

Find below a list of questions some students have put together. I have typed them out for you, and have also modified some of them, so I hope you don't mind. Once you have printed the questions, fold the paper in half (lengthways), and cut out the Q & A to test yourself

MICROSCOPES AND MAGNIFICATION QUESTIONS AND ANSWERS	
What does resolution mean?	The ability to distinguish between points that are close together
What does magnification mean?	The extent to which an image has been enlarged
There are two types of electron microscopes, what are they and how do they work?	Transmission Electron Microscope (TEM) – electrons pass through the specimen Scanning Electron Microscope (SEM) – the electrons bounce off the surface of the specimen, giving a 3D image
Which microscope creates better resolution – Electron or Optical?	Electron. Optical microscopes can not resolve objects which are less than a few hundred nanometers apart because of the wavelength of light.
In cell fractionation, a fluid mixture called a _____ is used. It's used to filter bits of cells that have not been broken up properly	Homogenate
How can cells be broken up in the first stages of cell fractionation?	By pestle and mortar
What does ultracentrifugation do?	Separates the components of cells that have been broken up
In cell fractionation, what two factors control the organelle extraction from the pellet?	The speed at which the centrifuge spins and the time for which the centrifuge spins (the centrifuge is an instrument that spins tubes of fluids around at high speeds)
DIFFUSION AND THE PROBLEM OF SIZE	
What is Ficks Law?	$\text{Rate of diffusion} \propto \frac{\text{Surface area} \times \text{concentration difference}}{\text{distance}}$ $\alpha = \text{proportional to}$
What factors affect Ficks Law?	<ul style="list-style-type: none"> • Concentration difference <ul style="list-style-type: none"> • Surface area • Distance (eg cell membrane)
As an organism gets larger, how is the surface area:volume ratio affected?	It gets smaller
What is the surface area:volume ratio?	$\frac{\text{Surface area}}{\text{Volume}}$
How do organisms over 100µm in size survive, when diffusion is impossible over this size?	They are multicellular
What is a maximum size for a single cell?	100 µm – anything larger means materials can not diffuse in or out fast enough, due to a smaller surface area:volume ratio
What does multicellular mean?	Bodies are made up of many cells
Why do small mammals eat continuously when some large animals eat once every few days?	Large mammals keep warm easily because of small surface area:volume ratio. Therefore smaller animals loose much more body heat. To maintain their heat loss, smaller animals will respire more - this requires more energy, therefore smaller animals eat more food (compared to their body size/weight)
Why do large animals have an advantage over smaller animals in the amount of heat loss?	Large animals have a smaller surface area:volume ratio
What is an isotonic solution?	The solution has the same water concentration as inside the cell

What happens to a plant cell in a hypotonic solution?	Water diffuses into the cell and it swells, becoming turgid (plant cells have a cell wall that will prevent the cell from bursting)
What happens to an animal, cell in a hypotonic solution?	Water diffuses into the cell, and it will swell, and eventually burst
What happens to an animal cell in a hypertonic solution?	Water diffuses out of the cell, and the cell shrinks – a process called plasmolysis
What happens to a plant cell in a hypertonic solution?	Water diffuses out of the cell, and the cell shrinks – a process called plasmolysis

WATER POTENTIAL QUESTIONS AND ANSWERS

What is water potential?	Water potential is a way of quantifying Osmosis. We can calculate which way water will move and how fast. Water always moves from a high water potential to a low water potential
What are the units of water potential?	Water potential is measured in units of pressure – Pa (pascals) or kPa (kilopascals)
What is the equation for water potential?	Ψ of cell = ψ of solute + ψ pressure potential
What is the symbol for water potential?	Ψ (the Greek letter psi, pronounced "sy")
What is the water potential of pure water?	0

Which solution has a more negative ψ

C

What to cell when placed in a hypotonic solution in relation to ψ ?

GCSE level → there is a higher concentration of water outside the cell when compared to inside the cell, therefore water diffuses into the cell, trying to reach equilibrium.

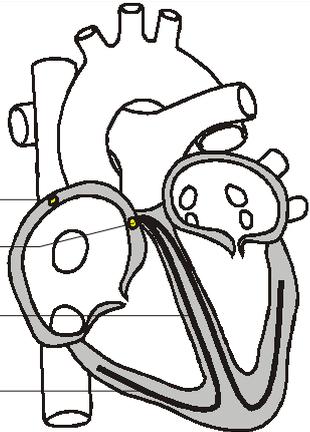
A level → there is higher water potential outside the cell than inside the cell, causing the net movement of water to enter the cell by diffusion. Since the highest value for ψ is 0 (distilled water), then water will always move from where there is a less negative ψ to a more negative ψ

What is a hypertonic solution in relation to ψ ?

