

11.4 Sexual Reproduction

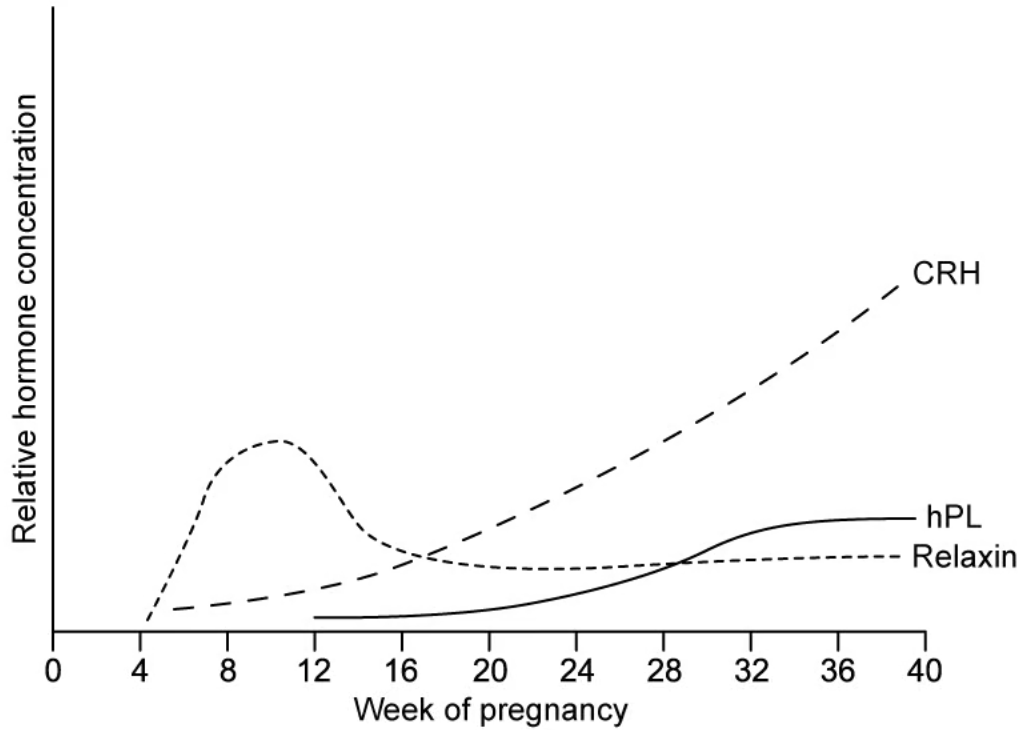
Question Paper

Course	DP IB Biology
Section	11. Animal Physiology (HL Only)
Topic	11.4 Sexual Reproduction
Difficulty	Hard

Time allowed: 60
Score: /45
Percentage: /100

Question 1a

a)
During pregnancy the placenta releases several hormones into the bloodstream. The graph below shows the relative concentrations of three such hormones, namely corticotropin-releasing hormone (CRH), human placental lactogen (hPL) and relaxin.



Contrast the changes in relative concentrations of hPL and relaxin.

[3 marks]

[3 marks]

Question 1b

b)
Recent studies suggest that CRH is involved with regulating the contractile properties of the myometrium.
With reference to the graph in part a) suggest, with a reason, the role of CRH in pregnancy.

[2 marks]

[2 marks]

Question 1c

c)
The hormone hPL affects several metabolic processes during the course of pregnancy. One such effect is that it decreases the response of the maternal cells to insulin.
Explain how high levels of hPL will benefit the growing foetus.

[2 marks]

[2 marks]

