
4	What type of energy is used in photosynthesis?	Put paper here	light energy
5	Give the word equation for photosynthesis.	Put paper here	carbon dioxide + water → glucose + oxygen
6	Give the balanced symbol equation for photosynthesis.	Put paper here	$6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
7	Define the term limiting factor.	Put paper here	anything that limits the rate of a reaction when it is in short supply
8	Give the limiting factors of photosynthesis.	Put paper here	<ul style="list-style-type: none">• temperature• carbon dioxide concentration• light intensity• amount of chlorophyll
9	Describe how light intensity affects the rate of photosynthesis.	Put paper here	increasing light intensity increases the rate of photosynthesis until another factor becomes limiting
10	Describe how carbon dioxide concentration affects the rate of photosynthesis.	Put paper here	increasing carbon dioxide concentration increases the rate of photosynthesis until another factor becomes limiting
11	Describe how temperature affects the rate of photosynthesis.	Put paper here	increasing temperature increases the rate of photosynthesis as the reaction rate increases – at high temperatures enzymes are denatured so the rate of photosynthesis quickly decreases
12	Give the equation for the inverse square law for light intensity.	Put paper here	light intensity $\propto \frac{1}{\text{distance}^2}$
13	Why are limiting factors important in the economics of growing plants in greenhouses?	Put paper here	greenhouses need to produce the maximum rate of photosynthesis whilst making profit
14	How do plants use the glucose produced in photosynthesis?	Put paper here	<ul style="list-style-type: none">• respiration• convert it into insoluble starch for storage• produce fat or oil for storage• produce cellulose to strengthen cell walls• produce amino acids for protein synthesis

B4: Respiration

Retrieval questions

Learn the answers to the questions below, then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1 Define the term cellular respiration.

Put paper here
an exothermic reaction that occurs continuously in the mitochondria of living cells to release energy from glucose

2 What do organisms need energy for?

- Put paper here
- chemical reactions to build larger molecules
 - muscle contraction for movement
 - keeping warm

3 What is the difference between aerobic and anaerobic respiration?

Put paper here
aerobic respiration uses oxygen, anaerobic respiration does not

4 Write the word equation for aerobic respiration.

Put paper here
glucose + oxygen → carbon dioxide + water

5 Write the word equation for anaerobic respiration in muscles.

Put paper here
glucose → lactic acid

6 Write the balanced symbol equation for aerobic respiration.

Put paper here
 $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

7 Why does aerobic respiration release more energy per glucose molecule than anaerobic respiration?

Put paper here
oxidation of glucose is complete in aerobic respiration and incomplete in anaerobic respiration

8 What is anaerobic respiration in yeast cells called?

Put paper here
fermentation

9 Write the word equation for anaerobic respiration in plant and yeast cells.

Put paper here
glucose → ethanol + carbon dioxide

10 How does the body supply the muscles with more oxygenated blood during exercise?

Put paper here
heart rate, breathing rate, and breath volume increase

11 What substance builds up in the muscles during anaerobic respiration?

Put paper here
lactic acid

12 What happens to muscles during long periods of activity?

Put paper here
muscles become fatigued and stop contracting efficiently

13 What is oxygen debt?

Put paper here
amount of oxygen the body needs after exercise to react with the accumulated lactic acid and remove it from cells

14 How is lactic acid removed from the body?

Put paper here
lactic acid in muscles → blood transports to the liver → lactic acid converted back to glucose

