

Transport in animals

Question Paper 1

Level	A Level
Subject	Biology
Exam Board	OCR
Module	Exchange and transport
Topic	Transport in animals
Booklet	Question Paper 1

Time allowed: 62 minutes

Score: /46

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E
>69%	56%	50%	42%	34%	26%

Question 1

A student investigated the heart rates of smokers and non-smokers.

- Each test subject had their resting heart rate measured using an electronic heart rate monitor.
- They ran 1 km on a running track and their heart rate after running 500 m was recorded.
- Their heart rate was recorded for a third time 3 minutes after the completion of the exercise.

All test subjects were 18 years old. Subjects were tested between 9 am and 4 pm on one day, one at a time. Each test lasted approximately 20 minutes in total. The tests were repeated one week later using the same method. Mean heart rates were calculated for each subject.

The student's plan was to compare the heart rates of smokers and non-smokers using Student's *t*-test.

The student's results are shown in Table 6.

Student	Smoker?	Gender	Resting heart rate (bpm)	Heart rate during exercise	Heart rate after exercise
1	Y	Male	60.5	130.0	66.5
2	N	Female	67.0	145.5	73
3	Y	Male	70.0	120	77.0
4	Y	Male	65.5	100	69
5	Y	Male	66.0	128.5	75.5
6	Y	Female	65.5	115.5	74.5
7	Y	Female	73.5	120.5	81
8	N	Female	63.0	118	66
9	N	Female	71.0	95.5	80.5
10	N	Female	65.5	110	71
11	N	Male	64.0	145.5	68
12	N	Male	52.5	140.0	58.5
13	N	Male	54.0	137.5	63
14	N	Female	73.0	130.5	81
15	N	Female	61.5	124	67
16	N	Female	71.0	130	81.5
17	N	Male	60.0	122.5	63
18	N	Female	64.5	118	69
19	N	Female	67.5	130.5	73.5
20	Y	Male	72.0	135	82
21	Y	Female	69.5	110	75.5

Table 6

Suggest and explain improvements that the student could make to his experimental method **and** his presentation of data.

In your answer you should explain the benefits of your suggested improvements. **[6]**

[Total: 6]

