

6.6 Hormones, Homeostasis & Reproduction

Question Paper

Course	DP IB Biology
Section	6. Human Physiology
Topic	6.6 Hormones, Homeostasis & Reproduction
Difficulty	Medium

Time allowed: 60
Score: /47
Percentage: /100

Question 1a

- a) Each year, a few people with type I diabetes are given a pancreas transplant. Pancreas transplants are not used to treat people with type II diabetes.

Give **two** reasons why pancreas transplants are not used for the treatment of type II diabetes.

[2 marks]

Question 1b

- b) About 85% of people with type II diabetes are overweight or obese. Some people who are obese have gastric bypass surgery (GBS) to help them to lose weight.

Scientists investigated whether having GBS affects sensitivity to insulin. They measured patients' sensitivity to insulin before and after GBS. Some of the patients had type II diabetes. The others did not but were considered to be at high risk of developing the condition.

The table below shows the scientists' results. The higher the number, the greater the sensitivity to insulin.

Patient type	Mean sensitivity to insulin / arbitrary units ± Standard Deviation (SD)	
	Before the gastric bypass	After the gastric bypass
Does not have diabetes	0.89 ± 0.29	1.35 ± 0.90
Has type II diabetes	0.45 ± 0.22	1.17 ± 0.92

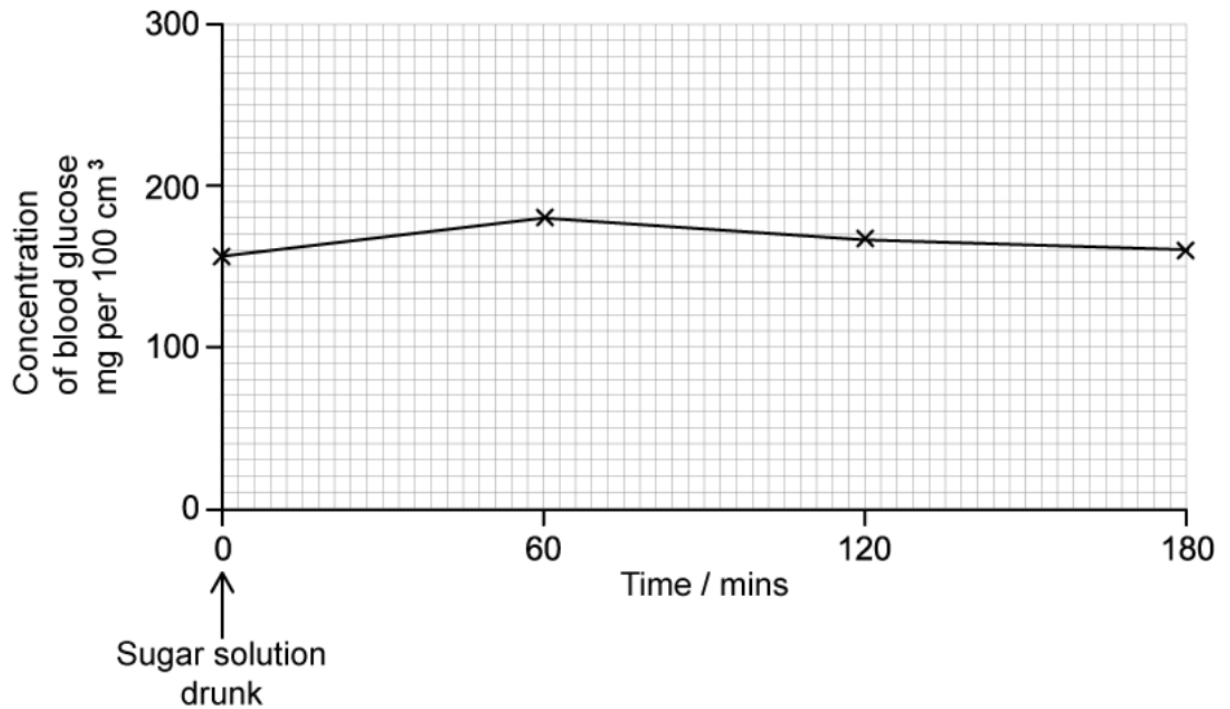
The scientists concluded that GBS cured many patients' diabetes.