15 What is metabolism?

Put paper here
sum of all the reactions in a cell or the body

C1: Atomic structure

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

Questions

Answers

1	What is an atom?	Put paper here	smallest part of an element that can exist
2	What is Dalton's model of the atom?	Put paper here	atoms as solid spheres that could not be divided into smaller parts
3	What is the plum pudding model of the atom?	Put paper here	sphere of positive charge with negative electrons embedded in it
4	What did scientists discover in the alpha scattering experiment?	Put paper here	some alpha particles were deflected by the gold foil – this showed that an atom's mass and positive charge must be concentrated in one small space (the nucleus)
5	Describe the nuclear model of the atom.	Put paper here	dense nucleus with electrons orbiting it
6	What did Niels Bohr discover?	Put paper here	electrons orbit in fixed energy levels (shells)
7	What did James Chadwick discover?	Put paper here	uncharged particle called the neutron
8	Where are protons and neutrons?	Put paper here	in the nucleus
9	What is the relative mass of each sub-atomic particle?	Put paper here	proton: 1, neutron: 1, electron: 0 (very small)
10	What is the relative charge of each sub-atomic particle?	Put paper here	proton: +1, neutron: 0, electron: -1
11	How can you find out the number of protons in an atom?	Put paper here	the atomic number on the Periodic Table
12	How can you calculate the number of neutrons in an atom?	Put paper here	mass number – atomic number
13	Why do atoms have no overall charge?	Put paper here	equal numbers of positive protons and negative electrons
14	How many electrons would you place in the first, second, and third shells?	Put paper here	up to 2 in the first shell and up to 8 in the second and third shells
15	What is an element?	Put paper here	substance made of one type of atom
16	What is a compound?	Put paper here	substance made of more than one type of atom chemically joined together
17	What is a mixture?	Put paper here	two or more substances not chemically combined
18	What are isotopes?	Put paper here	atoms of the same element (same number of protons) with different numbers of neutrons
19	What are the four physical processes that can be used to separate mixtures?	Put paper here	filtration, crystallisation, distillation, fractional distillation, chromatography
20	What is relative mass?	Put paper here	the average mass of all the atoms of an element

C2: The Periodic Table

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1	How is the modern Periodic Table ordered?	Put paper here	by atomic number
2	How were the early lists of elements ordered?	Put paper here	by atomic mass
3	Why did Mendeleev swap the order of some elements?	Put paper here	to group them by their chemical properties
4	Why did Mendeleev leave gaps in his Periodic Table?	Put paper here	leave room for elements that had not yet been discovered
5	Why do elements in a group have similar chemical properties?	Put paper here	have the same number of electrons in their outer shell
6	Where are metals and non-metals located on the Periodic Table?	Put paper here	metals to the left, non-metals to the right
7	What name is given to the Group 1 elements?	Put paper here	alkali metals
8	Why are the alkali metals named this?	Put paper here	they are metals that react with water to form an alkali metal + oxygen → metal oxide
9	Give the general equations for the reactions of alkali metals with oxygen, chlorine, and water.	Put paper here	metal + chlorine → metal chloride metal + water → metal hydroxide + hydrogen
10	How does the reactivity of the alkali metals change down the group?	Put paper here	increases (more reactive)
11	Why does the reactivity of the alkali metals increase down the group?	Put paper here	they are larger atoms, so the outermost electron is further from the nucleus, meaning there are weaker electrostatic forces of attraction and more shielding between the nucleus and outer electron, and it is easier to lose the electron
12	What name is given to the Group 7 elements?	Put paper here	halogens
13	Give the formulae of the first four halogens.	Put paper here	F ₂ , Cl ₂ , Br ₂ , I ₂
14	How do the melting points of the halogens change down the group?	Put paper here	increase (higher melting point)
15	How does the reactivity of the halogens change down the group?	Put paper here	decrease (less reactive)
16	Why does the reactivity of the halogens decrease down the group?	Put paper here	they are larger atoms, so the outermost shell is further from the nucleus, meaning there are weaker electrostatic forces of attraction and more shielding between the nucleus and outer shell, and it is harder to gain an electron
17	What is a displacement reaction?	Put paper here	when a more reactive element takes the place of a less reactive one in a compound
18	What name is given to the Group 0 elements?	Put paper here	noble gases
19	Why are the noble gases inert?	Put paper here	they have full outer shells so do not need to lose or gain electrons
20	How do the melting points of the noble gases change down the group?	Put paper here	increase (higher melting point)