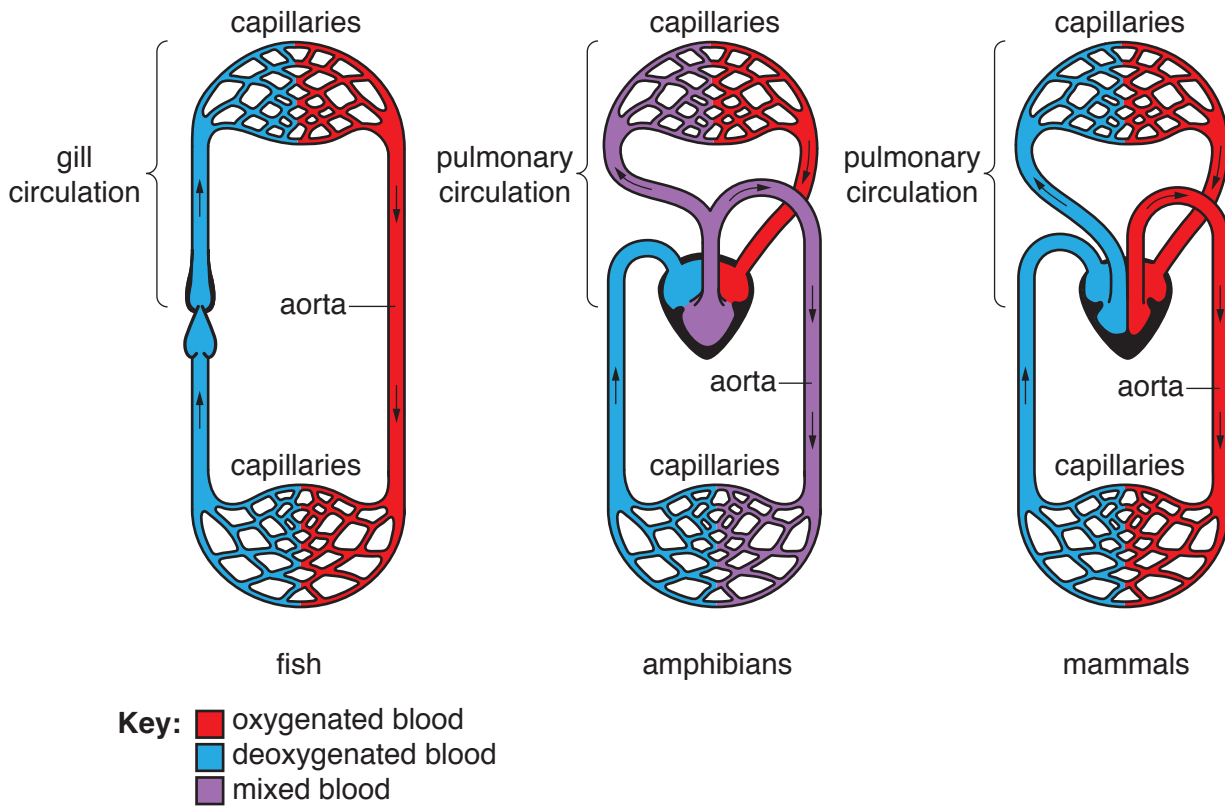


Fig. 5.1

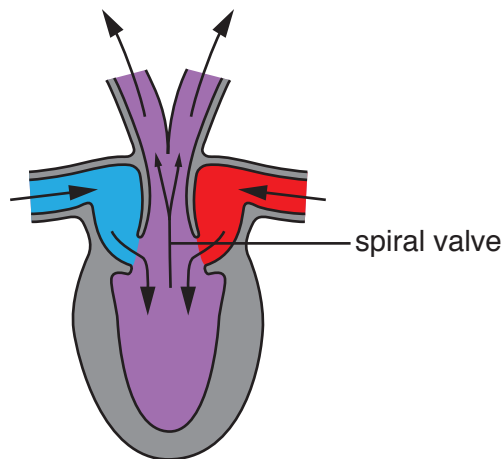


Fig. 5.2

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Question 2

(a) Fig. 5.1, **on the insert**, shows the circulatory systems of three groups of animals.

(i) What type of circulatory system is shown in **all** these animals? [1]

(ii) How does the circulatory system of a fish compare to that of a mammal? [1]

(b) Fig. 5.2, **on the insert**, shows the flow of blood through the heart of an amphibian such as a frog.

Use the information in Fig. 5.1 **and** Fig. 5.2 to compare the circulations of a frog and a mammal and the relative effectiveness of each type of circulation. [6]

[Total: 8]

Question 3

- (a) The electrical activity of the heart can be monitored using an electrocardiogram (ECG) trace.

Fig. 16.1 shows the ECG pattern for a single normal heartbeat.



Fig. 16.1

Fig. 16.2 shows an ECG trace for a person with normal heart rhythm and **Fig. 16.3** shows the trace for a person with tachycardia.

