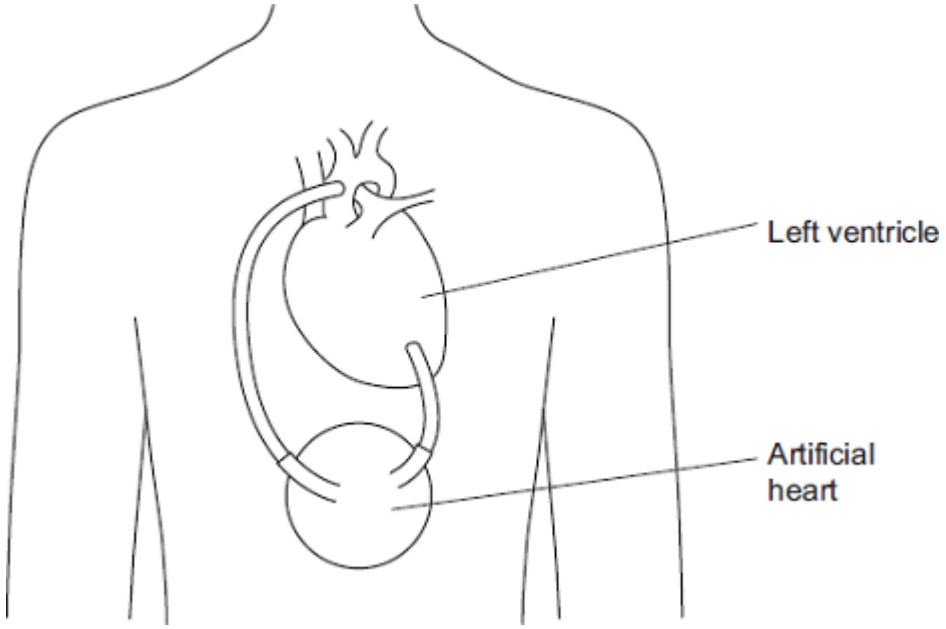
Q1.

Some people have a form of *heart failure* where their heart is not pumping blood as well as it used to. Some people with heart failure are given an artificial heart to improve circulation of blood from the left ventricle.
Figure 1 shows where this type of artificial heart is connected.

Figure 1



(a) Name the blood vessel to which the artificial heart is connected.

_____

(1)

(b) In these patients, the right ventricle still produces sufficient blood flow to keep the patient alive.

Suggest why the left ventricle requires the help of the artificial heart but the right ventricle does not.

_____

_____

_____

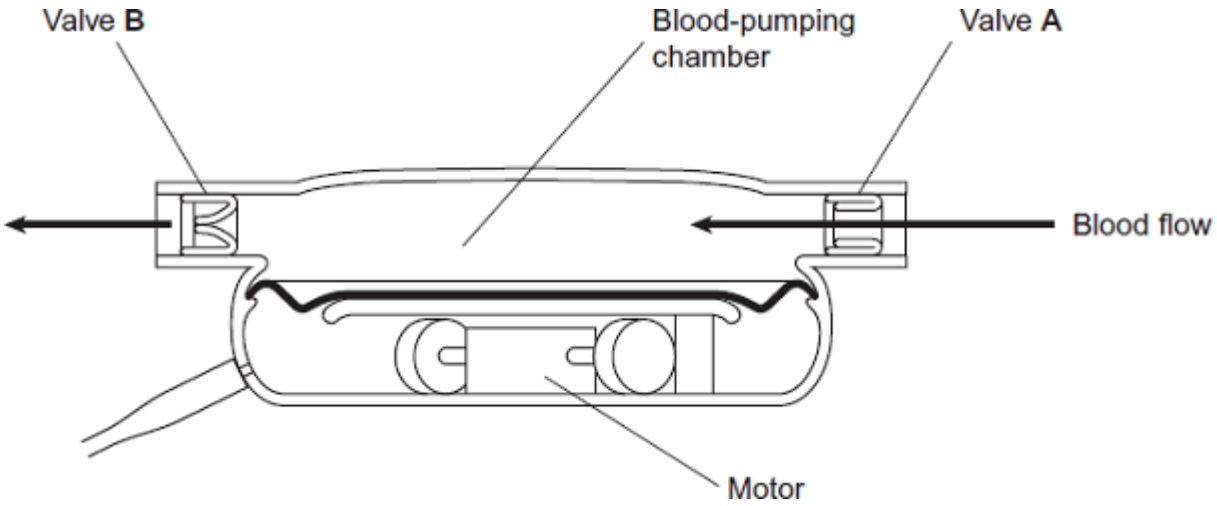
_____

_____

(2)

(c) **Figure 2** shows the internal structure of this type of artificial heart.

Figure 2



Valves **A** and **B** have the same functions as heart valves involved in the cardiac cycle. Name the heart valve that has the same function as:

valve **A** _____

valve **B** _____

(2)

(d) There are different designs of artificial heart. Doctors compared results for patients who received two different types of artificial heart, **X** and **Y.**

They recorded information 2 years after the artificial hearts were implanted. Their results are **shown in Figure 3**.

Figure 3

	Information recorded 2 years after artificial heart implanted		
Type of artificial heart	**Number of patients surviving without replacement of artificial heart**	**Number of patients surviving but who required repair or replacement of artificial heart**	**Number of patients who died**
X (119 patients)	62	13	44
Y (58 patients)	7	24	27

Which type of artificial heart was the more successful? Use calculations to support your answer.

_____

_____

_____

_____

_____

_____

_____

*(Extra space)*_____

_____

_____

(3)

(Total 8 marks)

Q2.

(a) (i) The human heart has four chambers.
In which **one** of the four chambers of the human heart does pressure reach the highest value?

_____

(1)

(ii) Explain how the structure of this chamber causes this high pressure.

_____

_____

_____

(1)

The table shows the volume of blood in a man's right ventricle at different times during one cardiac cycle.

Time / s	Volume of blood / cm^3
0.0	125
0.1	148
0.2	103
0.3	70
0.4	56
0.5	55
0.6	98

0.7	125

(b) (i) Use the data in the table to calculate the man's heart rate.

