

Volume 38, Number 3, February 2026

## Activity

# Your heart in your mouth

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## Introduction

Use information from Joanna Jager's article, *Your heart in your mouth*, and your own knowledge to answer the following questions.

## Questions

- 1 Arrhythmias and arrhythmogenic cardiomyopathies both involve an irregular heartbeat. Contrast the cause of these irregular heartbeats. [3 marks]
- 2 Desmosomes are cellular components that do not appear in your biology specification. They are common in the epithelia of the bladder and gut. Suggest **three** advantages of this. [3 marks]
- 3 The caption for Figure 2 tells us that desmoplakin (DSP) is a protein that connects the other proteins within a desmosome to sarcomeres. Make a line drawing of a single relaxed sarcomere and use labels to name the **two** types of protein within it and the bands that they cause. [3 marks]
- 4 'Arrhythmogenic cardiomyopathy (ACM) is an inherited heart disease. In up to 60% of cases we can identify DNA errors that occur in genes that code for one of the desmosomal proteins.' Not all DNA errors that occur in genes will affect the phenotype of an organism. Explain why. [4 marks]
- 5 What do the confocal micrographs in Figure 1.1 show about the localisation of connexin-43 (Cx43) in ACM-affected patients? Use information within the article to suggest the effect of this change in localisation in cardiac muscle. [2 marks]
- 6 Give the magnification of the confocal micrographs in Figure 1.1 of the article. [1 mark]

## Model answers

**1** In arrhythmias, the heart is structurally normal but the impulses stimulating contraction are irregular.

In cardiomyopathies, scar tissue in degenerated muscle inhibits transmission of impulses stimulating contraction.

**2** They hold cells together in tissue that undergoes stretching/mechanical stress.

The bladder undergoes stretching/mechanical stress as it fills with urine.

The gut undergoes stretching/mechanical stress as food is passed along it.

**3** Artwork shows:

- A single sarcomere between two labelled Z lines.
- Correctly labelled (thin) actin and (thicker) myosin.
- Correctly labelled H zone and I band

**4** Mutations affect the DNA base sequence of a gene.

These base sequences encode the amino acid sequence of a polypeptide.

Many / most amino acids are encoded by more than one base triplet.

(So) a change in one base (within a triplet) can still encode the same amino acid.

**5** Cx43 becomes degraded.

Will reduce transmission of impulses stimulating contraction.

**6** Correctly measured scale line (in mm) from Figure 1.1 multiplied by 1000 and divided by 100.

OR

Correctly measured scale line (in mm) from Figure 1.1 multiplied by 10.