1. 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.
The photograph shows one type of artificial heart and Diagram 1(a) shows where this type of artificial heart is connected.

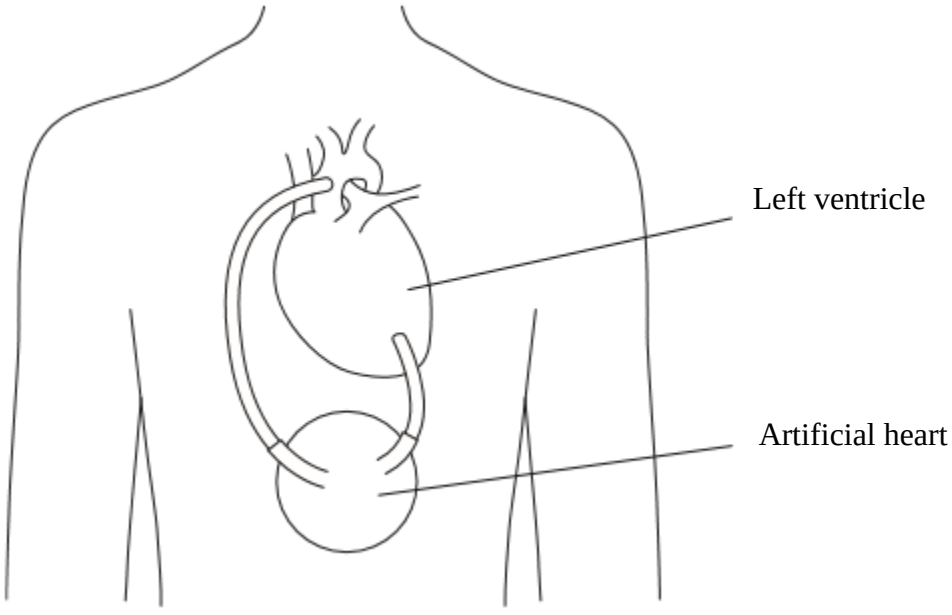

Diagram 1 (a)

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

.....

[1 mark]

(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.

.....

.....

.....

[3 marks]

(c) Diagram 1(b) shows the internal structure of this type of artificial heart.

Figure 5

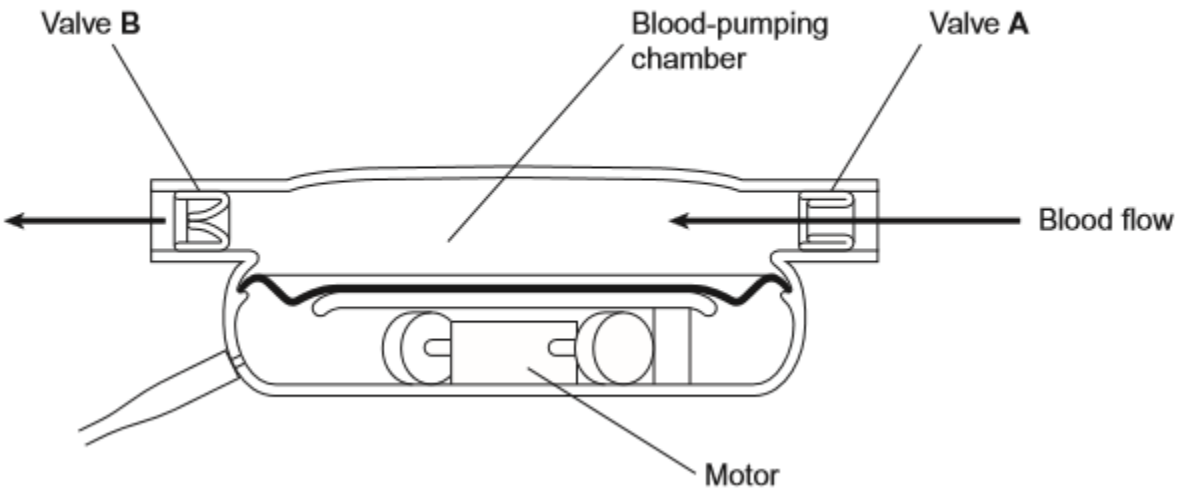

Diagram 1(b)

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:

(i) Valve A .....

