DRAFT SPECIMEN MATERIAL

GCSE
COMBINED SCIENCE: SYNERGY

H

Higher Tier Paper 1H

Specimen 2018 Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:
- a ruler
- a calculator
- the periodic table (enclosed)
- the Physics equation sheet (enclosed).

Instructions
- Answer all questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- There are 100 marks available on this paper.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice
- In all calculations, show clearly how you work out your answer.

Please write clearly, in block capitals, to allow character computer recognition.

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

Surname

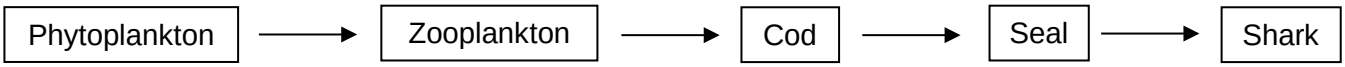
Forename(s)

Candidate signature _____

0 1 Feeding relationships within communities can be shown using food chains.

Figure 1 shows an ocean food chain.

Figure 1



0 1 . 1 Which organism in the food chain carries out photosynthesis?

[1 mark]

0 1 . 2 Which organism in the food chain is a tertiary consumer?

[1 mark]

0 1 . 3 Scientists often state that only 10% of the energy transferred into the food chain passes to the end of the food chain.

The shark in **Figure 1** receives 4000 J of energy.

Calculate how much energy entered the food chain if the shark received only 10% of this energy.

[2 marks]

Energy = _____ J

0 1 . 4 In one year, a disease infects and kills many of the seals.

Explain what might happen to the number of cod.

[2 marks]

Turn over for the next question

0 2 This question is about respiration.

0 2 . 1 Complete the word equation for respiration.

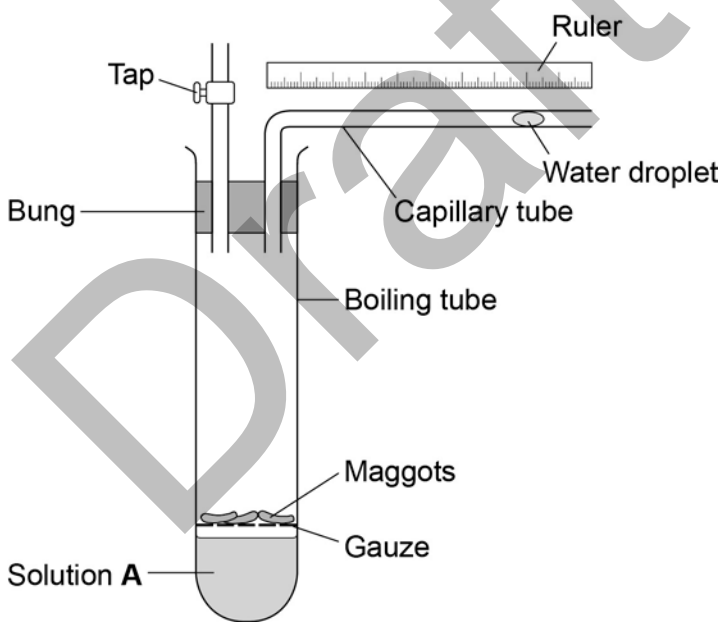
[2 marks]

_____ + _____ → _____ + water

A student investigates the rate of respiration in maggots.

Figure 2 shows the equipment he uses.

Figure 2



0 2 . 2 Why does the student put the maggots on gauze?

[1 mark]

0 2 . 3 When maggots respire they take in a gas from the air and release a different gas.

Solution **A** absorbs the gas released.

At the start of the investigation the student records the distance of the water droplet from the bend in the capillary tube.

What happens to the water droplet as the maggots respire?

Give reasons for your answer.

[3 marks]

Question 2 continues on the next page

Table 1 shows the student's results.

