Cell Structures

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How is the **magnification** of a light microscope calculated?

1

Cell Structures

Total **magnification** is calculated by multiplying the magnification of the eyepiece lens by the magnification of the objective lens.

1

What Happens in Cells

Collins GCSE OCR Revision • Combined Science

What term is used to describe the shape of a **DNA** molecule?

2

What Happens in Cells

A **DNA** molecule forms the shape of a **double helix**.

2

Respiration

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What is the word equation for **aerobic respiration**?

3

Respiration

glucose + oxygen ⟶ carbon dioxide + water (+ energy released)

3

Photosynthesis

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What are the products of **photosynthesis**?

4

Photosynthesis

The products of **photosynthesis** are glucose and oxygen.

4

Supplying the Cell

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What is the process by which water molecules move across a partially permeable membrane from a dilute solution to a more concentrated one?

5

Supplying the Cell

Osmosis is the movement of water molecules from a dilute to a more concentrated solution across a partially permeable membrane.

5

The Challenges of Size

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Exchange surfaces allow efficient transport of materials. What are the three main features of an efficient exchange system?

6

The Challenges of Size

An efficient exchange system should have: (1) a large surface-area-to-volume ratio; (2) thin membranes so the diffusion distance is short; (3) a good supply of transport medium (e.g. blood, air, etc.).

6

The Heart and Blood Cells

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What are the three types of blood vessel?

7

The Heart and Blood Cells

The three types of blood vessel are **arteries**, **capillaries** and **veins**.

7

Plants, Water and Minerals

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What is **translocation**?

8

Plants, Water and Minerals

Translocation is the movement of glucose from the leaf (where it is produced) to other parts of the plant (where it is needed) via the phloem.

8

Coordination and Control

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The **nervous system** is composed of two parts. What are they?

9

Coordination and Control

The nervous system is composed of the **central nervous system** (the brain and the spinal cord) and the **peripheral nervous system** (all the other nerve cells that connect to the central nervous system).

9

The Endocrine System

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Hormones are chemical messengers produced by **glands**. How do they reach their target organ?

10

The Endocrine System

Hormones are released directly into the blood, which transports them to their target organ.

10

Hormones and Their Uses

What two hormones are combined in most contraceptive pills?

11

Hormones and Their Uses

Most contraceptive pills contain oestrogen and progesterone.

11

Maintaining Internal Environments

What triggers the **pancreas** to produce **insulin**?

12

Maintaining Internal Environments

High blood sugar levels cause the **pancreas** to produce **insulin**.

12

Recycling

Photosynthesis removes carbon dioxide from the atmosphere. What two processes release carbon dioxide to the atmosphere?

13

Recycling

Respiration (animal, plant and microbial) and combustion release carbon dioxide to the atmosphere.

13

Interdependence

What is the name of the relationship between two organisms where both depend on each other and both benefit?

14

Interdependence

Mutualism. In a mutualistic relationship, both organisms depend on each other and both benefit.

14

Genes

The **allele** for brown eyes is **dominant** to the allele for blue eyes. What will be the **phenotype** of a person who is **heterozygous** for eye colour?

15

Genes

The person will have brown eyes.

15

Genetics and Reproduction

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What type of cell division produces **gametes**?

16

Genetics and Reproduction

Meiosis produces **gametes**.

16

Natural Selection and Evolution

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For evolution to occur, there must be genetic variation in a population. How might genetic variation arise?

17

Natural Selection and Evolution

Variation can arise through **mutations** in genes.

17

Monitoring and Maintaining the Environment

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What piece of equipment is used to sample the number of plant species in a field?

18

Monitoring and Maintaining the Environment

A quadrat is used to sample the number of plant species in a field.

18

Investigations

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In an investigation, how would you make sure your measurements are **reliable** and identify any that might be **anomalous**?

19

Investigations

All measurements should be repeated. If a single reading is very different to the others (**anomalous**), this might indicate that an error has been made in measuring.

19

Feeding the Human Race

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How is **selective breeding** different from **genetic engineering**?

