Year 11 summary notes

**Biology**

**Year 11 revision:** When looking at the following questions tick answer you are 100% sure you know, cross answer you need to get help with, and put a question mark beside answer you are unsure about.

Make use of the **MY GCSE Science** website
Bitesize
S-cool
Any other websites you use

Check the specification; [http://filestore.aqa.org.uk/subjects/AQA-4405-W-SP-14.PDF](http://filestore.aqa.org.uk/subjects/AQA-4405-W-SP-14.PDF)
In the topics of cells can you??
1. Label a plant and animal cell, bacterial cell and yeast cell
2. Compare the above cells, similarities and differences
3. Know what an organelle is
4. Explain the job of the different parts of a cell
5. Learn the job of 2 new organelles, ribosome and mitochondria
6. Explain the term specialised cell
7. Explain how some cells are specialised (structures and the function of these structures for purpose)
8. Explain what a tissue is and give three examples (glandular, epithelial and muscle) and their jobs
9. Explain what an organ is (and explain how the stomach tissues that make up the organ enable it to do its job)
10. Explain the term diffusion and some factors that affect the speed of diffusion

Environment and sampling can you??
1. Suggest some factors that affect the distribution of organisms and explain why??
2. Explain how to randomly sample (quadrats) and systematically sample (transect)?

In the topics of enzymes can you??
1. Explain what enzymes are what they are made of, what they are sensitive to
2. Explain what the active site is and what a substrate is
3. Can you sketch a diagram for the lock and key model?
4. Suggest some of the jobs enzymes carry out in our bodies
5. Explain why enzymes are catalysts
6. Can you describe and explain the effect of temperature on rate of enzyme activity (sketch a graph too)
7. Can you explain how pH affects an enzymes activity and sketch a graph
8. Can you explain the term denaturing?
9. Can you name the key digestive enzymes, site of production, site of activity and products produced?
10. Could you write a detailed 5/6 mark answer to explain the complete digestion of fats, carbs and protein
11. Can you explain the role of bile, where it is produced and stored?
12. Could you label key organs in the digestive system?
13. Do you understand the term optimum conditions relating to enzymes?
14. Can you give as much detail as possible about the uses of enzymes in industry?
15. Can you give reasons for and against the use of enzyme sin industry?
16. Can you give some examples of uses of enzymes in medicine?
17. Give some examples of proteins in the body (beyond enzymes)

In the topic of respiration can you??
1. Explain aerobic and anaerobic
2. Write the equations for both aerobic and anaerobic respiration
3. Can you write the formula equations (C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O)
4. Explain where most steps of respiration occur and how the organelle is adapted for the process
5. Explain the purpose of respiration and name the storage sugar in the muscles and liver
6. Explain how the energy from respiration is used
7. Recognise that it is controlled by enzymes and thus is sensitive to temp and pH
8. Explain how the body changes during exercise (heart and lungs)
9. Explain why the heart and lungs change in the way they do
10. What characteristics would a fit person have compared to a less fit?
11. Can you compare and contrast aerobic and anaerobic respiration
12. What is oxygen debt?
13. Explain how the heart will change with exercise over a long period making it more efficient
14. Explain the term muscle fatigue
In the topic of speciation and fossils can you???
1. Explain what a fossil is
2. Explain how they provide evidence for evolution
3. Explain the limitations of the fossils as evidence for evolution
4. Explain how fossils are made
5. Give some reasons for extinction
6. Explain speciation
7. Define speciation
8. Define a species

In the topic of inheritance can you???
1. Explain mitosis and meiosis in 5 points each
2. Compare these two types of cell division
3. Explain the following terms, gene, DNA, chromosomes, allele, homozygous dominant, homozygous recessive, heterozygous, recessive, dominant, haploid, diploid, stem cell, gamete, mitosis, meiosis, clone, genotype, phenotype, pure breed, homologous chromosomes
4. Do you know the chromosomes for a male and female?
5. Explain how a gene controls the development of a protein
6. Do you know what polydactyly is and what allele causes it?
7. Do you know what causes cystic fibrosis and how it affects people?
8. Suggest some treatments for cystic fibrosis and reasons for them, why antibiotics are given and enzymes (problem with taking enzymes orally)
9. Do you know how many chromosomes a human has?
10. Where the chromosomes are found
11. How many pairs of chromosomes a human has
12. What is genetic fingerprint and how could you use one to match an unknown DNA sample with a known sample
13. What genetic screening may be used for
14. Give some positive and negative thoughts on genetic screening
15. Who was Mendel and what did he do and say
16. What are stem cells, how can they be used, pros and cons of using them
17. Explain why meiosis and mitosis are important
18. Can you show using a genetic cross how the inheritance of gender is 50% chance of boy or girl

In the topic of photosynthesis can you???
1. Write the word and symbol equation for photosynthesis
2. Name three limiting factors for the process
3. Explain the uses of the glucose produced by the plant
4. Explain how the cross section of the leaf is adapted for photosynthesis
5. Explain how the palisade cells are adapted for photosynthesis
6. Label the different parts of the cross section of the leaf
7. Give examples of plant tissues
8. Recall that plants respire all the time but only photosynthesis in the presence of light
9. Name the storage sugar in plants
10. Explain how the leaf as an organ can function effectively in photosynthesis
Most human and animal cells have the following parts:

A **nucleus**, which controls the activities of the cell  
**Cytoplasm**, in which most of the chemical reactions take place  
A **cell membrane**, which controls the passage of substances into and out of the cell  
**Mitochondria**, which are where most energy is released in respiration  
**Ribosomes**, which are where protein synthesis occurs.

Plant cells have these and also  
**Chloroplast**: which contain a green pigment Chlorophyll that absorbs light energy for photosynthesis  
**Cell wall**: made of cellulose which strengthens the cell (supports the cell)  
**A permanent vacuole**: This contains the cell sap

**Bacterial cells**: have a cell wall (though not made of cellulose), they do not have a nucleus but do have genetic material, they have a cytoplasm, cell membrane and contain smaller ribosomes (than plant or animal cells)

**Yeast cells**: have a nucleus, cytoplasm and membrane.

After fertilisation, an embryo forms through cell division (mitosis) and this contains stem cells (unspecialised/undifferentiated cells). Certain genes are switched on and cells will begin to specialise/differentiate, meaning that they take on unique shapes and characteristics to perform particular jobs.

