Q1.

(a) Describe the myogenic stimulation of the heart and how the regular contraction of the atria and ventricles is coordinated.

Do **not** include the autonomic nervous system in your answer.

(5)

(b) Atrial fibrillation (AF) is a condition that causes an irregular heart rate. Scientists used a statistical test to investigate the association between different factors and the risk of developing AF.

The table below shows some of the scientists' results, including the probability (P) values obtained using the statistical test.

Factor	**Probability (P) value for association between factor and risk of AF**
Age	0.004
High blood pressure	0.001
High LDL (Low-density lipoprotein) concentration	0.222
Hyperthyroidism	0.018

What can you conclude from the table above?

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(3)

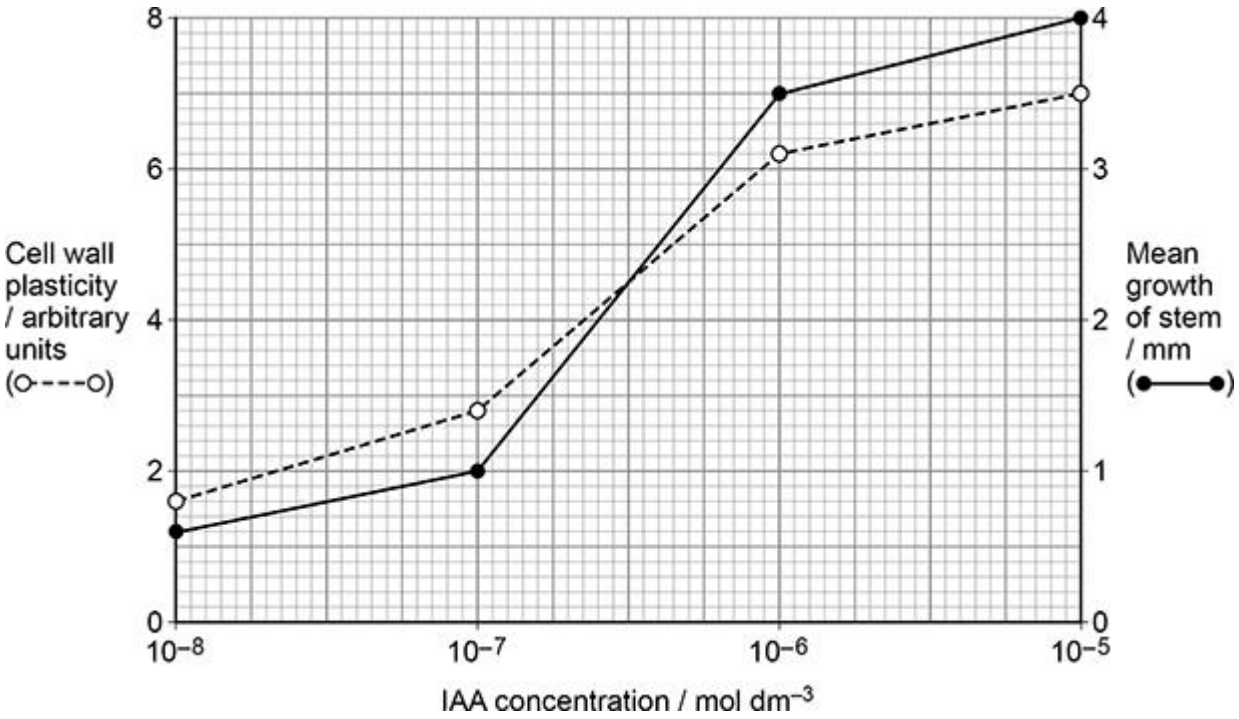
(Total 8 marks)

Q2.

Plant cells are surrounded by a rigid cell wall. Cell wall plasticity refers to the ability of a cell wall to stretch permanently. IAA is a growth factor which can activate enzymes that loosen the cell wall.

Scientists investigated the effect of IAA concentration on cell wall plasticity and the growth of stem segments.

The graph below shows some of the scientists' results.



(a) Use the information provided to explain the relationship between IAA concentration, cell wall plasticity and mean growth of the stem segments.

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(2)

(b) Use the graph above to calculate the percentage increase in mean growth of the stem segments when the IAA concentration was increased from 10^{-8} mol dm^{-3} to
10^{-5} mol dm^{-3}

Give your answer to 2 significant figures.

Show your working.

Answer _____ %

(2)

Gibberellic acid (GA) is another plant growth factor. A student was asked to design and carry out an investigation into the effect of different concentrations of GA on the growth of stem segments.

The student was provided with:

- 10^{-1}, 10^{-2}, 10^{-3}, 10^{-4} and 10^{-5} mol dm^{-3} concentrations of GA solution
- distilled water
- 6 Petri dishes and access to glassware
- 60 stem segments of different lengths.

(c) A technician produced the different concentrations of GA solution from a stock 10^{-1} mol dm^{-3} concentration of GA.

Describe how the technician produced the 10^{-3} mol dm^{-3} solution.

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(1)

(d) Describe a suitable procedure the student could follow to investigate the effect of different concentrations of GA on the growth of stem segments.

In your answer, you should include the variables that should be controlled in this investigation.

(5)
(Total 10 marks)

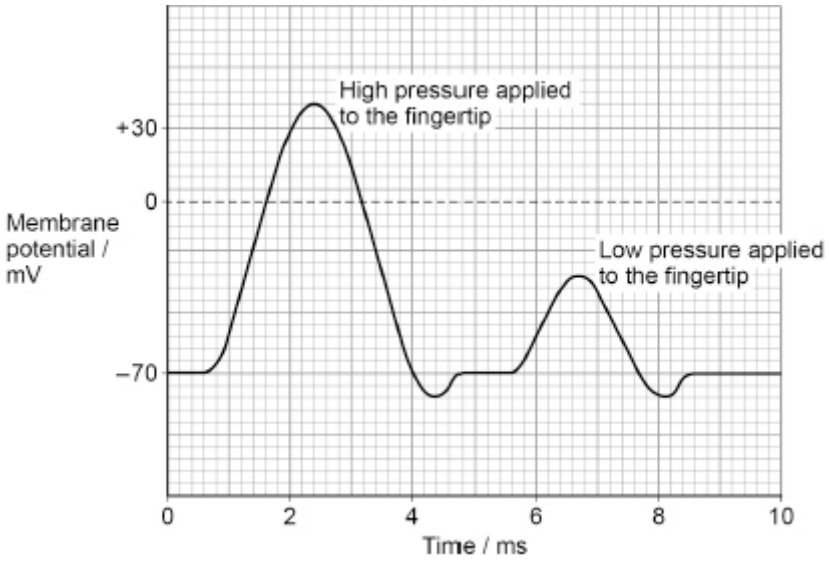
Q3.

(a) Describe how stimulation of a Pacinian corpuscle produces a generator potential.

(3)

Scientists investigated the stimulation of a Pacinian corpuscle in the skin of a fingertip. The scientists applied two different pressures to the fingertip and recorded the changes in membrane potential of the Pacinian corpuscle's sensory neurone.

The graph below shows the scientists' results.



(b) Use the graph to describe what is meant by the all-or-nothing principle.

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(2)

(c) On the graph above, from 0.6 ms to 4.0 ms, no new generator potential could be produced. What is this time period called?

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(1)

(Total 6 marks)