20

Feeding the Human Race

Selective breeding is the traditional, natural process of breeding plants and animals with certain, desirable genetic features. **Genetic engineering** is a modern, faster way of bringing about changes in organisms. It is the artificial process of transplanting genes for a desired characteristic into an organism.

20

Monitoring and Maintaining Health

Collins GCSE OCR Revision • Combined Science

What are the four main human defences to stop microorganisms entering the body?

21

Monitoring and Maintaining Health

Microorganisms are prevented from entering the body by the skin (a physical barrier), platelets that help the blood to clot and seal wounds, mucous in the lungs that traps microorganisms and acid in the stomach that destroys microorganisms.

21

Prevention and Treatment of Disease

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Why wouldn't you use **antibiotics** to treat a cold caused by a virus?

22

Prevention and Treatment of Disease

Antibiotics are used for bacterial infections. They have no effect on viruses, which are found inside the cell.

22

Non-Communicable Diseases

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What three options can be used to treat **cardiovascular disease**?

23

Non-Communicable Diseases

Cardiovascular disease can be treated with lifestyle changes (healthy eating and exercise, stopping smoking), surgery (heart transplants or **stents**) and medications (**statins** or aspirin).

23

Particle Model and Atomic Structure

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The following **symbols** describe two different **substances**. Deduce all the information you can from these **symbols**.

$^{13}_{6}C$ $^{12}_{6}C$

24

Particle Model and Atomic Structure

The **substances** are **isotopes** of the same **element**, carbon. The **atomic number** of carbon is 6 and the **mass numbers** of the **isotopes** are 13 and 12. An **atom** of carbon-13 contains 6 **protons** and 7 **neutrons**. An **atom** of carbon-12 contains 6 **protons** and 6 **neutrons**.

24

Purity and Separating Mixtures

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Explain how the three different types of **chromatography** can be used to **separate** a **mixture**.

25

Purity and Separating Mixtures

Chromatography separates mixtures using a **stationary phase** and a **mobile phase**. **Paper chromatography** is used to **separate mixtures** of coloured **dyes** in solution. **Thin layer chromatography** uses a thin layer of an **inert solid** as the **stationary phase**. **Gas chromatography separates mixtures** of gases by passing them through a solid **stationary phase**.

25

Bonding

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Describe the two main types of chemical **bond** that can form between two different **elements**.

26

Bonding

An **ionic bond** is formed when one or more **electrons** are **donated** from an **atom** of one **element** to an **atom** of another **element**, so both **atoms** have full **outer electron shells**. The **atoms** form electrically charged **ions**.

A **covalent bond** is formed when two **atoms share electrons** to complete the **outer electron shells** of both **atoms**.

26

Models of Bonding

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Explain the differences between **simple molecules**, **polymers** and **metals**, referring to how they are formed and the **bonding** that takes place.

27

Models of Bonding

Simple molecules are formed when two or more **atoms share electrons** and form **covalent bonds**.

Polymers are formed when **repeated units** of smaller **molecules bond covalently** to form a **long chain**.

Metal atoms have outermost **electrons** that can move freely from one **metal atom** to another. They are held together by strong **metallic bonds**.

27

Properties of Materials

Collins GCSE OCR Revision • Combined Science

Explain the difference between **intermolecular forces** and **intramolecular forces**.

28

Properties of Materials

Intermolecular forces are the forces between molecules.

Intramolecular forces are the forces between the **atoms** inside a **molecule**, such as **covalent bonds**.

28

Introducing Chemical Reactions

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Complete the table.

State of substance	State symbol
…	(s)
liquid	(…)
…	(g)
(…) dissolved in water	(…)

29

Introducing Chemical Reactions

State of substance	State symbol
solid	(s)
liquid	(l)
gas	(g)
(**aqueous**) dissolved in water	(aq)

29

Chemical Equations HT

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Simplify and balance the following **ionic equation**, which shows the reaction between copper sulfate and sodium hydroxide solutions to form solid copper hydroxide.