C2: Bonding

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions	Answers
1 How are covalent bonds formed?	by atoms sharing electrons
2 Which type of atoms form covalent bonds between them?	non-metals
3 Describe the structure and bonding of a giant covalent substance.	billions of atoms bonded together by strong covalent bonds
4 Describe the structure and bonding of small molecules.	small numbers of atoms group together into molecules with strong covalent bonds between the atoms and weak intermolecular forces between the molecules
5 Describe the structure and bonding of polymers.	many identical molecules joined together by strong covalent bonds in a long chain, with weak intermolecular forces between the chains
6 Why do giant covalent substances have high melting points?	it takes a lot of energy to break the strong covalent bonds between the atoms
7 Why do small molecules have low melting points?	only a small amount of energy is needed to break the weak intermolecular forces
8 Why do large molecules have higher melting and boiling points than small molecules?	the intermolecular forces are stronger in large molecules
9 Why do most covalent substances not conduct electricity?	do not have delocalised electrons or ions
10 Describe the structure and bonding in graphite.	each carbon atom is bonded to three others in hexagonal rings arranged in layers – it has delocalised electrons and weak forces between the layers
11 Why can graphite conduct electricity?	the delocalised electrons can move through the graphite
12 Explain why graphite is soft.	layers are not bonded so can slide over each other
13 What is graphene?	one layer of graphite
14 Give two properties of graphene.	strong, conducts electricity
15 What is a fullerene?	hollow cage of carbon atoms arranged as a sphere or a tube
16 What is a nanotube?	hollow cylinder of carbon atoms
17 Give two properties of nanotubes.	high tensile strength, conduct electricity
18 Give three uses of fullerenes.	lubricants, drug delivery (spheres), high-tech electronics
19 What is an ion?	atom that has lost or gained electrons
20 Which kinds of elements form ionic bonds?	metals and non-metals
21 What charges do ions from Groups 1 and 2 form?	Group 1 forms 1+, Group 2 forms 2+
22 What charges do ions from Groups 6 and 7 form?	Group 6 forms 2-, Group 7 forms 1-
23 Name the force that holds oppositely charged ions together.	electrostatic force of attraction
24 Describe the structure of a giant ionic lattice.	regular structure of alternating positive and negative ions, held together by the electrostatic force of attraction
25 Why do ionic substances have high melting points?	electrostatic force of attraction between positive and negative ions is strong and requires lots of energy to break
26 Why don't ionic substances conduct electricity when solid?	ions are fixed in position so cannot move, and there are no delocalised electrons
27 When can ionic substances conduct electricity?	when melted or dissolved
28 Why do ionic substances conduct electricity when melted or dissolved?	ions are free to move and carry charge
29 Describe the structure of a pure metal.	layers of positive metal ions surrounded by delocalised electrons
30 Describe the bonding in a pure metal.	strong electrostatic forces of attraction between metal ions and delocalised electrons
31 What are four properties of pure metals?	malleable, high melting/boiling points, good conductors of electricity, good conductors of thermal energy
32 Explain why pure metals are malleable.	layers can slide over each other easily
33 Explain why metals have high melting and boiling points.	electrostatic force of attraction between positive metal ions and delocalised electrons is strong and requires a lot of energy to break
34 Why are metals good conductors of electricity and of thermal energy?	delocalised electrons are free to move through the metal
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 How big are nanoparticles?	1–100 nm
38 How are nanomaterials different from bulk materials?	nanomaterials have a much higher surface area-to-volume ratio
39 What is the relationship between side length and surface area-to-volume ratio?	as side length decreases by a factor of ten, the surface-area-to-volume ratio increases by a factor of ten
40 What are nanoparticles used for?	used in healthcare, electronics, cosmetics, and catalysts

C3: Calculations

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions	Answers
1 What is a mole?	mass of a substance that contains 6.02×10^{23} particles
2 Give the value for Avogadro's constant.	6.02×10^{23}
3 Which formula is used to calculate the number of moles from mass and M_r ?	$\text{moles} = \frac{\text{mass}}{M_r}$
4 Which formula is used to calculate the mass of a substance from number of moles and M_r ?	$\text{mass} = \text{moles} \times M_r$
5 What is a limiting reactant?	the reactant that is completely used up in a chemical reaction
6 What is a unit for concentration?	g/dm^3 or mol/dm^3
7 Which formula is used to calculate concentration from mass and volume?	$\text{concentration (g/dm}^3) = \frac{\text{mass (g)}}{\text{volume (dm}^3)}$
8 Which formula is used to calculate volume from concentration and mass?	$\text{volume (dm}^3) = \frac{\text{mass (g)}}{\text{concentration (g/dm}^3)}$
9 Which formula is used to calculate mass from concentration in g/dm^3 and volume?	$\text{mass (g)} = \text{concentration (g/dm}^3) \times \text{volume (dm}^3)$
10 How can you convert a volume reading in cm^3 to dm^3 ?	divide by 1000
11 If the amount of solute in a solution is increased, what happens to its concentration?	increases
12 If the volume of water in a solution is increased, what happens to its concentration?	decreases
13 What is the yield of a reaction?	mass of product obtained from the reaction
14 What is the theoretical yield of a reaction?	maximum mass of the product that could have been produced
15 Why is the actual yield always less than the theoretical yield?	<ul style="list-style-type: none"> reaction may be reversible some of the product can be lost on separation unexpected side reactions between reactants
16 What is the percentage yield?	actual yield as a proportion of theoretical yield
17 How is percentage yield calculated?	$\frac{\text{actual yield}}{\text{theoretical yield}} \times 100$
18 What is atom economy?	measure of how many atoms of the reactants end up as useful products
19 Why is a high atom economy desirable?	results in less waste/is more sustainable
20 How is percentage atom economy calculated?	$\frac{M_r \text{ of useful product}}{M_r \text{ of all products}} \times 100$