**Sperm cells** are streamlined, have a tail to swim, the area around the tail is packed with mitochondria to release the energy for the tail to contract.  
**Red blood cells** have no nucleus so they can carry more oxygen  
**Root hair cells** have a large surface area to absorb more water  
**Palisade cells** are packed with chloroplasts

**Substances move in and out of cells by diffusion**

| Rate of diffusion | Net movement of molecules from a high concentration to a low concentration |

**Rate of diffusion** depends upon  
**Temperature**: higher temperature = more kinetic energy = faster diffusion  
**Concentration gradient** (difference between areas) = steeper = faster  
**Size of particles**: smaller = faster

Oxygen diffuses into cells from the blood because......  
Inside the cell oxygen is used in respiration and so is always at a low concentration compared to the blood (CO2 moves the opposite way as it is produced in respiration)

Carbon Dioxide diffuses into a leaf as it is used in the leaf for photosynthesis so is lower than the surrounding atmosphere

**Cells**: are the basic building blocks of life

**Tissues: groups of similar cells with similar structure and function:**  
Muscle cells → muscle tissue → contracts  
Glandular cells → glandular tissue → produce and secrete substances like hormones and enzymes  
Epithelial cells → epithelial tissue → covers parts of the body  
Palisade cells → palisade mesophyll → main site of photosynthesis  
Epidermal cells → epidermal tissue → cover the leaf  
Xylem and phloem tissue → transport water and sugar respectively

**Organs: made of different tissues working for a common purpose**  
Stomach: muscle tissue (churn food and digestive juices), glandular tissue (to produce digestive juices), epithelial tissue (to cover the inside and outside of the stomach)  
Leaf: mesophyll tissue where photosynthesis occurs, xylem and phloem for transport, epidermal tissue to cover the leaf
What are the main differences between a plant and animal cell?
Animal cell has no chloroplasts, cell wall or permanent vacuole

What are the main differences between an animal and bacterial cell?
Bacterial cell has no nucleus, no mitochondria, bacteria have a cell wall
Bacterial cells have a slime capsule (prevents them drying out), they have plasmids, that are circular pieces of DNA that usually carry genes for antibiotic resistance, they have flagella for movement.

What are the main differences between a plant and yeast cell?
Plant cell has a permanent vacuole, chloroplast. Yeast respire aerobically, using oxygen, but can respire anaerobically too, producing ethanol and CO2 (fermentation)

Tissues: a group of similar cells working together
Muscle tissue: a group of muscle cells. When these contract together they cause muscle to shorten and allow movement
Glandular tissue: group of cells that secrete substances like hormones and enzymes
Epithelial tissue: group of cells that form a covering for some parts of the body

Organelle C, looks like this close up

Organelle H, looks like this close up
Organ system: different organs working together. This division of labour improves efficiency.

The digestive system has a variety of organs doing different jobs

Organs for releasing digestive juices like........
1. Pancreas: releases digestive enzymes to the small intestine
2. Salivary glands: release s enzymes into the mouth
3. Liver: releases bile to neutralise stomach acid and help digest fat
4. Stomach: releases enzymes, acid

Organs for digestion like......
Stomach, mouth or small intestine. These all have glands to secrete enzymes, and these digestive secretions are mixed with the food by muscles or by the teeth

Organs for absorption of soluble products of digestion like......
The small intestine, with its folded wall and microvilli to give it a large surface area
The epithelial cells are thin so the nutrients only have a short distance to diffuse
There is muscle tissue to keep the food moving and to mix it
There are blood vessels to carry away the nutrients and keep a steep concentration gradient
The large intestine, where water is absorbed

Each organ has a different job, structure and is made up of different tissues, but they work together to ensure effective digestion of food

**Diffusion:** the net movement of molecules from a high concentration to a low concentration.

It is faster when the **temperature is high** and the **concentration gradient is steep** (like high oxygen in the alveoli and low oxygen in the blood), the **diffusion distance is short**, the **molecules are small**, the **surface area** across which diffusion occurs is **large**.
**Photosynthesis:** Carbon Dioxide + water → Oxygen + Glucose

\[ 6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow 6\text{O}_2 + \text{C}_6\text{H}_12\text{O}_6 \]

Photosynthesis occurs in chloroplasts
Light energy is absorbed by chlorophyll: used to convert carbon dioxide and water in to sugar
Water enters through the root hair cells
Carbon dioxide diffuses in through the stomata
Oxygen is released as a by-product and diffuses out of the leaf

Plants use oxygen for respiration.
In the day Rate of photosynthesis > rate of respiration, so there is a net production in oxygen
At night: there is no photosynthesis so only respiration occurs and oxygen levels decrease

**Limiting factors:** factors that affect the rate of photosynthesis. The key factors are
Light intensity (energy), Carbon Dioxide (raw material) concentration and Temperature (affects enzymes)
Carbon dioxide levels are so low in the atmosphere (0.04%) it is often a limiting factor
Light and temperature will vary with season, CO2 does not vary as greatly

[Graphs showing the relationship between rate of photosynthesis and light intensity, carbon dioxide concentration, and temperature]

Greenhouse, polytunnels and hydroponics are ways to grow plants and try to minimise effect of limiting factors. But raising temp, CO2 and light intensity costs money and so must be balanced against the profit form increased growth.

**Uses of glucose**
Respiration: to release energy
Cellulose: for cell walls
Starch: insoluble storage sugar
Fats and Oils: energy store
Amino Acids: glucose is combined with nitrates to make amino acid that can be made into proteins

Plants need minerals for growth
Nitrates \(\rightarrow\) to make amino acid for proteins \(\rightarrow\) lack of nitrate = stunted growth
Magnesium \(\rightarrow\) to make chlorophyll \(\rightarrow\) lack of magnesium = yellow leaves
The three limiting factors are: Carbon dioxide concentration, light intensity and temperature.

**The uses of glucose:**
- Used in respiration to release energy,
- Used to make starch an insoluble storage sugar,
- Used to make cellulose for the cell wall,
- Combined with nitrates to make amino acids for proteins,
- Used to make fats and oils.

**How a leaf is adapted for photosynthesis**
- Waxy layer reduces water loss, water is needed for photosynthesis.
- Palisade cells contain many chloroplasts and are close to the surface of the leaf to absorb most light. They have a thin cell wall so gases can diffuse in quicker.
- Spongy layer has air spaces so gas diffusion is quick. Spongy cells have chloroplasts to absorb light.
- Vascular tissue to bring water and minerals and remove sugar.
- Guard cells can open and close the stomata to reduce water loss and regulate gas exchange. Guard cells have chloroplasts to absorb light for photosynthesis.

**Mineral** | **Use in plant** | **deficiency**
--- | --- | ---
Nitrate | Making proteins | Stunted growth
Magnesium | Making chlorophyll | Yellow leaves

Plants can only photosynthesis in the day.

Plants respire all the time; this is how they get energy for making new thing or absorbing minerals from the soil.

In the day the rate of respiration is less than photosynthesis so more oxygen is released than used.
2. The graph shows how the rate of photosynthesis is affected by different conditions.

(a) What patterns can you find from this graph? (5)

(b) How useful could this information be to a grower using glasshouses? Give reasons for your answer. (2)

9. The graph shows the concentration of carbon dioxide in the air in a greenhouse full of tomato plants, measured over a period of 24 hours.