Table 1

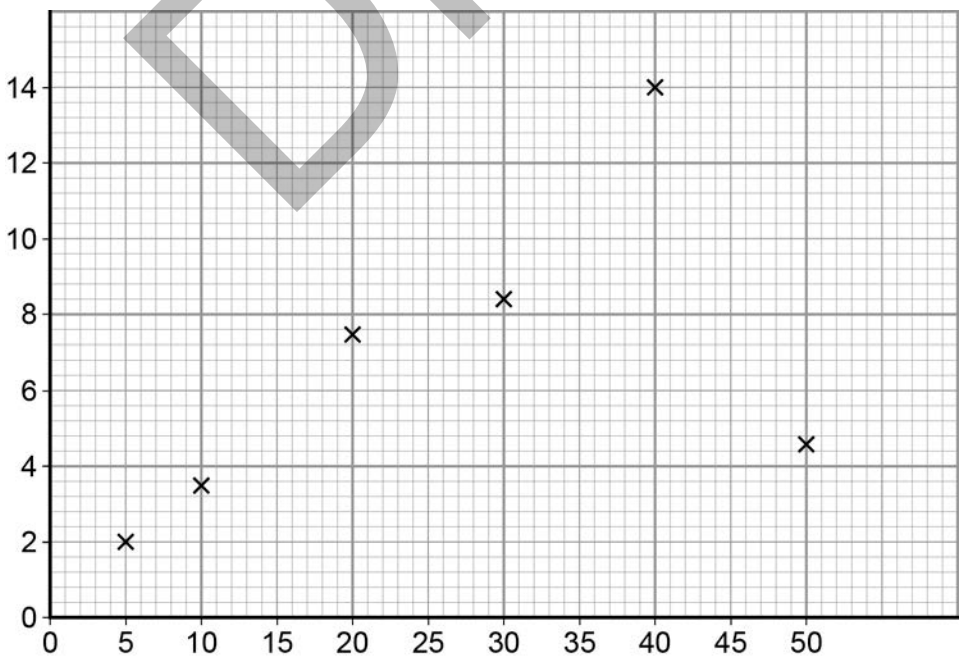
Temperature in °C	Rate of respiration in arbitrary units
5	2.2
10	3.5
20	7.5
30	8.4
40	14.0
50	4.6

0 2 . 4 The student uses his results to plot the graph in **Figure 3**.

Put the correct labels on the *x* and *y* axis.

[1 mark]

Figure 3



0 2 . 5 How could the student find out if the result at 30 °C is anomalous?

[1 mark]

0 2 . 6 Suggest what the value at 30 °C should be to fit the pattern of the graph.

[1 mark]

0 2 . 7 The results show that the rate of respiration increases between 5 °C and 40 °C.

Metabolism also increases between 5 °C and 40 °C.

What is metabolism?

[1 mark]

Turn over for the next question

0 3 This question is about water treatment.

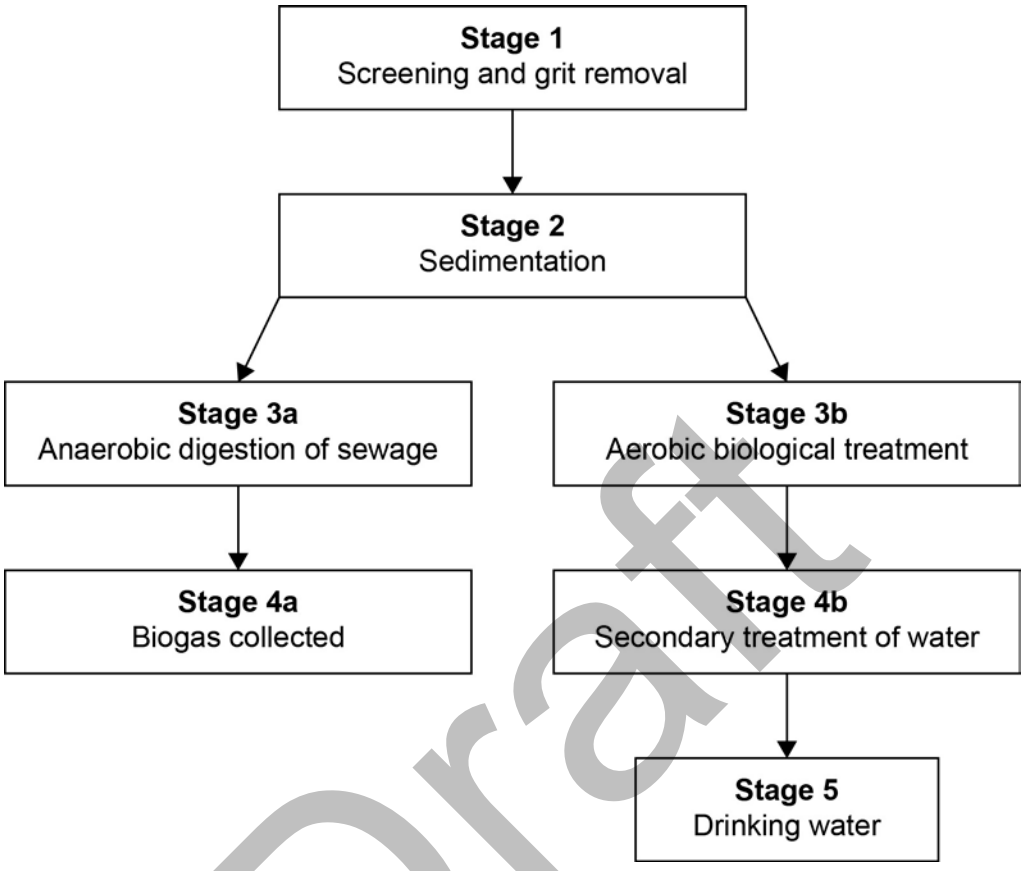
0 3 . 1 Rainwater collects in the ground in rivers and lakes.