21 How can concentration in mol/dm^3 be calculated?	$\frac{\text{moles of solute}}{\text{volume (dm}^3)}$
22 What is a titration?	method used to calculate the concentration of an unknown solution
23 What is the end-point?	the point at which the reaction is complete (when the indicator changes colour) and no substance is in excess
24 How should solution be added from the burette close to the end point?	drop by drop, swirling in between
25 Why is a white tile used in titration?	to see the colour change better
26 What is a titre?	volume of solution added from the burette
27 What volume does one mole of any gas occupy at room temperature and pressure?	24 dm^3 or $24\,000 \text{ cm}^3$

C4: Chemical changes

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions	Answers
1 What does reactivity mean?	how vigorously a substance chemically reacts
2 How can metals be ordered by their reactivity?	by comparing their reactions with water, acid, or oxygen
3 What name is given to a list of metals ordered by their reactivity?	reactivity series
4 In terms of electrons, what makes some metals more reactive than others?	they lose their outer shell electron(s) more easily
5 Why are gold and silver found naturally as elements in the Earth's crust?	they are very unreactive
6 What is an ore?	rock containing enough of a metal compound to be economically worth extracting
7 How are metals less reactive than carbon extracted from their ores?	reduction with carbon
8 In terms of oxygen, what is oxidation?	addition of oxygen
9 In terms of oxygen, what is reduction?	removal of oxygen
10 Why can metals like potassium and aluminium not be extracted by reduction with carbon?	they are more reactive than carbon
11 How are metals more reactive than carbon extracted from their ores?	electrolysis
12 What is a displacement reaction?	a more reactive substance takes the place of a less reactive substance in a compound
13 What is an ionic equation?	equation which gives some substances as ions and has spectator ions removed
14 What type of substance is given as ions in an ionic equation?	ionic compounds in solution (or liquid)
15 What is a spectator ion?	ion that is unchanged in a reaction
16 What is a half equation?	equation that shows whether a substance is losing or gaining electrons
17 In terms of electrons, what is oxidation?	loss of electrons
18 In terms of electrons, what is reduction?	gain of electrons
19 In terms of pH, what is an acid?	a solution with a pH of less than 7
20 In terms of pH, what is a neutral solution?	a solution with a pH of 7
21 In terms of H ⁺ ions, what is an acid?	a substance that releases H ⁺ ions when dissolved in water
22 How is the amount of H ⁺ ions in a solution related to its pH?	the more H ⁺ ions, the lower the pH
23 What are the names and formulae of three main acids?	hydrochloric acid, HCl; sulfuric acid, H ₂ SO ₄ ; nitric acid, HNO ₃
24 How do you measure the pH of a substance?	universal indicator or pH probe
25 What is a strong acid?	an acid where the molecules or ions completely ionise in water
26 What is a weak acid?	an acid where the molecules or ions partially ionise in water
27 What is a salt?	compound formed when a metal ion takes the place of a hydrogen ion in an acid
28 Which type of salts do sulfuric acid, hydrochloric acid, and nitric acid form?	sulfates, chlorides, nitrates
29 What are the products of a reaction between a metal and an acid?	salt + hydrogen
30 What are the products of a reaction between a metal hydroxide and an acid?	salt + water
31 What are the products of a reaction between a metal oxide and an acid?	salt + water
32 What are the products of a reaction between a metal carbonate and an acid?	salt + water + carbon dioxide
33 What is a base?	substance that reacts with acids in neutralisation reactions
34 What is an alkali?	substance that dissolves in water to form a solution above pH 7
35 What is a neutralisation reaction?	a reaction between an acid and a base to produce water
36 What is the ionic equation for a reaction between an acid and an alkali?	H ⁺ (aq) + OH ⁻ (aq) → H ₂ O(l)
37 How can you obtain a solid salt from a solution?	crystallisation
38 When an acid reacts with a metal, which species is oxidised?	the metal
39 When an acid reacts with a metal, which species is reduced?	hydrogen
40 What are the four state symbols and what do they stand for?	(s) solid, (l) liquid, (g) gas, (aq) aqueous or dissolved in water