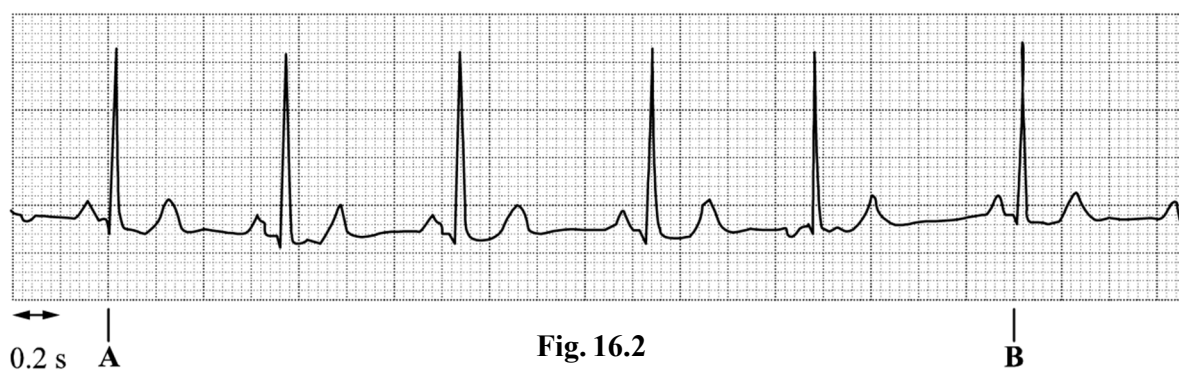


Fig. 16.2

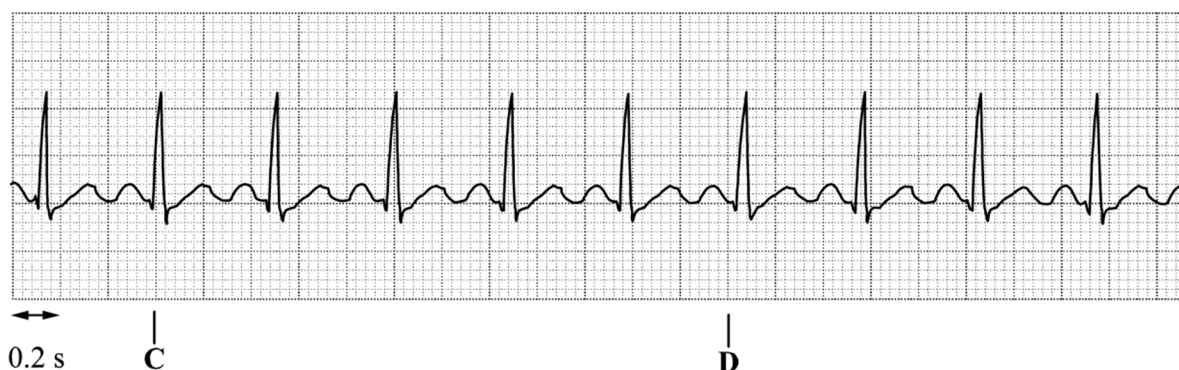


Fig. 16.3

- (i) Calculate the percentage increase in heart rate for the person with tachycardia compared to the person with normal heart rhythm.

Use the data between points **A** and **B** on **Fig. 16.2** and points **C** and **D** on **Fig. 16.3** for your calculations.

Give your answer to the nearest whole number.

[4]

- (ii) The most obvious feature of tachycardia is an increased heart rate.

Using the information in **Fig. 16.1**, **Fig. 16.2** and **Fig. 16.3**, what are **other** key features of tachycardia?

[2]

- (b) **Fig. 16.4** is an ECG trace of a person with an abnormal heart rhythm.



Fig. 16.4

Using the information from **Fig. 16.4**, what conclusions can you draw about the way in which this person's heart is functioning abnormally?

[3]

[Total: 9]

Question 4

(a) Table 5.1 and Table 5.2 list events that occur during the cardiac cycle.

Each event in Table 5.1 is immediately followed by one of the events listed in Table 5.2.

Complete Table 5.1 by inserting the appropriate letters of the events from Table 5.2.

The first row has been completed for you.

[4]

Event in the order in which they occur	Letter describing the event that follows
atrial walls start to relax	D
sinoatrial (SA) node generates electrical signals	
atrioventricular (AV) node receives electrical signals from SA node	
ventricle walls start to contract	
ventricle walls relax	

Table 5.1

Event	Letter
atrioventricular valves close	A
semilunar valves close	B
walls of atria contract	C
ventricle walls start to contract	D
electrical signals transmitted down septum	E

Table 5.2

(b) Fig. 5.1 shows a normal ECG trace. The electrical activity of the heart is measured in millivolts (mV).