Heart rate = _____ beats per minute

(ii) Use the data in the table and your answer to part (b) (i) to calculate the man's cardiac output. Show your working.

Cardiac output = _____ cm^3 per minute

(3)

(c) Use information from the table to complete the table below to show whether the valves are **open** or **closed** at each of the times shown. Write open or closed in the appropriate boxes.

Time / s	Valve between right atrium and right ventricle	Valve between right ventricle and pulmonary artery
0.2		
0.6		

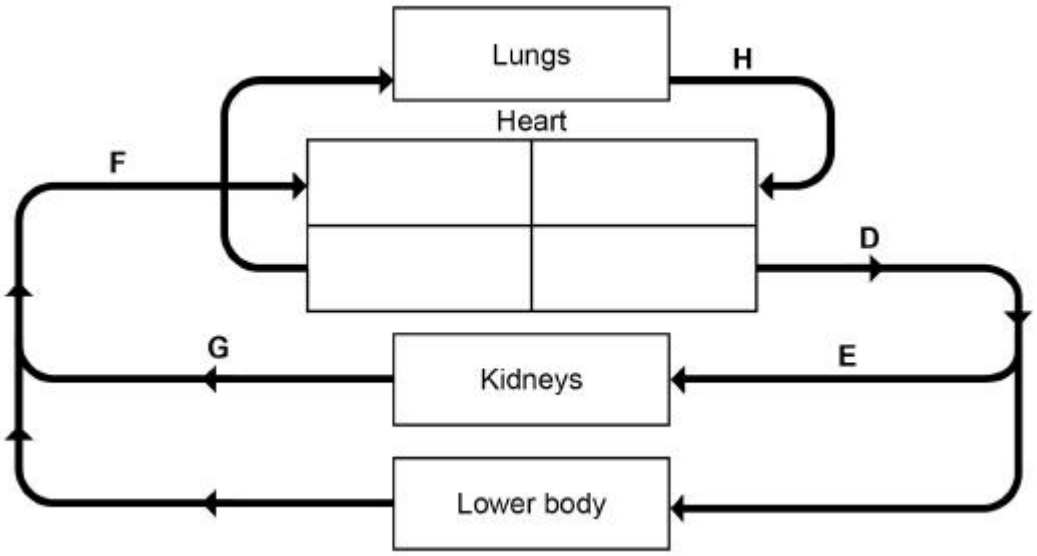
(2)

(Total 7 marks)

Q3.

(a) **Figure 1** shows part of the blood circulation in a mammal.

Figure 1



Use **Figure 1** to give the letter that represents each of these blood vessels.

Aorta ☐

Renal vein ☐

Vena cava ☐

(3)

(b) Name the blood vessels that carry blood to the heart **muscle**.

_____

(1)

(c) **Figure 2** shows a photograph of part of a mitochondrion from a mouse liver cell taken using a transmission electron microscope at × 62 800 magnification.

Figure 2

Produce a scientific drawing of the mitochondrion in **Figure 2** in the box below.

Label the following parts of the mitochondrion on your drawing.

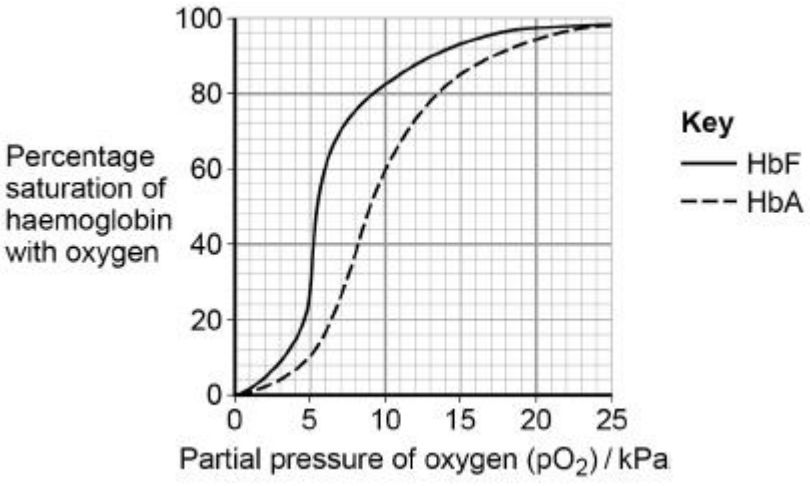
- Matrix
- Crista

(4)

(Total 8 marks)

Q4.

The graph shows the oxyhaemoglobin dissociation curves for fetal haemoglobin (HbF) and adult haemoglobin (HbA).



(a) Explain how changes in the shape of haemoglobin result in the S-shaped (sigmoid) oxyhaemoglobin dissociation curve for HbA.

(2)

(b) At birth 98% of the haemoglobin is HbF. By the age of 6 months, the HbF has usually completely disappeared from the baby's blood and been replaced by HbA.

Use the graph above to explain why this change is an advantage for the baby.

(2)

(c) Sickle cell disease (SCD) is caused by production of faulty HbA. This results in a reduced ability to transport oxygen to tissues. Scientists investigated the use of a substance called hydroxyurea to treat babies with SCD. Hydroxyurea changes the concentration of HbF in the blood.

The scientists carried out an investigation with 122 babies who had SCD. Each baby was given hydroxyurea for 41 months. The scientists then found the mean change in the concentration of HbF in the babies' blood.

Their results are shown in the table.

Mean concentration of HbF in the babies' blood / arbitrary units	
Before treatment with hydroxyurea (± 1 standard deviation)	**After treatment with hydroxyurea (± 1 standard deviation)**
7.6 (± 4.5)	19.1 (± 6.5)

The scientists concluded that treatment with hydroxyurea would increase the concentration of oxygen in the blood of babies with SCD.

Suggest how the graph and table above support this conclusion.

(3)

(Total 7 marks)

Q5.