Use the data in the table to evaluate this conclusion.

[2 marks]

Question 1c

- c) Some diabetic individuals do not produce insulin. In an experiment, a person with diabetes drank a sugary solution and then the glucose concentration in their blood was measured at regular intervals. The results are shown in the graph below.



Suggest **two** reasons why the concentration of glucose decreased after 60 minutes even though this person's blood contained no insulin.

[2 marks]

Question 1d

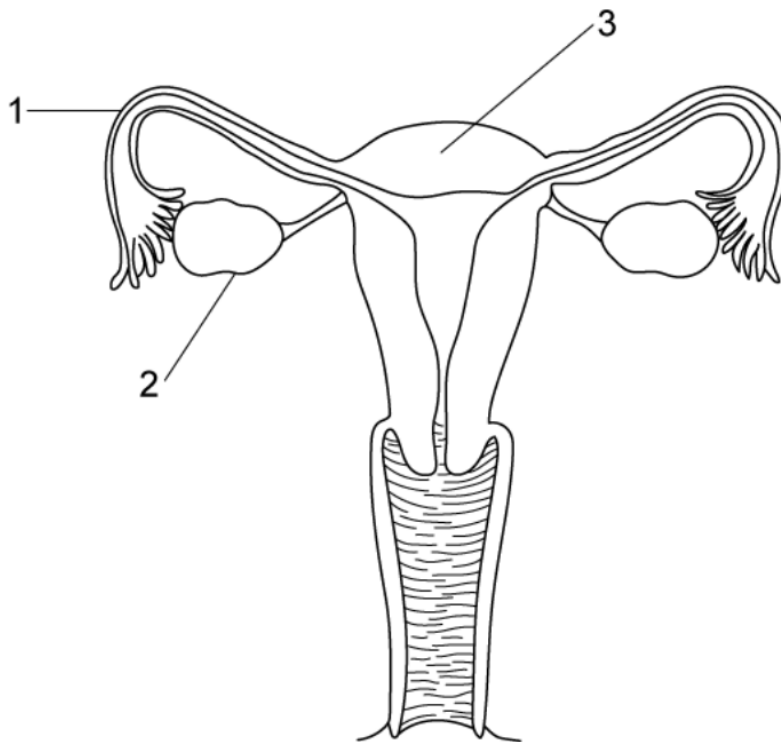
- d) The same experiment was repeated on a non-diabetic person. The glucose concentration in their blood prior to drinking the sugary solution was $75 \text{ mg per } 100 \text{ cm}^3$.

Sketch a curve on the graph in part (b) to show the results you would predict.

[1 mark]

Question 2a

- a) The diagram shows the female reproductive system in front view



Identify structures **1** and **2**.

[2 marks]

Question 2b

- b) State the function of structure **3** from part (a).

[1 mark]

Question 2c

- c) Outline the role of the SRY gene in the development of female embryonic reproductive organs

[3 marks]

Question 2d

- d) Ethinylestradiol is a synthetic form of the naturally occurring female hormone oestrogen. A group of scientists found that exposing fish eggs in the lab to ethinylestradiol resulted in fewer male offspring compared to control fish.

The scientists then exposed the fish and their eggs to water from different sources and found that the eggs exposed to river water had similar results to those exposed to ethinylestradiol.

The table gives information on the amount of oestrogen found in different sources of water.