C4: Electrolysis

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1	What is electrolysis?	Put paper here	process of using electricity to extract elements from a compound
2	What is the name of the positive electrode?	Put paper here	anode
3	What is the name of the negative electrode?	Put paper here	cathode
4	What is an electrolyte?	Put paper here	liquid or solution that contains ions and so can conduct electricity
5	Where are metals formed?	Put paper here	cathode
6	Where are non-metals formed?	Put paper here	anode
7	How can ionic substances be electrolysed?	Put paper here	by melting or dissolving them, and then passing a direct current through them
8	Why can solid ionic substances not be electrolysed?	Put paper here	they do not conduct electricity, or the ions cannot move
9	In the electrolysis of solutions, when is the metal <i>not</i> produced at the cathode?	Put paper here	when the metal is more reactive than hydrogen
10	In the electrolysis of a metal halide solution, what is produced at the anode?	Put paper here	halogen
11	In the electrolysis of a metal sulfate solution, what is produced at the anode?	Put paper here	oxygen
12	What is the half equation for the ionisation of water?	Put paper here	$\text{H}_2\text{O}(\text{l}) \rightarrow \text{H}^+(\text{aq}) + \text{OH}^-(\text{aq})$
13	What metals are extracted from ionic compounds by using electrolysis?	Put paper here	metals that are more reactive than carbon
14	In the electrolysis of aluminium oxide, why is the aluminium oxide mixed with cryolite?	Put paper here	to lower the melting point
15	In the electrolysis of aluminium oxide, what are the anodes made of?	Put paper here	graphite
16	In the electrolysis of aluminium oxide, why do the anodes need to be replaced?	Put paper here	they react with the oxygen being formed

C5: Energy changes

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1	What is an exothermic energy transfer?	Put paper here	transfer to the surroundings
2	What is an endothermic energy transfer?	Put paper here	transfer from the surroundings
3	What is a reaction profile?	Put paper here	diagram showing how the energy changes in a reaction
4	What is the activation energy?	Put paper here	minimum amount of energy required before a collision will result in a reaction
5	What is bond energy?	Put paper here	the energy required to break a bond or the energy released when a bond is formed
6	In terms of bond breaking and making, what is an exothermic reaction?	Put paper here	less energy is required to break the bonds than is released when making the bonds
7	In terms of bond breaking and making, what is an endothermic reaction?	Put paper here	more energy is required to break the bonds than is released when making the bonds
8	How are chemical cells made?	Put paper here	connect two different metals (electrodes) in a solution (electrolyte)
9	What is a battery?	Put paper here	two or more chemical cells connected in series
10	How does the potential difference of a cell depend on the metals that the electrodes are made of?	Put paper here	the bigger the difference in reactivity, the greater the potential difference
11	How can some cells be recharged?	Put paper here	by applying an external current
12	Why can some cells not be recharged?	Put paper here	the reaction cannot be reversed
13	What is a fuel cell?	Put paper here	cell that uses a fuel and oxygen to generate electricity
14	In the hydrogen fuel cell, what is the overall reaction?	Put paper here	$2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{l})$
15	In the alkaline hydrogen fuel cells, what are the half equations?	Put paper here	$2\text{H}_2(\text{g}) + 4\text{OH}^-(\text{aq}) \rightarrow 4\text{H}_2\text{O}(\text{l}) + 4\text{e}^-$ $\text{O}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l}) + 4\text{e}^- \rightarrow 4\text{OH}^-(\text{aq})$
16	Give an advantage of the hydrogen fuel cell.	Put paper here	only product is water, do not need to be electrically recharged
17	Give a disadvantage of the hydrogen fuel cell.	Put paper here	hydrogen is flammable, difficult to store and is often produced from non-renewable sources