How is water from rivers and lakes treated before it is piped into our homes for drinking?

[4 marks]

Figure 4 shows a sewage treatment process.

Figure 4



0 3 . 2 What does **anaerobic** in stage **3a** mean?

[1 mark]

0 3 . 3 What type of organism is used in stage **3a**?

[1 mark]

0 4 Drug companies develop new drugs to treat disease.

New drugs are trialled before they are licensed for use.

During drug trials the new drugs are tested for side effects.

0 4 . 1 Give **two** other factors that new drugs are tested for during trials.

[2 marks]

1 _____

_____

2 _____

_____

0 4 . 2 What is a double-blind trial?

[2 marks]

_____

_____

_____

_____

Statins are used to treat coronary heart disease (CHD).

Some scientists trialled two different types of statin.

The scientists:
- conducted the trial on 325 patients with a history of CHD in their family
- used a double-blind trial method
- measured the change in blood cholesterol levels over two years
- measured the change in thickness of an artery wall over two years.

Table 2 shows the results.

Table 2

	Drug A	**Drug B**
Number of patients who died during the trial	1	2
Number of patients who reported muscle aching	16	17
Number of patients who reported mild abdominal cramps	18	16
Change in blood cholesterol level in percentage	–50.5	–41.2
Change in thickness of artery in mm	–0.0033	+0.032

0 4 . 3 A student suggested that Drug **A** was more effective than Drug **B**.

She thought this because half the number of Drug **A** patients died during the trial compared to Drug **B** patients.

Give **two** other reasons that support the student's conclusion.

Use information from **Table 2**.

[2 marks]

1 _____

_____

2 _____

_____

0 4 . 4 Another student suggested that Drug **A** was a safer drug than Drug **B.**

Give reasons why this is **not** a valid conclusion.

[2 marks]

0 4 . 5 The results of drug trials are peer reviewed before they are published.

Why are peer reviews important in drug trials?

[1 mark]

Tick **one** box.

To calculate the best dose ☐

To check the drug works ☐

To make sure the scientist gets credit ☐

To prevent false claims ☐

0 5 Coronary heart disease (CHD) can be caused by many factors.

Look at **Table 3**.

Table 3

Country	Number of deaths from CHD per 100 000 population per year	Percentage of the population who smoke tobacco	Percentage of the population who drink alcohol heavily	Amount of fruit and vegetables eaten in kg per person per year
A	285	36	19	180
B	251	63	34	404
C	186	47	36	251
D	149	23	34	218
E	128	27	12	222

0 5 . 1 Name **one** risk factor for CHD that is **not** shown in **Table 3**.

[1 mark]

0 5 . 2 A student concludes that the main cause of CHD is not eating enough fruit and vegetables.

Give **three** reasons why the student's conclusion is **not** correct.

Use information from **Table 3**.

[3 marks]

0 5 . 3 Explain how the build-up of fatty material can cause a heart attack in a person with CHD.