(a) Explain why the concentration of carbon dioxide in the air in the greenhouse increased between X and Y. (2)

(b) Explain why the concentration of carbon dioxide in the air in the greenhouse decreased between Y and Z. (2)
5. (a) Balance the following equation for photosynthesis.

\[ \ldots \cdots \cdot \text{CO}_2 + \ldots \cdots \cdot \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_12\text{O}_6 + \ldots \cdots \cdot \text{O}_2 \] (1)

(b) Name two things necessary for photosynthesis apart from a suitable temperature range and the availability of water and carbon dioxide. (2)

(a) Plants have leaves which contain guard cells and palisade cells. Explain how each of these kinds of cell assists photosynthesis.

Guard cells (2)

Palisade cells (2)

(d) Glucose is a product of photosynthesis. Give three uses which green plants make of glucose. (3)

11. Algae are small green plants. Give three conditions needed by green plants to produce sugars. (3)

13. The graph shows the mean light intensity at different times of the year in an oak wood.

(a) (i) In which month would you expect the rate of photosynthesis in the oak trees to be greatest? (1)

(ii) There are plants living on the ground in the wood. In which month would you expect their rate of growth to be fastest? Explain your answer. (3)

(b) Name two factors, other than light intensity, that would affect the rate of photosynthesis in the oak trees. (2)
2. (a) \( + \text{ light} = + \text{ photosynthesis} \)
\( + \text{ light} = + \text{ photosynthesis to a limit} \)
limit depends on temp/CO\(_2\) levels
\( + \text{ CO}_2 = + \text{ photosynthesis} \)
\( + \text{ temp} = + \text{ photosynthesis} \)

\textit{each for 1 mark}

(b) need to raise optimum levels
when one other raised
to get max/economic yield

9. (a) respiration

no photosynthesis because no light

(b) photosynthesis rate greater than
respiration rate

\textit{reject no respiration / photosynthesis only}

photosynthesis since light

. (a) 6 6 6

(b) any \textit{two} of

- (presence of) chlorophyll \textit{or} (amount of) chloroplasts
  \textit{accept green leaves (or other green parts)}

- (sufficient) light (intensity)

- (light) of a suitable wavelength

(c) \textbf{guard cells}

any \textit{two} of

* control by osmosis
* the movement of gases
  \textit{accept movement of carbon dioxide \textit{or} oxygen \textit{or} water vapour beware movement of CO\(_2\) out}
  \textit{accept a diagram or description}

* through the stoma

\textbf{palisade cells}

any \textit{two} of

* near the upper surface
* contain (a great) \textit{many} \textit{or} more chloroplasts
* (so) contain the most chlorophyll
(d) any three of

* for respiration
* conversion to (insoluble) starch

or to food store or to (other) carbohydrates
* (conversion to) sucrose or to food store or to (other) carbohydrates

or polysaccharides
* (conversion to) lipids or fats or oils
* (conversion to) amino acids or (plant) proteins or auxins or (plant) hormones or enzymes

11. carbon dioxide
water
chlorophyll/chloroplasts
light

13. (a) (i) June

for 1 mark

(ii) April
max. light
photosynthesis makes sugars/substances needed for growth

for 1 mark each

(b) 2 of:
temperature
carbon dioxide availability
water
chlorophyll

any 2 for 1 mark each
The distribution of organisms is affected by
Temperature: affects enzyme activity
Nutrients: like magnesium and nitrates for plant growth
Light: for photosynthesis
Water: raw material for photosynthesis, needed for chemical reactions, transport
Oxygen: needed for aerobic respiration, release energy
Carbon Dioxide: raw material for photosynthesis
pH: affects enzyme activity

Sampling the distribution of organisms can be done using

1) **Transects:**
   - Use a tape measure to make transect
   - Place quadrats at regular interval along transect
   - Record the number of species in each quadrat
   - Repeat with several transects at regular intervals

2) **Random sampling:**
   - Divide the sample area into a grid
   - Generate random numbers on a calculator and Use random numbers as co-ordinates (avoid bias)
   - Place quadrats at coordinates
   - Count number of species in each quadrat, repeating with a large number to be representative

**Proteins** have many uses in organisms
Hormones antibodies structural components like muscles **enzymes**
Why sample an area???
To estimate the number of different types of organisms in the habitat

To estimate the amount of each organism living in the habitat (population size)

How do you sample an area?
Randomly: using a quadrat
Using transects when there is an environmental gradient (the habitat changes from one place to the next)
Use a random process to avoid bias
Use a large sample to be representative of the population

Using quadrats

Divide the area into a grid
Generate random number to use as coordinates (avoids bias)
Put the quadrat down and....
  • Count the number of different species within
  • The number of a particular species within
  • Or the area covered by one/each species

Use a large sample to be representative of the area

Creating a transect
Use a tape measure to create the transect

Place quadrats

At regular intervals along the transect
Record the number of different plants/number of each plant
Repeat the transect several times

At random/regular intervals along the habitat
Proteins are polymers of amino acids that are folded into specific shapes.

Enzymes have a specific region called an active site. They are biological catalysts: speed up chemical reactions by lowering the activation energy. They are sensitive to temperature and pH.

As temperature increases, the rate of reactions increase as the particles gain kinetic energy, collide more frequently and forcefully, forming more enzyme substrate complexes. Beyond the optimum temperature (temperature where enzyme works best), the enzyme denatures, meaning that its active site changes shape and is no longer complementary to the substrate.

Extreme pH beyond the optimum will also denature the enzyme. Different enzymes work in different conditions; human enzymes have an optimum at 37 degrees. Enzymes in the stomach (protease) prefer acidic conditions (hydrochloric acid), and enzymes in the small intestine prefer alkaline conditions as their optimum.

Digestion is the breakdown of large molecules that cannot be absorbed into the blood, into small molecules that can be absorbed.

**Digestion of carbohydrates**
Amylase is produced in the salivary glands, pancreas and small intestine. It catalyses the breakdown of starch into simple sugars in the mouth and small intestine.

**Digestion of proteins**
Protease is produced in the stomach, pancreas and small intestine. Protease catalyses the breakdown of proteins into amino acids in the small intestine and stomach.

**Digestion of lipids**
Lipase enzymes are produced by the small intestine and pancreas. They catalyse the breakdown of lipids into fatty acids and glycerol in the small intestine. Bile (from the liver which is stored in the gall bladder) aids fat digestion by emulsifying lipids to increase the surface area for lipase activity. Bile also neutralises stomach acid and creates the alkaline conditions for the enzymes in the small intestine.

**Enzymes in industry**
They are usually sourced from microbes. Used as they are reusable, and have a high turnover rate (rate at which they change substrate to product), so are effective in small quantities. Work at low temperatures and pressure so reduce cost of manufacturing processes.

**Problems:** water soluble so difficult to separate form products, activity is affected by temperature and pH, can be expensive to buy.