P1: Conservation and dissipation of energy

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1	Name the five energy stores	kinetic, gravitational potential, elastic potential, thermal, chemical
2	Name the four ways in which energy can be transferred.	heating, waves, electric current, mechanically (by forces)
3	What is a system?	an object or group of objects
4	What is a closed system?	a system where no energy can be transferred to or from the surroundings – the total energy in the system stays the same
5	What is work done?	energy transferred when a force moves an object
6	What is the unit for energy?	joules (J)
7	What is one joule of work?	the work done when a force of 1 N causes an object to move 1 m in the direction of the force
8	Describe the energy transfer when a moving car slows down.	energy is transferred mechanically from the kinetic store of the car to the thermal store of its brakes. Some energy is dissipated to the thermal store of the surroundings
9	Describe the energy transfer when an electric kettle is used to heat water.	the electric current in a kettle transfers energy to the heating element's thermal store – energy is then transferred by heating from the heating element's thermal store to the thermal store of the water
10	Describe the energy transfer when a ball is fired using an elastic band.	energy is transferred mechanically from the elastic store of the elastic band to the kinetic store of the ball – some energy is dissipated to the thermal store of the surroundings
11	Describe the energy transfer when a battery powered toy car is used.	energy is transferred electrically from the chemical store of the battery to the kinetic store of the toy car – some energy is dissipated to the thermal store of the surroundings
12	Describe the energy transfer when a falling apple hits the ground.	energy is transferred from the kinetic store of the apple and dissipated to the thermal store of the surroundings by sound waves
13	Name the unit that represents one joule transferred per second.	watt (W)
14	A motor is 30% efficient. What does that mean?	30% of the energy is usefully transferred and 70% is dissipated

P1: Energy resources

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1	What is a non-renewable energy resource?	Put paper here	will eventually run out, is not replaced at the same rate it is being used
2	What is a renewable energy resource?	Put paper here	will not run out, it is being (or can be) replaced at the same rate as which it is used
3	What are the main renewable and non-renewable resources available on Earth?	Put paper here	renewable: solar, tidal, wave, wind, geothermal, biofuel, hydroelectric non-renewable: coal, oil, gas, nuclear
4	What are the main advantages of using coal as an energy resource?	Put paper here	enough available to meet current demand, reliable, can control supply to match demand, cheap to extract and use
5	What are the main disadvantages of using coal as an energy resource?	Put paper here	will eventually run out, releases CO ₂ which contributes to climate change, releases sulfur dioxide which causes acid rain
6	What are the main advantages of using nuclear fuel as an energy resource?	Put paper here	lot of energy released from a small mass, reliable, can control supply to match demand, enough fuel available to meet current demand, no polluting gases
7	What are the main disadvantages of using nuclear fuel as an energy resource?	Put paper here	waste is dangerous and difficult and expensive to deal with, expensive initial set up, expensive to shut down and to run
8	What are the main advantages of using solar energy?	Put paper here	can be used in remote places, no polluting gases, no waste products, very low running cost
9	What are the main disadvantages of using solar energy?	Put paper here	unreliable, cannot control supply, initial set up expensive, cannot be used on a large scale
10	What are the main advantages of using tidal power?	Put paper here	no polluting gases, no waste products, reliable, can produce large amounts of electricity, low running cost, no fuel costs
11	What are the main disadvantages of using tidal power?	Put paper here	can harm marine habitats, initial set up expensive, cannot increase supply when needed, amount of energy varies on time of month, hazard for boats
12	What are the main advantages of using wave turbines?	Put paper here	no polluting gases produced, no waste products, low running cost, no fuel costs
13	What are the main disadvantages of using wave turbines?	Put paper here	unreliable, dependent on weather, cannot control supply, initial set up expensive, can harm marine habitats, hazard for boats, cannot be used on a large scale
14	What are the main disadvantages of using wind turbines?	Put paper here	unreliable, dependent on weather, cannot control supply, take up lot of space, can produce noise pollution
15	What are the advantages and the disadvantages of using geothermal energy?	Put paper here	advantages: no polluting gases, low running cost disadvantages: initial set up expensive, available in few locations
16	What are the main advantages and disadvantages of using biofuels?	Put paper here	advantages: can be 'carbon neutral', reliable disadvantages: expensive to produce, use land/water that might be needed to grow food
17	What are the main advantages and disadvantages of using hydroelectric power?	Put paper here	advantages: no polluting gases, no waste products, low running cost, no fuel cost, reliable, can be controlled to meet demand disadvantages: initial set up expensive, dams can harm/destroy marine habitats

