Practice Question Set For A-Level
Subject : Biology
Paper-2 Topic: 6 Organisms Response To Their Environment

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Name of the Student:_____
Max. Marks : 26 Marks **Time : 26 Minutes**

Q1.

(a) Describe how ultrafiltration occurs in a glomerulus.

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(3)

(b) Glucose and water are reabsorbed by the proximal convoluted tubule of a nephron.

Put a tick (✓) in the box next to the correct ways in which glucose and water are reabsorbed.

Glucose by active transport and water against a water potential gradient	☐
Glucose by diffusion and water down a water potential gradient	☐
Glucose by facilitated diffusion and active transport and water against a water potential gradient	☐
Glucose by facilitated diffusion and active transport and water down a water potential gradient	☐

(1)

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(c) The equation shows the relationship between urine concentration in arbitrary units (y) and mean length of the loop of Henle in mm (x).

$$y = 0.72x + 4$$

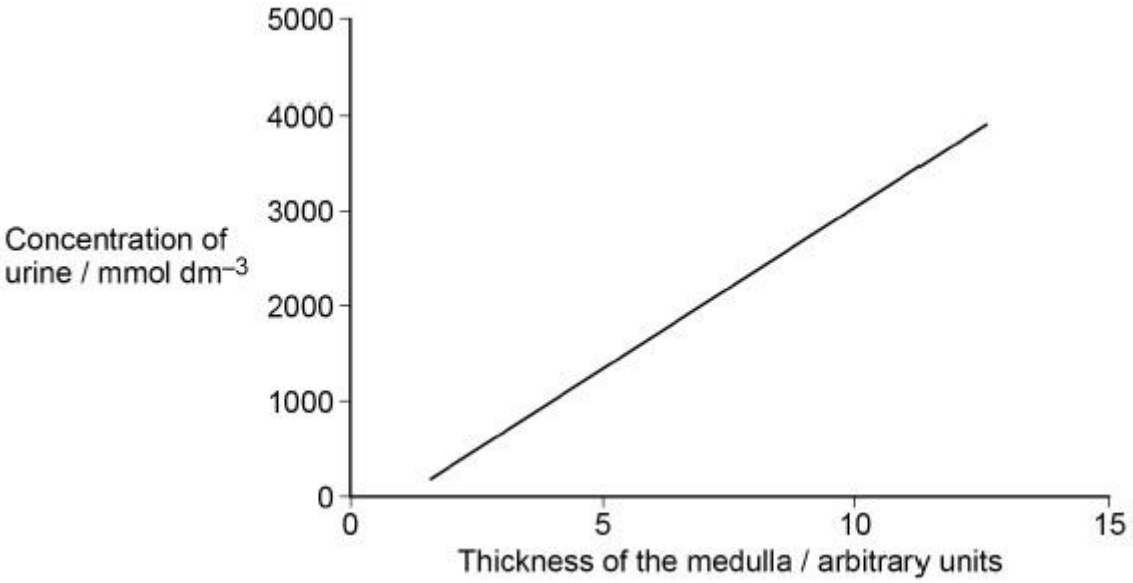
Calculate the mean length of the loop of Henle in an organism that produces urine with a concentration of 16.56 arbitrary units.

Answer = _____ mm

(1)

(d) Scientists investigated the relationship between the thickness of the kidney medulla of different species of mammals and the concentration of their urine.

The graph shows their results.



Explain the pattern shown by the results in the graph above.