**Applications** (making cheese, yoghurt, beer, wine, genetic engineering)
**Biological detergents:** proteases and lipases, so wash clothes at lower temperatures and get cleaner clothes. **Proteases** to pre-digest baby food. **Carbohydrases** to convert starch into glucose syrup. **Isomerase:** converts glucose to a sweeter sugar fructose. So is added in smaller quantities to slimming food making them less calorific.
**Enzyme Facts**

They are organic/biological catalysts that speed up chemical reactions by providing an alternate pathway of lower activation energy (graph).

They are proteins.

Proteins are made up of long chains of amino acids.

The chains of amino acids are folded in a specific way to give a unique shape.

Enzymes have a special region called an active site into which the substrate fits during a reaction.

A substrate is the molecule the enzyme reacts with.

**Enzymes are not destroyed or used up in the reaction**

Enzymes have an optimum pH and temperature at which they work fastest.

The rate of enzyme catalysed reactions are affected by...pH, temperature, substrate concentration and enzyme concentration.

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**This model shows the lock and key hypothesis**

1. The enzyme has a specific active site that is complementary to a particular substrate.
2. The substrate binds to the active site and an enzyme substrate complex forms, and the reaction occurs.
3. The new products no longer complement the active site and are released, the enzyme is ready to accept the next substrate molecule.

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**Describing and explaining effect of temp on enzymes**

As temperature increases so does enzyme activity up to a point (optimum) beyond which the rate of activity decreases.

Increase in activity because Enzyme and substrate have more kinetic energy, Collide more frequently, Collide with more energy, More successful enzyme substrate complexes form. If temperature gets too high the enzyme denatures, see diagram opposite explaining this term.

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**Describing effect of pH**

As the pH moves away from its optimum the rate of the reaction changes.

Large changes in the pH will denature the enzyme.
Digestion begins in the mouth. It is the breakdown of large molecules into smaller ones by enzymes. These small molecules can be absorbed into the bloodstream.

**Mechanical digestion**: is when the teeth grind up food to increase the surface area for enzymes.

**Chemical digestion**: is the action of enzymes.

**Salivary glands** (2) produce and secrete amylase. This enzyme digests starch to simple sugars (maltose).

The liver (4) produces bile which is stored in the gall bladder (3). Bile emulsifies lipids, to increase the surface area for lipase enzymes, so fat digestion is faster. Bile neutralises stomach acid and creates optimum conditions for digestive enzymes in the small intestine.

The pancreas (5) produces enzymes for the small intestine. Lipase, Protease and carbohydrases like amylase.

The small intestine is the site of most digestion. It receives enzymes from the pancreas and produces enzymes itself. Here...

- Lipids are digested by lipase, Lipids $\rightarrow$ fatty acids and glycerol
- Proteins are digested by protease, Proteins $\rightarrow$ amino acids
- Carbohydrates (starch), digested by carbohydrases (amylase), Carbohydrates $\rightarrow$ simple sugars

<table>
<thead>
<tr>
<th>Enzyme</th>
<th>Site of Production</th>
<th>Substrate</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protease</td>
<td>Pancreas, Stomach, Small intestine</td>
<td>Protein</td>
<td>Amino Acids</td>
</tr>
<tr>
<td>Lipase</td>
<td>Pancreas, Small intestine</td>
<td>Lipids</td>
<td>Fatty acids and glycerol</td>
</tr>
<tr>
<td>Carbohydrases: an example is Amylase is produced in the mouth</td>
<td>Pancreas, Mouth, Small intestine</td>
<td>Carbohydrates (Starch)</td>
<td>Simple sugars (Maltose, Glucose)</td>
</tr>
</tbody>
</table>

The large intestine absorbs water and minerals.

The stomach stores food for 2-3 hours and churns it with the muscular wall to mix it with digestive juices containing HCl: kills bacteria and creates optimum conditions for protease enzyme, **Protease**: enzyme called pepsin digests proteins to amino acids.

The diagram illustrates the digestive processes with enzymes and substrates. The flowchart shows the conversion of starch to glucose through the actions of amylase and maltase.
<table>
<thead>
<tr>
<th>Temperature (ºC)</th>
<th>0</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of bubbling (per minute)</td>
<td>2</td>
<td>8</td>
<td>40</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

(i) Briefly describe how the rate of bubbling depends on the temperature. (3)

(ii) What does an enzyme do?. (2)

(iii) Enzymes have many uses. For example they are used in some washing powders. Give two examples of other uses for which enzymes, or products containing enzymes, are sold. (2)

3. (a) Starch and protein are foods which have to be digested before they can be absorbed. For each, state the enzyme involved in the digestion process, where it occurs in the digestive system and what is formed and absorbed.

<table>
<thead>
<tr>
<th>Food absorbed</th>
<th>Enzyme</th>
<th>Where digestion occurs</th>
<th>What is formed and absorbed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starch</td>
<td>...........</td>
<td>..................................</td>
<td>..............................................</td>
</tr>
<tr>
<td>Protein</td>
<td>...........</td>
<td>..................................</td>
<td>.............................................. (4)</td>
</tr>
</tbody>
</table>

Which enzyme is used:

(i) to help to get greasy stains out of clothes?

(ii) in making slimming foods?

(iii) in making baby foods?...... (3)

Explain why enzymes are used in industry. (3)
12. (a) The graph shows how the rate of an enzyme-catalysed reaction changes with temperature.

(i) Explain why, in terms of particles, the rate of most reactions increases as the temperature is increased. (3)

Q6. A manufacturer of slimming foods is investigating the effectiveness of carbohydrases from different microorganisms. Iodine solution is a pale golden brown, transparent solution. Starch reacts with iodine to form a dark blue mixture. Known concentrations of starch are added to iodine solution. The mixture is placed in a colorimeter which measures the percentage of light passing through the mixture.

Graph 1 shows the results.
(a) Explain why less light passes through the mixture when the starch is more concentrated. (1)

(b) The manufacturer adds carbohydrase from each of three different microorganisms, A, B and C, to starch in flasks at 40 °C.

Every minute a sample of the mixture is added to iodine solution and placed in the colorimeter. 

**Graph 2** shows these results.

(i) When the concentration of starch reaches 2 %, digestion is considered to be sufficient for the next stage in the manufacture of the slimming food.

How long does this take for the most effective carbohydrase?

Show clearly how you work out your answer. .............................. minutes (2)

(ii) Explain why the manufacturer carried out the investigation at 40 °C. (2)

(c) Carbohydrases convert starch into glucose. To complete the manufacture of the slimming food the glucose should be converted into fructose.