(a) The oxygen dissociation curve for haemoglobin shifts to the right during vigorous exercise. Explain the advantage of this shift.

(3)

(b) Weddell seals are diving mammals that live in cold environments. A Weddell seal is shown in **Figure 1**.

Figure 1

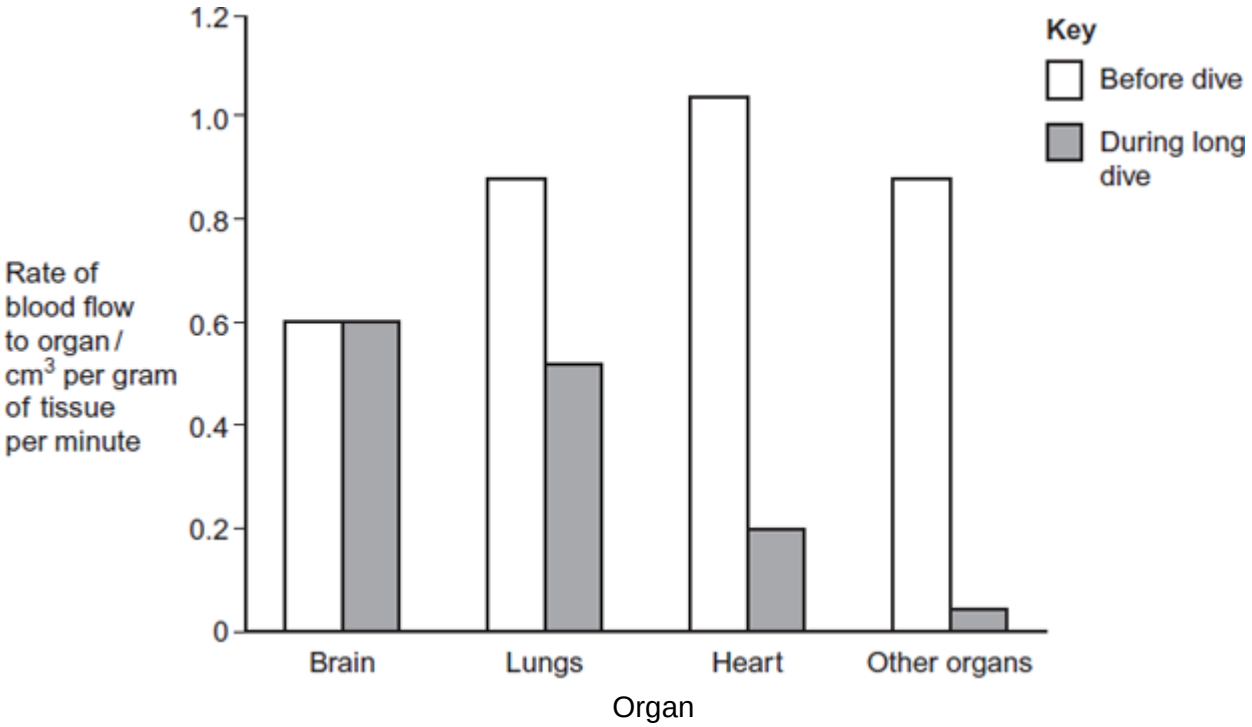
By Jerzystrzelecki (own work)
[CC BY 3.0] via Wikimedia Commons

(i) Explain how the body shape of a Weddell seal is an adaptation to living in a cold environment.

(2)

(ii) Weddell seals can remain underwater for long periods of time. **Figure 2** shows the rate of blood flow to different organs of a Weddell seal before a dive and during a long dive.

Figure 2



Describe and explain the changes in the rate of blood flow to the different organs during a long dive.

_____

_____

_____

_____

_____

_____

(Extra space) _____

_____

_____

(3)

(Total 8 marks)

Q6.

If red blood cells are placed in pure water, water enters the cells by osmosis and they burst. This is called haemolysis. As red blood cells burst they release pigment.

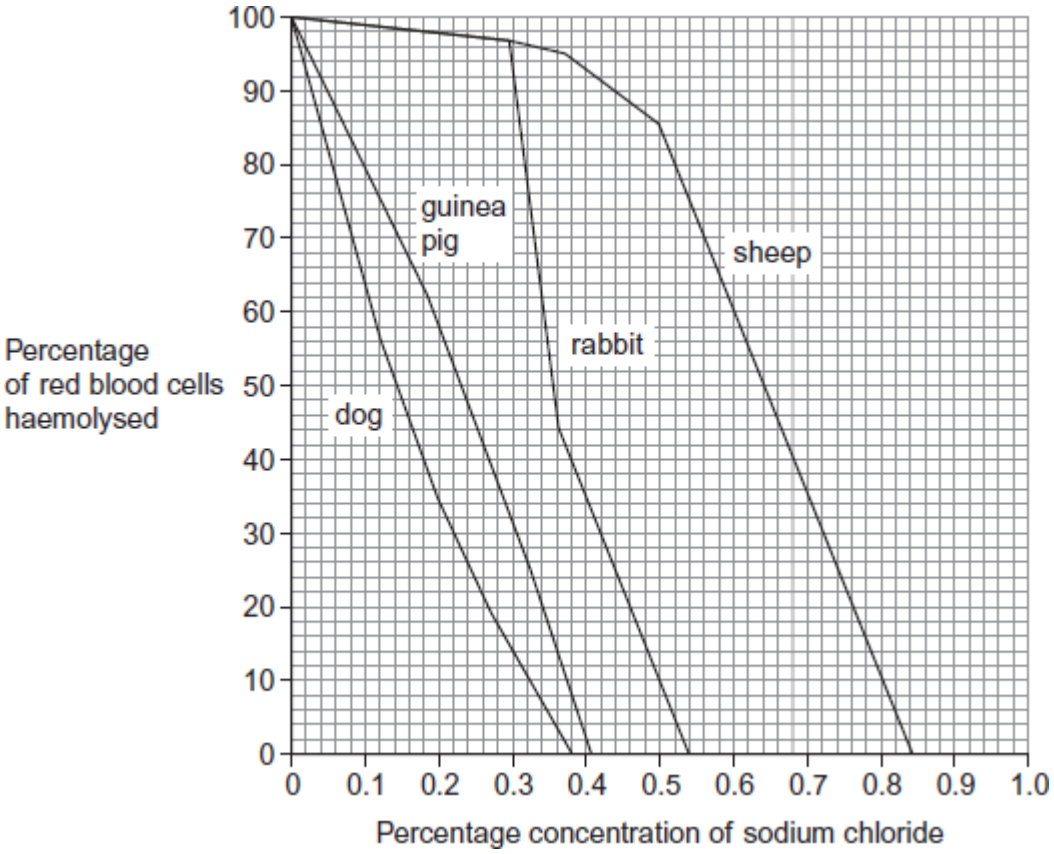
Scientists placed samples of red blood cells in different concentrations of sodium chloride