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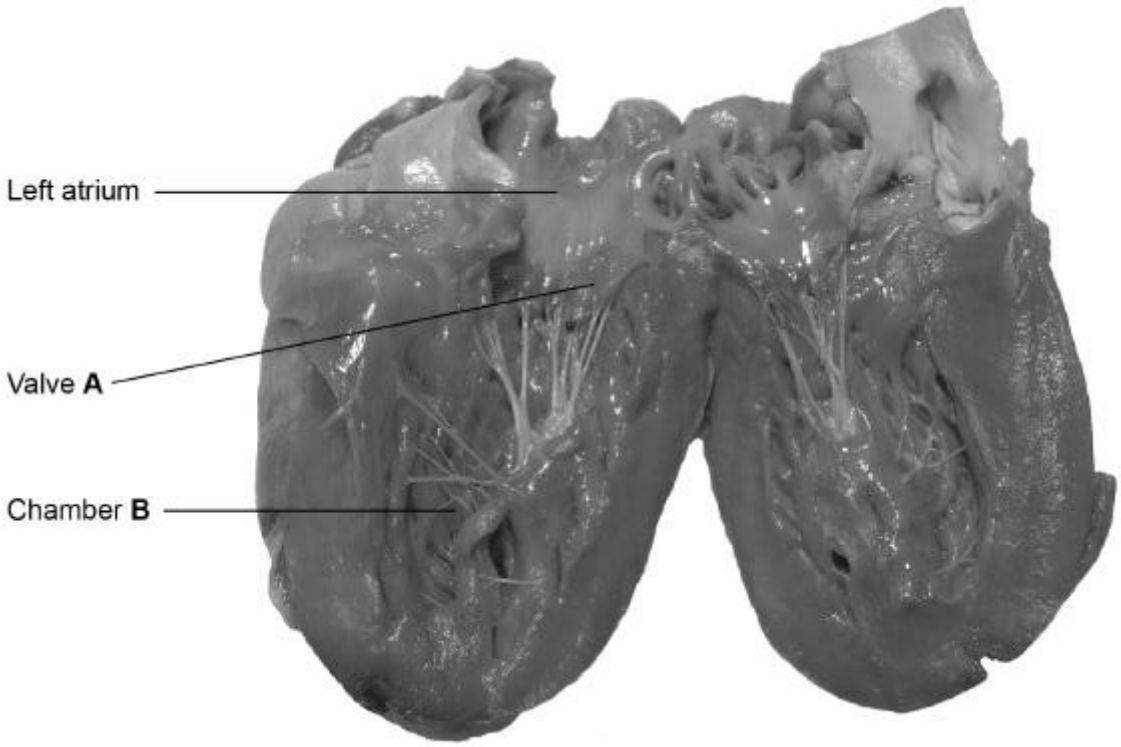
(3)
(Total 8 marks)

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Q2.

Figure 1 shows a photograph of a dissected heart.

Figure 1



(a) Name valve **A** and chamber **B**.

Valve **A** _____

Chamber **B** _____

(1)

(b) Give **two** safety precautions that should be followed when dissecting a heart.

1 _____

_____

_____

_____

2 _____

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(1)

(c) Explain how valve **A** in **Figure 1** maintains a unidirectional flow of blood.

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(2)

A research scientist investigated the effect of caffeine on heart rate in human volunteers.

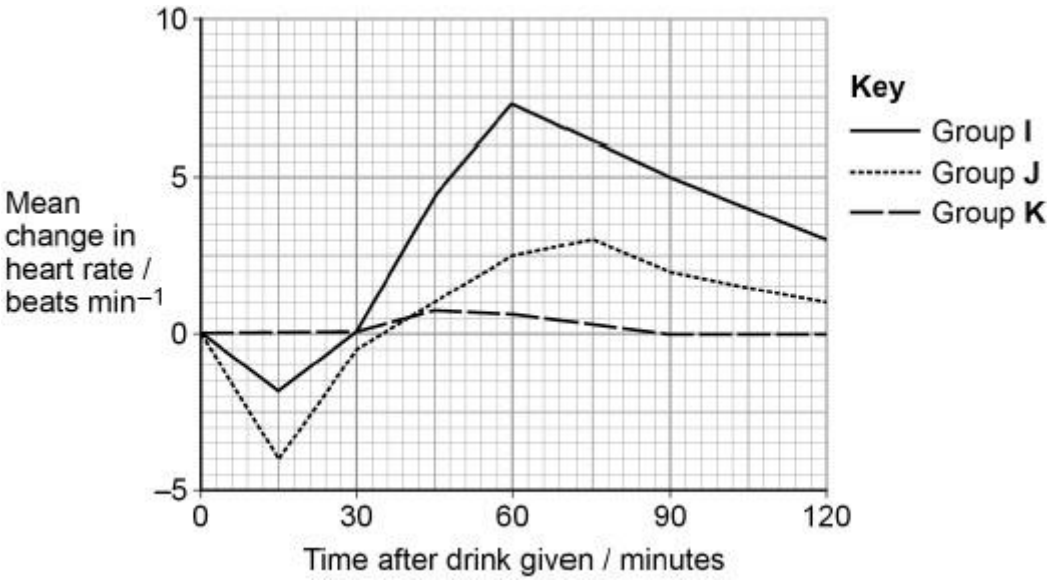
The scientist divided volunteers into three groups. Each group was given the same volume of fluid.