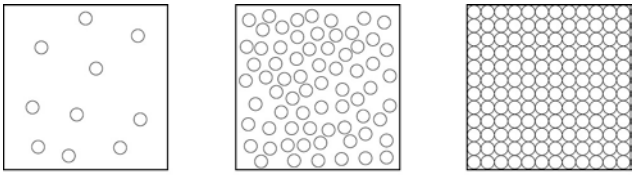
[4 marks]

0 5 . 4 Describe how statins can help to reduce deaths from CHD.

[2 marks]

0 6 **Figure 5** shows a simple model of the three states of matter.

Figure 5



0 6 . 1 What is the correct equation to work out the density of a material?

[1 mark]

Tick **one** box.

Density = mass/volume ☐

Density = volume/mass ☐

Density = mass × volume ☐

Density = 0.5 × mass × volume^2 ☐

0 6 . 2 A student explains density to his teacher using the particle model in **Figure 5**.

His teacher says there are limitations to the model.

Give **two** limitations of the particle model in **Figure 5**.

[2 marks]

1 _____

_____

2 _____

_____

0 6 . 3 When the gas in box **A** is heated the pressure inside the box increases.

Explain why the pressure increases.

[4 marks]

Turn over for the next question

0 7 Hormones are released from glands.

0 7 . 1 Which gland is a 'master gland' and releases several different hormones?

[1 mark]

Tick **one** box.

Adrenal ☐

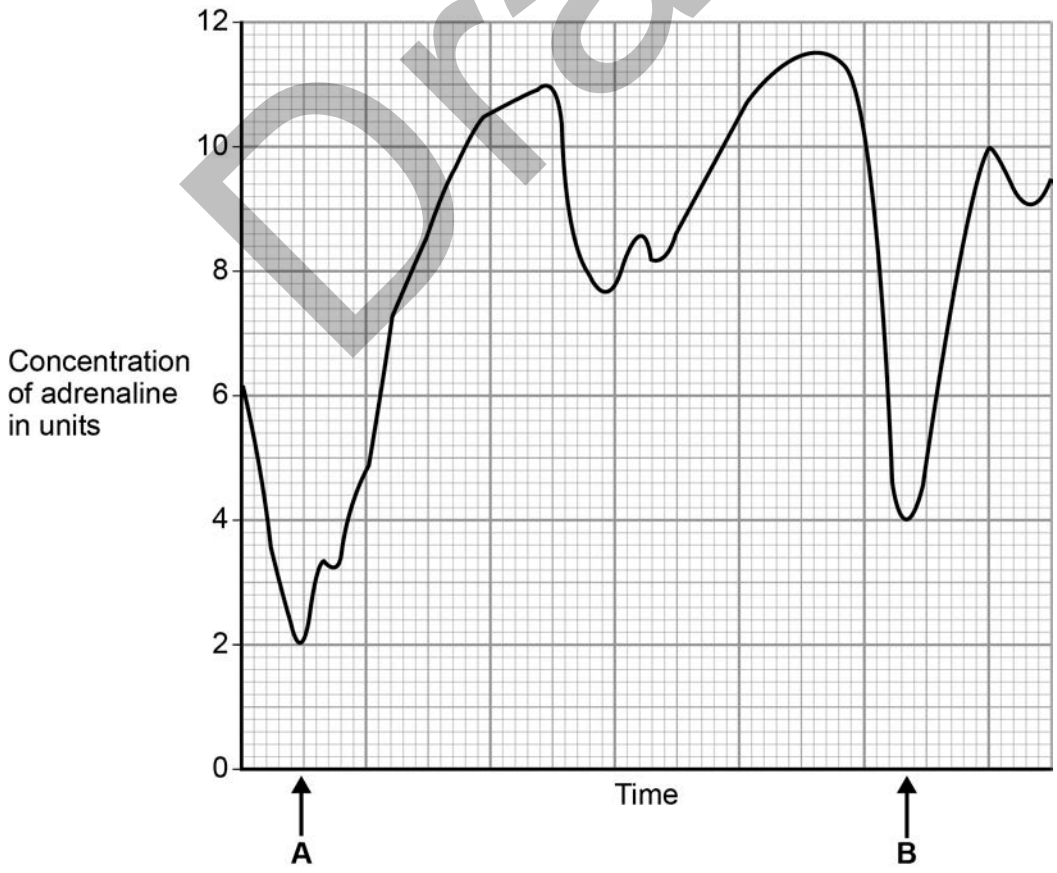
Ovary ☐

Pituitary ☐

Thyroid ☐

Figure 6 shows the level of adrenaline in a man's bloodstream while he was watching a 10-minute film.