Question 1d

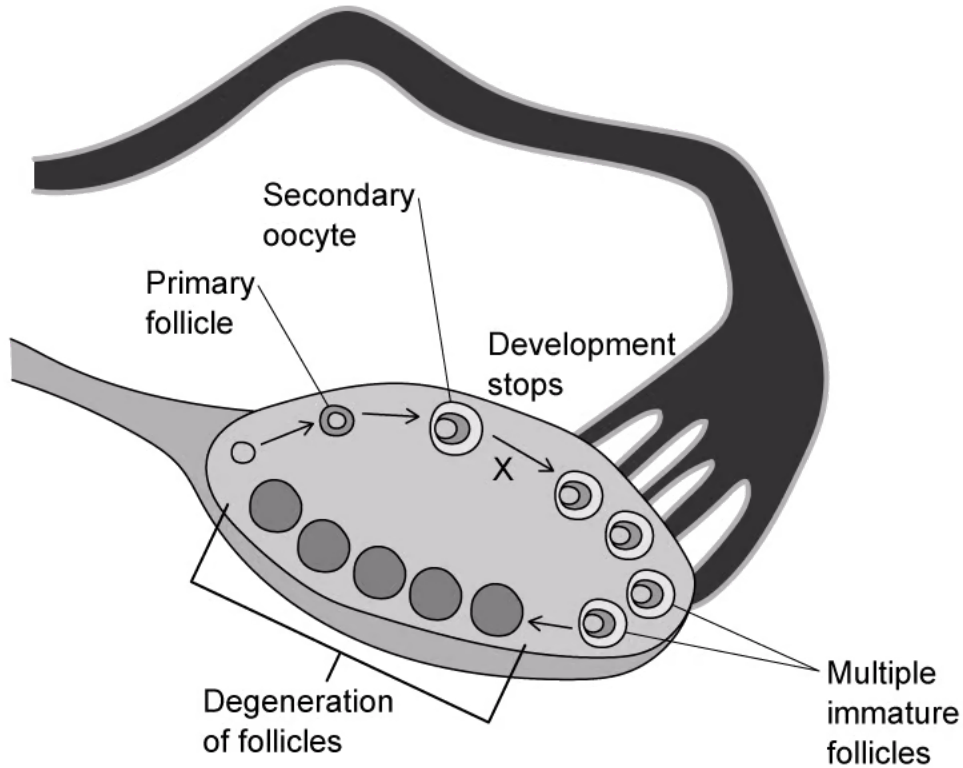
d)
The hormone relaxin will lead to an increase in renal blood flow during pregnancy.
Suggest why this increased blood flow is important during pregnancy.

[2 marks]

[2 marks]

Question 2a

a)
 Polycystic ovary syndrome (PCOS) is a common hormonal disorder in women aged 15 to 44. The diagram below shows the progression of oogenesis in the ovary of a person suffering from PCOS.



Contrast the process of oogenesis in a person suffering from PCOS with someone who does not have the condition.

[2 marks]

[2 marks]

Question 2b

b)
 Women suffering from PCOS will often have low levels of progesterone in their bloodstream.

Use the information in part a) to suggest why this is the case.

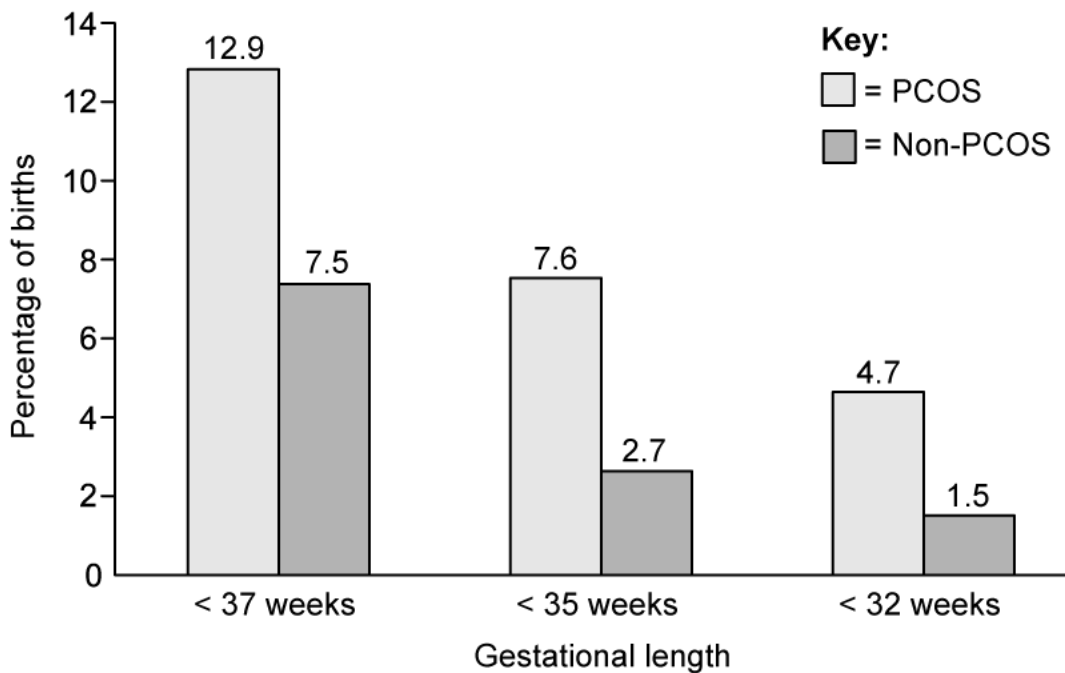
[2 marks]

