

Nutrition

Balanced diet:

		Source	Function
Carbohydrate		PASTA	ENERGY
Protein		MEAT	GROWTH/REPAIR
Lipids	Fats	CHEESE	ENERGY
	Oils	NUTS	
Vitamin A		CARROTS	VISION
Vitamin C		CITRUS FRUITS	SKIN FORMATION
Vitamin D		FISH OIL	ABSORPTION OF WATER ^{CALCIUM} → STRONG BONES
Calcium		MILK	BONES / TEETH
Iron		RED MEAT	HAEMOGLOBIN

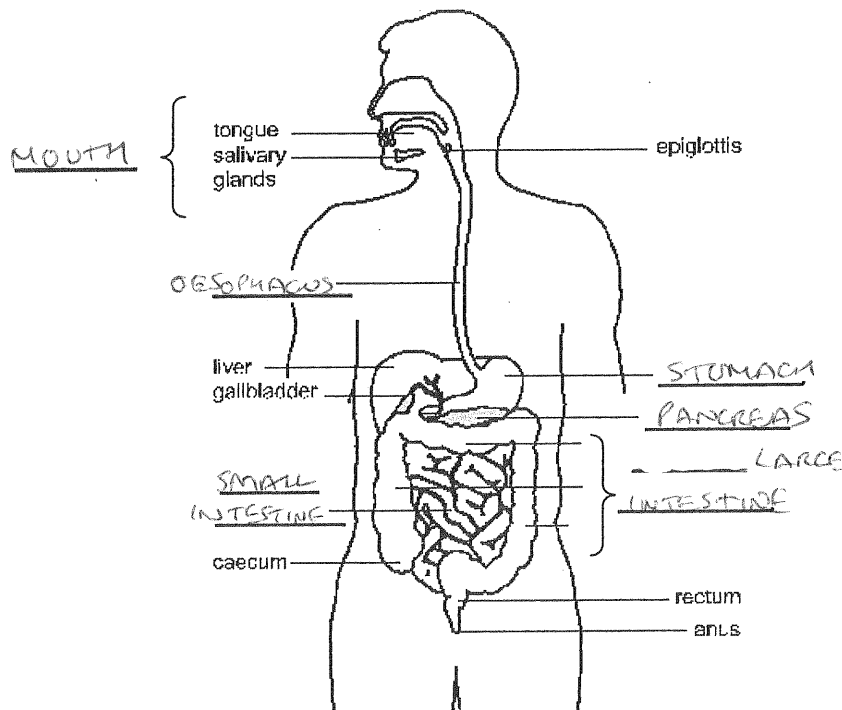
In addition a balanced diet must also include

FIBRE..... - ease passage of food through alimentary canal.

Water - HYDRATION.....

The exact balance of nutrients and the ENERGY requirements depends upon factors such as: activity level; pregnancy and AGE.....

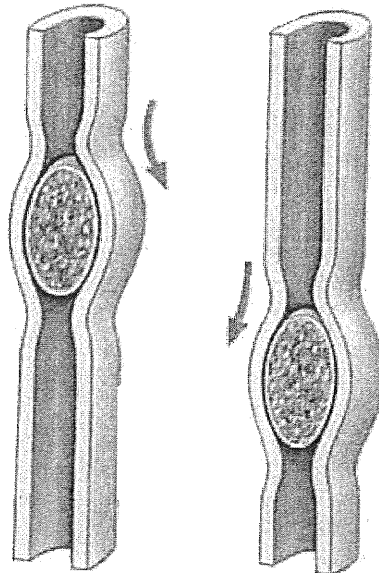
The diagram below shows the human **alimentary** canal, name the structures indicated and state the functions of them:



The process of obtaining nutrition involves several different processes, link the correct word below to its definition and indicate by using a number the sequence in which these events take place:

- Digestion — The consumption of a substance by an organism through the mouth
- Egestion — The transformation of nutrients into substances internal to the body
- Absorption — The process of breaking large insoluble molecules into small solubles ones.
- Assimilation — The uptake of the products of digestion into the blood stream
- Ingestion — The removal of unwanted by-products of digestion.