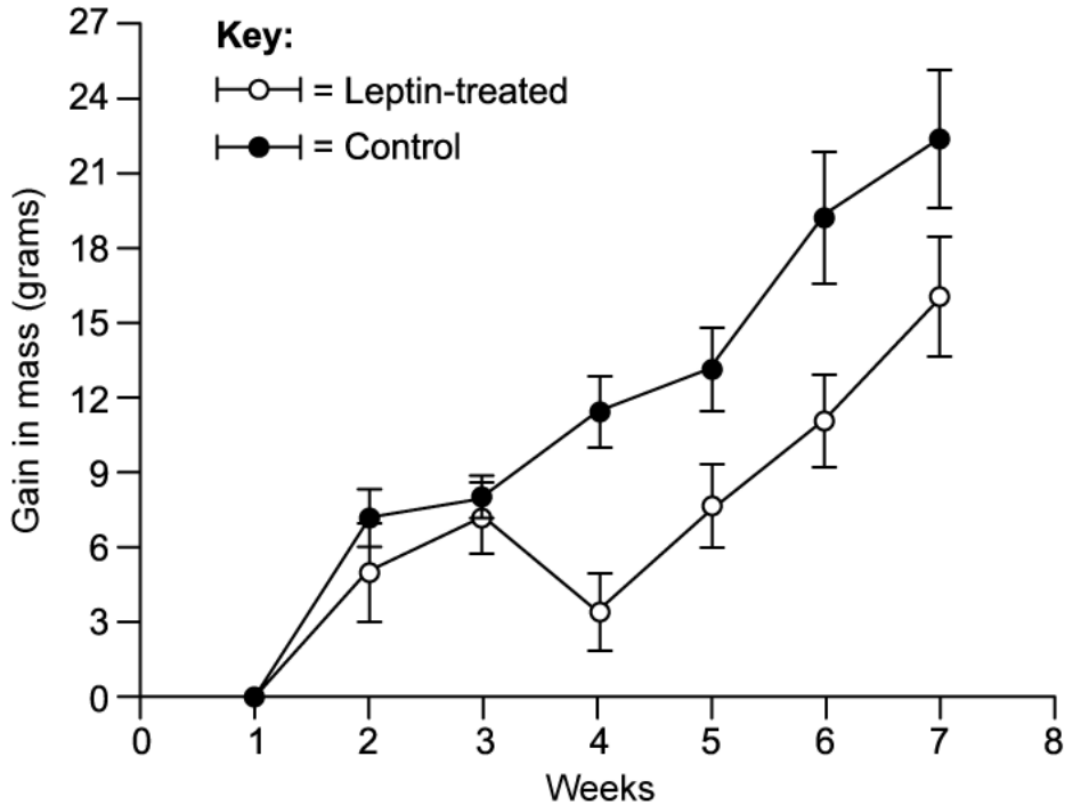
Water source exposed to fish eggs	Oestrogen level ng/m³
Ground water	5
Surface water - river	60
Surface water - reservoir	12
Drinking water	25

Use your knowledge of hormones and the data provided to suggest an explanation for the scientists' results.

[2 marks]

Question 3a

- a) The graph below shows data collected on mice exposed to the hormone leptin. One group of mice were treated with leptin injections. The control mice received no leptin. Both groups of mice were fed the same diet over an eight week period.



Describe the results shown in the graph above.

[3 marks]

Question 3b

- b) Explain the results shown in part (a).

[3 marks]

Question 3c

- c) Another hormone is thyroxine, released from the thyroid gland. Thyroxine contains iodine as part of its chemical structure.

Suggest, with a reason, **two** effects that iodine deficiency may have on the human body.

[2 marks]

Question 4a

- a) *In vitro* fertilisation, known as IVF, involves fertilisation of a female egg outside of the human body. The hormones FSH and LH are used in IVF.