- Each member of Group **I** was given a sports drink containing caffeine and sugar.
- Each member of Group **J** was given a sports drink containing caffeine and no sugar.
- Each member of Group **K** was given water.

The scientist recorded the volunteers' heart rate before the drink was given and for 120 minutes after the drink was given.

Her results can be seen in **Figure 2**.

Figure 2



(d) Caffeine affects the autonomic nervous system.

Suggest how caffeine could account for the results of Group **I** in **Figure 2** at 60 minutes.

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(2)

(e) Before taking the drink, the mean heart rate of Group **J** was 68 beats per minute.

Fifteen minutes after taking the drink, the mean volume of blood leaving the hearts of Group **J** was 4700 cm^3 per minute.

Calculate the mean volume of blood leaving the heart at each beat fifteen minutes after taking the drink.

Answer = _____ cm^3

(1)

(f) The increase seen in Group **I** could be due to the combination of caffeine and sugar.

Suggest **one** drink to be given to an **additional** group that should be investigated to find out if this is true.

Give a reason for your answer.

Group to be given _____

_____

_____

Reason _____

_____

_____

_____

_____

_____

_____

(2)

(Total 9 marks)

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Q3.

Furosemide and CVT are drugs used to remove excess fluid from the body. Scientists investigated the effect of these drugs on the volume of urine produced by human volunteers. The scientists used the following method.

- They divided volunteers into three groups, **A**, **B** and **C** at random.
- They gave all the volunteers the same food for 3 days.
- After 3 days, they gave the volunteers in group **A** a tablet containing furosemide, the volunteers in group **B** a tablet containing CVT and the volunteers in group **C** a placebo (a tablet that did **not** contain either drug).
- They then found the mean volume of urine produced by each group in the 4 hours after taking the tablets.

Some of the results the scientists obtained are shown in **Table 1**.
A value of ± 2 standard deviations from the mean includes over 95% of the data.

Table 1

Group	Mean volume of urine produced in 4 hours / cm^3 (± 2 standard deviations)
A (furosemide)	1980 (± 152)
B (CVT)	1201 (± 119)
C (placebo)	312 (± 57)

(a) All the volunteers were given the same food for 3 days.

Suggest and explain **one** reason why they were given the same food.

_____

_____

_____

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(2)

(b) Using **Table 1**, what can you conclude about the effectiveness of furosemide and CVT in the removal of excess fluid from the body?

_____

_____

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(2)

(c) Furosemide is sometimes used to treat high blood pressure.

Suggest how furosemide would cause a decrease in blood pressure.

(1)

(d) Furosemide inhibits the absorption of sodium and chloride ions from the filtrate produced in the nephrons.

Explain how furosemide causes an increase in the volume of urine produced.

(3)

The scientists also measured the mean rate of flow of blood plasma into the kidneys.

The results the scientists obtained are shown in **Table 2**.

Table 2

Group	Mean rate of flow of blood plasma into the kidneys / cm^3 min^{-1}
A (furosemide)	380
B (CVT)	342

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C (placebo)	295

(e) The mean rate of flow of blood plasma is 60% of the mean rate of blood flow into the kidneys.

How much greater is the flow of blood into the kidneys with furosemide than with group **C** (placebo) over the 4 hours of the investigation? Give your answer in cm^3.

Answer = _____ cm^3

(1)

(Total 9 marks)

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