Digestion comprises of both physical and chemical actions. In the mouth food is mechanically digested by the action of chewing while the enzyme amylase in saliva will help convert starch into maltose. Salivary fluid will also allow the food bolus to be swallowed passing down the oesophagus. The bolus moves to the stomach by the action of waves of muscle contraction know as peristalsis

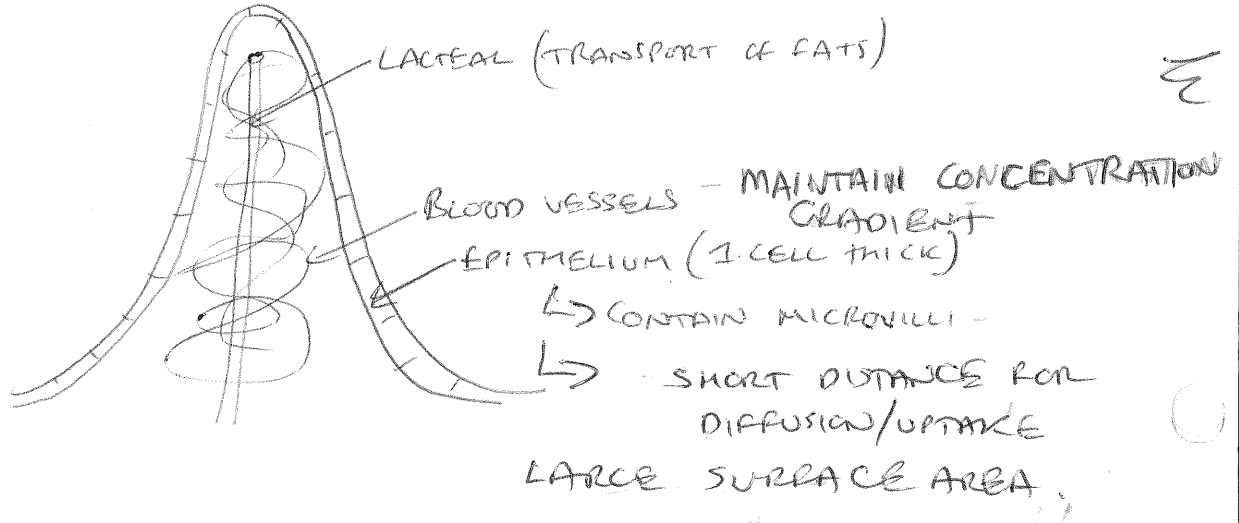


Label the diagram to show where muscle is contracted and where it is relaxed.

Complete the following table of chemical digestion:

	Source	Works on	Effect / product
<u>amylase</u>	Saliva	Starch	Maltose
Maltase	Pancreas	<u>MALTOSE</u>	<u>GLUCOSE</u>
Protease	<u>PANCREAS</u>	Proteins	<u>AMINO ACIDS</u>
Lipase	<u>PANCREAS</u>	<u>LIPIDS</u>	Fatty acids & <u>GLYCEROL</u>
<u>BILE</u>	Liver (stored in <u>GALL</u> <u>BLADDER</u>)	Fats & Stomach acid	<u>EMULSIFIER</u> <u>FATS</u> <u>NEUTRALISES</u>

Absorption of food takes place in the small..... intestine. This is well adapted to this function. Specifically the wall contains many in-foldings known as villi..... Use the space below to make a sketch of such a structure and indicate how it is adapted for its function.



Experiment: how much energy in a sample of food?

The amount of energy can be simply worked out by burning a known mass of the food stuff and recording the change in temperature of a set volume of water. The energy content is then calculated by using the specific heat capacity of water ($4.2 \text{ J/g}^\circ\text{C}$). For example how much energy in 100g of mini-cheddars when a fully burnt 1.67g mini-cheddar heated 20ml of water up by 35°C ?

$$4.2 \times 20 \times 35 = 2940 \text{ J per } 1.67\text{g}$$

$$\text{So } \left(\frac{2940}{1.67} \right) \times 100 = 176,048 \text{ J}$$

This value is likely to be less than the stated pack value, why?