[2 marks]

Question 2c

c)

Scientists investigated the link between PCOS in pregnant women and the risk of premature birth. The study was conducted in the maternity ward of a hospital and only women that had previously been diagnosed with PCOS were included in the PCOS group of the investigation. The results of the investigation are shown in the graph below.



Calculate the percentage difference between the PCOS and non-PCOS groups that delivered their babies between 32 and 35 weeks of pregnancy. Show your working.

[2 marks]

[2 marks]

Question 2d

d)
The scientists concluded that pregnant women suffering from PCOS will have an increased risk of premature birth.
Evaluate this conclusion.

[3 marks]

[3 marks]

Question 3a

a)
Research suggests that exposure to elevated levels of ethinylestradiol (synthetic oestrogen) in males leads to a significant decrease in the diameter of the seminiferous tubules, as well as fewer germinal epithelial cells.
Suggest the effect of these changes on spermatogenesis.

[3 marks]

[3 marks]

Question 3b

b)
Scientists measured the effect of changing ethinylestradiol levels on egg production and embryo formation in a species of fish.
Use your knowledge of the effects of oestrogen pollution to suggest a hypothesis for this investigation.

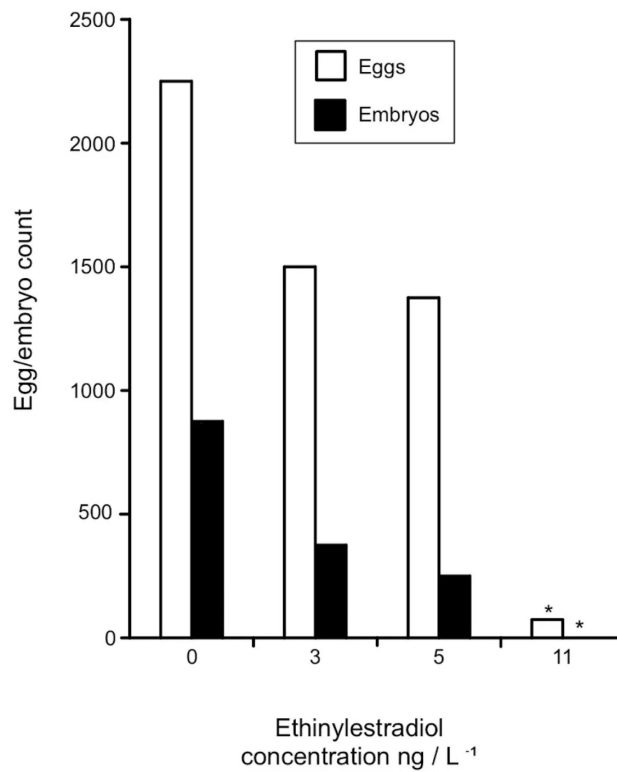
[1 mark]

[1 mark]

Question 3c

c)

The results of the investigation described at part c) are shown in the graph below. Note that the symbol * indicates a result that differs significantly from the control (0 ng L⁻¹).