P2: Electric circuits

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1	How does a material become charged?	Put paper here	becomes negatively charged by gaining electrons and becomes positively charged by losing electrons
2	What will two objects carrying the same type of charge do if they are brought close to each other?	Put paper here	repel each other
3	What is an electric field?	Put paper here	region of space around a charged object in which another charged object will experience an electrostatic force
4	What happens to the strength of an electric field as you get further from the charged object?	Put paper here	it decreases
5	What is electric current?	Put paper here	rate of flow of charge
6	What units are charge, current, and time measured in?	Put paper here	coulombs (C), amperes (A), seconds (s) respectively
7	What is the same at all points when charge flows in a closed loop?	Put paper here	current
8	What must there be in a closed circuit so that electrical charge can flow?	Put paper here	source of potential difference (p.d.)
9	Which two factors does current depend on and what are their units?	Put paper here	resistance in ohms (Ω), p.d. in volts (V)
10	What happens to the current if the resistance is increased but the p.d. stays the same?	Put paper here	current decreases
11	What is an ohmic conductor?	Put paper here	conductor where current is directly proportional to the voltage so resistance is constant (at constant temperature)
12	What happens to the resistance of a filament lamp as its temperature increases?	Put paper here	resistance increases
13	What happens to the resistance of a thermistor as its temperature increases?	Put paper here	resistance decreases
14	What happens to the resistance of a light-dependent resistor when light intensity increases?	Put paper here	resistance decreases
15	What are the main features of a series circuit?	Put paper here	same current through each component, total p.d. of power supply is shared between components, total resistance of all components is the sum of the resistance of each component
16	What are the main features of a parallel circuit?	Put paper here	p.d. across each branch is the same, total current through circuit is the sum of the currents in each branch – total resistance of all resistors is less than the resistance of the smallest individual resistor

P2: Electricity in the home

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1	Why is the current provided by a cell called a direct current (d.c.)?	Put paper here	only flows in one direction
2	What is an alternating current (a.c.)?	Put paper here	current that repeatedly reverses direction
3	What kind of current is supplied by mains electricity?	Put paper here	alternating current
4	What is the frequency and voltage of mains electricity?	Put paper here	50 Hz, 230 V
5	What colours are the live, neutral, and earth wires in a three-core cable?	Put paper here	live = brown, neutral = blue, earth = green and yellow stripes
6	What is the function of the live wire in a three-core cable?	Put paper here	carries the alternating potential difference from the supply
7	What is the function of the neutral wire in a three-core cable?	Put paper here	completes the circuit
8	What is the function of the earth wire in a three-core cable?	Put paper here	safety wire to stop the appliance becoming live
9	When is there a current in the earth wire?	Put paper here	when there is a fault
10	Why is the live wire dangerous?	Put paper here	provides a large p.d. that would cause a large current to flow through a person if they touched it
11	What is the National Grid?	Put paper here	nationwide network of cables and transformers that link power stations to customers
12	What are step-up transformers used for in the National Grid?	Put paper here	increase the p.d. from the power station to the transmission cables
13	What are step-down transformers used for in the National Grid?	Put paper here	decrease the p.d. from the transmission cables to the mains supply in buildings so that it is safe to use
14	How does having a large potential difference in the transmission cables help to make the National Grid an efficient way to transfer energy?	Put paper here	large p.d. means a small current is needed to transfer the same amount of power, small current in the transmission cables means less electrical power is wasted due to heating
15	What two things does energy transfer to an appliance depend on?	Put paper here	power of appliance, time it is switched on for
16	What are the units for power, current, potential difference, and resistance?	Put paper here	watts (W), amps (A), volts (V), ohms (Ω)