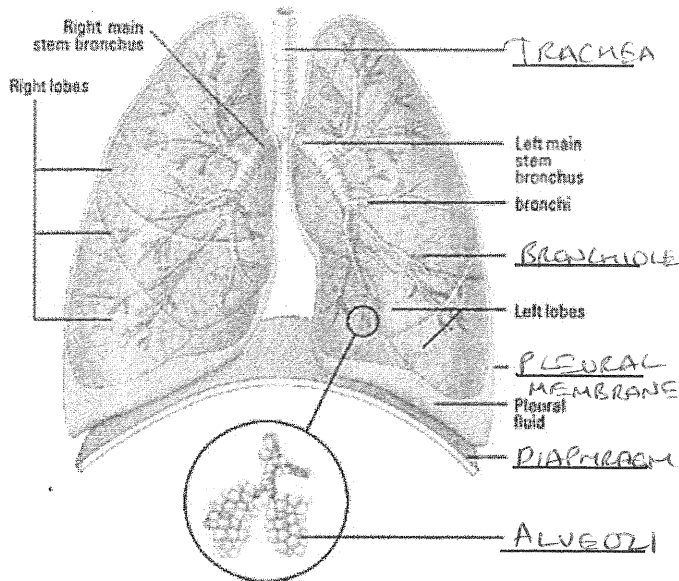
ENERGY LOST - INEFFICIENT ENERGY TRANSFER TO WATER.

- ENERGY RELEASED AS LIGHT
- FATS DRIPS OFF
- NOT FULLY COMBUSTED.

em:

Gas exchange

The human gas exchange organ is the LUNGS..... Label the diagram below:



Protecting this structure is a set of R.I.B.S....., between which lie INTERCOSTAL muscles. In order to inhale the DIAPHRAGM contracts (thereby becoming flatter) as do the muscles. This lifts the rib-cage up and out increasing the VOLUME... of the thorax and therefore DECREASING the pressure. This results in air being drawn into the lungs. For EXHALATION the muscle contract, the volume DECREASES so PRESSURE goes up causing air to be forced out.

The site of gas exchange is actually the ALVEOLI... How are these adapted to this function?

- 1 CELL THICK - SHORT DISTANCE FOR DIFFUSION
- LARGE SURFACE AREA - FOR DIFFUSION
- GOOD BLOOD SUPPLY - MAINTAINS CONC GRADIENT FOR DIFFUSION

Smoking is known to damage the lungs, describe six ways in which smoking affects the lungs and blood vessels/transport system.

- I. EMPHYSEMA - REDUCED SURFACE AREA
∴ LESS GAS EXCHANGE
- II. BRONCHITIS
- III. MOUTH/THROAT/LUNG CANCER - due to mutations
- IV. COUGHING - ACCUMULATION OF TAR + MUCUS
- V. BLOOD VESSEL DAMAGE → ATHEROSCLEROSIS
→ BLOOD CLOTS
- VI. CO BINDS TO HEMOGLOBIN → REDUCED O₂
TRANSPORT

Transport

The TRANSPORT system of a human includes, the heart, blood and blood vessels. Complete the table below to show the composition of blood:

	Structure / composition	Function
Red blood cells	Cells are <u>DISC</u> shaped and small which allows them to squeeze individually down <u>CAPILLARIES</u> . They contain no <u>NUCLEUS</u> but are packed with the red pigment <u>HAEMOGLOBIN</u> which binds to <u>O₂</u> .	<u>TRANSPORT O₂</u>
White blood cells	<u>HAVE NUCLEUS</u> <u>CONTAIN VESICLES WITH DIGESTIVE ENZYMES</u>	There are two main types. Lymphocytes prevent infection by producing <u>ANTIBODIES</u> while <u>PHAGOCYTES</u> can engulf / ingest and then digest pathogens.
Platelets	These are cell fragments similar in shape to red blood cells	<u>BLOOD CLOTTING</u>
Plasma	<u>WATERY FLUID</u> <u>CONTAINING MANY PROTEINS.</u>	Responsible for the transport of: 1. <u>RED BLOOD CELLS</u> 2. <u>WHITE "</u> 3. <u>UREA & CO₂</u> 4. <u>HORMONES</u> 5. <u>HEAT</u>