(ii) Valve B .....

[2 marks]

(d) Suggest one advantages and two disadvantages of treating patients with this artificial heart.

Advantages:

……

Disadvantages:

……

……

……

[3 marks]

(e) Heart valve disease occurs when one or more of the valves is damaged. A scientist is designing a new heart valve. The scientist knows that the valve must be the correct size to fit in the heart.
Suggest two other factors the scientist needs to consider so that the newly designed valve works effectively in the heart

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……

[2 marks]

Some people have a condition called white-coat hypertension. People with this condition develop a higher than normal heart rate and blood pressure when they are in a doctor's surgery. High heart rate is correlated with high blood pressure.

Doctors investigated differences in heart rate between men with white-coat hypertension and those without the condition. They measured the men's mean heart rates:

- in the doctor's surgery, by recording the pulse in the wrist for 1 minute, when the men were lying down
- at home, using a portable heart rate monitor when the men were walking around
- at home, using a portable heart rate monitor when the men were sleeping

(f) (i) The groups of men selected for this investigation were matched. Other than being men, suggest one factor for which they should have been matched.

.....

[1 mark]

(ii) Suggest why the pulse recordings in the doctor's surgery were taken when the men were lying down.

.....

[1 mark]

(iii) The portable heart rate monitor recorded the men's heart rates continuously. This gives more reliable mean heart rates than those obtained by recording the pulse in the wrist for 1 minute. Suggest why it is more reliable.

.....

[1 mark]

2. Some students investigated the distribution of *mimosa pudica* sp in a grassy field . The grassy field was between two areas of woodland. Diagram 2 (a) shows two students recording how many dandelion plants there are in a 1 metre x 1 metre quadrat . Diagram 5 (b) shows a section across the area studied and table 2 shows the students' results.

Diagram 2(a)

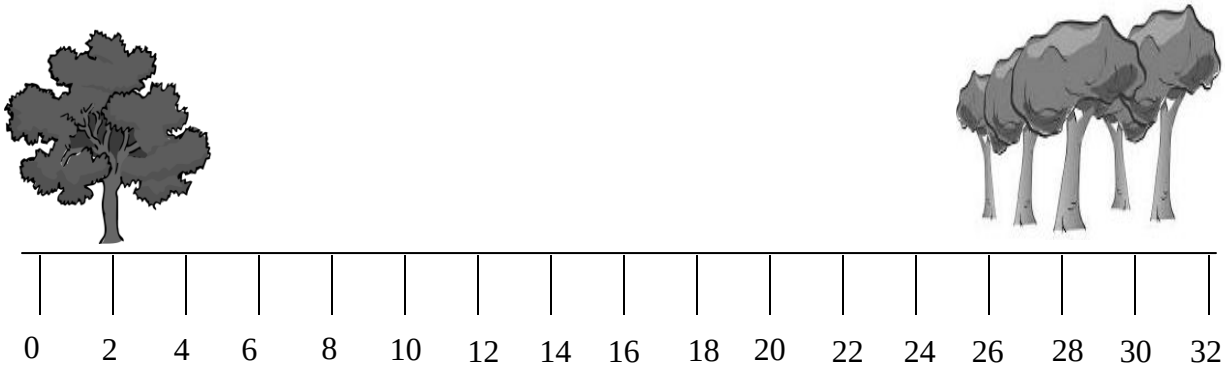

Diagram 2 (b)

Distance in meter (m)	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32
Number of *mimosa pudica* sp	0	0	1	2	6	5	8	4	0	3	4	3	2	0	0	0	0

Table 1

(a) How did the students use the quadrat and the 30-metre tape measure to get the results in diagram 5 (c) ?

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[3 marks]

(b) Suggest one reason why the students found no *mimosa pudica* sp under the trees.

……

……

[1 mark]

(c) Suggest one possible reason why the students found no *mimosa pudica* sp at 16 metres.

……

……

[1 mark]

(d) The teacher suggested that it was not possible to make a valid conclusion from these results. Describe how the students could improve the investigation so that they could make a valid conclusion

……

……

[2 marks]

3. Weddell seals are diving mammals that live in cold environments. A Weddell seal is shown in Diagram 3 (a).

Diagram 3 (a)

Weddell seals can remain underwater for long periods of time. Diagram 3(b) shows the rate of blood flow to different organs of a Weddell seal before a dive and during a long dive.

