

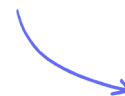
Structured Questions

Reproduction

Sexual & Asexual Reproduction / Sexual Reproduction / The Menstrual Cycle / Fertilisation / Plant Reproduction / Pollination / Seed Dispersal & Germination / Hormones & Puberty (HL) / Gametogenesis (HL) / Fertilisation & Implantation (HL) / Hormones in Pregnancy (HL) / The Placenta (HL) / Hormone Replacement Therapy (HL)

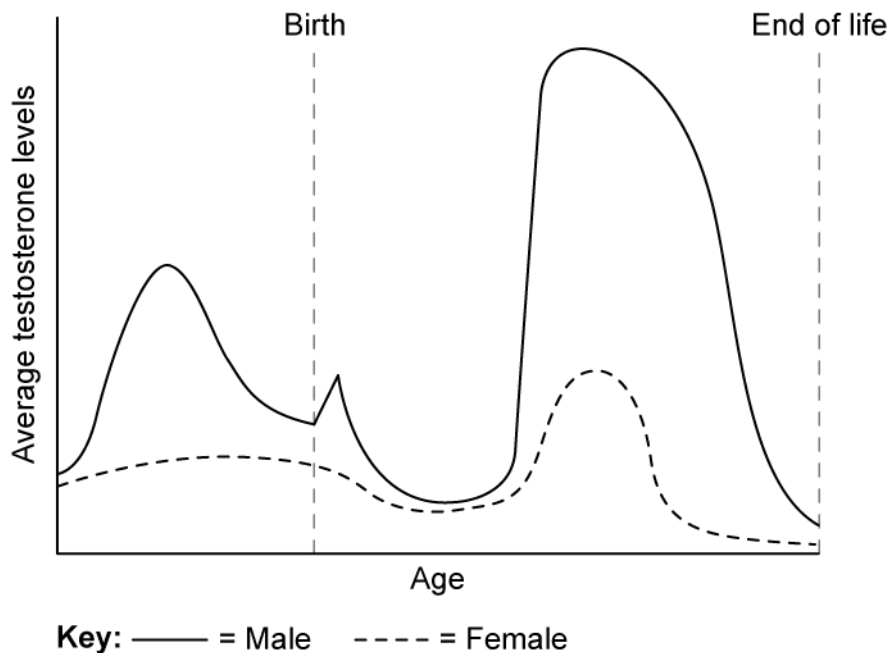
Easy (11 questions)	/76
Medium (12 questions)	/72
Hard (10 questions)	/72
Total Marks	/220

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Easy Questions

- 1 (a) The graph below shows changing testosterone levels in male and female humans from before birth until old-age. Note that the scale on the x-axis is not evenly distributed.



Compare and contrast the changes in testosterone levels for males and females.

(3 marks)

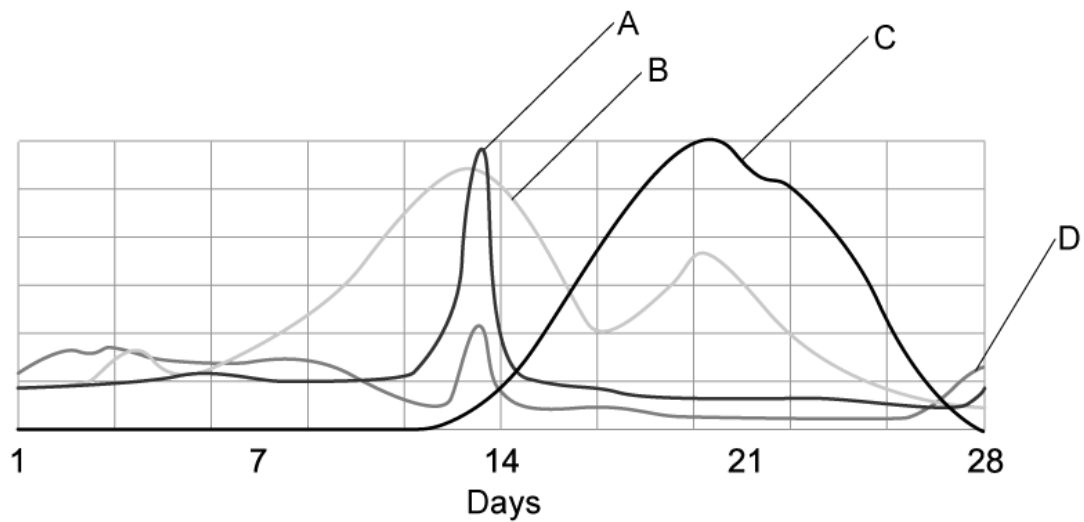
- (b) Label the graph in part a) with an **X** at roughly the point at which puberty begins in males.

(1 mark)

- (c) State **two** physiological changes that would occur in males at the point you have marked **X** on the graph in part a).

(2 marks)

2 (a) The process of reproduction is controlled by a series of hormones. The graph below shows changes in the levels of reproductive hormones **A-D** in females during a single menstrual cycle.



Identify, with a reason, the hormone represented by line **A**.

(1 mark)

(b) Line **C** represents the hormone progesterone.

(i) Identify the source of the hormone progesterone during the regular menstrual cycle.

[1]

(ii) State **one** role of progesterone.

[1]

(2 marks)

- (c) A common treatment for fertility problems is *in vitro* fertilisation, or IVF. During IVF a woman will be given medication containing the hormone FSH.

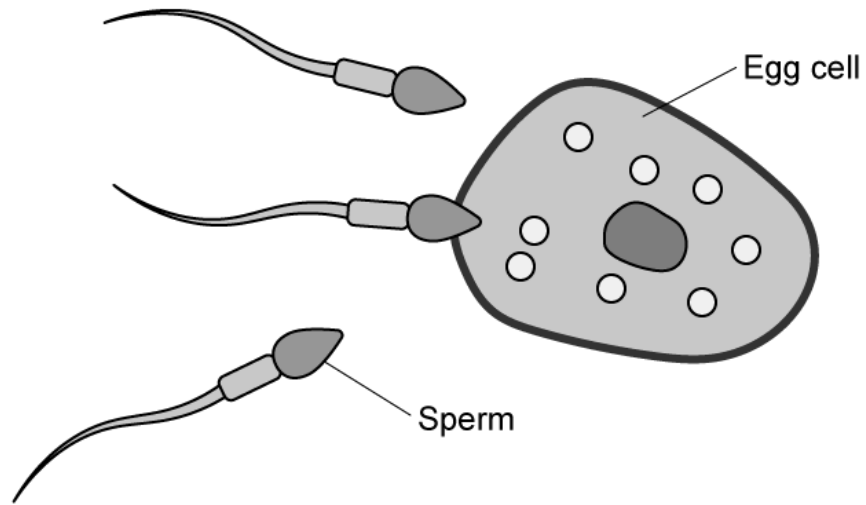
Explain why medication containing FSH is administered during IVF.

(2 marks)

- 3 Draw a labelled diagram of the female reproductive system.

(4 marks)

4 (a) The diagram shows a human egg and three sperm cells at the moment of fertilisation.



Suggest why the egg is so much larger than one sperm, even though they carry the same amount of genetic information as each other.

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(2 marks)

(b) State the number of chromosomes in a human egg.