$Cu^{2+}(aq) + SO_4^{2-}(aq) + Na^+(aq) + OH^-(aq) \longrightarrow Cu(OH)_2(s) + Na^+(aq) + SO_4^{2-}(aq)$

30

Chemical Equations HT

$Cu^{2+}(aq) + 2OH^-(aq) \longrightarrow Cu(OH)_2(s)$

(The sodium and sulfate **ions** are **spectator ions** that do not change during the reaction, so they can be deleted from both sides.)

30

Moles and Mass HT

Which of the following sentences are true and which are false?

A. Two **moles** of calcium **atoms** contain a total of just over 12×10^{23} **atoms**.

B. Carbon has a lower **relative atomic mass** than calcium, so two **moles** of carbon atoms contain fewer than 12×10^{23} **atoms**.

31

Moles and Mass HT

A is true: one **mole** is 6.022×10^{23} **atoms**, so $2 \times 6.022 \times 10^{23} = 12.044 \times 10^{23}$ atoms

B is false: one **mole** of any **element** always contains 6.022×10^{23} **atoms**

31

Energetics

What is the **activation energy** of a reaction and why is it not the same as the total **energy given out** or **taken in** during the reaction?

32

Energetics

For most chemical reactions, energy is needed to **break chemical bonds** so the reaction can start. This is the **activation energy**. Any new bonds that form will cause some energy to be **given out**, so the **total energy** of the reaction is not the same as the **activation energy**.

32

Types of Chemical Reactions

Use these words to complete the sentences that follow. (You do not need to use all the words.)

separately oxygen together reduction gains

In **oxidation** reactions, a substance often … oxygen.

In … reactions, a substance often loses … .

These two types of reaction always occur … .

33

Types of Chemical Reactions

In **oxidation** reactions, a substance often **gains** oxygen.

In **reduction** reactions, a substance often loses **oxygen**.

These two types of reaction always occur **together**.

33

pH, Acids and Neutralisation HT

Explain the difference between a **strong acid** and a **weak acid**.

34

pH, Acids and Neutralisation HT

A **strong acid** easily forms H^+ **ions**, so the acids **fully ionise**.

A **weak acid** forms an **equilibrium** mixture, so that some of the **ions** formed can **recombine** into the original acid.

34

Electrolysis

Use these words to complete the sentences that follow.

positive negative anode dissociate electrolyte cathode

In **electrolysis**, the solution containing the **ionic compound** is called the … .

In solution, the **ions** in the compound … .

The negative electrode is the … and attracts … **ions**.

The positive electrode is the … and attracts … **ions**.

35

Electrolysis

In **electrolysis**, the solution containing the **ionic compound** is called the **electrolyte**.

In solution, the **ions** in the compound **dissociate**.

The negative electrode is the **cathode** and attracts **positive ions**.

The positive electrode is the **anode** and attracts **negative ions**.

35

Predicting Chemical Reactions

Explain the differences in **electron shells** between atoms of Group 1, Group 7 and Group 0 **elements** and suggest what happens to these **elements** in chemical reactions.

36

Predicting Chemical Reactions

Group 1 **elements** all have one **electron** in their **outer shell**. In a chemical reaction, they tend to **lose** this outer **electron** so that the 'new' **outer shell** is **complete**.

Group 7 **elements** all have seven **electrons** in their **outer shell**. They tend to **gain** one **electron** so the **outer shell** is **complete**.

Group 0 **elements** all have a **complete outer shell** of **electrons**. They are **unreactive**.

36

Controlling Chemical Reactions

A sample of solid calcium carbonate is divided precisely into two equal masses. One half is a **single solid piece**, which is then reacted with an acid. The other half is **broken into small pieces** and reacted with a fresh sample of the same acid. Which half will **react faster**, and why?

37

Controlling Chemical Reactions

The half that is broken into small pieces will **react** faster. This is because small pieces have a **large surface area** in relation to their **volume**. More **solid particles** are exposed to contact with **acid particles**, so there are more **collisions** and a faster **reaction**.

37

Catalysts and Activation Energy

What is a **catalyst**?

38

Catalysts and Activation Energy

A **catalyst** is a substance that **speeds up** the **rate** of a chemical reaction without being used up or changed in the reaction.