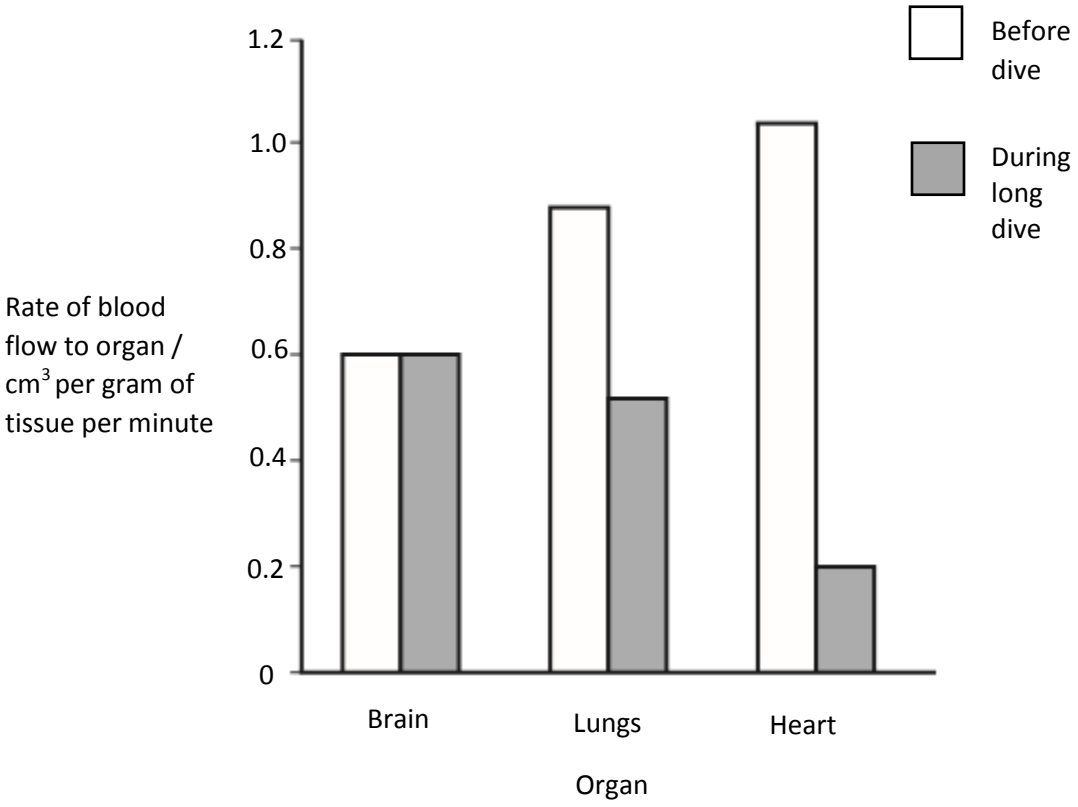

Diagram 3(b)

(a)` Describe the changes in the rate of blood flow to the different organs during a long dive.

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[3 marks]

(b) Diagram 3(c) shows a man falling through thin ice into very cold water. The man's core body temperature falls. He may die of hypothermia (when core body temperature falls too low).

Diagram 3 (c)

(i) While in the water the man begins to shiver. Do you think shivering can help to stop the core body temperature falling too quickly.

.....

.....

[2 marks]

(ii) The man has been drinking alcohol. Alcohol causes changes to the blood vessels supplying the skin, making the skin look red. Suggest the change to the blood vessels.

.....

[1 mark]

(iii) The man is much more likely to die of hypothermia than someone who has not been drinking alcohol. Support the statement with more information

.....

.....

.....

[3 marks]

(c) Hanani is a deep sea diver. She reads these two articles in a magazine

The deeper you dive, the greater the pressure of the water.The longer you stay under water, the more air dissolves in your blood. Air bubbles in the blood can block blood flow to organs causing pain and damage.