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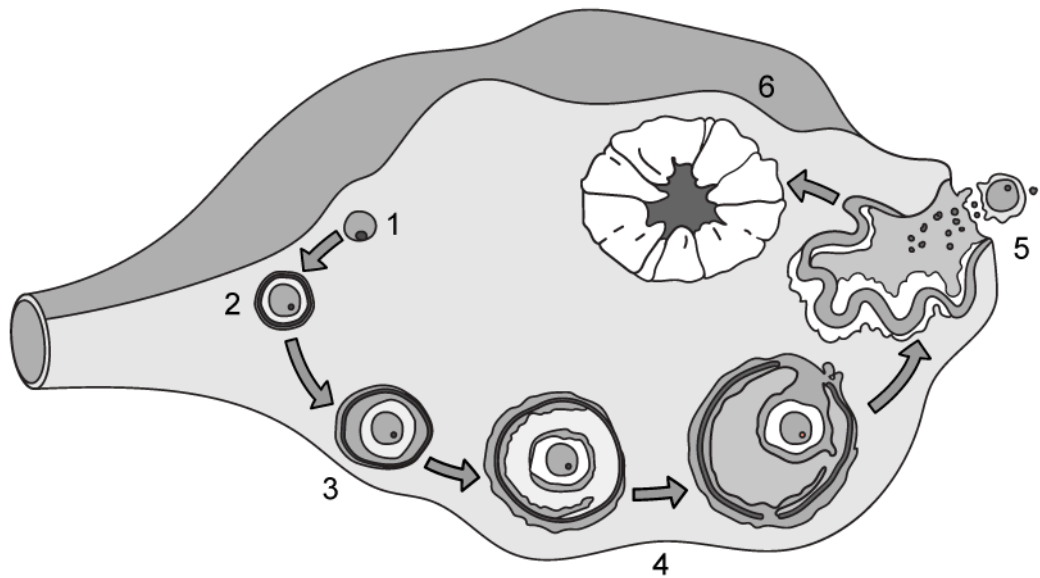
(1 mark)

(c) Name the cell that forms when a sperm fertilises an egg.

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(1 mark)

5 (a) The following diagram shows the process of oogenesis in a human ovary.



Identify the structure present at stage **2** in the diagram.

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(1 mark)

(b) Describe what is happening to the structure identified in a) between steps **3** and **4** in the diagram in part a).

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.....
(2 marks)

(c) Identify **three** similarities between the processes of oogenesis and spermatogenesis.

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(3 marks)

6 (a) Humans are placental mammals.

Outline what is meant by the term **placental mammal**.

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(2 marks)

(b) The table below lists some of the substances that are transported across the placenta, as well as the names of some transport mechanisms.

Substance	Transport mechanism
Carbon dioxide and oxygen	
Glucose	
Antibodies	
Water	

endocytosis

facilitated diffusion

diffusion

osmosis

Identify the transport mechanism for each of the substances by correctly matching them in the table.

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(4 marks)

(c) The placenta primarily consists of finger-like projections called placental, or chorionic, villi.

Suggest why the number of these villi increases throughout the course of a pregnancy.

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(1 mark)

(d) The placenta is also responsible for producing key pregnancy hormones.

(i) Identify **one** hormone produced by the placenta.

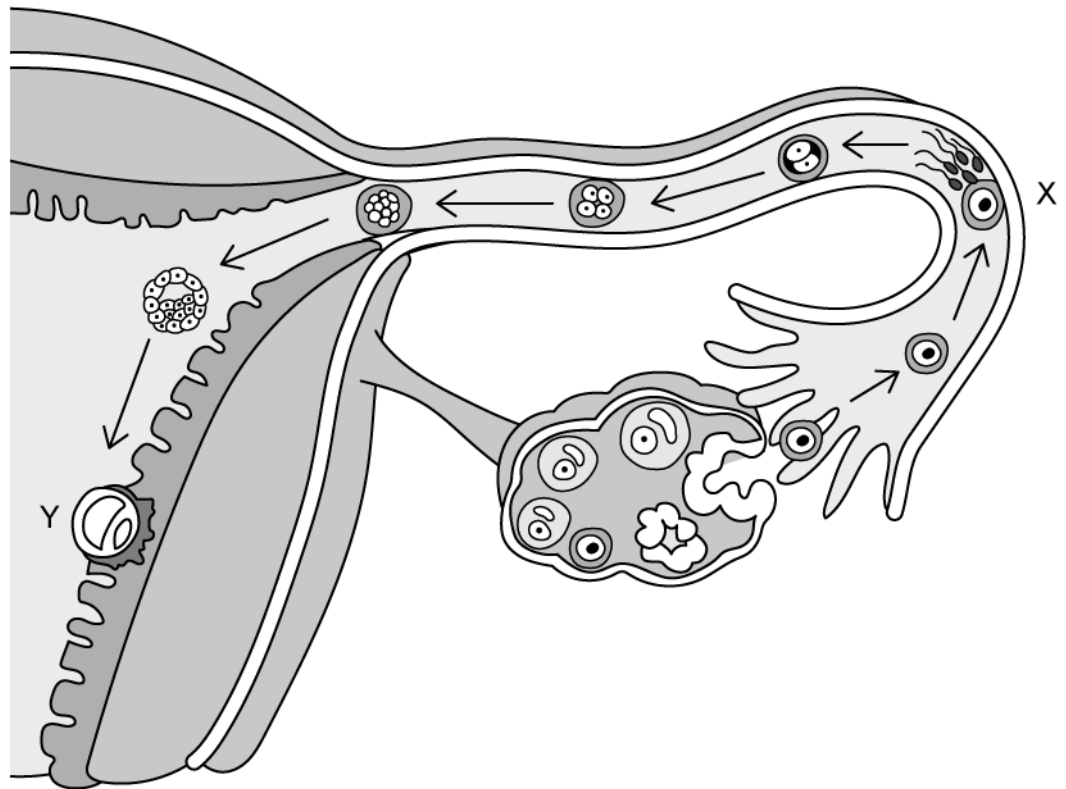
[1]

(ii) State the function of the hormone identified in part i).

[1]

(2 marks)

7 (a) The diagram below shows some of the events that can occur in the female reproductive system after ovulation.



Identify the events occurring at **X** and **Y** in the diagram.

(2 marks)

(b) Event **X** involves a series of mechanisms that prevent polyspermy.

Define the term **polyspermy**.

(1 mark)

(c) One of the mechanisms that prevents polyspermy is known as the cortical reaction.

Describe the steps of the cortical reaction.

(2 marks)

(d) Process **Y** is essential for pregnancy to occur.

Explain the importance of process **Y**

(2 marks)

8 (a) Describe the secretion and role of human chorionic gonadotropin (hCG) in early pregnancy.

