

## Cell Structure

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What are the two main types of cell?

1

## Cell Structure

The two main types of cell are **prokaryotic** and **eukaryotic**.

1

## Investigating Cells

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How is **magnification** calculated?

2

## Investigating Cells

**Magnification** is the size of the image divided by the size of the real object.

2

## Cell Division

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What are **chromosomes** made of?

3

## Cell Division

Chromosomes are made of **DNA**.

3

## Transport In and Out of Cells

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Name the process by which water molecules move across a semi-permeable membrane from a dilute solution to a more concentrated one.

4

## Transport In and Out of Cells

**Osmosis** is the movement of water molecules to a more concentrated solution across a semi-permeable membrane.

4

## Levels of Organisation

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What is an **organ**?

5

## Levels of Organisation

An **organ** is a group of different **tissues** working together to perform a specific job.

5

## Digestion

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What are the three main types of digestive **enzymes**?

6

## Digestion

The three types of digestive enzymes are **protease**, **lipase** and **carbohydrase**.

6

## Blood and the Circulation

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What are the three different types of blood vessel?

7

## Blood and the Circulation

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

7

## Non-Communicable Diseases

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What two treatments can be used for **coronary heart disease**?

8

## Non-Communicable Diseases

**Coronary heart disease** can be treated with **stents** to keep coronary arteries open or **statins** to reduce cholesterol.

8

## Transport in Plants

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Name the process by which water evaporates through **stomata** in the leaves.

9

## Transport in Plants

The loss of water through **stomata** in the leaves is called **transpiration**.

9

## Pathogens and Disease

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What is the **vector** of malaria?

10

## Pathogens and Disease

A type of mosquito is the **vector** of malaria.

10

## Human Defences Against Disease

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How can a person be made **immune** to a specific disease?

11

## Human Defences Against Disease

A **vaccination** will make a person **immune** to the disease.

11

## Treating Diseases

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What is **MRSA**?

12

## Treating Diseases

**MRSA** is a strain of bacteria that is resistant to **antibiotics**.

12

## Photosynthesis

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What two products are produced when carbon dioxide and water combine in photosynthesis?

13

## Photosynthesis

Glucose and oxygen are produced by photosynthesis.

13

## Respiration and Exercise

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What is **anaerobic respiration** in yeast cells called?

14

## Respiration and Exercise

**Anaerobic respiration** in yeast cells is called **fermentation**.

14

## Homeostasis and the Nervous System

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What is the difference between **receptors** and **effectors**?

15

## Homeostasis and the Nervous System

**Receptors** are cells which detect stimuli, whereas **effectors** are parts of the body (e.g. muscles or glands) which produce responses to stimuli.

15

What are the chemical messengers produced by glands of the **endocrine system**?

16

**Hormones** are the chemical messengers produced by glands of the **endocrine system**.

16

What four **hormones** are involved in the **menstrual cycle**?

17

The four **hormones** that control the **menstrual cycle** are **follicle stimulating hormone (FSH)**, **oestrogen**, **luteinising hormone (LH)** and **progesterone**.

17

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

18

**Gametes** are formed by **meiosis**.

18

What word describes having two different **alleles** for a **gene**?

19

**Heterozygous** means having two different **alleles** for a **gene**.

19

What process is the gradual change in the inherited characteristics of a population over time?

20

**Evolution** is the gradual change in the inherited characteristics of a population over time.

20

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

21

**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.

21

What is the classification system called in which organisms are given a two-part name made up of their **genus + species**?

22

The **binomial system** names organisms by their **genus + species**.

22

What is a **population**?

23

A **population** is a group of individuals of one species living in a habitat.

23

What are the top consumers in a food chain called?

24

The top consumers in a food chain are **apex predators**.

24

Name two gases that contribute to **global warming**.

25

Carbon dioxide and methane both contribute to **global warming**.

25

Explain how **fractional distillation** can be used to **separate** a **mixture**.