Fizzy drinks get their fizz from a gas that is dissolved in the drink under great pressure.When the bottle is opened the pressure is released and bubbles of gas appear in the drink.If the bottle is opened slowly fewer bubbles appear in the drink.

(i) Hanani plans to dive with a supply of air.
Predict what might happen in Hanani's body as she returns to the surface.

.....

[1 mark]

(ii) Explain any possible problems and how she might avoid them

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[2 marks]

4.

A **biological detergent** is a laundry detergent that contains enzymes. Biological detergents clean in the same way as non-biological ones with additional effects from the enzymes, whose purpose is to break down protein, starches and fat in dirt and stains on clothing to be laundered, for example food stains, sweat and mud. The enzymes in biological detergents enable effective cleaning at lower temperatures than required by normal detergents, but are denatured at higher temperatures

(a) Some bacteria, called thermophilic bacteria live in hot springs at temperatures of 80 º C. Scientists have extracted enzymes from these thermophilic bacteria. These enzymes are being trialled in industrial laundries.

(i) A number of laundries expect to increase the amount of clothes they can clean by using enzymes from thermophilic bacteria instead of using the biological washing powders they are using now.
Suggest how the use of thermophilic bacteria can increase the number of clothes that the laundries can clean each day.

……

……

[2 marks]

(ii) Do you think using washing powders with enzymes from thermophilic bacteria can be more harmful to the environment than using the biological washing powders that laundries use now.

……

……

[2 marks]

(b) Trypsin is a protease enzyme. Trypsin will digest a protein called gelatine which covers the surface of photographic film. In a laboratory experiment, students used used 1– 5% trypsin at 20°C to study the the time taken to digest the gelatine with trypsin.

In industry, trypsin is used to pre-treat some baby foods. The baby food manufacturers make most profit if they use 0.5 % trypsin at 35 °C as compared to the concentration and temperature used in the laboratory experiment .

(i) Suggest why the manufacturers make most profit with these conditions .

……

……

[2 marks]

(ii) Describe the effect trypsin would have on the baby food

……

……

[2 marks]

5. (a) Producing food for humans affects the environment. Increasing the efficiency of human food production will help to feed an increasing world population. Give two ways in which the efficiency of human food production can be increased

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[2 marks]

(b) Protein known as mycoprotein is promoted as a healthy alternative to meat. Mycoprotein is made using fungal microorganisms.
Discuss the advantages and disadvantages of using microorganisms to produce protein for human consumption.

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[4 marks]

(c) Organic foods have become popular in recent years. They are grown without the use of artificial pesticides and fertilisers. A government report in 2007 showed that the production of some organic foods is more damaging to the environment than their non-organic equivalents. However, supporters of organic farming claim that it is better than non-organic farming in conserving biodiversity and is better for the soil.

Table 2 compares some of the effects of non-organic and organic food production on the environment.

Environmental effect and units of kilogram of production on farm	Chicken		Milk	
	Non-organic	Organic	Non-organic	Organic
Energy used (in kJ)	12	16	2.5	1.6
Global warming potential (in grams of CO^2 equivalent	4750	6680	1060	1230
Freshwater pollution potential by fertilizer (in grams of phosphate equivalent)	49	86	6.3	10.3
Land used (in hectares)	0.64	1.4	0.001	0.002

Table 2

(i) Why is it important to conserve biodiversity?

……

[1 mark]

(ii) How would a complete change from non-organic to organic farming affect the area of land used for food production?

……

[1 mark]

(iii) Raising cows has a greater global warming potential than raising chickens, per kilogram of meat produced

……

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[2 marks]

6. Diagram 4 (a) shows a sand gazelle. The sand gazelle lives in the Arabian Desert where temperatures often reach 45 °C.

Diagram 4 (a)

(a) The sand gazelle feeds only at dawn and at dusk. At other times it stays in the shade. In addition, during the dry season, the sand gazelle's liver and heart shrink in size. Suggest how these behavior and adaptation help the animal to conserve water.

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[3 marks]

(b) **Gerbil** is another animal adapted to living in deserts . It is also known as a desert rat. It feeds on plants.The gerbil can go for very long periods of time without drinking water. In your opinion, how does a gerbil manage to survive on so little water.