(4 marks)

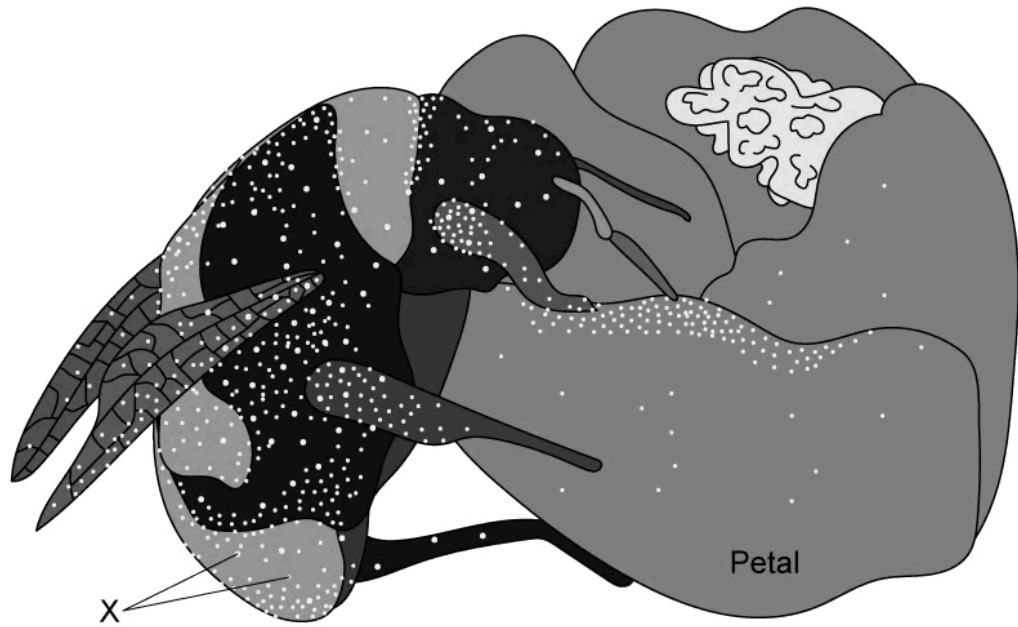
(b) The process of childbirth occurs in several stages.

Outline the events that occur during childbirth.

(7 marks)

9 (a) The image below shows a bee feeding on nectar from a flower.

(I) Identify the small specks indicated X.



[1]

(II) Explain how the flower benefits from feeding nectar to insects such as bees.

[2]

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(3 marks)

(b) State the name of the type of relationship that exists between the bee and the flower in part c) of this question.

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(1 mark)

10 (a) Gregor Mendel's landmark experiments on the basis of genetic inheritance, involved the flowering plant the sweet pea (*Lathyrus odoratus*). In these experiments, Mendel transferred the male sexual organs of certain plants to the female sexual organs of separate plants as a way of performing crosses.

Before completing the transfer, he cut away the male sexual organs of the recipient plants before the transfer.

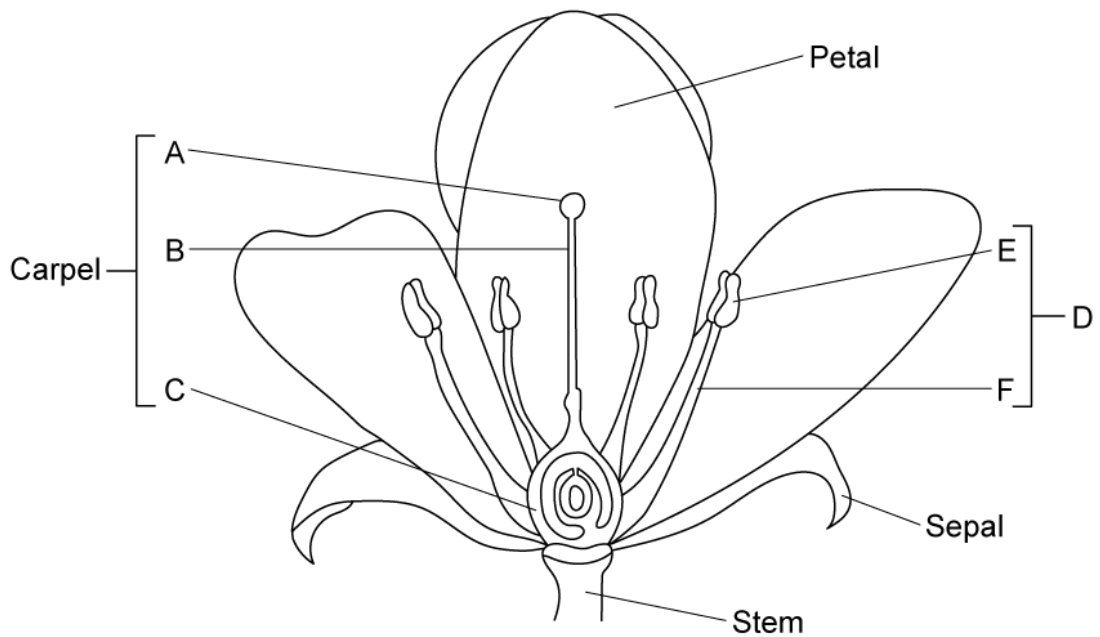
Explain why.

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(2 marks)

(b) The image below shows a flower.



Label the parts **A - F** indicated.

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(6 marks)

- (c)** State the name of the part of the flower shown in part b) that receives pollen during sexual reproduction.

(1 mark)

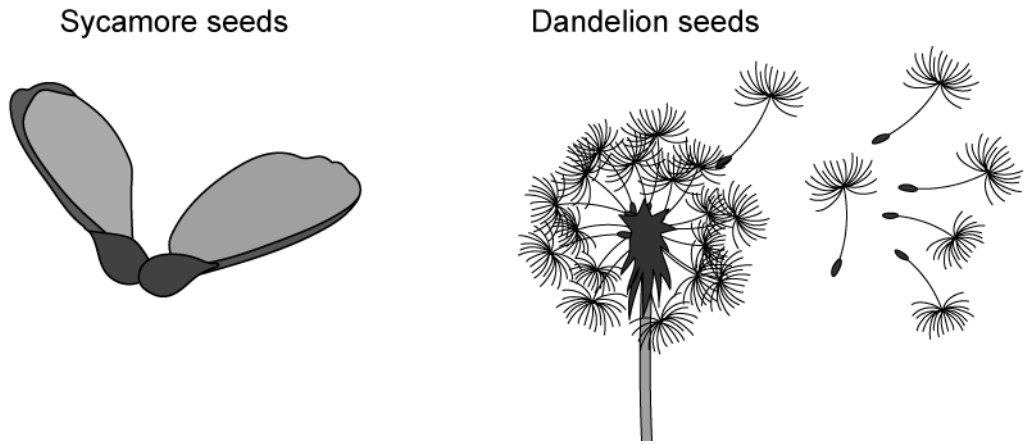
- (d)** State the principal purpose of the:

(i) Petals

(ii) Sepal

(2 marks)

11 (a) The diagram below shows two types of seed; sycamore and dandelion.



State the method by which these seeds are dispersed and in each case, **one** adaptation of the seed that allows effective dispersal.

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(3 marks)

(b) Seeds such as those shown in part a) are more effective if they can be dispersed far away from the parent plant.

Explain why.

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(2 marks)

The coco de mer is a seed that comes from a type of palm tree native to the Seychelles. *Lodoicea maldivica* is the species that produces the largest seeds known in nature. One such seed was found that had a mass of 25kg. To show the scale, a coco de mer seed is pictured below in the hands of a human.

(c)



Suggest why some plants like the dandelion and sycamore have small, lightweight seeds whereas others produce huge seeds like the coco de mer.