GCSE level → there is a lower concentration of water outside the cell when compared to inside the cell, therefore water diffuses out of the cell, trying to reach equilibrium.

A level → there is lower water potential outside the cell than inside the cell, causing the net movement of water to leave the cell by diffusion. Since the highest value for ψ is 0 (distilled water), then water will always move from where there is a less negative ψ to a more negative ψ

HEART AND CARDIAC CYCLE QUESTIONS AND ANSWERS

What is cardiac output?	Cardiac output is the amount of blood pumped out of the heart in one minute
What events, in relation to pressure, does the cardiac cycle consist of?	Systole – contraction of the atrium followed by the contraction of the ventricles Diastole – when the atrium and ventricle are relaxed and fill with blood
Why do arteries have thick elastic walls?	So that they can carry blood away from the heart at a high pressure
What is the simple equation for working out cardiac output?	Cardiac output = stroke volume X heart rate
What is the function of the valves?	To prevent backflow of blood
Name the 4 chambers of the heart	Right atrium, left atrium, right ventricle, left ventricle
Mammals have a double circulation. What does this mean?	The right side of the heart pumps blood to the lungs only and is called the pulmonary circulation, while the left side of the heart pumps blood to the rest of the body – the systemic circulation
Where is the bundle of His situated in the heart?	<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>sino-atrial node (SAN)</p> <p>atrio-ventricular node (AVN)</p> <p>Bundle of His</p> <p>Purkinje fibres</p> </div>  </div>
What is the name of the valve on the left side of the heart?	Bicuspid valve
What is the name of the valve on the right side of the heart?	Tricuspid valve
What is cardiac muscle composed of?	Myocytes (often referred to as myogenic muscle) receive electrical impulses, they then contract together which results in a heart beat

DNA AND RNA STRUCTURE QUESTIONS AND ANSWERS

What is a nucleotide?	A nucleotide is units of DNA and RNA
What is base pairing?	When two nucleotide chains have base pairs that are complementary to each other. The purines and pyrimidines naturally link together by weak hydrogen bonds. i.e. A=T C≡G
What are the two types of nucleic acids present in cells?	There are two types of nucleic acids present in cells. <ul style="list-style-type: none"> • Deoxyribonucleic acid (DNA) • Ribonucleic acid (RNA)
In DNA, what does adenine always pair with, and what does cytosine pair with?	Adenine pairs with Thymine Cytosine always pairs with Guanine
There are 3 things a nucleotide, what are they?	Each Nucleotide has: <ul style="list-style-type: none"> • 5 carbon sugar (deoxyribose in DNA and ribose in RNA) • one phosphate group • One organic nitrogenous base (ACTG in DNA and ACUG in RNA)
DNA has 2 separate chains of Nucleotides, what holds the chains together?	The chains are held together by weak hydrogen bonds between complementary bases
A nucleic acid molecule is a very long chain of nucleotides. How is the chain formed?	The phosphate group on one nucleotide will join with the 5-carbon sugar of another nucleotide. This will happen through a process called condensation (where a molecule of water is lost). This will continue to form a 'sugar-phosphate backbone'. In RNA this will remain single stranded, whereas in DNA, it will be double stranded with H-bonds forming between complementary bases

THE GENETIC CODE QUESTIONS AND ANSWERS

Define a gene?	A gene is a length of DNA that carries a genetic code for a single protein
Below is a DNA base triplet sequence, what will the mRNA sequence be? TAG GCT TGA TCG	AUC CGA ACU AGC
What is a codon?	A group of three bases coding for 1 amino acid
What is a linear code?	Where the code is only read in one direction along the mRNA
Describe a degenerate code	There is often more than one codon for an amino acid i.e. there are more base combinations than there are amino acids. This means that several base sequences may code for the same amino acid. E.g. CCA, CCC, CCG and CCT all code for the same amino acid: proline.
What is a universal code?	The same base sequence always codes for the same amino acid, regardless of the species
What is the difference between overlapping and non-overlapping code?	Non-overlapping → Each triplet in DNA specifies one amino acid. Each base is part of only one triplet, and is therefore involved in specifying only one amino acid Eg. AUC CGA ACU AGC Overlapping code → as the code is read in blocks of three, it will only move up one base at a time, rather than three bases at a time, like the non-overlapping code Eg. AUC UCC CCG CGA GAA AAC ACU CUA AGC
What are introns?	Unused pieces of RNA
What are exons?	Expressed portions of RNA that code for a particular protein