……

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[2 marks]

(c) The man in diagram 4 (b) went island hopping. He was caught in a terrible storm and his boat capsized. Later, he found himself on a deserted island with no supply of freshwater and had to rely on sea water most of the time.

Diagram 4 (b)

Based on the story above, suggest ways for the man to prevent dehydration for his survival.

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[3 marks]

(d) An athlete can run a marathon in 2 hours 15 minutes on a dry day in outside temperatures up to 35°C. If the air is dry, his body will not overheat. In humid conditions the same athlete can run the marathon in the same time. However, in humid conditions, if the outside temperature goes over 18°C then his body will overheat. Suggest an explanation for the athlete overheating in humid conditions

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[2 marks]

7. Nicotine is the addictive substance in tobacco. When nicotine reaches the brain, it binds to a specific protein. This causes the release of chemicals that give a feeling of reward to the smoker. This reward is part of the reason why people find it difficult to stop smoking.

Scientists have developed a vaccine against nicotine to help people stop smoking. They set up an investigation, which involved a large number of volunteers. Once a month for 5 months, one group of volunteers was given the vaccine and the other group was given a placebo.

At regular intervals, the scientists measured the concentration of antibodies to nicotine in the blood of each group of volunteers. They also calculated the percentage of volunteers who had stopped smoking from months 2 to 6 of the investigation.

The scientists measured the concentration of nicotine in the blood of two volunteers who smoked the same number of cigarettes per day. They found that the concentration of nicotine in the blood of these smokers were different.

(a) Suggest two reasons why the concentration of nicotine in the blood of these smokers were different.

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……

[2 marks]

(b) Some people have suggested that this vaccine should not be given free to smokers on the National Health Service (NHS). Evaluate this suggestion.

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[2 marks]

Measles is a dangerous disease caused by a virus. Normally, MMR vaccinations are given at 1 year old and again at 4 years old. Each vaccination is 90% effective in protecting against the measles virus.

In April 2013, there were 630 cases of measles in children aged 4 and over in Malaysia. Of these cases, 504 children had not been vaccinated against MMR at all and only a few had been given a second vaccination.

(c) (i) Antibiotics can only be used to treat some infection but not measles. Do you agree with the statement

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……

……

[3 marks]

(ii) Why do antibiotics become less useful at treating an infection if the antibiotic is overused?

……

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[2 marks]

Immunizations protect us from getting an infectious disease. When we are immunized , we are protecting others as well. Immunisation costs the Malaysian government a lot of money. Much of the money spent on immunisation programmes is used to publicise the health benefits of immunisation. Despite this, some individuals are reluctant to have the immunisation.

(d) Give two possible reasons why some people choose not to be immunised.

……

[2 marks]

8. There is an increasing demand for fish and fish protein, which has resulted in widespread overfishing in wild fisheries. This has caused the number of fish in the oceans to decrease. .Table 3 shows information about the mass of fish caught by fishermen between 2002 and 2010.

Year	Mass of fish caught by fishermen from **ALL SOURCES** in thousands of tonnes	Mass of fish caught by fishermen from **SUSTAINABLE SOURCES** in thousands of tonnes	Percentage of fis caught form sustainable sources
2002	690.0	427.8	62.0
2004	655.0	396.6	60.5
2006	619.0	386.0	62.4
2008	589.0	438.1	74.0
2010	573.0	485.0	

Table 3

(a) Calculate the percentage of fish caught from sustainable sources in 2010. Show your calculation

[2 marks]

(b) What do you understand about fishing from **SUSTAINABLE SOURCES.**

……

……

[2 marks]

(c) Suggest why the percentage of fish caught from sustainable sources is increasing.

……

[1 mark]

(d) (i) Give one method of maintaining fish stocks at a sustainable level.

……

[1 mark]

(ii) State how the method you have given in (d)(i) helps to preserve fish stocks.

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[1 mark]

(e) Fish farming is the principal form of aquaculture. Fish farming involves raising fish commercially in tanks or enclosures. Diagram 4 shows an example of a fish farm.

Diagram 4

In a fish farm, large numbers of fish are grown in cages in the sea.
Suggest why do fish in the cages grow faster than fish of the same species that are free in the sea?

……

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[2 marks]