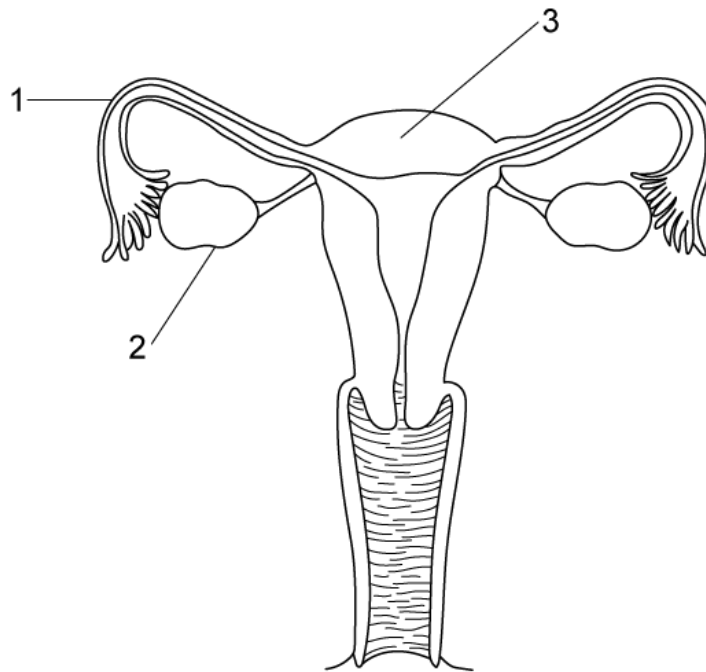
(2 marks)

(d) Describe how seeds found in fruit such as apple pips are dispersed.

(2 marks)

Medium Questions

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



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

(2 marks)

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

(1 mark)

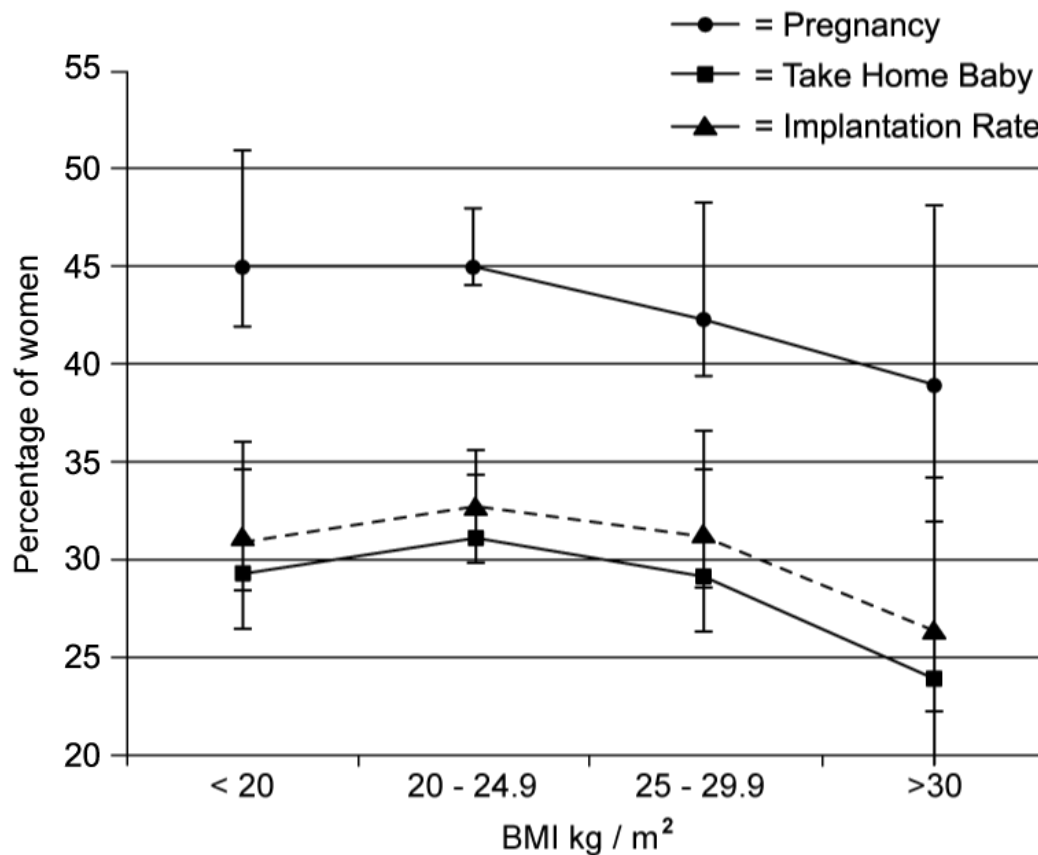
2 (a) *In vitro* fertilisation, known as IVF, involves fertilisation of a female egg outside of the human body. The hormones FSH and LH are used in IVF.

State the functions of FSH and LH in IVF.

(2 marks)

(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)

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

(1 mark)

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

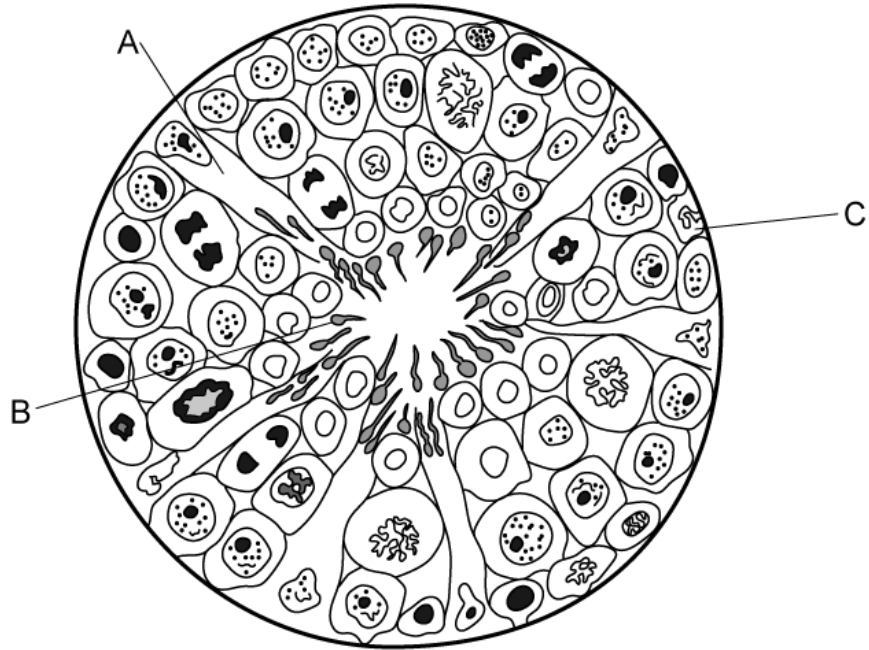
(5 marks)

(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)

- 4 (a) The image below shows a cross-section through a seminiferous tubule during spermatogenesis.



Identify the cells labelled **A-C** in the image.

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(3 marks)

- (b) Outline the events that take place between the formation of cells **C** and **B** labelled in part a).

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(3 marks)

- (c) Contrast the processes of spermatogenesis and oogenesis.