Figure 6



0 7 . 2 After point **A**, the concentration of adrenaline in the man's blood rose by 450%.

Suggest what happened in the film at point **A**.

[1 mark]

0 7 . 3 Calculate the percentage increase in adrenaline after point **B**.

[2 marks]

Percentage increase in adrenaline = _____

0 7 . 4 Suggest why the percentage increase in adrenaline after point **B** is different from the percentage rise after point **A**.

[2 marks]

Question 7 continues on the next page

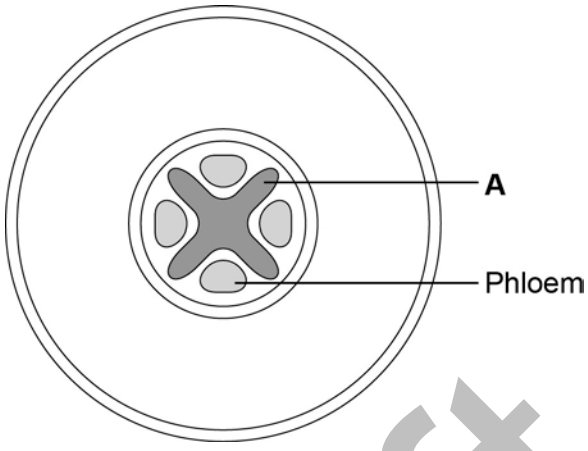
0 7 . 5 Adrenaline causes changes in the body to prepare for a 'fight or flight' response.

What changes in the man's body have been caused by adrenaline?

[2 marks]

0 8 **Figure 7** shows a cross-section through a plant root.

Figure 7



0 8 . 1 What is tissue **A**?

[1 mark]

Tick **one** box.

- Cuticle ☐
- Epidermis ☐
- Meristem ☐
- Xylem ☐

Question 8 continues on the next page

0 8 . 2 A student was given samples of two fluids.

One fluid was from the phloem of a plant and one from the xylem of a plant.

The student wanted to work out which fluid was from the phloem and which was from the xylem.

She measured the pH and the concentrations of sugar, nitrate ions and potassium ions of each fluid.

Table 4 shows the student's results.

Table 4

	Fluid A	**Fluid B**
pH	7.3	5.6
Sugar in mg/cm^3	118	1.18
Nitrate ions in mg/cm^3	10	600
Potassium ions in µg/cm^3	1.18	2500

Which fluid is from the phloem, and which is from the xylem?

Give reasons for your answer.

Use the information from **Table 4**.

[3 marks]

0 8 . 3 In fluid **A**, how many times greater is the concentration of sugar than the concentration of potassium ions?

[2 marks]

0 8 . 4 The concentration of potassium ions in the soil is 3.9 µg/cm^3

The concentration of potassium ions in the root tissue is 2500 µg/cm^3

Explain why the concentration is so much higher in the roots than in the soil.