solution for the same period of time. They used red blood cells from four different mammals: dog, guinea pig, rabbit and sheep.

If haemolysis had taken place, the solution turned red. The scientists measured the intensity of the red colour using a colorimeter. The more intense the red colour, the greater the amount of haemolysis.

The scientists calculated the percentage of red blood cells that were haemolysed in each sodium chloride solution.

The following figure shows the scientists' results.



(a) Use the figure to give **two** differences between the results for dog and sheep.

Difference 1 _____

_____

Difference 2 _____

_____

(2)

(b) Calculate the difference in the percentage of haemolysed cells between sheep and rabbit at a sodium chloride concentration of 0.5%.

_____

(1)

(c) Explain the relationship between the depth of the red colour of the solution and how much haemolysis has taken place.

_____

_____

_____

_____

_____

(2)

(d) During treatment in a veterinary surgery, any of the mammals in the figure above may be given an infusion of sodium chloride solution directly into a vein. The concentration of sodium chloride solution used is 0.9%, rather than 0.5%, regardless of the species of mammal.

Explain the advantage to the vet of using this concentration.

_____

_____

_____

_____

(Extra space) _____

_____

_____

(2)

(Total 7 marks)

Q7.

Haemoglobin is a protein. It is made of two alpha polypeptides and two beta polypeptides. Each alpha polypeptide has 141 amino acids and each beta polypeptide has 146 amino acids.

(a) What term is used to describe the structure of a protein made of two or more polypeptides?

_____

(1)

(b) Calculate the minimum number of DNA bases needed to code for the number of amino acids in one alpha polypeptide.

Answer = _____

(1)

(c) Describe the role of haemoglobin in supplying oxygen to the tissues of the body.

_____

_____

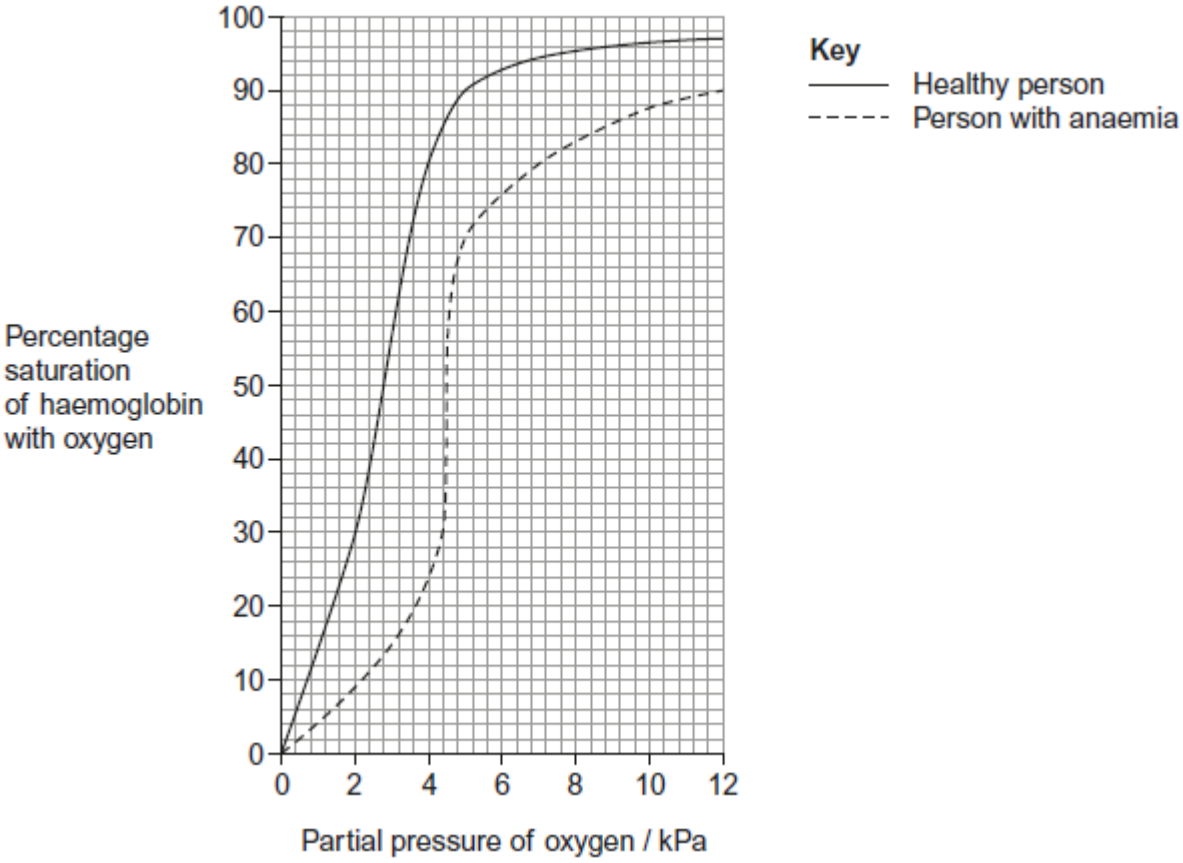
_____

_____

(2)

Anaemia is a condition in which there is a decrease in the concentration of haemoglobin in blood. In some people with anaemia, substances are produced which change the oxygen dissociation curve of haemoglobin.