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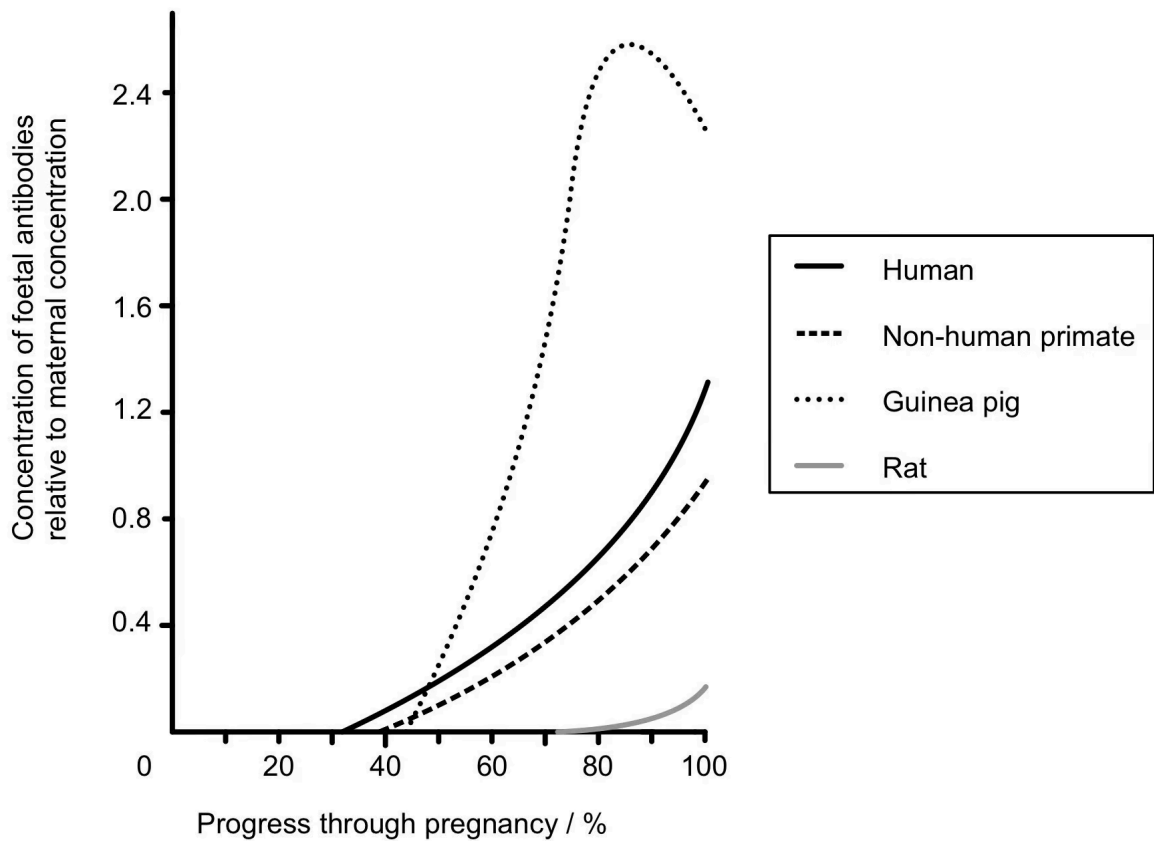
(3 marks)

5 (a) Fertilisation in humans is followed by implantation of the blastocyst.

Outline the events that allow implantation to occur.

(2 marks)

(b) Once implantation has occurred, part of the blastocyst develops into the placenta. The transfer of antibodies from mother to foetus at the placenta in several different species can be seen in the graph below.



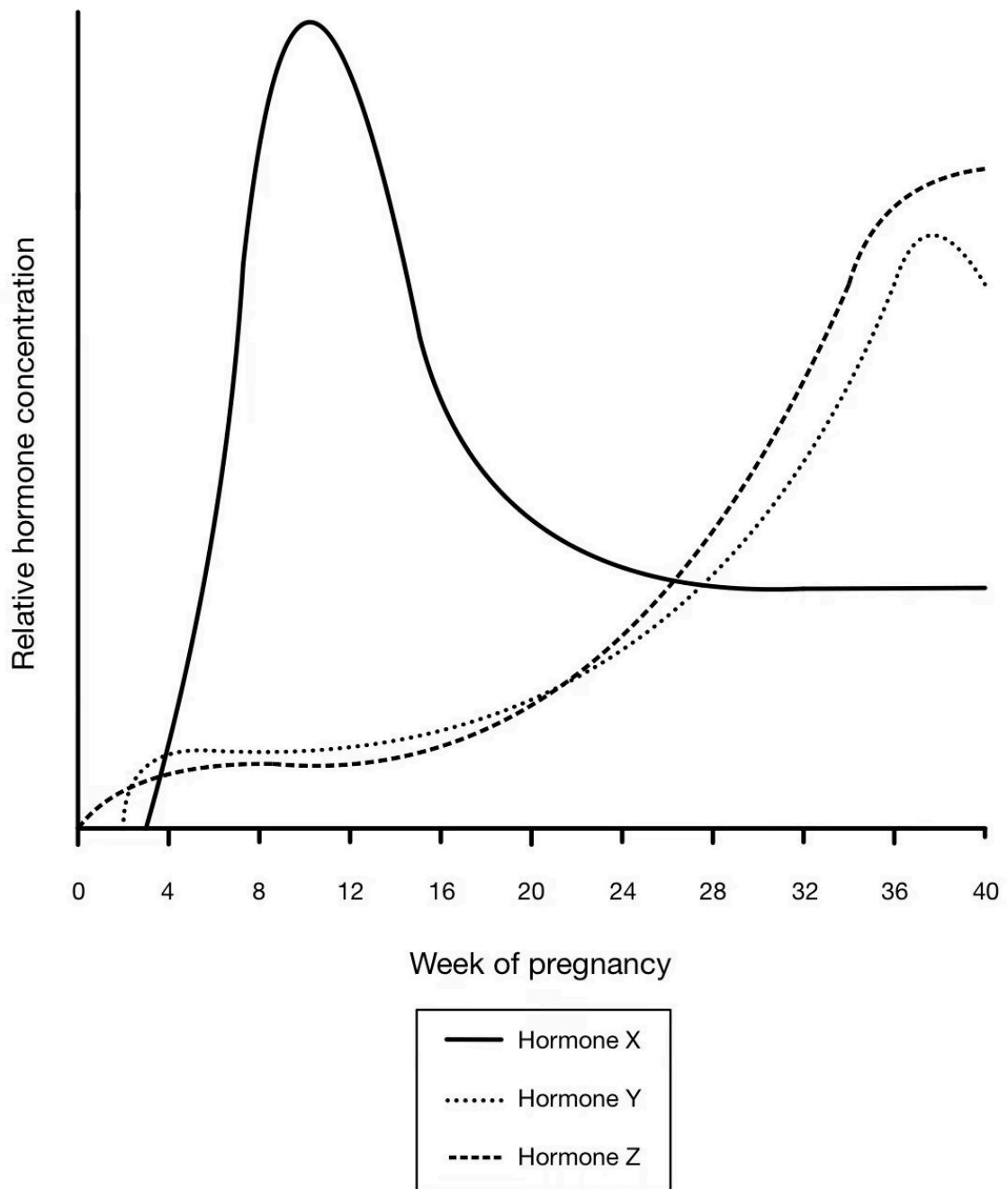
Contrast the changes in antibody concentration in the foetuses of humans and rats.

(2 marks)

(c) Suggest, with a reason, which of the species in the graph shown in part c) will need the least maternal care from birth.