26

**Fractional distillation** is used to **separate components** with different **boiling points** from a **mixture**. The **mixture** is heated gradually and each **component** is collected when it **boils**.

26

If an **element** has different **isotopes**, what does this mean?

27

Each **isotope** of an **element** has the same number of **protons** but a different number of **neutrons** in each **atom**.

27

What are the elements in these groups of the Periodic Table known as?

- a) **Group 0**
- b) **Group 1**
- c) **Group 7**

28

- a) **Group 0** – the noble gases
- b) **Group 1** – the alkali metals
- c) **Group 7** – the halogens

28

Complete the table.

State of substance	State symbol
<b>solid</b>	( ... )
...	(l)
...	(g)
( ... ) dissolved in water	( ... )

29

State of substance	State symbol
<b>solid</b>	(s)
<b>liquid</b>	(l)
<b>gas</b>	(g)
<b>(aqueous)</b> dissolved in water	(aq)

29

Describe what happens to a **metal atom** and a **non-metal atom** when an **ionic bond** forms between them.

30

The **metal atoms** lose **electrons** to become **positively charged ions**. The **electrons** are transferred to the **non-metal atoms**, which **gain electrons** to become **negatively charged ions**.

30

Describe what happens when one chlorine **atom** forms a **bond** with another chlorine **atom**.

31

An **electron** from each **atom** is **shared** so that each **atom** has a **complete outer shell** of **electrons**.

31

Explain why most **polymers** are **solid** at room temperature.

32

The **atoms** within **polymer molecules** are held together by strong **covalent bonds**. The **intermolecular forces** between the large **polymer molecules** are also quite **strong**.

32

Why do chemical **symbol equations** always need to be balanced?

33

**Mass** is **conserved**. In a chemical reaction, no **atoms** are **made** or **lost**.

33

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

- A. Three **moles** of potassium **atoms** contain a total of just over  $18 \times 10^{23}$  **atoms**
- B. Sodium has a lower **relative atomic mass** than potassium, so three **moles** of sodium atoms contain fewer than  $18 \times 10^{23}$  **atoms**

34

A is true: one **mole** is  $6.02 \times 10^{23}$  **atoms**, so  $3 \times 6.02 \times 10^{23} = 18.06 \times 10^{23}$  atoms

B is false: one **mole** of any **element** always contains  $6.02 \times 10^{23}$  **atoms**

34

Use these words to complete the sentences that follow. (Use each word once only.)  
**together loses gains**  
 In **oxidation** reactions, a substance often ... oxygen.  
 In **reduction** reactions, a substance often ... oxygen.  
**Oxidation** and **reduction** always occur ...

35

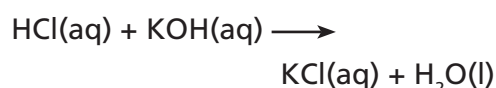
In **oxidation** reactions, a substance often **gains oxygen**.

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

**Oxidation** and **reduction** always occur **together**.

35

Why is the following reaction called a **neutralisation** reaction?



36

Hydrochloric **acid** (HCl) **neutralises** the **alkali** potassium hydroxide (KOH). The **solution** that remains has a **pH** of 7, meaning that it is **neutral**.

36

Explain why **electrolysis** is an expensive way of **extracting metals** from their **ores**.

37

**Electrolysis** requires a lot of **heat** and **electrical energy**.

37

What is the difference between **endothermic** and **exothermic** reactions?

38

**Endothermic** reactions **take in energy** from the surroundings and cause a **temperature drop**. **Exothermic** reactions **give out energy** to the surroundings and cause a **temperature rise**.

38

If a **reaction** is **endothermic**, what does this tell us about the **energy** needed to break and make **bonds** in the **reaction**?

39

An **endothermic reaction** takes in **energy** from the **surroundings**. This means that the **energy** needed to **break bonds** is greater than the **energy given out** by the making of bonds.