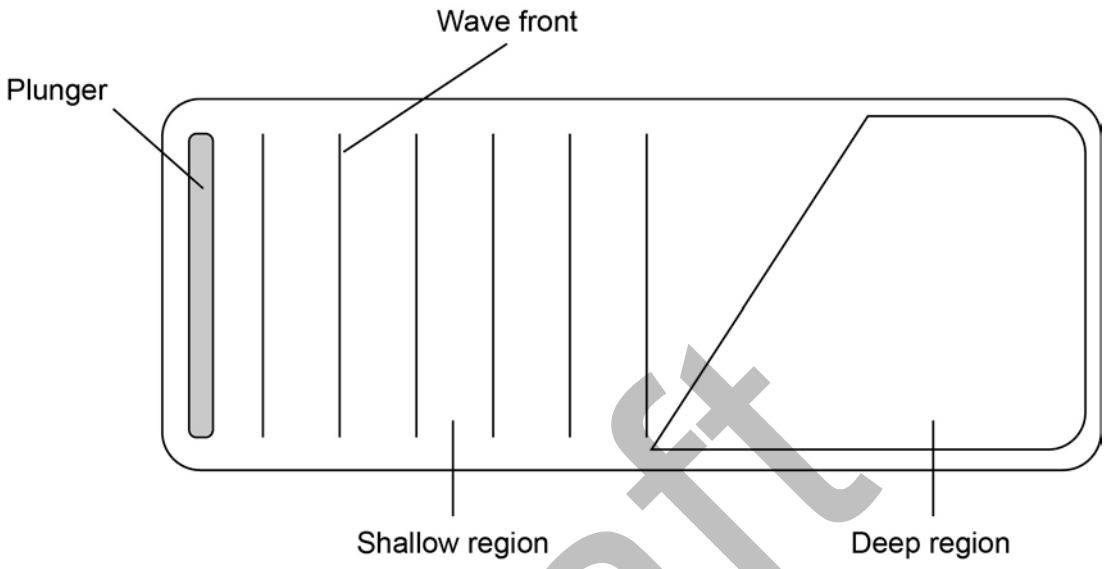
[3 marks]

Turn over for the next question

0 9 Some students did an investigation to study the behaviour of waves.

Figure 8 shows a ripple tank that they used to model the behaviour of waves.

Figure 8



0 9 . 1 Complete the wave fronts on **Figure 8** to show how the wave is refracted as it passes from the shallow region into the deep region.

[1 mark]

0 9 . 2 Explain what happens to the waves as they pass into the deep region.

[2 marks]

0 9 . 3 The waves generated on the surface of the water are transverse waves.

Describe the differences between longitudinal waves and transverse waves.

[3 marks]

0 9 . 4 Some students investigated the properties of the waves generated in **Figure 8**.

Student **A** said 'the waves move water from one end of the tank to the other'.

Student **B** said 'that's wrong. Only the waves move, not the water'.

Suggest what the students could do to decide which of them is correct.

[2 marks]

Question 9 continues on the next page

0 9 . 5 Another student used a ripple tank where all the water was the same depth.

She measured the wavelength of each wave as 0.3 m.

The period of each wave was 0.5 s.

Calculate the speed of the wave.

Write down any equations you use.

Give the unit.

[5 marks]

Speed = _____

Unit = _____

Turn over for the next question

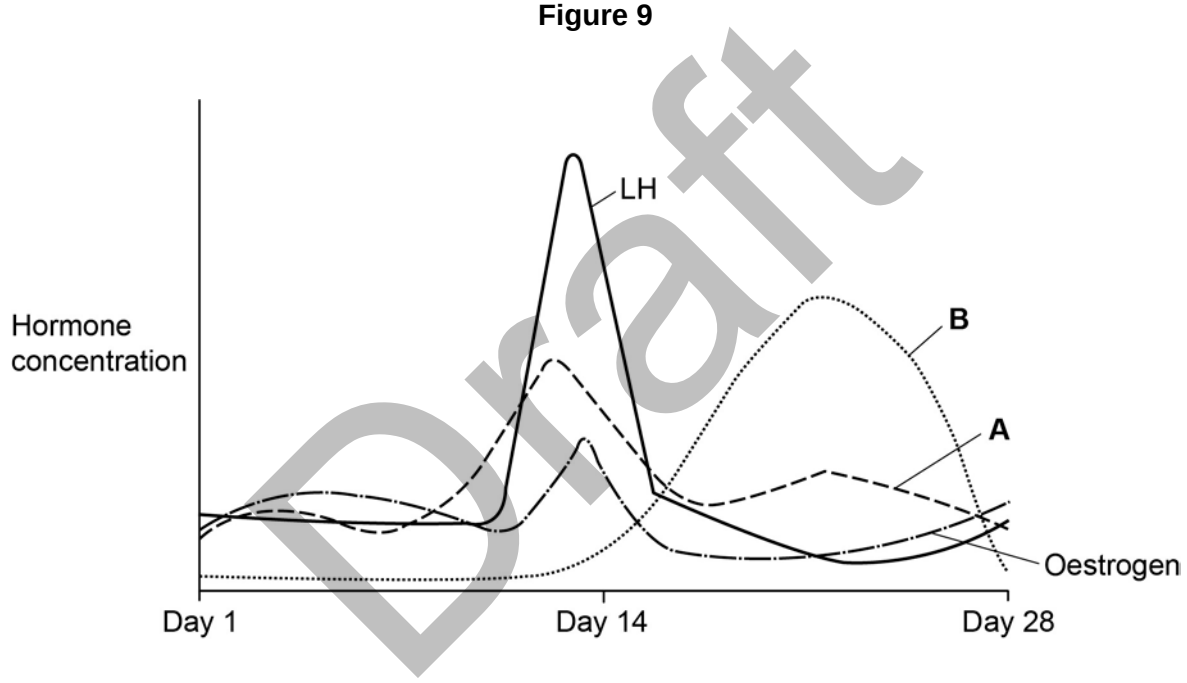
1 0 During puberty reproductive hormones cause secondary sex characteristics to develop.