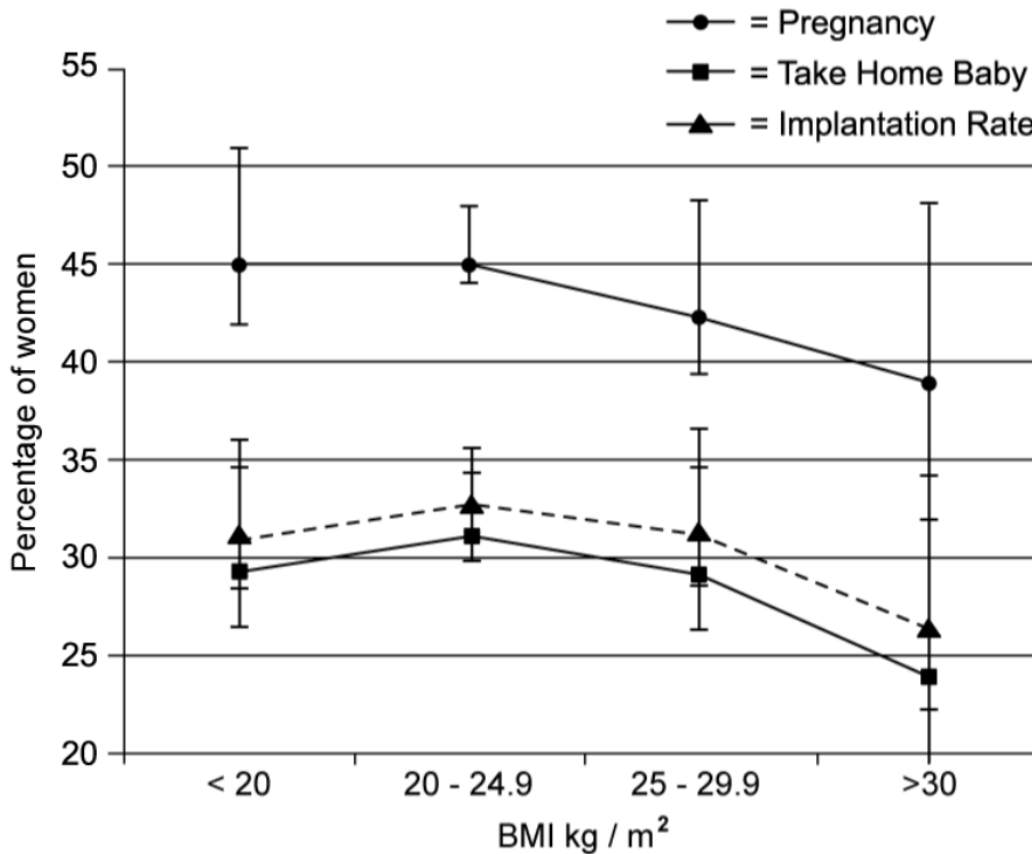
State the functions of FSH and LH in IVF.

[2 marks]

Question 4b

- b) A fertility clinic investigated the effect of body mass index (BMI) on the outcome of the percentage of women who had successful implantation, became and remained pregnant, and were able to take home a healthy baby following IVF treatment.

Their results are shown in the graph below.



The clinic advised women with a BMI greater than 30kg/m² to lose weight before embarking on IVF treatment.

Use the data to explain why.

[2 marks]

Question 4c

- c) State what is meant by the term superovulation.

[1 mark]

Question 4d

- d) William Harvey conducted observational research on sexual reproduction in deer in the 1600s.

State what Harvey was and was not able to observe in the deer.

[4 marks]

Question 5a

One mark is available for clarity of communication throughout this question.

- a) Outline the events that occur, including the hormones involved, during days 14-28 of the menstrual cycle in the absence of fertilisation.

[5 marks]

Question 5b

- b) The hormone oestrogen is involved in both positive and negative feedback loops within the menstrual cycle.

Explain how oestrogen functions in both positive and negative feedback within the menstrual cycle.

[3 marks]

Question 5c

- c) Describe the role of the pancreas and associated hormones in the control of blood glucose concentration.

[7 marks]