39

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?

40

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**.

40



Choose the correct phrase from this list to complete the sentence that follows.

**much less than**  
**exactly the same as**  
**much more than**

When a **reversible reaction** takes place in a **closed system**, an **equilibrium** is achieved when the rate of the **backward reaction** is ... the rate of the **forward reaction**.

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When a **reversible reaction** takes place in a **closed system**, an **equilibrium** is achieved when the rate of the **backward reaction** is **exactly the same as** the rate of the **forward reaction**.

41

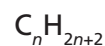
Choose the correct **general formula** for **alkanes** from the following list.

- $C_nH_{2n-2}$
- $C_{2n}H_n$
- $C_nH_{2n}$
- $C_nH_{2n+2}$

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42

What are the two main methods of **cracking** hydrocarbons?

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43

The two main methods of cracking hydrocarbons are **steam cracking** and **catalytic cracking**.

43

Complete the following table that describes tests for different gases.

Gas	Test for gas
...	Turns limewater cloudy
Hydrogen	...
Oxygen	...
...	Turns damp indicator paper white

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Gas	Test for gas
<b>Carbon dioxide</b>	Turns limewater cloudy
Hydrogen	<b>Burns with a squeaky pop</b>
Oxygen	<b>Relights a glowing splint</b>
<b>Chlorine</b>	Turns damp indicator paper white

44

Describe the effects that the evolution of **plants** had on the Earth's **atmosphere**.

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**Plants** use carbon dioxide and water to produce oxygen in the reaction called **photosynthesis**. As more plants evolved, the amount of oxygen in the **atmosphere** increased. Eventually the levels of oxygen were enough for land-based **animals** that breathed oxygen from the air to evolve.

45

What is the **carbon footprint**?

46

The **carbon footprint** of a product, service or event is the **total** amount of **carbon dioxide** and other **greenhouse gases** that are **emitted** over its **full life cycle**.

46

Why can't we release our **waste water** directly into the **environment**?

47

**Waste water** can contain **toxic chemicals**, harmful **microorganisms** and other **organic matter**. All these things can cause **pollution** and affect **plants** and **animals**, including humans.

47

What is the purpose of a **life cycle assessment**?

48

A **life cycle assessment** provides a way of comparing different products to see which cause **least damage** to the **environment**, over their whole lifetime.

48

A **force** is a **vector** quantity. What does this mean?

49

A **vector** quantity, such as force, has a **direction** as well as a **magnitude**.

49

Define the **spring constant** and write an equation for calculating it.

50

The **spring constant** is a measure of how easy it is to stretch or compress a spring.  

$$\text{spring constant} = \frac{\text{force}}{\text{extension}}$$

50

What is a typical **speed** for a person walking?

Choose from:

2.5 m/s    1.5 m/s    0.5 m/s

51

A typical **speed** for a person walking is **1.5 m/s**.

2.5 m/s would be running.

0.5 m/s would be very slow walking.

51

Which equation is used to summarise **Newton's Second Law**?

52

We can use this equation to summarise **Newton's Second Law**:

**force = mass × acceleration**

52

What can you say about the **forces** on an object that is falling at its **terminal velocity**?

53

The **resistive force** acting upwards equals the **weight** acting downwards. The forces are **balanced** and there is no **resultant force** on the object.

53

List factors that will **increase** the **braking distance** of a vehicle.

54

Factors that **increase** the **braking distance** include: higher vehicle speed; ice, snow or water on the road; poorly functioning brakes; worn tyres; incorrectly inflated tyres.

54

In the equation  $E_e = \frac{1}{2} ke^2$  for calculating the **elastic potential energy** stored in a stretched spring, what does  $k$  represent and what is its **unit**?

55

$k$  is the **spring constant** of the spring, which is a measure of its stiffness:

force applied to spring =  $k \times$  extension

The **unit** of  $k$  is N/m.

