Describe what is meant by tidal volume stating a typical figure - CORRECT ANSWERS -Volume of air moved in and out with each breath at rest. A normal value would be 0.5 dm3.

State the equation for ventilation rate - CORRECT ANSWERS -Ventilation rate = tidal volume x breathing rate (breaths per minute)

The normal breathing rate of a healthy 50 year old woman is 18 breaths per minute and her tidal volume is 500 cm3. During strenuous exercise, her ventilation rate increases to 45 000 cm3min-1 and she is breathing 30 times a minute. Calculate her tidal volume during this exercise and state how much higher than normal this figure is. - CORRECT ANSWERS -TV = 1500 cm3 ...1 dm3 higher than normal

Most bony fish have 5 pairs of gills which are covered by a bony flap, known as the ...? What is the function of this bony flap? - CORRECT ANSWERS - Operculum; protects the gills and ensures a constant flow of water

Describe the structure of gills in bony fish - CORRECT ANSWERS -Two rows of gill filaments; these are slender branches of tissue known as primary lamellae and are attached to a bony arch. Each gill filament is folded into secondary lamellae providing a very large surface area

Describe ventilation in bony fish - CORRECT ANSWERS -Buccal cavity (mouth) can change volume; floor of mouth moves downwards, drawing water into the buccal cavity; mouth closes and water is pushed through the gills. As water is pushed from the buccal cavity through the gills, the operculum moves outwards

State two disadvantages of open circulatory systems - *CORRECT ANSWERS* - Blood pressure is low and blood flow is therefore slow; circulation can be affected by body movements (or lack of)

State four advantages of closed circulation over open circulation - *CORRECT ANSWERS* -Blood travels at higher pressure and therefore flow is faster; oxygen/nutrients supplied and CO2/urea removed more quickly; transport is independent of body movements.

What is the purpose of semilunar valves? - *CORRECT ANSWERS* -To prevent backflow of blood from arteries to the ventricles

Why is the left ventricular wall so much thicker than the right ventricular walls? - *CORRECT ANSWERS* -Blood is pumped through the aorta and needs sufficient pressure to overcome the resistance of the systemic circulation

Why are there so many mitochondria in cardiac muscle? - *CORRECT ANSWERS* -Supply energy for contraction

What is the purpose of intercalated discs between adjacent muscle cells? - *CORRECT ANSWERS* -Ensures an even, synchronised contraction

Briefly outline the events of atrial systole - *CORRECT ANSWERS* -Left and right atria contract together; blood is squeezed from the atria through the atrioventricular valves into the ventricles, down a pressure gradient.

Briefly outline the events of ventricular systole - *CORRECT ANSWERS* - Ventricular blood pressure rises very quickly to a level above the arteries; semilunar valves open and blood rushes out of ventricles into the arteries

elastic/muscle/collagen in walls as no need to stretch and recoil; valves to prevent backflow of blood

Where is hydrostatic pressure created of the blood created? - *CORRECT ANSWERS* -In the ventricles of the heart

What is oncotic pressure? - *CORRECT ANSWERS* -The pressure created by the osmotic effects of the solutes

What substances might affect the oncotic pressure of the blood? - *CORRECT ANSWERS* -Dissolved solutes such as mineral ions, sugars and proteins

State the cell types that are most likely to be found in blood plasma, tissue fluid and lymph - *CORRECT ANSWERS* -Blood plasma - red blood cells, neutrophils, lymphocytes; tissue fluid - neutrophils (especially during infection); lymph - lymphocytes

Why can proteins known as plasma proteins not leave the blood plasma? - *CORRECT ANSWERS* -They are too large to pass between the squamous cells of the capillary wall

Why can neutrophils enter the tissue fluid but erythrocytes cannot? - *CORRECT ANSWERS* -Neutrophils can change shape very easily (multilobed nucleus) and squeeze themselves between cells. Erythrocytes cannot change shape as much

Describe the role of the lymph fluid - *CORRECT ANSWERS* -A system of tubes that returns excess tissue fluid to the blood system

Describe how the charge inside a RBC is maintained when hydreogencarbonate ions diffuse into the plasma - CORRECT ANSWERS - Chloride ions move into the RBCs from the plasma (chloride shift)

Describe how the pH inside a RBC is buffered as hydrogen ions build up inside, making the RBC very acidic - CORRECT ANSWERS -Hydrogen ions are taken out of solution and combined with haemoglobin to form haemoglobinic acid (HHb)

What is the net result of the Bohr effect? - CORRECT ANSWERS -More oxygen is released where more carbon dioxide is produced in respiration

With reference to protein structure, explain how increasing hydrogen ion levels affects haemoglobin - CORRECT ANSWERS - More hydrogen ions --> lower pH (more acidic cytoplasm); tertiary structure of Hb altered which reduces its affinity for oxygen

State three events that occur in G1 phase of the cell cycle - CORRECT ANSWERS -Cells grow and increase in size; proteins from which organelles are made are synthesised (transcribed and translated); organelles replicate

What happens during the S phase of the cell cycle? - CORRECT ANSWERS -This is the synthesis phase, DNA is replicated.

What happens during the G2 phase? - CORRECT ANSWERS -Second growth phase, proteins which involved in making the chromosomes condense are synthesised (transcribed and translated).

Describe how neutrophils are specialised for their role - *CORRECT ANSWERS* - Plasma membrane contains receptors for opsonins, well developed cytoskeleton for phagocytosis, many mitochondria for respiration, many ribosomes to make enzymes, many lysosomes.

Opsonins are non-specific. Explain why - *CORRECT ANSWERS* -Opsonins can attach to many types of pathogen and help the process of phagocytosis, by giving the phagocyte something to bind to. They must be non-specific, so they can attach to many different pathogens.

Where do B lymphocytes and T lymphocytes mature? - *CORRECT ANSWERS* - Bone marrow and thymus respectively

What is meant by the term 'autoimmunity' and give two examples of autoimmune diseases - *CORRECT ANSWERS* -Destruction of self-tissue; rheumatoid arthritis, lupus, type I diabetes

What is the role of T regulatory cells? - *CORRECT ANSWERS* -Dampen down the immune response; prevents destruction of self tissue (autoimmunity)

Describe how an antigen presenting cell leads to large numbers of T helper cells - *CORRECT ANSWERS* -APC binds specifically to a Th cell (clonal selection). This selected Th cell then proliferates by mitosis (clonal expansion)

Describe how B lymphocytes are activated and the role of activated B lymphocytes - *CORRECT ANSWERS* -Th cell binds specifically to B lymphocyte; B lymphocyte differentiates into a plasma cell. Plasma cells release antibodies specific to the particular antigen

What is resolution? - *CORRECT ANSWERS* -The ability to distinguish between to adjacent individual points as separate.

What are the maximum resolutions of the different microscopes? - *CORRECT ANSWERS* -Light: 200nm; SEM: 10nm; TEM: 0.2nm.

What is the maximum magnification of the different microscopes? - *CORRECT ANSWERS* -Light: 1,500X; SEM: 100,000X; TEM: 500,000X.

What are the main structures of all eukaryotic cells? - *CORRECT ANSWERS* - Nucleus; nucleolus; cytoplasm; cytoskeleton; plasma membrane;mitochondria; Golgi apparatus; smooth endoplasmic reticulum; rough endoplasmic reticulum; ribosomes.

Why is the binomial naming system important? - *CORRECT ANSWERS* -A species may have many different common names, but the scientific name will be universal.