The graph shows the effect of these substances on the oxygen dissociation curve of haemoglobin.



(d) (i) Use information in the graph to find the difference in the percentage saturation of haemoglobin with oxygen between a healthy person and a person with anaemia at a partial pressure of oxygen of 4 kPa.

Answer = _____

(1)

(ii) Explain the advantage to a person with anaemia of the change shown in the oxygen dissociation curve.

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 8 marks)

Q8.

(a) Describe how water is moved through a plant according to the *cohesion-tension* hypothesis.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(b) The mass of water lost from a plant was investigated. The same plant was used in every treatment and the plant was subjected to identical environmental conditions. In some treatments, the leaves were coated with a type of grease. This grease provides a waterproof barrier. The results of the investigation are given in the table.

Treatment	Mass lost in 5 days / g
No grease applied	10.0
Grease applied only to the	8.7

upper surface of every leaf	
Grease applied to both surfaces of every leaf	0.1

(i) What is the advantage of using the same plant in every treatment?

_____

_____

(1)

(ii) Why was it important to keep the environmental conditions constant?

_____

_____

(1)

(iii) What is the evidence that the grease provides a waterproof barrier?

_____

_____

(1)

(c) (i) Calculate the mass of water lost in 5 days through the upper surface of the leaves.

Answer _____

(1)

(ii) Use your knowledge of leaf structure to explain why less water is lost through the upper surface of leaves than is lost through the lower surface.

_____

_____

_____

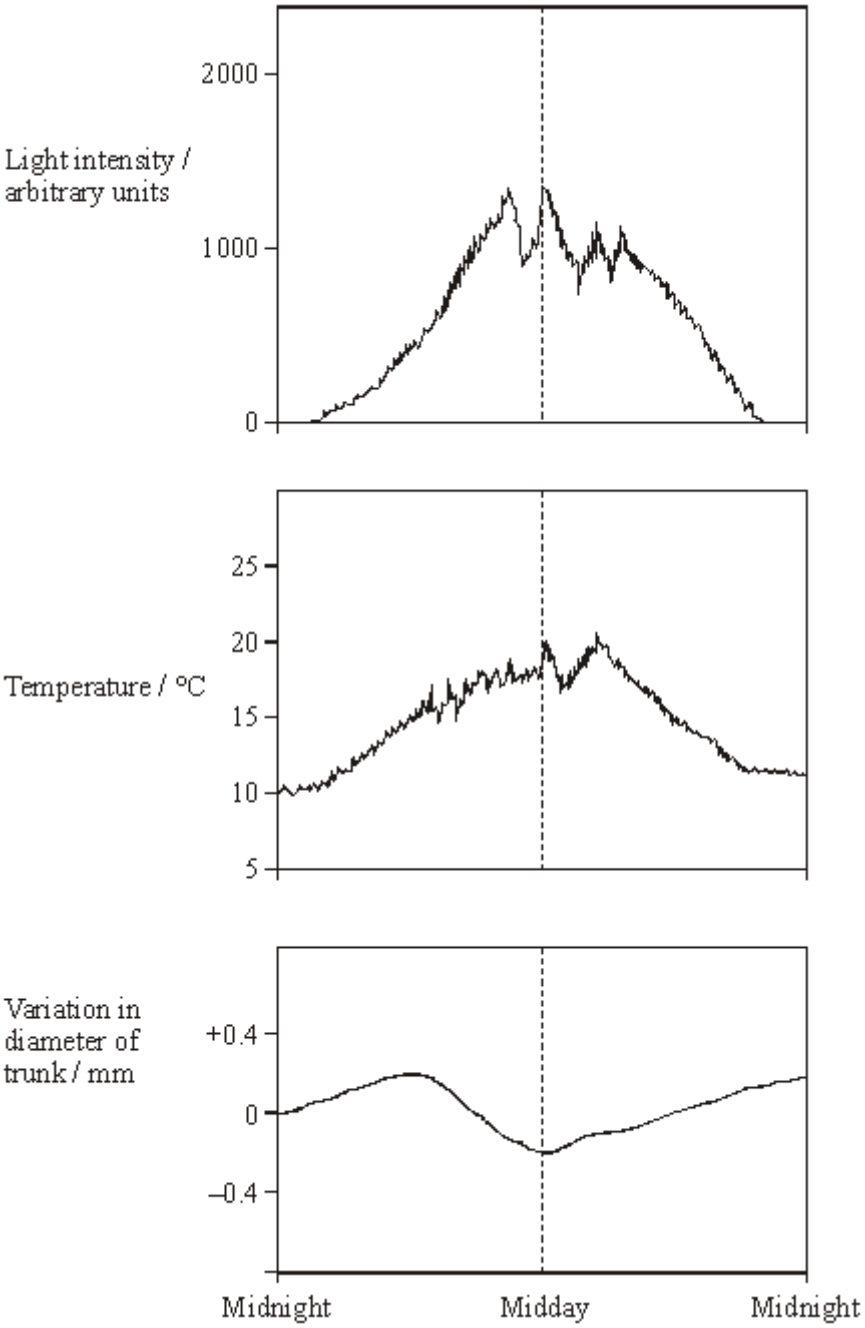
_____

(2)

(Total 10 marks)

Q9.

(a) The graphs show the daily changes in environmental temperature and light intensity, and changes in the diameter of the trunk of a pine tree.



Use information from the graphs, and your knowledge of the cohesion-tension theory of water movement through a plant, to explain why the diameter of the trunk is smallest at midday.

(6)

(b) Describe and explain **three** ways in which the leaves of xerophytic plants may be adapted to reduce water loss.

(3)

(Total 9 marks)

Q10.

Scientists used fossil leaves from one species of pine tree to investigate whether changes in the concentration of carbon dioxide in the air over long periods of time had led to changes in the number of stomata in the leaves.

Their method is outlined below.