P3: Molecules and matter

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1	Which two quantities do you need to measure to find the density of a solid or liquid?	Put paper here	mass and volume
2	What happens to the particles in a substance if its temperature is increased?	Put paper here	they move faster and the energy in their kinetic energy store increases
3	Why are changes of state physical changes?	Put paper here	no new substances are produced and the substance will have the same properties as before if the change is reversed
4	Why is the mass of a substance conserved when it changes state?	Put paper here	the number of particles does not change
5	What is the internal energy of a substance?	Put paper here	the total kinetic energy and potential energy of all the particles in the substance
6	Why does a graph showing the change in temperature as a substance cools have a flat section when the substance is changing state?	Put paper here	the energy transferred during a change in state causes a change in the internal energy of the substance
7	What is the name given to the energy transferred when a substance changes state?	Put paper here	latent heat
8	What is the specific latent heat of a substance?	Put paper here	the energy required to change the state of one kilogram of that substance with no change in temperature
9	What is the specific latent heat of fusion a substance?	Put paper here	the energy required to change one kilogram of the substance from solid to liquid at its melting point, without changing its temperature
10	What is the specific latent heat of vaporisation of a substance?	Put paper here	the energy required to change one kilogram of the substance from liquid to vapour at its boiling point, without changing its temperature
11	On a graph of temperature against time for a substance being heated up or cooled down, what do the flat (horizontal) sections show?	Put paper here	the time when the substance is changing state and the temperature is not changing
12	What property of a gas is related to the average kinetic energy of its particles?	Put paper here	temperature
13	What causes the pressure of a gas on a surface?	Put paper here	the force of the gas particles hitting the surface
14	Give two reasons why the pressure of a gas in a sealed container increases if its temperature is increased.	Put paper here	the molecules move faster so they hit the surfaces with more force and the number of impacts per second increases, so the total force of the impacts increases
15	Give two reasons why the temperature of a gas increases if it is compressed quickly.	Put paper here	the force applied to compress the gas results in work being done to the gas, and the energy gained by the gas is not transferred quickly enough to the surroundings
16	Explain why the pressure of a fixed mass of gas decreases if the volume is increased and kept at constant temperature.	Put paper here	the distance the particles travel between each impact with a wall of the container is greater, so the number of impacts per second decreases, so the total force of the impacts decreases

P4: Radioactivity

Retrieval questions

Learn the answers to the questions below then cover the answers column with a piece of paper and write as many as you can. Check and repeat.

questions

Answers

1	Describe the basic structure of an atom.	Put paper here	nucleus containing protons and neutrons, around which electrons orbit in fixed energy levels/shells
2	Describe the plum pudding model of the atom.	Put paper here	sphere of positive charge with negative electrons embedded in it
3	What charges do protons, neutrons, and electrons carry?	Put paper here	protons = positive, neutrons = no charge, electrons = negative
4	Why do atoms have no overall charge?	Put paper here	equal numbers of positive protons and negative electrons
5	What is the radius of an atom?	Put paper here	around 1×10^{-10} m
6	What is ionisation?	Put paper here	process which adds or removes electrons from an atom
7	What is the mass number of an element?	Put paper here	number of protons + number of neutrons
8	Which particle do atoms of the same element always have the same number of?	Put paper here	protons
9	What are isotopes?	Put paper here	atoms of the same element (same number of protons) with different numbers of neutrons
10	What were the two main conclusions from the alpha particle scattering experiment?	Put paper here	<ul style="list-style-type: none">most of the mass of an atom is concentrated in the nucleusnucleus is positively charged
11	What are the three types of nuclear radiation?	Put paper here	alpha, beta, and gamma
12	Which type of nuclear radiation is the most ionising?	Put paper here	alpha
13	What is the range in air of alpha, beta, and gamma radiation?	Put paper here	a few cm, 1 m, and unlimited, respectively
14	What are the equation symbols for alpha and beta particles?	Put paper here	${}^4_2\alpha$ and ${}^0_{-1}\beta$
15	What is meant by the half-life of a radioactive source?	Put paper here	time taken for half the unstable nuclei to decay or the time taken for the count rate to halve
16	What is radioactive contamination?	Put paper here	unwanted presence of substances containing radioactive atoms on or in other materials
17	Where does background radiation come from?	Put paper here	rocks, cosmic rays, fallout from nuclear weapons testing, nuclear accidents
18	Why are gamma-emitting sources used for medical tracers and imaging?	Put paper here	gamma rays pass through the body without causing much damage to cells
19	What is nuclear fusion?	Put paper here	when two light nuclei join to make a heavier one
20	How does nuclear fission occur?	Put paper here	an unstable nucleus absorbs a neutron, it splits into two smaller nuclei, and emits two or three neutrons plus gamma rays