The white blood cells form part of our immune system. The antibodies released by lymphocytes are SPECIFIC to particular pathogens. This means our white blood cells produce a huge variety of different antibodies to recognise so many potential pathogens. After coming into contact with a pathogen the specific white blood cell will rapidly divide and start making antibodies. However, this response takes several DAYS. The white blood cell also produces MEMORY cells which remain in our bodies and can produce antibodies much sooner, RAPIDLY and in HOGE amount should you come into contact with the same pathogen again. This rapid second response is the principle behind the process of VACCINATION. Another important part of our bodies defence to disease is blood CLOTTING when you get a wound. This helps prevent excess blood loss but also prevents the entry of PATHOGENS.

Proteins in your plasma form a mesh around a wound into which PLATELETS get stuck thus forming a CLOT.....

Blood vessels:

Complete the following table:

	Artery	Vein	Capillary
Valves	X	✓	X
Muscle layer	THICK	THIN	X
Elastic tissue layer	THICK	THIN	X
Function	BLOOD AWAY FROM HEART	BLOOD TO HEART	EXCHANGE BETWEEN CELLS & BLOOD

Name the blood vessels supplying the:

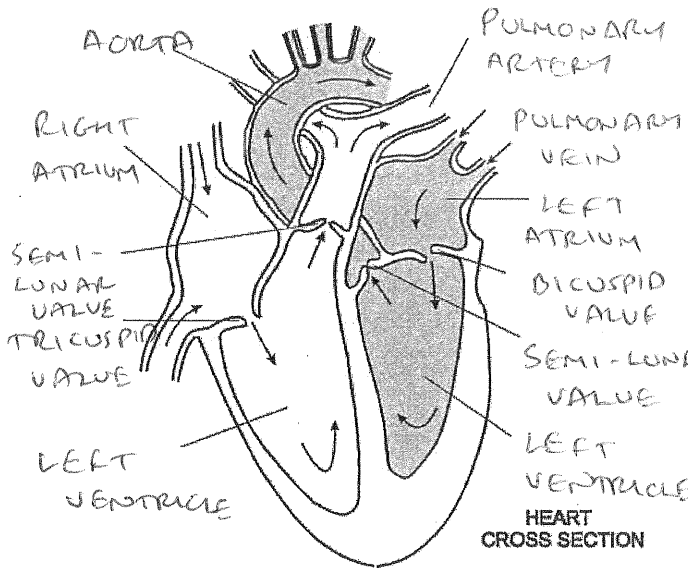
Heart: CORONARY.....

Lungs: PULMONARY.....

Liver: HEPATIC.....

Kidneys: RENAL.....

The heart: Label the diagram.



Describe how and why the heart responds to:

Exercise:

HR GOES UP
 STROKE VOLUME (BLOOD/BEAT)
GOES UP
INCREASE O₂ DELIVERY
TO MUSCLES

FOR AEROBIC RESPIRATION

Adrenaline:

INCREASES HR + SV TO
INCREASE O₂ DELIVERY
TO MUSCLES

Excretion

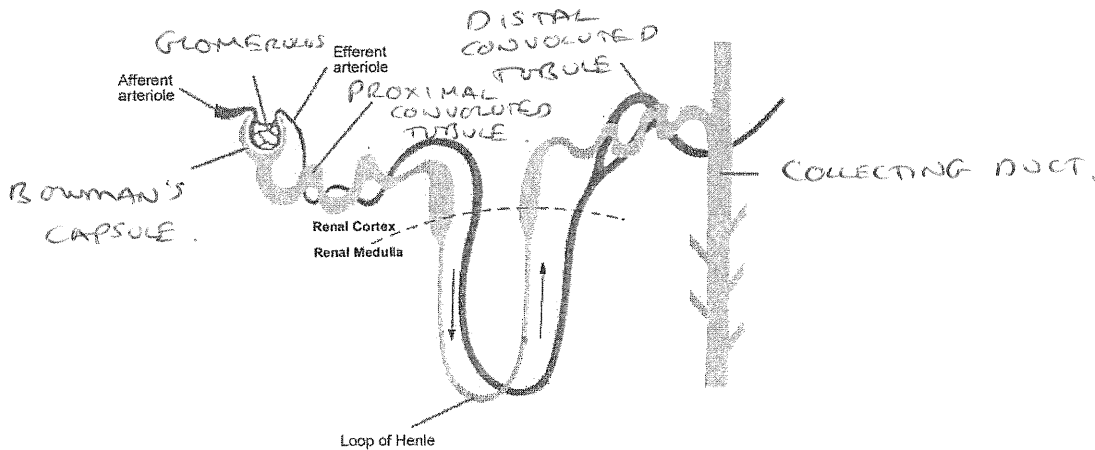
Excretion is the removal of METABOLIC WASTE. Homeostasis is the maintenance of a STEADY state in the body. Such factors under control include:

TEMPERATURE; BLOOD SUGAR and WATER.

The following organs are involved:

- i) Kidney
- ii) LUNGS
- iii) SKIN

The kidney is responsible for removing UREA and is also vital in controlling WATER levels in the body. The 2 kidneys are joined by the URETERS which also links them to the BLADDER. The urine (containing WATER, UREA and SALTS) then exits the body via the URETHRA. The kidney is made up of thousands of nephrons. Label the nephron below:



In the nephron 3 important processes take place. Describe each in the space below:

Ultrafiltration :

HIGH PRESSURE OF BLOOD IN GLOMERULUS FORCES
SUBSTANCES INTO BOWMAN'S CAPSULE NON-SELECTIVE,
EXCEPT ALTHOUGH LARGE PROTEINS & CELLS REMAIN IN BLOOD

Selective reabsorption:

ACTIVE UPTAKE OF CERTAIN SUBSTANCES, e.g. GLUCOSE,
AMINO ACIDS, BACK INTO THE BLOOD. PROXIMAL (+DISTAL)
CONVOLUTED TUBULES.

Control of water levels (osmoregulation – mention ADH)

MUCH WATER REABSORBED IN LOOP OF HENLE
MORE CAN BE TAKEN BACK IN COLLECTING DUCTS.
IF LACKING WATER PITUITARY GLAND RELEASES ADH
WHICH CAUSES MORE WATER TO LEAVE FILTRATE IN
COLLECTING DUCT BACK INTO BLOOD. CONCENTRATES
URINE AND MAINTAINS BLOOD VOLUME

Describe how the skin helps to control temperature:

SWEATING - LOSE HEAT AS WATER EVAPORATES
 PILORRECTION (GOOSE BUMPS) - RAISE HAIRS & TRAP
 LAYER OF AIR

The urine formed contains:

1. WATER
2. IONS
3. UREA

Coordination and response

A coordinated response requires the three following: a DETECTOR / RECEPTOR; a CO-ORDINATOR and an EFFECTOR. Such coordination can involve the nervous or hormonal systems or even both. Compare the nervous and hormonal system in the following table:

	Nervous	Hormonal
Type of message	ELECTRICAL IMPULSE	CHEMICAL
Speed	QUICK	SLOW
Location of effect	USUALLY LOCALISED	SPREAD OUT OVER VARIOUS PARTS OF BODY
Duration	QUICK	SLOWER

Complete the following table of important hormones:

	Source	Role	Effect
ADH	PITUITARY	OSMOREGULATION	CONSERVE WATER
Insulin	PANCREAS	CONTROL BLOOD SUGAR	LOWERS BLOOD SUGAR
Adrenaline	ADRENAL	FIGHT/FLIGHT	PREPARE FOR ACTIVITY
Testosterone	TESTES	MALE SECONDARY SEXUAL CHARACTERISTICS	
Progesterone	OVARY	} SEE SECTION ON MENSTRUAL CYCLE	
Oestrogen	OVARY		

The nervous system comprises the CENTRAL nervous system (CNS) consisting of the BRAIN and SPINAL CORD, which is linked to the sense organs (receptors) via SENSORY neurones and to the effectors (muscle and GLANDS) via MOTOR neurones.