(2 marks)

6 (a) The graph below shows the relative levels of three hormones during pregnancy.



Identify, with a reason, the hormone labelled **X** in the graph above.

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(3 marks)

(b) As the woman's body prepares to give birth, a fourth hormone, oxytocin, has an important role.

Sketch what you might expect to happen to levels of oxytocin on the graph in part a).

Note that hormone **Y** in the graph in part a) is progesterone.

(2 marks)

(c) Oxytocin is part of a positive feedback loop during birth.

Outline the role of this positive feedback loop during birth.

(3 marks)

7 (a) Describe the process of fertilisation in humans.

(5 marks)

(b) Outline the process of oogenesis.

(7 marks)

8 The life cycle of a flower involves a vegetative phase, during which the plant may be able to reproduce asexually, and a reproductive phase, during which sexual reproduction is possible.

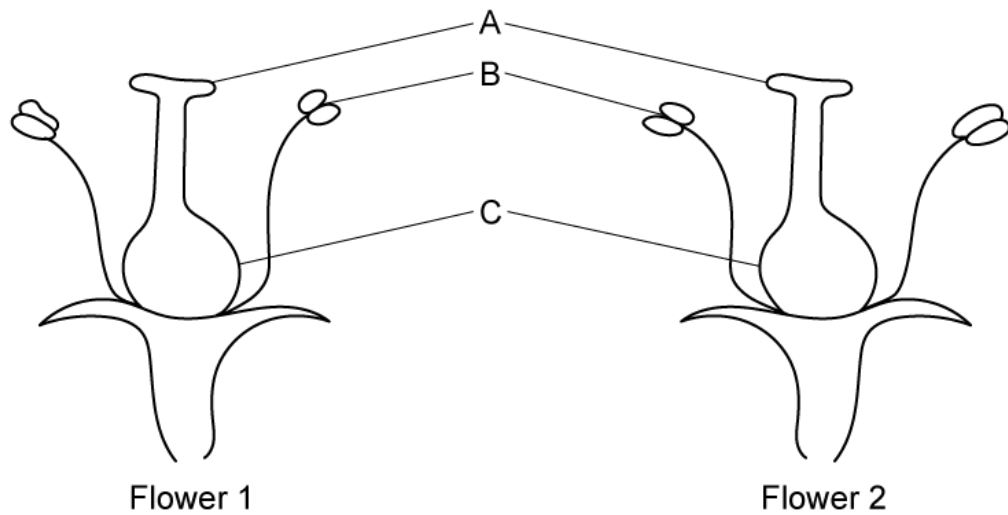
Contrast asexual and sexual reproduction.

(2 marks)

9 (a) Explain why the relationship between flowering plants and pollinators can be considered mutualistic.

(2 marks)

(b) The following diagram shows the reproductive parts of two flowers of the same species.



Identify structures **A** to **C** and state how each contributes to the process of sexual reproduction in the plant.

(3 marks)

10 (a) Pollination is the first step in sexual reproduction in plants.

Describe the events that occur after a pollen grain lands on the stigma of a flower until fertilisation happens.

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(3 marks)

(b) The following table shows the number of honey bee colonies documented by a beekeeper on a farm from 2008 to 2018.

Year	Number of living colonies
2008	36
2010	34
2012	22
2014	23
2016	27
2018	21

Calculate the percentage decrease in bee colonies from 2008 to 2018.

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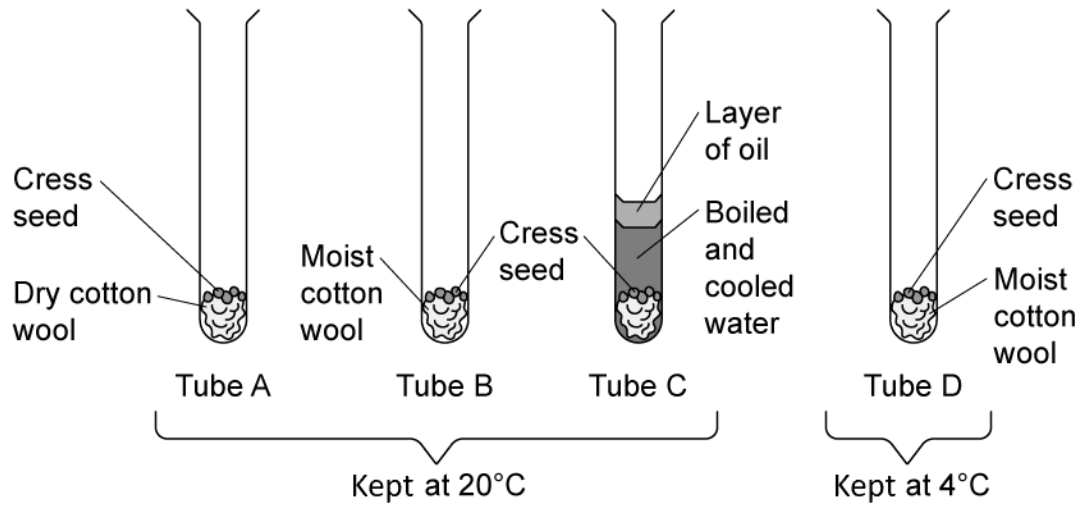
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(2 marks)

(c) Suggest the impacts that a decline in pollinators would have on the wider ecosystem.

(3 marks)

11 (a) The following investigation was set up to determine the conditions needed for germination.



Identify the control in this experiment and explain the importance of including this test tube in the investigation.

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(2 marks)

(b) Explain why no seeds would germinate if test tube D from the investigation at c) was placed in an environment with a temperature of 45°C.

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(1 mark)

12 Outline the adaptations of seeds with different methods of seed dispersal in flowering plants.

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(3 marks)

Hard Questions

1 (a) Draw a labelled diagram of the male reproductive system.

(7 marks)

(b) Describe the role of hormones in the regulation of the menstrual cycle.

(8 marks)

2 Outline the process which occurs in a pregnancy test to give a positive test result.

(5 marks)

- 3 (a)** A group of insects called flower thrips includes the species *Frankliniella intonsa*, as shown in the image below.



Adult *F. intonsa* flower thrips pollinate flowers of the genus *Stellera* in central and southern Asia. In return for the pollination it receives, *Stellera* provides sites for *F. intonsa* to lay their larvae (young).

State how this differs from a more conventional insect-flower mutualistic relationship.

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(2 marks)

- (b)** Changes to abiotic conditions such as those caused by climate change can disrupt mutualism between pollinators and flowering plants.

Suggest the consequences of extinction of a pollinator on other species.

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(2 marks)

- (c) A **symbiotic** relationship between two species is defined as any type of a close and long-term biological interaction between two different biological organisms.