38

Equilibria HT

State **Le Chatelier's principle**.

39

Equilibria HT

Le Chatelier's principle: When the **conditions** of a system are **altered**, the **position** of the **equilibrium** changes to try and restore the **original conditions**.

39

Improving Processes and Products

How is carbon useful in the **extraction** of **metals**?

40

Improving Processes and Products

Most **metals** are found naturally as **minerals** (compounds). Carbon can **displace** less **reactive** metals from their mineral oxides. The carbon is heated with the metal oxide, and the pure metal is **extracted**.

40

Life Cycle Assessments and Recycling

Collins GCSE OCR Revision • Combined Science

According to a **life cycle assessment**, what are the four stages in the life of a product?

41

Life Cycle Assessments and Recycling

1 Obtaining **raw materials**.
2 **Manufacture** of the product.
3 **Use** of the product.
4 **Disposal** of the product when it is no longer useful.

41

Crude Oil

Collins GCSE OCR Revision • Combined Science

Describe the **conditions** needed for the reaction called **cracking**, and explain why this reaction is useful.

42

Crude Oil

Cracking requires a **catalyst**, **high temperature** and **high pressure**. **Cracking** breaks down some of the large molecules in **crude oil** to form smaller, more useful molecules.

42

Interpreting and Interacting with Earth's Systems

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Suggest **three** ways in which we could slow down **climate change**.

43

Interpreting and Interacting with Earth's Systems

Any **three** from:
Use less **fossil fuels**.
Develop and use **alternative energy sources**.
Improve **energy efficiency**/cut down on wasted energy.
Plant new forests that can change carbon dioxide into oxygen.
Reduce the amount of **waste** we produce, to cut down the amount of methane gas in the air.

43

Air Pollution and Potable Water

Collins GCSE OCR Revision • Combined Science

Why have many governments passed laws restricting the amounts of **particulates** that can be emitted?

44

Air Pollution and Potable Water

Particulates in the air can cause lung problems and **respiratory** diseases. They can coat buildings and trees. Laws to restrict their emissions aim to improve air quality.

44

Matter, Models and Density

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What is a typical size of an **atom**? Choose from the following.

10^{-15} m **10^{-12} m** **10^{-10} m**

45

Matter, Models and Density

The size of an **atom** is of the order of **10^{-10} m**.

45

Temperature and State

Collins GCSE OCR Revision • Combined Science

What is the difference between the **specific heat capacity** and the **specific latent heat** of a material?

46

Temperature and State

Specific heat capacity is the energy needed to raise the temperature of 1 kg of the material by 1 °C, with no change of state.

Specific latent heat is the energy needed to change the state of 1 kg of the material, with no change in temperature.

46

Journeys

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State the equation for calculating the **kinetic energy** of a moving object, and give the **unit** of each quantity.

47

Journeys

Kinetic energy $= 0.5 \times \text{mass} \times (\text{speed})^2$

Unit of kinetic energy: **joule** (J)

Unit of mass: **kilogram** (kg)

Unit of speed: **metres per second** (m/s)

47

Forces

Collins GCSE OCR Revision • Combined Science

Which equation is a statement of **Newton's second law**?

48

Forces

Force = mass × acceleration is a statement of **Newton's second law**.

48

Force, Energy and Power

Collins GCSE OCR Revision • Combined Science

What is meant by **work** in physics?

49

Force, Energy and Power

Work is done on an object when a **force** causes the object to move through a distance.

Work done = force × distance (along the line of action of the force)

The work done is equal to the **energy transferred**.

49

Changes of Shape

Collins GCSE OCR Revision • Combined Science

What is the difference between **elastic deformation** and **plastic deformation**?

50

Changes of Shape

Elastic deformation: forces make an object change shape, but it returns to its original shape when the forces are removed.

Plastic deformation: forces make an object change shape, and the object keeps its new shape when the forces are removed.

50

Electric Charge

How does **friction** cause objects to become charged?

51

Electric Charge

Friction transfers **electrons** between two objects that are rubbed together. This leaves one object with an excess of electrons (making it negatively charged) and the other object with a shortage of electrons (making it positively charged).