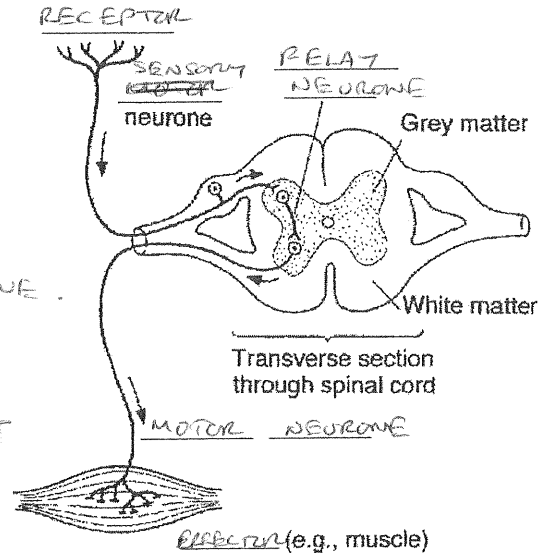
Label the diagram illustrating a simple REFLEX arc. The advantage of this is the SPEED..... with which a response is generated.

This kind of system is used when:

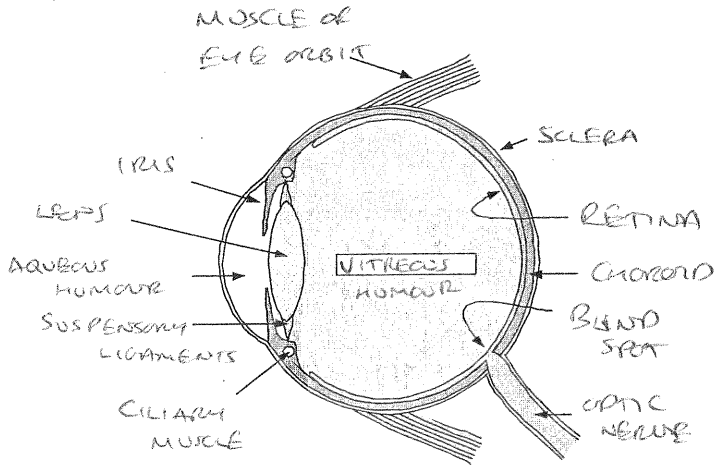
IMMEDIATE RESPONSE - PROTECTIVE

Examples include:

- TOUCHING SOMETHING HOT
- BLINK REFLEX



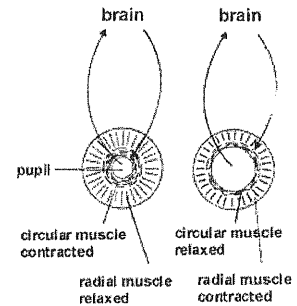
Label the following diagram of the eye:



How does the eye **accommodate** to focus on near and far objects:

(CM)
FAR: CILIARY MUSCLES RELAX
VITREOUS HUMOUR PUSHES OUT
CAUSING LENS TO STRETCH → LIGHT
RAY'S NOT REFRACTED GREATLY
NEAR: CONTRACTION OF CM CAUSE
OUTWARD PRESSURE SO LIGAMENTS
SLACKEN & LENS FATENS

When moving from a dark to a light room the circular muscles of the iris CONTRACT..... to reduce the size of the PUPIL..... and thus restrict the amount of light entering the eye (which could damage the RETINA...). In the reverse situation the radial muscles of the iris contract so that the pupil DILATES.....



IGCSE Questions

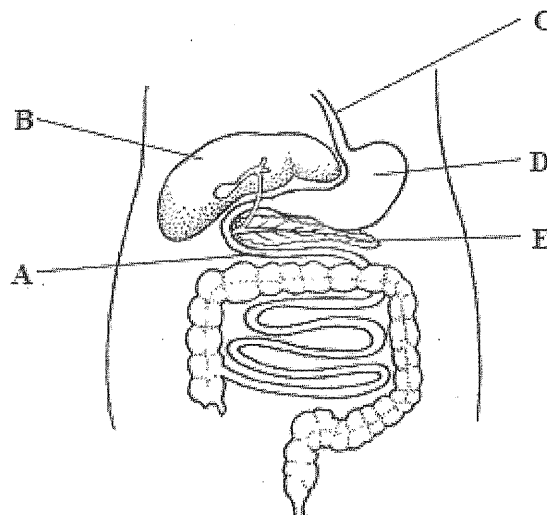
1. A poisonous snake bites a man's toe.