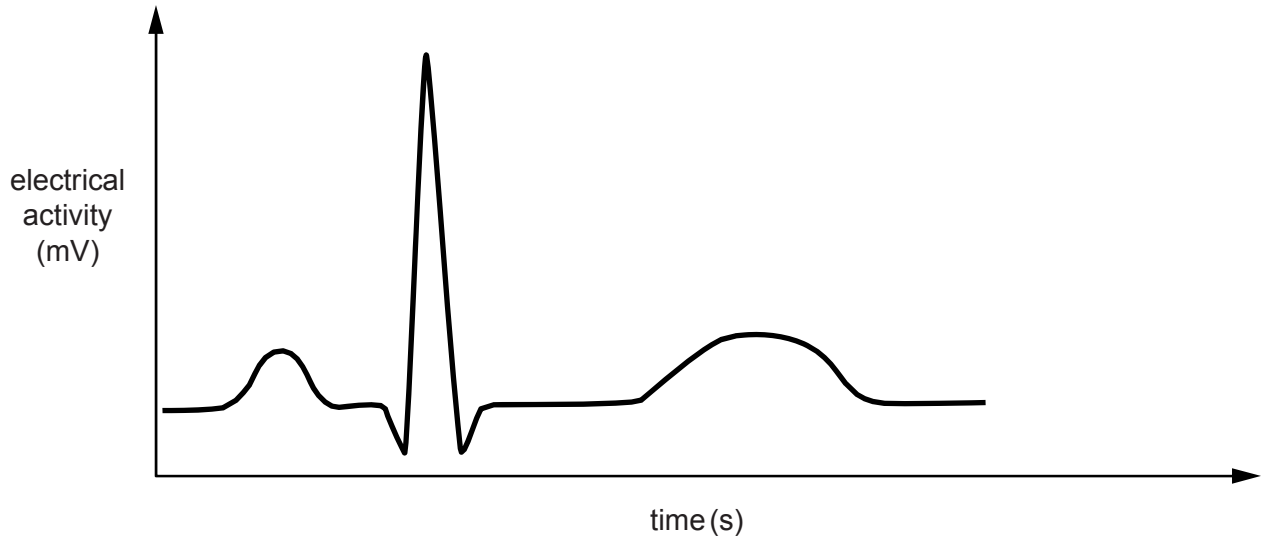
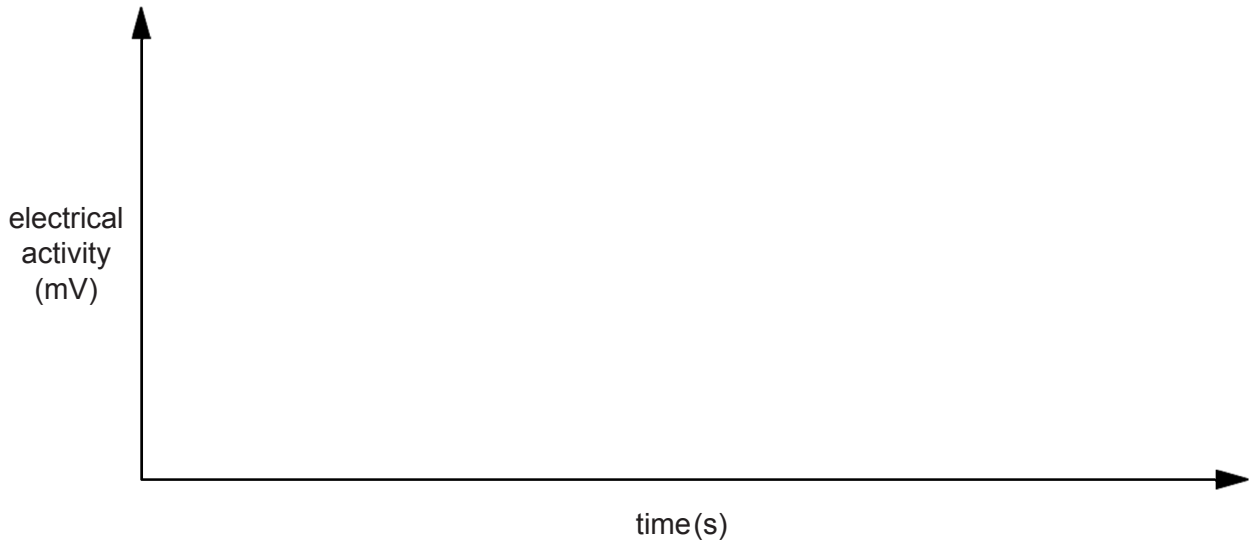


Fig. 5.1

In a condition known as supraventricular tachycardia, electrical signals leak from the atrial walls directly to the top of the ventricles. This causes the ventricle walls to contract twice for every atrial contraction.

(i) Using the axes below, sketch an ECG trace that might be expected in a patient with this condition.

[1]



- (ii) Suggest and explain what effect supraventricular tachycardia might have on blood flow from the heart.

[2]

- (c) The blood circulatory system of a mammal undergoes changes at, or soon after, birth.

- (i) One of these changes is that the foramen ovale, a hole in the septum between the right and left atria, closes. In the fetus, the foramen ovale allows blood to flow directly from the right atrium to the left atrium.

Suggest why the foramen ovale is open in the fetus before birth.

[2]

- (ii) Another change occurring after birth is that fetal haemoglobin is replaced with adult haemoglobin.

State one difference between fetal haemoglobin and adult haemoglobin **and** give one reason why this difference is essential to the fetus.

[2]

difference

reason

[Total: 11]

Question 5

(a) Blood contains erythrocytes and neutrophils.

Tissue fluid may contain neutrophils but does not contain erythrocytes.

Tissue fluid is formed from plasma by pressure filtration through the capillary walls.

All materials exchanged between the blood and cells pass through the capillary wall.

Explain why tissue fluid does not contain erythrocytes. [2]

(b) Erythrocytes are full of haemoglobin.

Describe the role of haemoglobin in transporting oxygen around the body. [3]

(c) Most carbon dioxide is transported as hydrogencarbonate ions in the plasma.

Hydrogencarbonate ions are produced in the erythrocytes and diffuse into the plasma.

(i) Describe how the hydrogencarbonate ions are **produced** in the erythrocytes.



In your answer you should use appropriate technical terms, spelled correctly.

[4]

(ii) High concentrations of carbon dioxide in the blood reduce the amount of oxygen transported by haemoglobin.

Name this effect and explain why it occurs. [3]

name

explanation

[Total: 12]