55

Complete this sentence correctly.

On a very cold day, a hut with thin metal walls will cool down very quickly because of the metal's ...

... **low thermal conductivity**  
... **high thermal conductivity**

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56

On a very cold day, a hut with thin metal walls will cool down very quickly because of the metal's **high thermal conductivity**.

The higher the thermal conductivity of a material, the higher the **rate of energy transfer** by **conduction** through the material.

56

What is the relationship between wave **speed**, wave **frequency** and **wavelength**?

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**wave speed = frequency × wavelength**

57

Light travels across a boundary from a material of high **refractive index** into air. Describe its change of direction.

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58

The light changes direction (is **refracted**) **away from the normal** (the perpendicular to the boundary) – unless the light is travelling perpendicular to the boundary, in which case it will continue straight.

58

Which type of electromagnetic radiation correctly fills the gap in these sentences?

In an **energy efficient** lamp, ..... waves are produced by the gas inside when an electric current passes. These waves are absorbed by the coating on the lamp, which then gives off **visible light**.

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**Ultraviolet (UV)**

59

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

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**Potential difference = current × resistance**

60

State the behaviour of an **LDR** in a circuit when the light intensity falling on it **decreases**.

61

An **LDR** is a light-dependent resistor. Its electrical **resistance increases** when the light intensity **decreases**.

61

State the equation for calculating the electrical **power**  $P$  of a device of resistance  $R$ , when the current through it is  $I$ , and state the **unit** of power.

62

Power  $P = I^2 R$   
The **unit** of power is the **watt**, W (equivalent to J/s).

62

State the colours of the wires in the cable of a domestic appliance: the **live** wire, the **neutral** wire and the **earth** wire.

63

**Live wire:** brown  
**Neutral wire:** blue  
**Earth wire:** green and yellow (stripes)

63

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,  $\Delta\theta$ .  $IVt = mc\Delta\theta$

64

True.  
The electrical energy supplied to the kettle is **power  $\times$  time =  $IVt$** .  
The rise in temperature of the water  $\Delta\theta$  depends on the mass  $m$  and the **specific heat capacity**  $c$  of the water. Energy change of water =  $mc\Delta\theta$ .

64

Which of these sentence endings makes the statement correct?  
A **magnetic material** brought close to a magnet ...  
... is always attracted to the N pole of the magnet.  
... is attracted to the nearest pole of the magnet.

65

A **magnetic material** brought close to a magnet is attracted to the **nearest pole** of the magnet.  
The strong **magnetic field** near **either** magnet pole makes the nearby magnetic material an **induced magnet** and this always causes attraction.

65

List the factors that affect the size of the force on a **current-carrying conductor** in a **magnetic field**.

66

The **magnetic flux density**, the size of the **current** and the length of the conductor that is in (and perpendicular to) the magnetic field.

66

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

67

**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.

67

Choose the correct word to complete this sentence.

**Isotopes** of an element contain the same number of ...  
... **neutrons** ... **protons**

68

**Isotopes** of an element contain the same number of **protons**.

They have **different** numbers of **neutrons**.

68

Complete the gaps in the sentences. Choose from:

**greater smaller**  
**more less**

**Beta radiation** has a ... **ionising power** than **alpha radiation** and so is ... **penetrating** and has a ... **range** in air.

A beta source a few metres away from you is therefore likely to be ... dangerous than an alpha source at that distance.

69

**Beta radiation** has a **smaller ionising power** than **alpha radiation** and so is **more penetrating** and has a **greater range** in air.

A beta source a few metres away from you is therefore likely to be **more** dangerous than an alpha source at that distance.

69

State **two** definitions of radioactive **half-life**.

70

1. The **half-life** is the (average) time taken for half of the radioactive nuclei in a sample to **decay**.
2. The **half-life** is the time taken for the **activity** (or count rate) of a radioactive sample to fall to half its original value.

70