- They selected sites of different ages.
- They collected between 11 and 24 fossil leaves from each site.
- They found the mean number of stomata per mm^2 on the leaves from each site.
- They estimated the age of each sample by dating organic remains around the leaves at each site.

They compared results from the fossil leaves with leaves from the same species of pine tree growing today.

They knew the concentration of carbon dioxide in the air at different times in the past.

Their results are shown in the table.

Age of	Concentration of carbon dioxide in the	Mean number of stomata per mm^2

sample/years	air/%	(± standard deviation)
present day	0.0350	92 (±2)
5000	0.0270	87 (±4)
10 000	0.0250	95 (±2)
15 000	0.0205	108 (±6)
20 000	0.0195	115 (±4)
25 000	0.0188	118 (±6)
30 000	0.0190	130 (±6)

(a) The concentration of carbon dioxide in the air has changed with time. Use the data to describe how.

(2)

(b) The scientists calculated the mean number of stomata per mm^2 and the standard deviation.

What does the standard deviation show?

(2)

(c) The scientists found the age of the fossil leaves by dating the organic remains around them.
Would this have affected the accuracy of their data? Explain your answer.

(1)

(d) 30 000 years ago the mean number of stomata per mm^2 on the lower epidermis of pine tree leaves was much higher than it is today. This would have enabled the plant to grow faster when the carbon dioxide concentration of the air was low.

Explain why.

_____

_____

_____

(1)

(e) A student who saw these results concluded that as the carbon dioxide concentration of the air had increased the number of stomata per mm^2 in leaves had decreased.
Do the results support this conclusion?

_____

_____

_____

_____

_____

_____

(Extra space)_____

_____

_____

(3)

(f) The leaves of plants that grow in dry areas usually have a low number of stomata per mm^2. Use your knowledge of leaf structure to suggest **three** other adaptations that the leaves might have that enable the plants to grow well in dry conditions.

1. _____

2. _____

3. _____

(3)

(Total 12 marks)

Q11.

(a) Describe how the structures of starch and cellulose molecules are related to their functions.

(5)

(b) Describe the processes involved in the transport of sugars in plant stems.

(5)

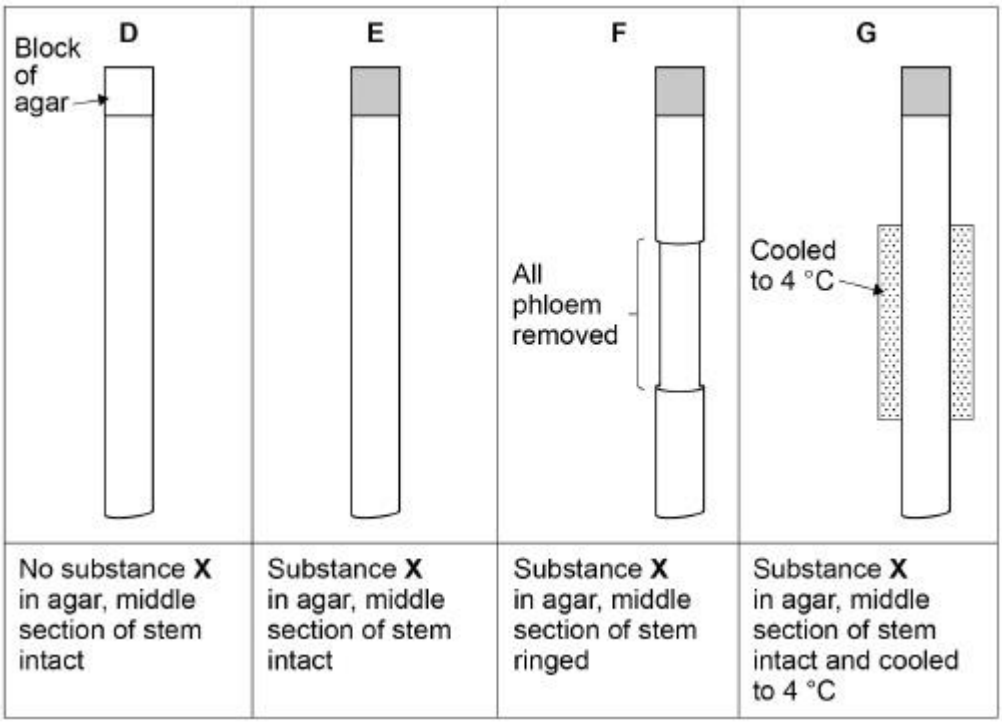
(Total 10 marks)

Q12.

Under the correct conditions, new roots grow from the cut end of a plant stem. A scientist investigated the effect of substance X on the growth of new roots.

She used a ringing experiment to investigate the movement of substance X in stems taken from lemon plants. She cut out a length of stem from each plant. She then put a small block of agar on the top of each length of stem. Some agar blocks contained substance X.

The diagram below shows how she treated each length of stem.



She grew the lengths of stem in the same environmental conditions for 6 weeks, and then found the number of roots per length of stem. Roots grew at the other end of the stem from where the agar blocks were placed.

The table below shows the scientist's results.

Treatment	Mean number of roots per length of stem
D	5
E	11
F	4
G	3

(a) Treatment **D** is a control. Explain how the measurement obtained from this control is used by the scientist.

_____

(2)

(b) Using the diagram and the table above, what can you conclude from treatments **D** and **E** about root growth?

(3)

(c) The mass flow hypothesis is used to explain the movement of substances through phloem.

Evaluate whether the information from this investigation supports this hypothesis. Do **not** consider statistical analysis in the answer.

(4)
(Total 9 marks)

Q1.