The passage below describes how the snake venom travels from the toe to the brain. Use suitable words to complete the sentences in the passage.

The venom travels to the heart in the largest vein called the..... The right atrium contracts and pumps the venom through the atrio-ventricular valve into the right The muscles of this heart chamber contract and pump the venom through a valve and along the artery to the The venom returns from this organ to the left atrium of the heart in a vein. It then enters the chamber of the heart with the thickest wall, made of tissue. This chamber pumps the blood out of the heart into the largest artery called the..... A branch of this blood vessel transports the venom to the brain.

Total 7 marks

2. The diagram shows part of the human digestive system.



(a) The table below lists some processes that occur in the human digestive system. Complete the table using letters from the diagram to show where each process occurs. Write **one** letter only in each box.

Process	Letter
protein is first digested	
fat is emulsified	
bile is produced	
insulin is released	

(4)

(a) (i) How many deaths occur each year from heart disease in men who have the highest blood cholesterol level recorded in these data?
(1)

(ii) How many fewer deaths would occur each year from heart disease if these men reduced their blood cholesterol to 4 mmol per litre?
(1)

(b) Cholesterol causes heart disease by blocking blood vessels leading to important organs such as the heart.

(i) Name the blood vessel that transports blood to the heart muscle.
(1)

(ii) Explain how blocking this blood vessel can cause death.

(3)

(c) Cholesterol is used in the human body to make some important substances. Three of these substances are shown in the table. Complete the table by giving **one** function of each substance.

Substance	Function
testosterone	
progesterone	
myelin	

(3)

Total 9 marks

5. Some people are unable to produce enough of the hormone ADH. This condition is called diabetes insipidus.

(a) (i) Name the organ that normally produces ADH.
(1)

(ii) How does ADH get from this organ to the kidney?
(1)

(iii) Name the part of the kidney nephron that responds to ADH.
(1)

(b) (i) Explain why a lack of ADH is a problem.

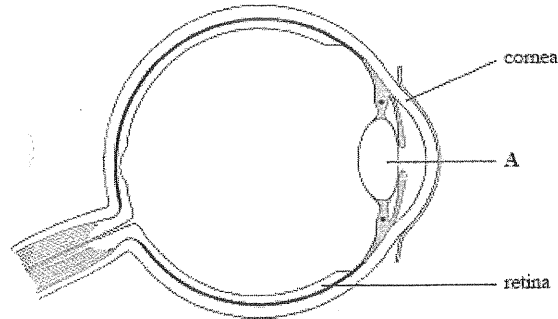
(2)

(ii) Suggest what people with diabetes insipidus must do in order to survive.

..... (1)

Total 6 marks

6. The diagram shows a section of the human eye.



(a) Name the part labelled A.

.....(1)

(b) Some people have a rare genetic condition that makes the cornea become cloudy. As a result they find it difficult to see clearly and may become blind.

(i) Suggest why a cloudy cornea makes it difficult for a person to see clearly.

.....
.....
.....(2)

Total 3 marks

1.

- vena cava;
- ventricle;
- semi lunar;
- pulmonary;
- lung(s);
- muscle / cardiac;
- aorta;

(7)

Total 7 marks

2.

(a)

Event	Letter
protein is first digested	D;
fat is emulsified	A;
bile is produced	B;
insulin is released	E;

(4)

(b)

- (i) peristalsis;
- (ii) egestion / defecation; R excretion

(1)

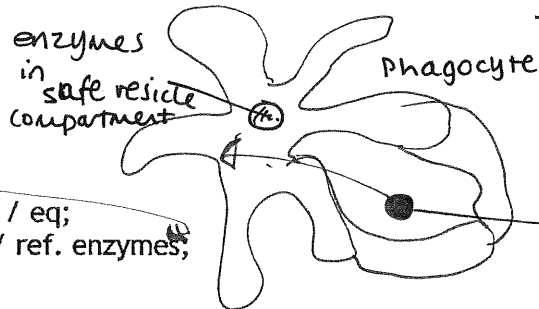
(1)

Total 6 marks

3.