(i) Name the enzyme which would be used to convert glucose into fructose. (1)

(ii) Explain why fructose, rather than glucose, is used in slimming foods. (2)

- it/the rate is fastest at 40°C
- bubbling stops at 80°C/between 60°–80°C
- the rate is slower at lower temperatures/increases with temp

- i) 35 (°C)

- ii) speeds up or alters the rate of (chemical) reactions

- *do not credit speeds up things*
- *accept speeds up specific (1) reaction (1)*

- *in living things or body or material in* 
  *from living things* 
- *accept to act as a biological (1) catalyst (1)*

(a) amylase  
mouth or small intestine  
sugar or maltose

protease  
small intestine or stomach  
amino acids or peptides

b) (i) lipase  
(ii) isomerase  
(iii) protease

(b) bring about reactions at lower temperatures  
lower pressures  
less expensive process

12. (a) (i) any three from:  
- particles / they gain energy  
- particles / they move faster  
- collide more often or more collisions or more chance of collision  
- have more energy when they collide or more energetic collisions or more collisions with activation energy

M6. (a) opaque / less transparent / blue  
*allow mixture becomes dark / black*  
*ignore thicker*  

(b) (i) 7 (minutes) or in range 6.7 to 7  
*award 2 marks for correct answer*  

if answer is incorrect evidence of selection of  
40(% light intensity) either in working or in graph  
2 for 1 mark

(ii) any two from:  
- slower / takes longer at lower temperatures  
- (40°C is) optimum / best temperature  
  *allow near to 37°C / body*  
  *temperature where enzymes work best*  
- enzyme denatured / destroyed / damaged at higher temperatures  
  *allow description of denaturation*
Respiration (occurs in all living organisms, plants and animals)

**Aerobic** (with oxygen): \( \text{Glucose} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water} \)

Most steps occur in the mitochondria (folded inner membrane to increase surface area for reaction)

Releases a lot of energy from each glucose molecule used

Energy is used for

- **Building** large molecules from smaller (amino acids into proteins)
- **Enabling** muscle contraction
- **Maintaining** body temperature in mammals and birds
- **Building** sugars and nitrates into amino acids in plants

**Anaerobic** (without oxygen): \( \text{Glucose} \rightarrow \text{lactic acid} \)

Occurs in the cytoplasm

Releases a little energy from each glucose molecule

**Lactic acid:** causes muscle cramp/fatigue, inability of the muscle to generate a full force

Anaerobic respiration creates an **oxygen debt:** oxygen is needed to break down lactic acid into carbon dioxide and water

**Energy and Exercise**

In exercise muscles contract more, so need more energy so respiration rate must increase

To achieve this...

1) **The heart rate increases:**

Delivers more oxygen and more glucose to the muscles for respiration

This also helps to remove more lactic acid, heat and carbon dioxide form the muscles

2) **Breathing rate and depth increases**

More oxygen is taken in and more carbon dioxide is exhaled.

**Muscles store glucose as insoluble glycogen.** In exercise, glycogen levels decrease as it is converted back to glucose and used in respiration to release energy for muscle contraction.
**Cellular respiration:**
A series of enzyme controlled reactions that **release energy** from organic molecules, like glucose. Animals store sugar as glycogen in the liver and muscles. This is broken down during exercise to release glucose.

There are two types

- **Aerobic:** With oxygen
- **Anaerobic:** Without oxygen

**Aerobic respiration**
Most steps take place in the mitochondria (an organelle found in plant and animal cells)
This releases a lot of energy. The energy is used in many ways

Glucose comes from the breakdown of starch. Starch Digestion begins in the mouth, with amylase enzymes, this produces maltose. Maltose is then broken down by maltase enzymes in the small intestine to form glucose, which is soluble, and is absorbed into the blood stream.

Carried by red blood cells. Diffuses into the blood at the alveoli. There are many alveoli to give a large surface area for rapid diffusion, and they have thin wall to speed up diffusion. Ventilation and circulation keeps the concentration gradient steep so diffusion is fast. Red blood cells have no nucleus so they can carry more oxygen.

This is carried in the blood to the lungs where it diffuses into the alveoli and is exhaled.

Water levels in the body are maintained as part of homeostasis, this is the concept where the body keeps a constant internal environment.

**How aerobic respiration differs to anaerobic....**
- Aerobic uses oxygen
- Aerobic does not produce lactic acid
- Aerobic produces carbon dioxide and water
- Aerobic respiration releases more energy

**Anaerobic respiration:** this occurs during sustained periods of exercise or short intervals of high intensity. The muscles cannot get sufficient energy from aerobic respiration and so use anaerobic respiration to **release energy without oxygen**. Lactic acid is produced and builds up causing muscle fatigue. After exercise the lactic acid is removed by the blood and broken down by oxygen to carbon dioxide and water. **So even after exercise we have a high oxygen demand to break down the lactic acid, this is called the oxygen debt.**

**Used in many ways...**
- Muscle contraction
- Building large molecules form smaller ones in animals, like amino acids into proteins, of simple sugars into large carbohydrates
- Building proteins form glucose and nitrates in plants
- Keeping a constant body temperature in mammals and birds.

**A fit person**
- Has a low resting heart rate
- During exercise their heart rate does not increase as much
- They recover quickly to rest after exercise

**Exhaled air has**
- Less oxygen (used in respiration)
- More CO2 (released in respiration)
- More water
- Is warmer

**During exercise our heart rate and breathing rate and depth of breathing increase** because....
Our muscles are contracting more, so they require more energy; so more respiration must take place. We breathe faster and deeper to take in more oxygen and to exhale the excess carbon dioxide, and our heart beats faster to deliver more oxygen and glucose to the muscles faster, the fast hear rate also removes lactic acid/carbon dioxide quicker.
1. (i) What is the name of the process which takes place in living cells in your body and which releases energy from oxygen and glucose? (1)

(ii) Name the **two** products of the process in part (i).

(c) The bar charts show what happens in an athlete’s muscles when running in two races of different distances.

![Bar charts showing energy transfer and carbon dioxide production](image)

(i) Compare what happens in the athlete’s muscles when running in the two races. (3)

Use the information in the box to explain your answer to (4)

12. In an investigation four groups of athletes were studied. The maximum rate of oxygen consumption for each athlete was measured and the mean for each group was calculated. The athletes then ran 10 mile races and the mean of the best times was calculated for each group. The results are shown in the table below.

<table>
<thead>
<tr>
<th>GROUP OF ATHLETES</th>
<th>MAXIMUM RATE OF OXYGEN CONSUMPTION (cm³ per kg per min)</th>
<th>BEST TIME IN 10 MILE RACE (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>78.6</td>
<td>48.9</td>
</tr>
<tr>
<td>B</td>
<td>67.5</td>
<td>55.1</td>
</tr>
<tr>
<td>C</td>
<td>63.0</td>
<td>58.7</td>
</tr>
<tr>
<td>D</td>
<td>57.4</td>
<td>64.6</td>
</tr>
</tbody>
</table>

(i) What is the relationship between maximum rate of oxygen consumption and time for a 10 mile race? (1)

(ii) Suggest an explanation for this relationship. (3)
Paula is training for a marathon. When she runs, her heart beats faster than it does when she is resting. Complete the sentences, using words from the box.