(a) Aorta;

1

(b) 1. Left ventricle pumps to whole body (except lungs) / pumps blood further;

Accept converse for right ventricle

Reject 'push'

2. Left ventricle does most work / produces a greater pressure / produces a greater force;

2

(c) 1. (Valve **A**) atrioventricular valve;

Accept bicuspid / mitral

2. Semi-lunar valve;

Accept aortic valve

Ignore references to left and right

2

(d) **X** because (no mark)

Accept other valid calculations - probabilities

1. 52.1% survived without replacement compared to 12.1% / difference of 40%;

If correct figures written in table, award marks

2. 10.9% required repair or replacement of artificial heart compared to 41.4% / difference of 30.5%;

Max 2 if incorrect rounding of values

3. 37% died compared to 46.6% / difference of 9.6%;

OR

(X / Y = 119 divided by 58 = 2.05)

14.4; 49.2; 55.4;

Note that this ratio could be reversed i.e. 58 divided by 119 multiplied by numbers in top row

Accept rounded to 14; 49; and 55;

3

[8]

Q2.

(a) (i) Left ventricle;

1

(ii) Thick muscle / thick walls;

Accept more muscle / more muscular.

Ignore stronger muscle.

1

(b) (i) 85.7 / 86;

Accept 85

Ignore additional decimal places.

1

(ii) Two marks for correct answer of 7905 - 7998;

Accept either formula or illustration with figures from table.

One mark for incorrect answer in which candidate provides evidence of multiplying heart rate by stroke volume;

2

(c) 1. Closed open;

2. Open closed;

2

[7]

Q3.

(a) D;
G;
F;

3

(b) Coronary arteries;

Accept coronary artery

Ignore aorta, arteriole and capillary

Reject coronary veins

Do not accept coronary by itself

Accept phonetic spelling

1

(c) 1. No sketched / hanging / crossing lines / shading;

Ignore stippling

2. Must look similar;
3. Matrix **and** crista correctly labelled;

Ignore any other labels

4. Correct scale stated (x 62 800);

Accept other suitable scale given

4

[8]

Q4.

(a) First oxygen binds (to Hb) causing change in shape;
(Shape change of Hb) allows more O_2 to bind (easily) / greater saturation with O_2
OR
Cooperative binding;

2

(b) 1. (HbA has) lower affinity for O_2 at low partial pressures;

OR
(HbA has) lower affinity for oxygen at pp found in tissues;

2. Easier unloading of O_2 for (aerobic) respiration;

2

(c) 1. A large/significant increase in HbF;
2. (HbF has) higher affinity for O_2 (than faulty HbA);
3. Higher proportion of HbF in blood so more oxygen carried;
OR
More oxygen carried after treatment;

3

[7]

Q5.

(a) 1. Lower affinity for oxygen / releases more oxygen / oxygen is released quicker / oxygen dissociates / unloads more readily;

***Q** Neutral: the organism / body has a lower affinity for oxygen / releases more oxygen*

2. (To) muscles / tissues / cells

3. (For) high / rapid respiration;

***Q** Reject: '**produces** more energy' on its own*
Neutral: reference to partial pressure
Accept: (for) respiration to produce more energy in the form of ATP / release more energy

3

(b) (i) 1. Small SA:VOL;
Neutral: small limbs / small ears / extremities
Neutral: small SA
Accept: large VOL:SA
Neutral: reference to fat / blubber / insulation

2. (So) reduces heat loss / (more) heat retained;
Note: MP2 is independent of MP1

2

(ii) 1. Brain is the same, others fall;
Note: 1. might not be given in the same sentence
Assume that 'other organs fall' = all three organ categories fall
Accept: 'blood flow is reduced to all organs except for the brain'

2. Brain controls other organs / remains active / needs constant supply of oxygen;
Accept: 'seal would die' = brain remains active

3. Lungs not used / are used less / seal is not breathing / heart rate decreases / heart pumps less / blood diverted to muscles;
Reject: seal is not respiring

3

[8]

Q6.

(a) 1. (Curve for) dog falls rapidly at the start but (curve for) sheep falls slowly at first;

*Do **not** allow curve for dog falls more steeply (since from 0.5% NaCl fall in sheep is just as steep as fall in dog)*

2. Sheep doesn't fall rapidly until 0.5 (but dog falls rapidly from 0);

3. (Trend shows that) for any concentration of sodium chloride haemolysis is lower in the dog;

The idea of a trend is required. Statement of individual values alone is insufficient, eg 'at 0.2, 34% in dog and 98% in sheep' is insufficient

Accept dog reaches 0 at lower concentration of sodium chloride than for sheep / dog reaches 0 at 0.38% compared to 0.84 % in sheep;

2 max

(b) 74 to 76;

Accept a value within this range

1

(c) 1. (Red) colour is due to haemoglobin;

Note: a correct response to marking point 2 also scores marking point 1

2. The more haemoglobin released the more red the solution;

Need idea of haemoglobin release before giving credit

2

(d) 1. (Use of 0.9%) will not cause haemolysis in any (of the mammals);

Full credit requires statement of marking point 1 and any approach from marking point 2

2. (So) will not kill any of the animals;

or

Only need to use / store / buy one concentration of sodium chloride solution / cheaper to have one concentration of sodium chloride solution / can buy in bulk;

or

Anyone can give it / no need to find out what concentration any animal requires;

Different approaches available for this marking point

2 max

[7]

Q7.

(a) Quaternary (structure);

Accept phonetic spelling eg quarternary/quarternery /4°

Award no mark for quaternary as part of a list

1

(b) 423;

1

(c) 1. Oxyhaemoglobin formed/ haemoglobin is loaded/ uptakes/associates/binds with oxygen in area of higher ppO_2 / in gas exchange surface/lungs/gills;

Reference to "react with" = max 1

Accept: reversible interaction with oxygen

Ignore: haemoglobin is carried / contained in red blood cells

2. (oxygen) unloaded/dissociates from/released (in area of lower ppO_2 / in capillaries/to cells/tissues);

2

(d) (i) 56(%);

Accept responses in the range 54-58(%)

1

(ii) 1. (Anaemia curve shifted to right) haemoglobin has lower affinity for oxygen / binds less tightly;

Assume reference is to haemoglobin of anaemia unless stated

2. releases more oxygen / oxygen is released quicker / oxygen dissociates/ unloads more readily to muscles/tissues/cells;

3. (For) respiration;

Accept: even with a lower haemoglobin concentration / meet demand for ATP/energy;

3

[8]

Q8.