GENETICS (PROTEIN SYNTHESIS) QUESTIONS AND ANSWERS

<p>What is the function of DNA?</p>	<p>There are two main functions of DNA: Replication and expression.</p> <div style="text-align: center;"> <pre> graph LR DNA -- Replication --> DNA DNA -- transcription --> RNA RNA -- translation --> Protein subgraph expression DNA -- transcription --> RNA RNA -- translation --> Protein end </pre> </div>
<p>What is the role of mRNA?</p>	<p>The RNA molecule is built up from the four ribose nucleotides (A, C, G and U). mRNA carries the "message" that codes for a particular protein from the nucleus (where the DNA master copy is) to the cytoplasm (where proteins are synthesised). It is single stranded and just long enough to contain one gene only. It has a short lifetime and is degraded soon after it is used</p>
<p>What is the role of tRNA?</p>	<p>tRNA matches amino acids to their mRNA codon. There are 64 different tRNA molecules, each with a different anticodon sequence complementary to the 64 codons.</p>
<p>What is the role of ribosomes in protein synthesis?</p>	<p>Ribosomes are proteins, and it is where translation and protein synthesis occurs. They are responsible for 'reading' the mRNA, and allowing the tRNA with complementary anticodons to assemble the correct order of amino acids.</p>
<p>Describe the stages of transcription</p>	<p style="text-align: center;">Transcription = RNA synthesis</p> <ul style="list-style-type: none"> DNA helix unwinds and Hydrogen bonds break Separated DNA chains leave exposed (unpaired) bases RNA nucleotides (A, C, U, G) attach themselves to the DNA bases by complementary base pairing DNA that is copied is called the template or sense strand (the other strand is called the non-template or antisense strand) New RNA nucleotides are joined together by strong covalent bonds by the enzyme RNA polymerase The initial mRNA contains many regions that are not needed as part of the protein code. These are called introns, while the parts that are needed are called exons. Introns are cut out.
<p>What is a codon?</p>	<p>A group of three bases coding for an amino acid</p>
<p>Explain what a non-overlapping code is?</p>	<p>Each triplet in DNA specifies one amino acid. Each base is part of only one triplet, and is therefore involved in specifying only one amino acid.</p>
<p>Explain what a degenerate code is?</p>	<p>There is often more than one codon for an amino acid i.e. there are more base combinations than there are amino acids. This means that several base sequences may code for the same amino acid. E.g. CCA, CCC, CCG and CCT all code for the same amino acid: proline.</p>
<p>Explain the various stages in Translation?</p>	<p style="text-align: center;">Translation = protein synthesis</p> <ul style="list-style-type: none"> Ribosome will attach to a start codon on mRNA. tRNA (with the anticodon complementary to the mRNA codon) diffuses into the ribosome and attaches to the mRNA codon by complementary base pairing. On the tRNA is a specific amino acid The next amino acid-tRNA attaches to the adjacent mRNA codon. Bond between the amino acid and the tRNA is cut and a peptide bond is formed between the two amino acids Ribosome moves along one codon so that a new amino acid-tRNA can attach. Polypeptide chain elongates one amino acid at a time. This continues until a stop codon is reached

In DNA replication the free nucleotides pair with exposed bases, what enzyme joins them together?	DNA polymerase
GENETIC ENGINEERING QUESTIONS AND ANSWERS	
What are plasmids?	Plasmids are small circular strands of DNA often found in bacterial cells. They are used as vectors to transfer DNA from one cell to another
Name three techniques used to locate and isolate genes	<ul style="list-style-type: none"> • Genetic probes • Reverse transcription • Artificial DNA synthesis
Which enzymes cut DNA at specific points?	Restriction endonucleases
What is cDNA?	Complementary DNA
What does a genetic probe consist of?	Consists of a single strand of DNA that contains the known sequence of bases
What are the two most important enzymes used in genetic engineering?	<ul style="list-style-type: none"> • Restriction endonucleases • DNA ligase
Which enzymes cut DNA at specific points?	Restriction endonucleases
What does DNA ligase do?	Join/anneal lengths of DNA together
What is cDNA?	Complementary DNA is DNA made from mRNA, by the use of restriction endonuclease, which does the reverse of transcription – it synthesises DNA from an RNA template. Reverse transcriptase is used to make an artificial gene of cDNA.
What process is needed to amplify large amounts of DNA?	Polymerase Chain Reaction (PCR) → cloning/ amplifying genes
HORMONES AND REPRODUCTION QUESTIONS AND ANSWERS	
What gland produces LH (Lutenising Hormone)	Pituitary Gland
What does LH do to the oestrogen levels?	LH makes the oestrogen levels rise rapidly (just before ovulation)
What hormone prevents development of FSH?	Oestrogen
What does the follicle become after ovulation?	Corpus Luteum
What does oestrogen do to the uterine lining (endometrium)?	Oestrogen helps to repair the endometrium in the uterus
In primates, what is another name for the oestrous cycle?	Menstrual cycle
What does the hypothalamus produce a day before menstruation?	Gonadotrophin hormone (GnRH)
What stimulating hormone does GnRH produce?	Follicle Stimulating Hormone (FSH)