<table>
<thead>
<tr>
<th>blood</th>
<th>breathe</th>
<th>carbon dioxide</th>
<th>glucose</th>
<th>heat</th>
<th>nitrogen</th>
<th>oxygen</th>
<th>respire</th>
</tr>
</thead>
</table>

When she is running, Paula's muscle activity increases. To do this, her muscle cells ........................ at a faster rate to give her more energy. Her muscles need to be supplied with ........................................ and ................................ more quickly. Her heart beats faster to increase the flow of......................... which carries the products ........................................ and ....................... away from her muscles. (Total 6 marks)

Questions

What is the immediate effect of extreme physical activity on the glycogen content of muscles? Describe how this effect occurs. (why does the glycogen change in the way you suggested above) (3)

Give three differences between aerobic and anaerobic respiration. (3)

Explain the advantage to the student's heart rates increasing during exercise. (4)

The breathing rate and the amount of oxygen used were still higher after exercise, even though the student sat down to rest. Why were they still higher?

(a) (i) ideas that
- energy transferred faster in 100m race
- carbon dioxide produced faster during 1500m race / more
- carbon dioxide produced
  for 1 mark each
- correct reference to twice / half as fast in either / both cases
  for a further mark

(ii) ideas that
- respiration during 100m race (mainly) anaerobic
- respiration during 1500m race (mainly) aerobic
- aerobic respiration produced carbon dioxide
- anaerobic respiration produced / lactic acid
  for 1 mark each

(b) (ii) the higher the rate of oxygen consumption, the shorter the time taken to complete
  for 1 mark

(ii) the faster oxygen is taken into the blood, the faster energy can be released in the muscles,
and the faster the athlete can run

_for 1 mark each_

16. (a) respire

1

oxygen / glucose

1

[each once only]

1

[glucose / oxygen]

[each once only]

1

[blood]

1

[carbon dioxide / heat]

[heat / carbon dioxide]

[each once only]

1

1

answers

reduced sharply
Converted to glucose
Which is respired
to release energy

[Oxygen used in aerobic respiration]
more energy from aerobic respiration
[Carbon dioxide and water are end products of aerobic respiration]
lactic acid is end product of anaerobic respiration

when exercising the rate of respiration (in the muscles) is higher
(the increased heart rate delivers)
more oxygen to the (respiring) muscles
more glucose to the (respiring) muscles
and results in faster removal of carbon dioxide and lactic acid and heat

still need to remove extra carbon dioxide

still need to remove heat / to cool

(some) anaerobic respiration (in exercise)
lactic acid made (in exercise)
oxygen needed to break down lactic acid or suitable reference to oxygen debt
lactic acid broken down to CO₂ and water or lactic acid changed into glucose
Genetics

The nucleus contains 23 pairs (46) chromosomes. We inherit 1 of each pair from our parents when sperm and egg cells nuclei fuse in fertilisation. So are similar but not identical to them. Sexual reproduction produces variation as offspring inherit different combinations of their parent’s alleles on the chromosomes.

Chromosomes are made of DNA
Short sections of DNA are genes
Genes determine our characteristics,
They are unique sequences of bases, that code for amino acid sequences which make proteins.
Alleles are alternate forms of genes

Alleles can be
**Dominant**: allele expressed in the heterozygous form, (shown as a capital letter)
**Recessive**: allele not expressed in the heterozygous form (shown as a lower case letter)

**Phenotype**: physical appearance of an organism
**Genotype**: the allele combination an organism contains

Genotypes can be described as the following
**Homozygous** = pure breed: same alleles
Homozygous dominant: two dominant alleles (AA)
Homozygous recessive: two recessive alleles (aa)
**Heterozygous**: 2 different alleles in the genotype (Aa)

**Genetic disorders**

**Cystic fibrosis: caused by a recessive allele**
To have condition must be homozygous recessive. Heterozygous people are carriers
A disorder of the **cell membranes** causing a thicker/sticky/viscous mucus; difficult breathing/trachea blocked; digestion difficult/glands blocked
Treated with antibiotics, physiotherapy and supplementation of digestive enzymes

**Polydactyl: caused by a dominant allele**
Results in additional fingers and toes

**Cell division**

**Mitosis**: growth, repair replacement, asexual reproduction. Occurs in most body cells
DNA is copied → one division → 2 daughter cells → that are diploid → genetically identical to parent cell

**Meiosis**: gamete formation, sexual reproduction, occur in the testes and ovaries
DNA is copied → 2 divisions → 4 daughter cells → that are haploid → genetically unique

Stem cells: unspecialised cells, with ability to differentiate into any other type of cell and divide.

Stem cell sources: embryos, umbilical cord, bone marrow
Uses: treatment of diseases

**Stem cells: pros and cons**

(A) Stem cells from an embryo can grow into any type of tissue.
(A) Stem cells may be used in medical research or to treat some human diseases.
(A) Large numbers of stem cells can be grown in the laboratory.
(D) Stem cells may grow out of control, to form cancers.
(D) Patients treated with stem cells need to take drugs for the rest of their life to prevent rejection.
(D) Collecting and growing stem cells is expensive.
Embryo screening

(embryos) checked for inherited / genetic disorders / conditions / specific allele

Embryo Screening: pros and cons
Reduce number of people with cystic fibrosis (in population)
Reduce health-care costs
Expensive to have baby with cystic fibrosis
allow decision / emotional preparation example: understand how to care for child better/allows abortion
Allows people to make choices about termination
Help to prepare financially / emotionally etc

Possible damage / risk to embryo / foetus / baby
Allow possible harm / risk to mother
Screening / it is expensive
Have to make ethical / moral / religious decisions / playing God / unethical / immoral / right to life
Mitosis:
The DNA replicates
There is one cell division
2 daughter cells form
The daughter cells are genetically identical
Each daughter cell has a full set of chromosomes (diploid)

Meiosis
The DNA replicates
There are two cell divisions
4 daughter cells form
These are genetically unique
They have half the genetic information (Haploid cells)

<table>
<thead>
<tr>
<th>Mitosis</th>
<th>Meiosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asexual reproduction</td>
<td>For sexual reproduction</td>
</tr>
<tr>
<td>For growth</td>
<td>For gamete formation</td>
</tr>
<tr>
<td>Occurs in most cells</td>
<td>Occurs only in testes or ovaries</td>
</tr>
<tr>
<td>Daughter cells are diploid (46 chromosomes)</td>
<td>Daughter cells are haploid (23 chromosomes)</td>
</tr>
<tr>
<td>Daughter cells are identical</td>
<td>Daughter cells are not identical</td>
</tr>
<tr>
<td>2 daughter cells produced</td>
<td>4 daughter cells produced</td>
</tr>
<tr>
<td>1 cell division occurs</td>
<td>2 cell divisions occur</td>
</tr>
</tbody>
</table>

The nucleus controls the cells activities.
It contains 23 pairs of chromosomes (46 in total)
Chromosomes are made up of DNA
A short section of DNA is called a gene
Genes determine our characteristics (eye colour, hair colour)
Alleles are the different forms of a gene (blue eyes, brown eyes)
Some alleles are dominant: always expressed when present
Some alleles are recessive: only expressed when present on both chromosomes

Genetic information is passed on from parents to offspring in the gametes/sx cells.
Males have sex chromosomes....XY
Females have sex chromosomes...XX
Diploid: cells that contain a full set of chromosomes
Haploid: cells that contain a half set of chromosomes

DNA determines our proteins because.....
DNA is a code, sequence of bases (A, T, C and G)
Every three letters codes for 1 amino acid
The order of the bases determines
The order of amino acids in proteins
1. (a) Complete the sentence.