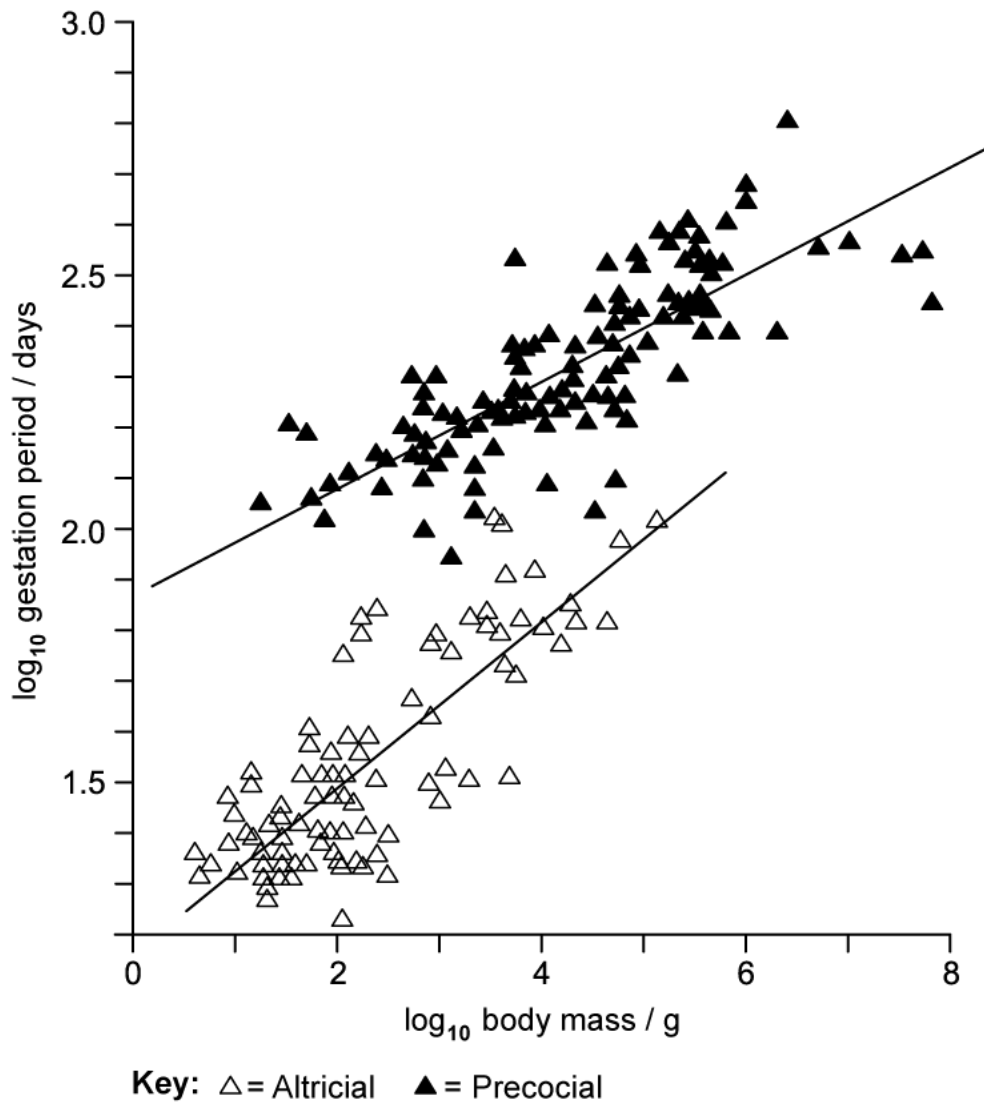
Suggest a possible explanation for the result obtained at an ethinylestradiol concentration of 11 ng L⁻¹.

[2 marks]

[2 marks]

Question 4a

a)
The graph below shows the relationship between body mass and gestation period for different species of mammals.



The American black bear *Ursus americanus* is a large carnivore with an average body mass of 70 kg and a gestation period of 220 days.

Draw the data point for the black bear on the graph. Show your working.

[2 marks]

[2 marks]

Question 4b

b)

Black bear mating season typically occurs from June to August but implantation of the blastocyst will only happen during November or December. Their cubs are born in January or February weighing between 250 and 400 grams and with very little fur covering their bodies. They are blind at this stage and rely on smell to locate their mother.

Based on the information provided, suggest:

i)

Why black bears are considered to be altricial.

[1 mark]

ii)

The benefit to the mother of the reproductive strategy described above.

[1 mark]

[2 marks]

Question 4c

c)

Large mammals are typically precocial with long gestation periods.

Explain the advantage of this strategy.

[2 marks]

[2 marks]

Question 5a

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

a)

Outline the role of the zona pellucida in an oocyte.

[3 marks]

[3 marks]

Question 5b

b)

Compare and contrast the processes of oogenesis and spermatogenesis.

[7 marks]

[7 marks]

Question 5c

c)

Explain the advantages of internal fertilisation to terrestrial animals.

[5 marks]**[5 marks]**