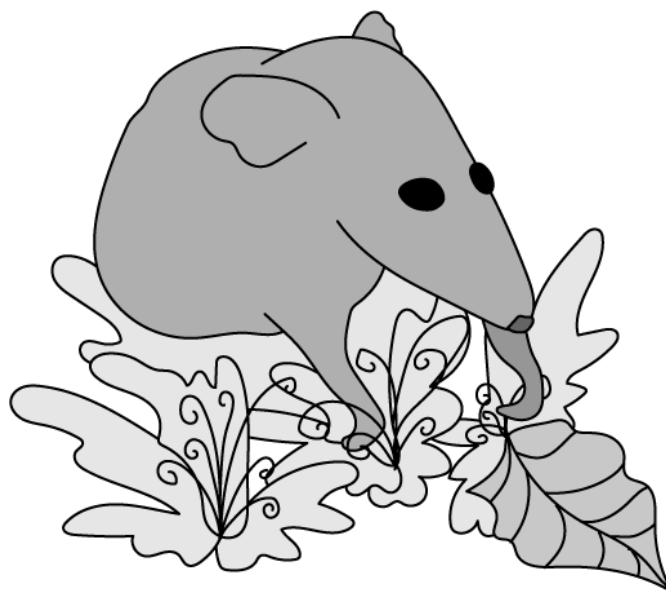
The relationship between a bumblebee and the flowers it feeds from (and pollinates) is referred to as **mutualistic**.

Using this information, distinguish between symbiosis and mutualism.

(2 marks)

- (d) The best-documented examples of animal pollinators include bees and other insects. However, some larger animals are very active pollinators.

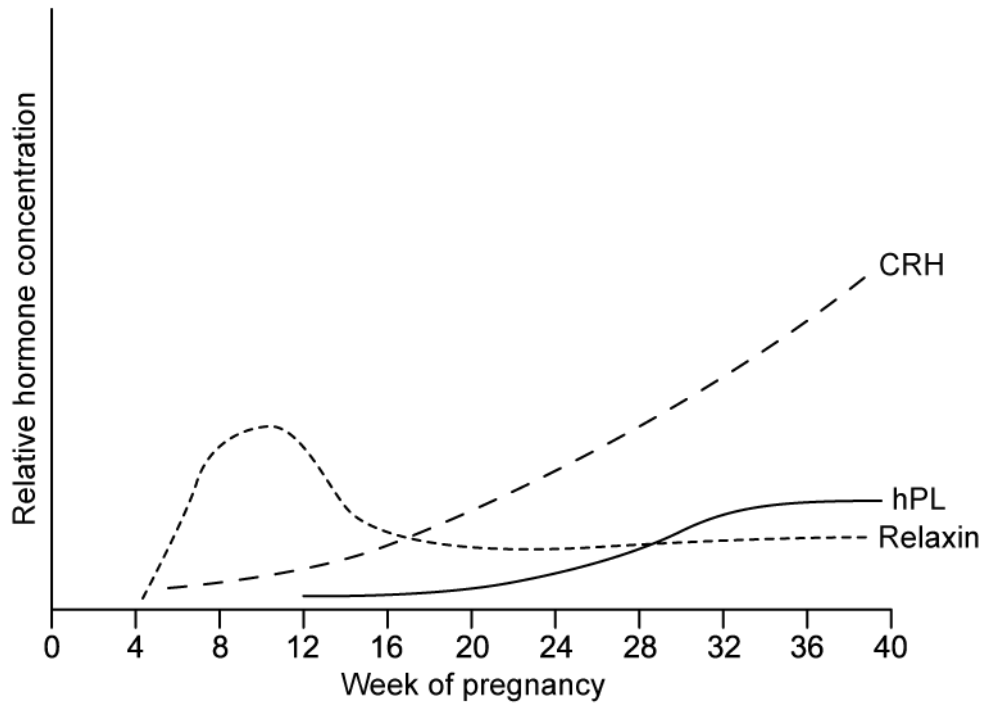
One such animal is the honey possum (*Tarsipes rostratus*), a small marsupial native to southwestern Australia. Some of the pollen that a honey possum comes into contact with is used as a food, with all the available nutrients being used by the honey possum for its own dietary requirements.



Suggest **one** adaptation, from the image above, of the honey possum that hints at its role as a pollinator.

(1 mark)

- 4 (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.

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(3 marks)

- (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.

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(2 marks)

- (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.

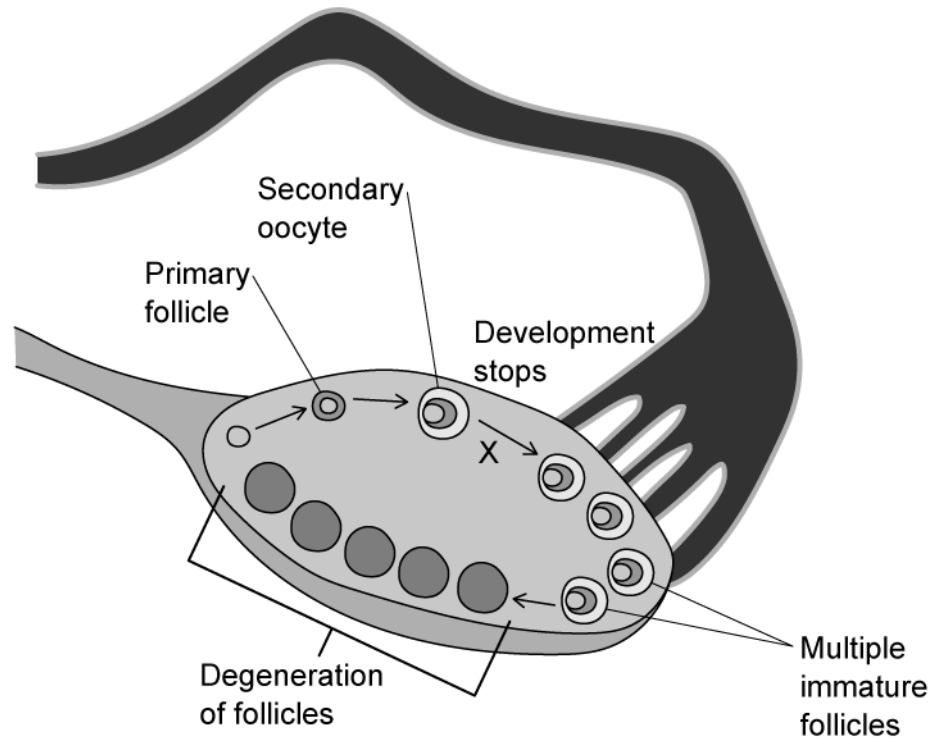
(2 marks)

- (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)

5 (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.

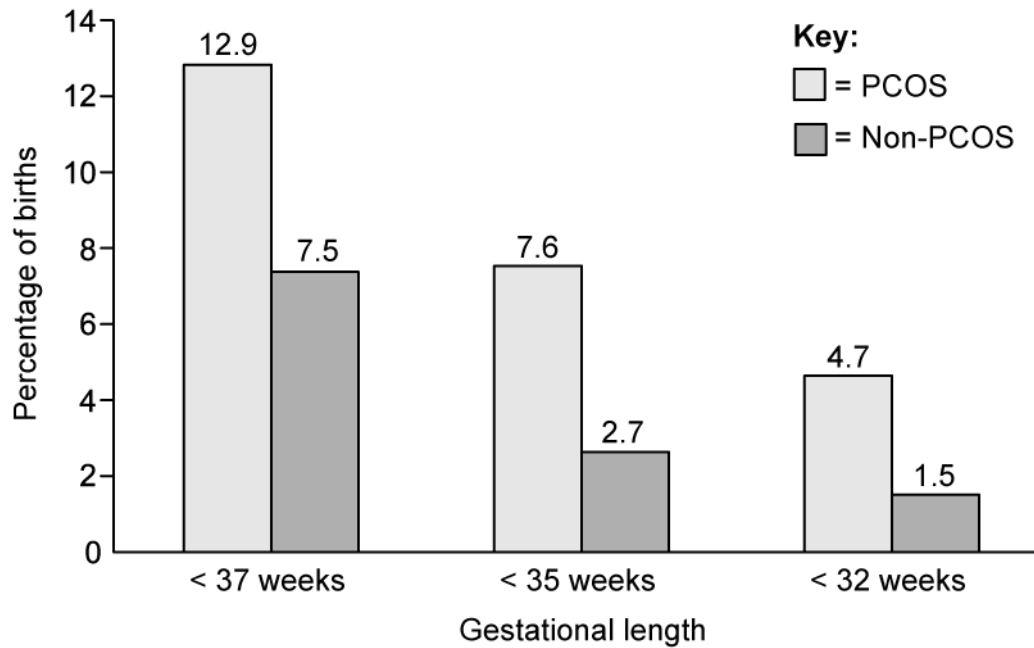
(2 marks)

(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)

(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.



