

AS Level Biology A
H020/02 Depth in biology

Question Set 8

1. (a) A patient was admitted to a hospital ward suffering from a heart rhythm abnormality.

Fig. 1.1(a) shows an ECG trace of the patient upon arrival at the hospital.

Fig. 1.1(b) shows an ECG trace of the patient when their heart rhythm had settled down to that of a normally functioning heart.

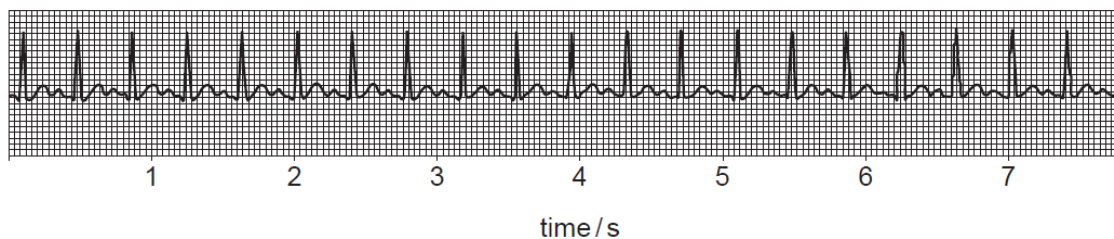


Fig. 1.1 (a)

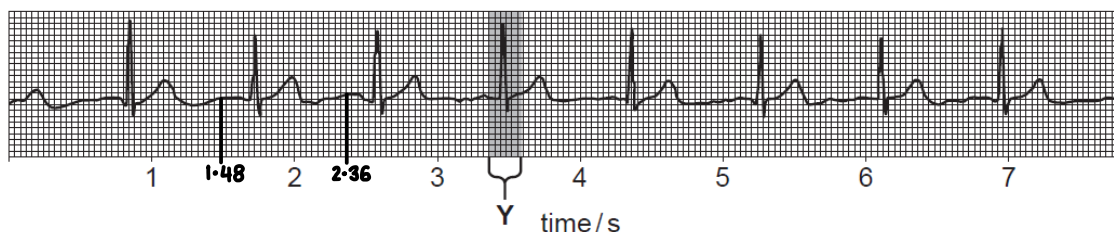


Fig. 1.1 (b)

(i) Using the traces shown in Fig. 1.1, name the heart rhythm abnormality that the patient is suffering from. **Tachycardia** [1]

(ii) The equation for working out cardiac output is:

$$\text{cardiac output} = \text{stroke volume} \times \text{heart rate}$$

Stroke volume is the volume of blood pumped per heart beat.

The stroke volume of the patient is 80 cm^3 .

Calculate the cardiac output of the patient using Fig. 1.1(b).

Give your answer in standard form.

1 beat in 0.88s

$$\frac{60}{0.88} \times 1 = 68.2$$

68.2 beats in 1 minute

$$\begin{aligned} \text{Cardiac output} &= 68.2 \times 80 = 5454.54 \text{ cm}^3 \text{ min}^{-1} \\ &= \underline{\underline{5.45 \times 10^3 \text{ cm}^3 \text{ min}^{-1}}} \end{aligned}$$

Answer $5.45 \times 10^3 \text{ cm}^3 \text{ min}^{-1}$ Units [3]

(iii) Explain how the heart is controlling the electrical activity at Y on Fig. 1.1(b).

Prior to y, a wave of depolarisation spreads across the atrial walls. The AVN lies in the septum and delays the wave. The impulse is then carried to the purkyne tissue along the bundle of His, and then to the apex of the ventricles where it initiates ventricular contraction.

[2]

- (b) Fig. 1.2, **on the insert**, shows photographs of sheep's hearts that were considered for use in a school dissection.

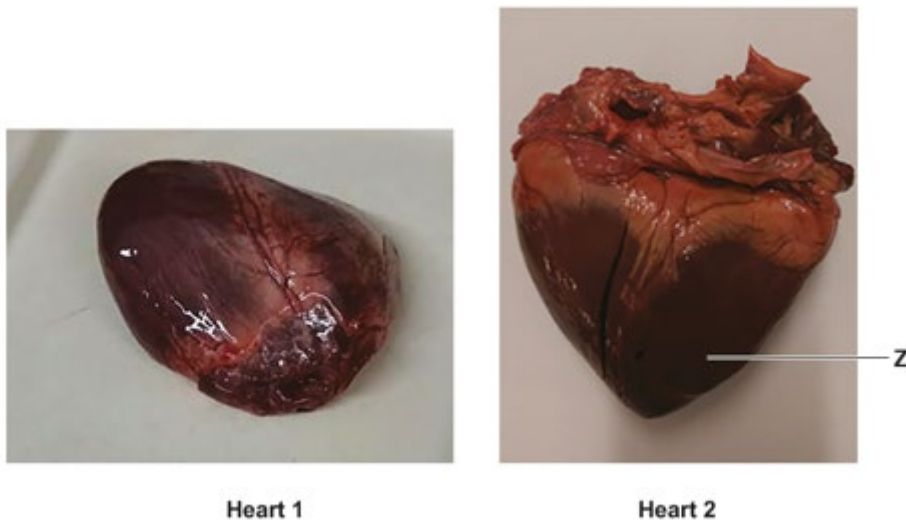


Fig. 1.2

- (i) Looking at the two hearts in Fig. 1.2, a student decided that **Heart 2** was a better choice for the dissection because it had more structures present.