51

Circuits

What is the relationship between the **potential difference** across, the **current** through and the **resistance** of a component in a circuit?

52

Circuits

Potential difference = current × resistance

52

Resistors and Energy Transfers

State the equation for calculating the electrical **power** of a device in terms of its **resistance** and the **current** through it, and state the **unit** of power.

53

Resistors and Energy Transfers

Power = (current)^2 × resistance

The **unit** of power is the **watt**, W (equivalent to J/s).

53

Magnetic Fields and Motors

Describe the basic structure of an **electromagnet** and how it works.

54

Magnetic Fields and Motors

An **electromagnet** is a coil of wire of many turns wound on an **iron core**. When **current** is passed through the coil, a strong **magnetic field** is set up through the core and around the coil.

54

Wave Behaviour

What is a **wavelength** and what is its **unit**?

55

Wave Behaviour

A **wavelength** is the **distance** from one point on a wave to the equivalent point on the next wave. Its **unit** is **metre** (m).

55

Electromagnetic Radiation

List the types of radiation in the **electromagnetic spectrum**, in order of **increasing frequency**.

56

Electromagnetic Radiation

In order of **increasing frequency**:

radio waves, **microwaves**, **infrared** radiation, visible light, **ultraviolet** (UV) radiation, **X-rays**, **gamma rays**.

56

Nuclei of Atoms

Which type of **radioactive emission** is **least penetrating**, and why?

alpha **beta** **gamma**

57

Nuclei of Atoms

Alpha radiation is **least penetrating** because it loses its energy in the shortest distance, by strongly **ionising** the atoms of a material.

57

Half-Life

Define the **half-life** of a **radioactive** material, and explain why radioactive **decay** can be considered **random**.

58

Half-Life

The **half-life of** a **radioactive** material is the time taken for the number of undecayed nuclei in a sample of the material to reduce by half. The decay of a particular nucleus is unpredictable, so the decay is described as **random**.

58

Systems and Transfers

True or false?

If all of the electrical energy supplied to an efficient kettle is used to heat the water, this equation determines the change in temperature of the water.

potential difference × current × time = mass of water × specific heat capacity of water × change in temperature

59

Systems and Transfers

True.

The electrical energy supplied to the kettle is **potential difference × charge = potential difference × current × time**.

The rise in temperature of the water depends on the mass and the **specific heat capacity** of the water. The thermal energy change of water is **mass × specific heat capacity × change in temperature**.

59

Energy, Power and Efficiency

When a device **transfers energy**, some energy is wasted. How does the energy transfer obey the **law of conservation of energy**?

60

Energy, Power and Efficiency

Energy is said to be wasted when the useful output energy of a device is less than the input (supplied) energy. This does not contravene the **law of conservation of energy** because the 'wasted' energy is **dissipated** to the surroundings, raising the temperature.

60

Physics on the Road

Collins GCSE OCR Revision • Combined Science

What is a typical **speed** for a cyclist on a clear flat road? Choose from:

1 m/s **10 m/s** **100 m/s**

61

Physics on the Road

A typical **speed** for a cyclist on a clear flat road is **10 m/s**.

A person walking slowly would have a speed of about 1 m/s.

A plane, or an extremely fast train, might have a speed of 100 m/s.

61

Energy for the World

Collins GCSE OCR Revision • Combined Science

Give some types of **bio-fuel**, and explain whether bio-fuels are **renewable** or **non-renewable** energy resources.

62

Energy for the World

Types of **bio-fuel** include: wood; oils and 'bio-diesels' from crops such as rape and palm; also 'bio-ethanol' from crops such as sugar cane.

Bio-fuels are **renewable** energy resources, because we can plant more trees and crops.

62

Energy at Home

Collins GCSE OCR Revision • Combined Science

Why are **transformers** used in the **national grid**?

63

Energy at Home

Transformers are used in the **national grid** to increase (**step up**) the generated voltage to a high value for transmission around the country, because there is then less energy loss from the cables. Transformers are then used to reduce (**step down**) the voltage to a safer and more convenient voltage for the user.

63