With reference to the groups that delivered their babies between 32 and 35 weeks of pregnancy, calculate the percentage difference of the PCOS group compared to the non-PCOS group. Show your working.

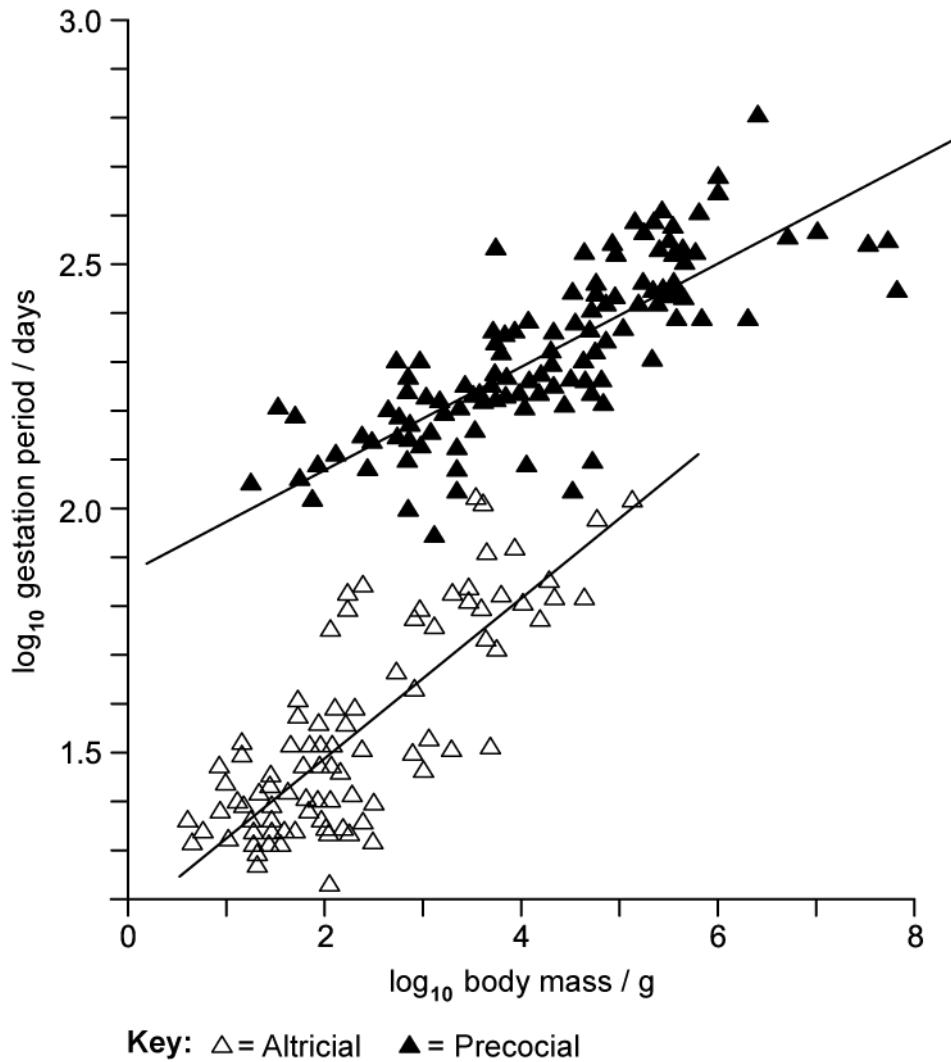
(2 marks)

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

Evaluate this conclusion.

(3 marks)

- 6 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)

7 (a) Outline the role of the zona pellucida in an oocyte.

(3 marks)

(b) Compare and contrast the processes of oogenesis and spermatogenesis

(7 marks)

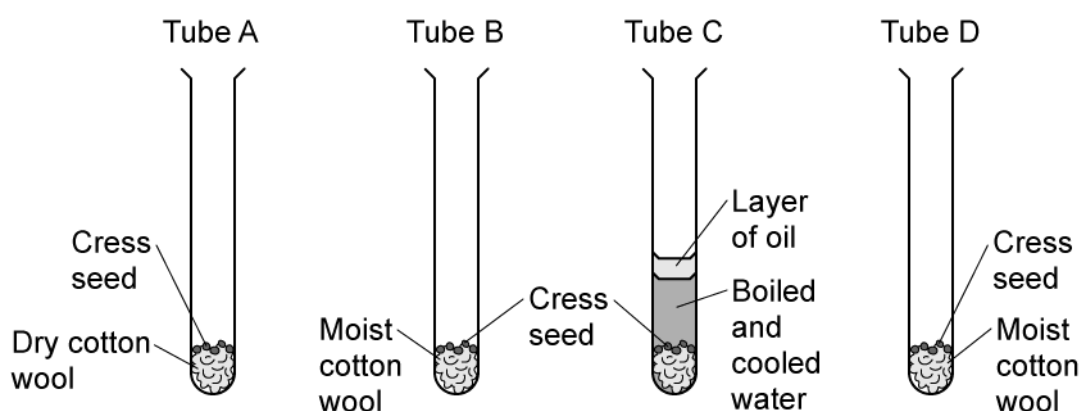
8 (a) Outline the events that take place during the germination of a seed.

(4 marks)

(b) In exploring the effects of subjecting germinating seeds to different growth conditions, the following experiment was set up.

Method summary:

- Set up 4 test tubes, each containing cress seeds on cotton wool
- For test tube **A**, cotton wool left dry
- For test tube **B**, add enough water to the cotton wool so that it becomes moist
- For test tube **C**, add enough water to cover the cotton wool and seeds, then carefully add a layer of oil on top of the water
- For test tube **D**, add enough water to the cotton wool so that it becomes moist
- Leave tubes **A**, **B** and **C** at room temperature or incubated at a specific temperature e.g. 20 °C
- Place tube **D** in a fridge at approximately 4 °C
- Compare the results and see which tube has the greatest number of germinated seeds



Outline the control variables that the scientists would need to adhere to in order to produce valid data.

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(2 marks)

- (c)** Rather than counting the number of seeds that had germinated at the end of the experiment, suggest a more accurate measure of the dependent variable.

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(1 mark)

- 9** Compare and contrast the methods employed by plants for pollen distribution and seed dispersal.

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(5 marks)

- 10** 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.

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(3 marks)