What evidence from the two hearts in Fig. 1.2 supports the student's decision?

The aorta is present in heart 2 but not heart 1.

[1]

- (ii) Name the structure labelled **Z** on Fig. 1.2.

[1]

Left ventricle

(c)* Fig. 1.3 shows the heart at different stages of the cardiac cycle.

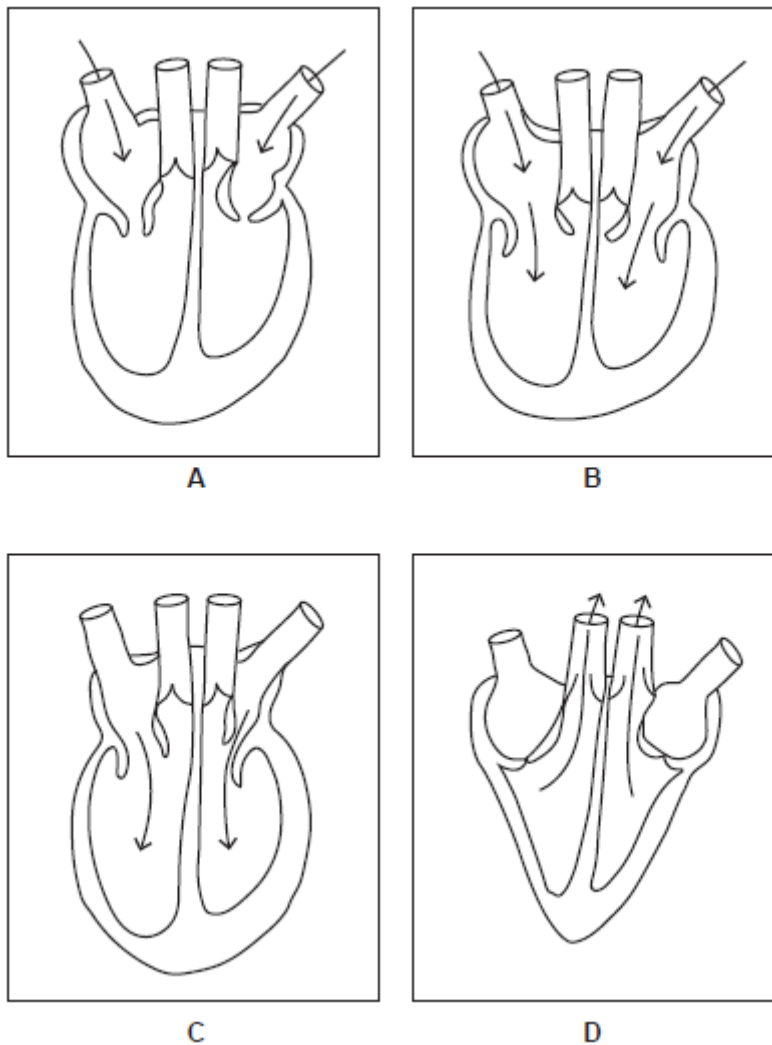


Fig. 1.3

Box A shows atrial diastole. Blood is entering the atria, which are relaxed.

Outline the remaining stages of the cardiac cycle, with reference to boxes B, C and D in Fig. 1.3.

[6]

Box B shows atrial and ventricular diastole. The muscular walls of the heart are relaxed. The semilunar valves are closed as the pressure in the arteries exceeds that of the ventricles. The atria fill with blood. The atrioventricular (AV) valves open allowing blood to passively enter the ventricles. Atrial pressure rises as they fill with blood but falls as the AV valves open. Ventricular pressure continues to rise. Box C shows atrial systole. The atria contract, forcing the AV valves fully open and pushing blood into the ventricles. The atria are emptied of blood. Atrial pressure rises as they contract and ventricular pressure rises slightly as blood enters. Ventricular volume rises rapidly. Pressure in the arteries is at a minimum. Box D shows ventricular systole. The AV valves close because pressure in the ventricles exceeds that in the atria. The ventricles contract and blood is pumped into the arteries. The semi-lunar valves are pushed fully open as the pressure in the ventricles is greater than in the arteries. Ventricular volume rapidly decreases. Arterial pressure rises but then slightly falls as some blood flows backwards.

Total Marks for Question Set 8: 14

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