Cystic fibrosis is a disorder of................................................................. (1)

(b) Explain, as fully as you can, how a person usually inherits cystic fibrosis. (3)

(c) One effect of cystic fibrosis in some patients is that enzymes from the pancreas do not reach food in the intestine. Doctors now give capsules containing enzymes to these patients.

(i) Name **three** digestive enzymes produced by the pancreas. (3)

(ii) The first attempts at giving pancreatic enzymes involved giving a pill consisting of powdered pancreatic enzymes to the patient. The treatment failed. When scientists investigated why this happened, they found the enzymes from the pill in the stomach of the patient, but not in the intestine.

Suggest **two** possible reasons why the enzymes in the pill did not reach the small intestine.

(2)

3. The diagram shows a family tree in which some individuals have an inherited disorder, which may cause serious long-term health problems.

![Family Tree Diagram]

(a) What proportion of the children of **A** and **B** have the disorder? (1)

(b) Explain the evidence from the diagram which shows that the allele for the disorder is dominant. Use the appropriate letters to identify individuals in your answer.

You may use genetic diagrams in your explanation. There is space for you to draw a genetic diagram at the top of the facing page. (3)
Explain how DNA controls the structure of proteins. (3)

What are the symptoms of cystic fibrosis? (3)

The black pigment in human skin and eyes is called melanin.

A single gene controls the production of melanin.

A person who is homozygous for the recessive allele of the gene has no melanin and is said to be albino.

The diagram shows the inheritance of albinism in a family.

(a) Use a genetic diagram to explain the inheritance of the albino allele by children of parents P and Q. (3)

(b) R and S decide to have a child.

What is the chance that this child will be an albino? ...............................................

Use a genetic diagram to explain your answer. (3)

1. (a) cell membranes 1

(b) caused by recessive allele 1

both parents carriers / do not have condition 1

receives one recessive allele from each 1

(c) (i) amylase 1

protease 1

lipase 1

(ii) acid destroys enzymes 1

enzymes digested by stomach enzymes 1
3. (a) 1 in 4 / 1/4 / 1:3 / 25% / 0.25

do not accept 3:1 / 1:4 / 2:6

(b) either from C and D

accept synonyms for dominant / recessive eg
Normal / faulty

accept genetic diagram if clearly referring to correct
individuals or genotypes on family tree

allow ‘gene’ for ‘allele’

any three from:

• C and D have disorder

  ignore ‘C & D are carriers’

• I/J don’t have disorder

• C and D have dominant and
  recessive alleles

• recessive alleles from C and D passed to I/J
  or I/J have two recessive alleles

  NB if allele was recessive then all offspring of C and D
  would have the disorder = 3 marks

or from A and B

assume response refers to A+B unless contradicted

• A is homozygous recessive / rr, and B is
  heterozygous / Rr can be shown in words or symbols

  allow any symbol

• offspring can be rr or Rr described

  allow without key

(c) (i) (embryos) checked for inherited / genetic
disorders / conditions

  accept diseases for disorders

(ii) any three from:

• C/D have disorder / have dominant allele

  accept disease / condition

  accept ‘gene’ for ‘allele’

  ignore reference to ‘carriers’

• chance of embryo / foetus / child having disorder
  or may pass on alleles for disorder to their offspring

• C/D might want to decide on termination or prepare
  for child with disorder
order of bases acts as a code; 3
which controls the order; 3
in which amino acids are assembled into protein; 3
read in triplet

affects the cell membranes causing
thicker/sticky/viscous mucus; 3
difficult breathing/trachea blocked; 3
digestion difficult/glands blocked

19. (a) gametes A or a A or a 1

F₁ genotypes correctly derived 1

albino identified 1

\[
\begin{array}{c|cc}
A & a & \\
\hline
A & AA & Aa \\
a & Aa & aa \\
\end{array}
\]

\text{gametes} \ -1
\text{boxes all correct} \ -1
\text{albino (aa) identified} \ -1

(b) \frac{1}{2} / half / 50% evens / 1 in 2 1

\text{do not credit} 1 to 2 or 50/50

<table>
<thead>
<tr>
<th>(S)</th>
<th>A</th>
<th>a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a</td>
<td>Aa</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>Aa</td>
</tr>
</tbody>
</table>

\text{gametes correctly derived} \ -1
\text{F₁ genotypes correctly derived} \ -1
Speciation and fossils

Fossils are the ‘remains’ of organisms from many years ago, and are found in rocks. Fossils may be formed in various ways:
- From the hard parts of animals that do not decay easily
- From parts of organisms that have not decayed because one or more of the conditions needed for decay are absent
- When parts of the organism are replaced by other materials as they decay
- As preserved traces of organisms, eg footprints, burrows and rootlet traces.

Many early forms of life were soft-bodied, which means that they have left few traces behind. What traces there were have been mainly destroyed by geological activity.

Fossils provide evidence that species alive today have evolved from simpler organisms
- fossil is (remains / impression of) organism that lived a long time ago
- fossils show changes over time or older fossils simpler or fossils simpler than present-day species
- fossils have similar features to present-day species

Extinction may be caused by:
- changes to the environment over geological time
- New predators
- New diseases
- New, more successful, competitors
- A single catastrophic event, eg massive volcanic eruptions or collisions with asteroids
- Through the cyclical nature of speciation.

Species: organisms that can interbreed and produce fertile offspring

Speciation: development of a new species from an existing species

Explained by.....
Isolation of members of a population
By geographical barrier (example???)
Variation in isolated communities
Different selection pressures (examples???) temperature, food, body shape
Natural selection (certain alleles passed on, certain alleles die out)
Over time population no longer able to produce fertile offspring if they interbreed
Fossils are the ‘remains’ of organisms from many years ago, and are found in rocks.

Fossils may be formed in various ways:
- From the hard parts of animals that do not decay easily
- From parts of organisms that have not decayed because one or more of the conditions needed for decay are absent
- When parts of the organism are replaced by other materials as they decay
- As preserved traces of organisms, eg footprints, burrows and rootlet traces.

The fossil record is incomplete!!!

Speciation: the development of a new species from an existing one.