(a)

Pneumococcus;



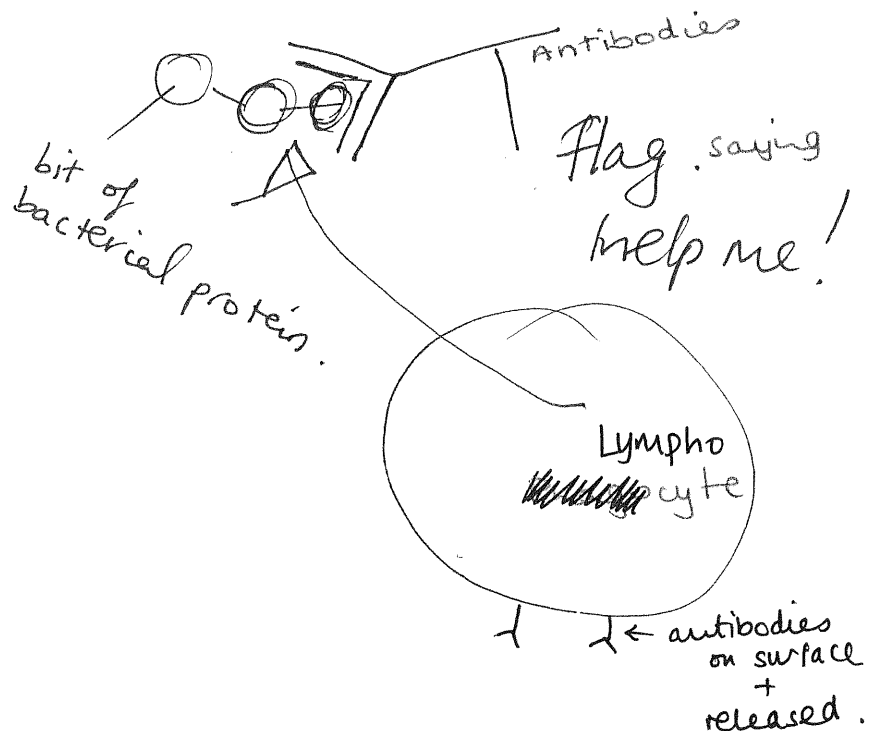
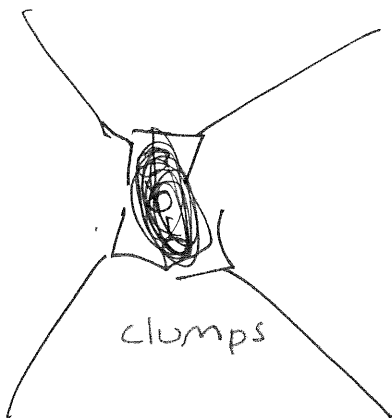
(1)

(b)

- phagocytes;
- ingest / engulf / eat / eq;
- digest / breakdown / ref. enzymes;
- lymphocytes;
- antibodies;
- clump/stick/lyse/neutralise;; (ie 2 max for this point)
- maximum of 5

(5)

Total 6 marks



- 4.
- (a) (i) 11 300; (1)
(ii) 5 100; (1)
- (b) (i) coronary artery; (1)
(ii) less oxygen / glucose;
less aerobic respiration / anaerobic respiration;
less energy / ATP;
lactic acid;
toxic / eq; max
heart attack / no muscle contraction / eq; (3)
- (c) testosterone: develop male secondary sexual characteristics / eq;
progesterone: maintain uterus lining / inhibit FH/FSH;
myelin: speed nerve impulses; (3)

Total 9 marks

- 5.
- (a) (i) pituitary; (1)
(ii) blood / eq; (1)
(iii) collecting duct; (1)
- (b) (i) no / less reabsorption less water into blood / blood more concentrated;
dehydration / loses too much water; (2)
(ii) drink (lots of) water;
ACCEPT ADH tablets / injection (1)

Total 6 marks

6.

Question Number	Question		
4	(a)		
	Acceptable Answers	Reject	Mark
	lens;		(1)

Question Number	Question		
4	(b)		
	Acceptable Answers	Reject	Mark
	(i) light doesn't pass through easily / is scattered / eq; not focussed / not on retina / eq.;		2

Total 3 marks