1 0 . 1 Name the male hormone produced by the testes.

[1 mark]

Figure 9 shows how hormone concentrations in the blood of a 30-year-old woman change over 28 days.

Figure 9



1 0 . 2 Name hormones **A** and **B**.

[2 marks]

A _____

B _____

1 0 . 3 Use information from **Figure 9** to explain what happens on Day 14.

[2 marks]

1 0 . 4 In Vitro Fertilisation (IVF) treatment can be used to help women become pregnant and have a baby.

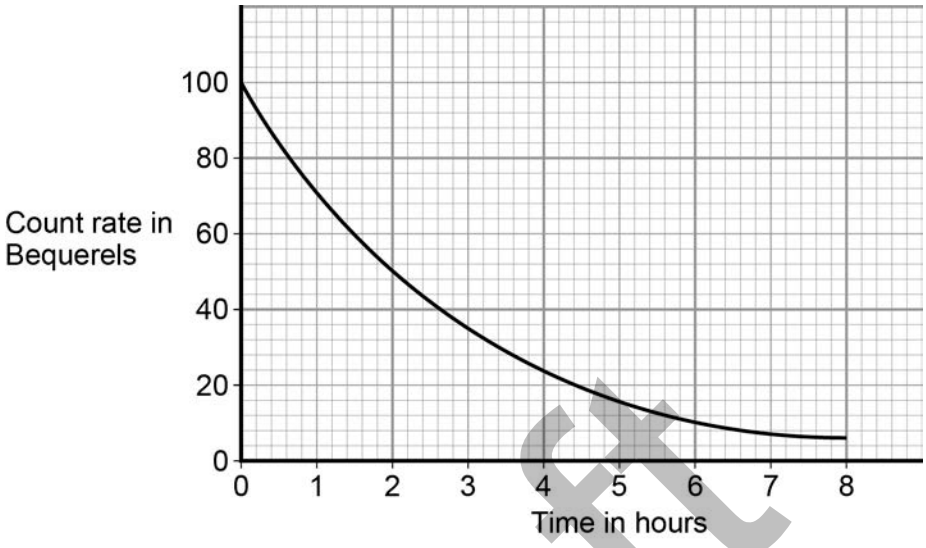
IVF uses some of the hormones shown in **Figure 9**.

Explain the process of IVF.

[6 marks]

1 1 **Figure 10** shows how the activity of a radioactive isotope changes over an 8 hour period of time.

Figure 10



1 1 . 1 What is the half-life of the radioactive isotope?

[1 mark]

1 1 . 2 Calculate how long it will take for the count rate to fall from 100 to 1.56 Bequerels.

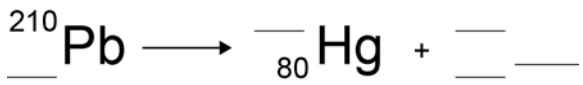
[2 marks]

Time = _____ hours

1 1 . 3 Lead-210 is a radioactive isotope that decays to an isotope of mercury by alpha decay.

Complete the nuclear equation to show the alpha decay of lead-210.

[3 marks]



1 1 . 4 Explain the hazardous effects ionising radiation has on the human body.

[5 marks]

END OF QUESTIONS

There are no questions printed on this page