It occurs due to isolation of members of the species and exposure to different environmental conditions over many generations

Species: organisms that can interbreed and have fertile off-spring
1. What are the problems with using enzymes in industry?
2. What is respiration?
3. Where do most steps of aerobic respiration occur?
4. What does aerobic mean
5. What does anaerobic mean
6. What are the equations for aerobic and anaerobic respiration?
7. How is energy used in organisms?
8. What happens to glycogen in exercise?
9. How does aerobic respiration differ to anaerobic?
10. What is oxygen debt?
11. What is muscle fatigue?
12. Why does the heart beat faster during exercise?
13. Why do we breathe heavier during exercise?
14. Name two types of cell divisions
15. What is an allele?
16. What is a chromosome?
17. What is a gene?
18. How many pairs of chromosomes are there in humans?
19. How many chromosomes do humans have in their cells?
20. Where in the cells are chromosomes found?
21. What are dominant alleles?
22. What are recessive alleles?
23. What does homozygous mean
24. What does heterozygous mean
25. What does pure breed mean?
26. What type of allele causes cystic fibrosis?
27. What other term is used for people who are heterozygous for cystic fibrosis?
28. What type of allele causes polydactyly?
29. What is the result of polydactyly?
30. What is genotype?
31. What is phenotype?
32. What are the symptoms of cystic fibrosis?
33. What are the male chromosomes?
34. What are the female chromosomes?
35. What did Mendel call chromosomes?
36. Why did people reject Mendel’s ideas?
37. What are stem cells?
38. Where can stem cells come from?
39. Why are people for and against stem cells?
40. What is embryo screening?
41. Why are people for and against embryo screening?
42. Describe mitosis?
43. Describe meiosis?
44. Compare meiosis and mitosis?
45. What are gametes?
46. What are gametes made?
47. Why is variation produced by sexual reproduction important?
48. Describe how a gene is responsible for the production of a protein?
49. What are fossils?
50. Explain how fossils can be made?
51. What is extinction?
52. Suggest some factors that cause extinction?
53. Explain how speciation develops?
54. Define a species?
55. Describe complete digestion of fats, carbohydrates and proteins.
| 1. | Controls what enters and exits the cell |
| 2. | Contains genetic information/controls cells activities |
| 3. | Site of chemical reactions |
| 4. | Photosynthesis (has chlorophyll to absorb light energy) |
| 5. | Protein synthesis |
| 6. | Respiration |
| 7. | Support the cell |
| 8. | Contains cell sap |
| 9. | Net Movement form high to low concentration |
| 10. | Concentration/temperature/surface area/diffusion distance/size of molecules |
| 11. | A tissue is a group of cells with similar structure and function |
| 12. | Organs are made of different tissues doing common function |
| 13. | Cover the outside and inside |
| 14. | Churn the food and digestive juices |
| 15. | Secrete digestive juices, acid and protease |
| 16. | Cover the leaf |
| 17. | Palisade and spongy |
| 18. | Palisade = packed chloroplasts/ spongy = air spaces |
| 19. | Carry water and dissolved minerals |
| 20. | Carry sugar |
| 21. | -------- |
| 22. | Respiration/starch/cellulose/fats/oils/ amino acids |
| 23. | To make amino acids |
| 24. | Make chlorophyll |
| 25. | CO2/Light/Temp |
| 26. | Starch |
| 27. | Glycogen |
| 29. | Amino acids, linked as proteins/folded to specific shape |
| 30. | Ribosomes |
| 31. | Biological catalysts |
| 32. | Active site |
| 33. | Lower activation energy |
| 34. | Temp and pH |
| 35. | Active site changes shape |
| 36. | Salivary gland and pancreas |
| 37. | Mouth and small intestine |
| 38. | Stomach and pancreas |
| 39. | Stomach and small intestine |
| 40. | Pancreas |
| 41. | Small intestine |
| 42. | Starch |
| 43. | Lipids/fats |
| 44. | Protein |
| 45. | Antibodies/hormones/structural components of muscle |
| 46. | ----------- |
| 47. | Emulsify fats, neutralise stomach acid |
| 48. | Liver |
| 49. | Gall bladder |
| 50. | Isomerase |
| 51. | Sweeter |
| 52. | Slimming foods |
| 53. | Proteases |
| 54. | Lipases and proteases |
| 55. | Microbes |
| 56. | Reactions at lower temps/higher pressure less expensive process/less likely to produce unwanted by-products |

1. Expensive/affected by temp + pH/water soluble difficult to separate form products |
2. Release of energy from glucose |
3. Mitochondria |
4. With O2 |
5. Without O2 |
6. -------- |
7. Muscles contraction/build large molecules from smaller/keep body temp steady in birds and mammals/in plants to build sugar and nitrates into amino acids |
8. Broken down to glucose/use din respiration/release energy |
9. More energy/need oxygen/no lactic acid |
10. O2 needed to break down lactic acid → CO2 and water |
11. Inability of muscle to contract with full force due to lactic acid |
12. More oxygen and glucose to muscle for increased respiration to release more energy/remove heat/CO2 and Lactic acid |
13. More O2 in more CO2 out |
14. Mitosis and meiosis |
15. Alternate form of a gene |
16. Threat structure made from DNA |
17. Short section DNA/determines characteristics |
18. 23 |
19. 46 |
20. Nucleus |
21. Allele expressed in heterozygote |
22. Allele not expressed in heterozygote |
23. Same allele in genotype |
24. One of each allele |
25. Homozygous |
26. Recessive |
27. Carriers |
28. Dominant |
29. Extra fingers and toes |
30. Genetic constitution of organisms (allele combination) |
31. Physical appearance |
32. Damaged cell membrane, thick viscous mucus Difficult to breathe, difficult to digest |
33. Xy |
34. Xx |
35. Units of inheritance |
36. Not a scientist/chromosomes not discovered/different ideas |
37. Unspecialised cells with potential to form any cell |
38. Bone marrow, embryos, umbilical cord |
39. Cure disease, grow tissues and organs/ large numbers grown/may cause cancer/destroy embryos/rejection of organs/expensive |
40. Embryos are checked for a particular allele |
41. Make informed choices, prepare mentally, financially, plan for treatments, may encourage abortion, screen for other things intelligence, gender |
42. DNA copied, cell divides once, 2 daughter cell genetically identical, diploid |
43. DNA copied, cell divides twice, 4 haploid cells with genetic variation |
44. -------- |
45. Sex cell |
46. Testes/sperm eggs/ovary |
47. More likely for species to survive |
48. Order DNA bases = Code for order of amino acids |
49. Remains of an organism form a long time ago, show changes in species over time, can be compared to other organisms and thus look for similarities to present day species.

50. From the hard parts of animals that do not decay easily.
From parts of organisms that have not decayed because one or more of the conditions needed for decay are absent.
When parts of the organism are replaced by other materials as they decay.
As preserved traces of organisms, e.g., footprints, burrows, and rootlet trace.

51. Permanent loss of a species from the earth.

52. Changes to the environment over geological time/new predators/new diseases/new, more successful competitors/a single catastrophic event, e.g., massive volcanic eruptions or collisions with asteroids/through the cyclical nature of speciation.

53. Isolation/geographical barrier/variation/different selection pressure in areas/natural selection/no longer interbreed after a long time.

54. Species = organisms that can interbreed and produce fertile offspring.