(a) 1. water evaporates / transpires from leaves;
2. reduces water potential in cell / water potential / osmotic gradient across cells *(ignore reference to air space)*;
3. water is drawn out of xylem;
4. creates tension *(accept negative pressure, not reduced pressure)*;
5. cohesive forces between water molecules;
6. water pulled up as a column;

4 max

(b) (i) same surface area of leaf / number of leaves / age / thickness of cuticle;

1

(ii) (environmental conditions) affect rate of transpiration / evaporation;

1

(iii) presence of grease reduces water loss;

1

(c) (i) 1.2 / 1.3g;

1

(ii) more stomata on the lower surface;
(thicker) waxy cuticle on the upper surface;

2

[10]

Q9.

(a) 1. Diameter of trunk minimal at warmest / brightest time of day / midday = warmest / brightest;
2. Stomata open in light → more water loss;
3. Water evaporates more when warm / more heat energy for water evaporation;
4. Hydrogen-bonding between water molecules / cohesion (/ described) between water molecules;
5. Adhesion (described) between water molecules and walls of xylem vessels;
6. (Xylem) pulled inwards by faster flow of water / pulled in by tension;

6

(b)

Feature	Explanation
Think cuticle / wax layer	waterproof / impermeable;
Sunken stomata	saturated layer of still air outside;
Hairy	saturated layer of still air outside;
Leaves small / reduced to spines / needles	reduced S.A. for water loss;
Leaves roll up in dry weather	less S.A. for water loss / stomata covered / saturated region of still air;
Reduced number of stomata	reduced S.A. for water loss;
CAM (/ Crassulacean Acid Metabolism)	stomata closed in light / in warm / only open in dark / when cool;

3 features but no explanations – max 1 mark

max 3

[9]

Q10.

(a) 1. The more recent the sample the greater the concentration;
Accept converse
This could be expressed by reference to time e.g. 'concentration has increased since 25 000 years ago

2. Increases most in last 5000 years / more or less constant / slight increase between 30 000 and 15 000 years ago;

2

(b) 1. Variation in data / spread of data;
Reject references to range e.g. 'range of data'

2. Around the mean;
Both marks are possible in the context of using the data

2

(c) 1. Yes as pine leaves not in organic matter of the same age;

2. No as organic matter would be the same age as the pine leaves;

Accept either approach

1 max

(d) Can get more CO_2 for photosynthesis;

More CO_2 enters leaf is insufficient.
Accept light-independent (reaction) as equivalent

1

(e) Any **three** from:

1. (Overall data show) negative correlation;
   Do not allow description of correlation because in question stem
2. Little change in number of stomata in last 10 000 years;
3. Small sample size;
4. Only one species studied;
5. Other factors / named factor may have affected number of stomata;
6. Evidence does not support the conclusion between 30 000 and 25 000 years ago / between 5000 years ago and present day;
   Accept reference to either one of these age ranges
7. Appropriate reference to standard deviations (in comparing means);
   E.g. no overlap between 15 000 and 10 000 years ago

3 max

(f) Any **three** from :

1. Thick cuticle;
2. Small leaves / low surface area;
   Accept other ways of describing 'small', e.g. 'needle-like'
3. Hairy leaves;
4. Sunken stomata;
5. Rolled leaves;

3 max

[12]

Q11.

(a) Starch (max 3)

1. Helical/ spiral shape **so** compact;
2. Large (molecule)/insoluble **so** osmotically inactive;
   Accept: does not affect water potential/ψ.
3. Branched **so** glucose is (easily) released for respiration;
   Ignore: unbranched.
4. Large (molecule) **so** cannot leave cell/cross cell-surface membrane;

Cellulose (max 3)

5. Long, straight/unbranched chains of β glucose;
6. Joined by hydrogen bonding;

Note: references to 'strong hydrogen bonds' disqualifies this mark point.

7. To form (micro/macro)fibrils;
8. Provides rigidity/strength;

5 max

(b) 1. (At source) sucrose is actively (transported) into the phloem/sieve element/tube;

Accept: 'sugar/s' for sucrose but reject other named sugars e.g. glucose.

Accept: co-transport (with H^+ ions).

2. By companion/transfer cells;
3. Lowers water potential in phloem/sieve element/tube **and** water enters by osmosis;
4. (Produces) high (hydrostatic) pressure;

Accept: pressure gradient.

5. Mass flow/transport towards sink/roots/storage tissue;

Accept: sieve element/tube.

6. At sink/roots sugars are removed/unloaded;

Accept: at sink/roots sugars are used in respiration/stored.

5 max

[10]

Q12.

(a) 1. Used to compare effect of other treatments / as a baseline;

Accept for 2 marks, substance (X) and not agar / block / water that caused the difference in the number of roots.

Do not accept unqualified reference to "compare results".

2. Shows / Measures effect of substance (X);
OR

Accounts for effect of substances produced naturally;

Accept measures effect of independent variable

2

(b) 1. (**D** shows) substance (X) is not required for (some) root growth / production of roots;
OR
Substances (already) present in stem cause (some) root growth;

2. Substance X moves through plant;

Accept X moves through stem / phloem

3. (**E** shows) substance (X) causes / increases / doubles number of roots / root growth;

3

(c) **In support of mass flow hypothesis**

1. (**F** shows) phloem is involved;

2. (**G** shows) respiration / active transport is involved (in flow / movement);

3. Because 4 °C / cooling reduces / slows / stops flow / movement;

4. The agar block is the source;

5. Roots are the sink;

Against the mass flow hypothesis

6. No bulge above ringing (in **F**);

7. No (role for) osmosis / hydrostatic pressure / water movement;
   Accept no turgor pressure

8. Movement could be due to gravity;

9. Roots still grow without (intact/functioning) phloem;

10. No leaves / sugars / photosynthesis to act as a source;
    Each point must be clearly made in the context of support or against.
    Ignore sugar / sucrose
    3 max for "support" and 3 max for "against"

4 max

[9]