IG.B5 The Menstrual Cycle and Hormonal Control of Fertility

Total Marks

EDEXCEL 4BI1 · Calculator allowed · about 50 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 State what is meant by menstruation in the context of the human female menstrual cycle.

(Total for Question 1 is 1 mark)

2 State the approximate length, in days, of a typical menstrual cycle used as the textbook example.

(Total for Question 2 is 1 mark)

3 Describe, in the context of the 28-day cycle, when ovulation usually occurs and what ovulation is.

(Total for Question 3 is 2 marks)

4 Describe the main change to the lining of the uterus (endometrium) after ovulation and its purpose in the cycle.

(Total for Question 4 is 2 marks)

5 Interpret the following simplified hormone graph for a 28-day menstrual cycle showing relative levels of FSH, LH, oestrogen and progesterone, and answer: which hormone has a sharp peak at around day 14 and what event does that peak trigger?

(Total for Question 5 is 3 marks)

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6 Interpret the same simplified 28-day hormone graph and state why progesterone levels rise after day 14 in the cycle.

(Total for Question 6 is 2 marks)

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7 Describe briefly how combined hormonal contraceptive pills use oestrogen and progesterone to prevent pregnancy.

(Total for Question 7 is 3 marks)

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8 Describe one way synthetic hormones are used in fertility treatment such as in vitro fertilisation (IVF) to help a woman produce eggs for collection.

(Total for Question 8 is 3 marks)

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9 Explain the role of FSH in the menstrual cycle, including where it is produced.

(Total for Question 9 is 2 marks)

10 Explain the role of LH in the menstrual cycle and its relationship with ovulation.

(Total for Question 10 is 2 marks)

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11 Explain the role of oestrogen in the menstrual cycle, including both effects on the uterus lining and on pituitary hormones.

(Total for Question 11 is 2 marks)

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12 Explain the role of progesterone in the menstrual cycle, including its effect if fertilisation does not occur.

(Total for Question 12 is 2 marks)

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13 Compare hormone levels at day 7 and day 21 in the 28-day cycle and state one reason for the difference in progesterone between these days.

(Total for Question 13 is 2 marks)

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14 Explain how hormones control the 28-day menstrual cycle. In your answer describe the roles and interactions of FSH, LH, oestrogen and progesterone, and explain how changes in these hormones lead to ovulation and menstruation.

(Total for Question 14 is 6 marks)

Mark scheme · IG.B5 The Menstrual Cycle and Hormonal Control of Fertility

Question 1

- **B1** the shedding or loss of the lining of the uterus (endometrium) with bleeding
- **Answer: Shedding of the uterus lining (endometrium) with bleeding**

Question 2

- **B1** 28 days
- **Answer: 28 days**

Question 3

- **B1** ovulation usually occurs around day 14 of a 28-day cycle
- **B1** ovulation is the release of a mature egg (ovum) from an ovary
- **Answer: Ovulation occurs about day 14 in a 28-day cycle; it is the release of a mature egg from an ovary**

Question 4

- **B1** the lining becomes thickened and more vascular (more blood vessels)
- **B1** purpose: to provide a suitable environment for implantation of a fertilised egg
- **Answer: The lining becomes thicker and more vascular to provide a suitable site for implantation of a fertilised egg**

Question 5

- **B1** identifies LH as the hormone with a sharp peak at around day 14
- **B1** states that the LH surge triggers ovulation (release of the egg)
- **B1** links the timing to day 14 in a 28-day cycle
- **Answer: LH has the sharp peak at day 14; the LH surge triggers ovulation, the release of the egg**

Question 6

- **B1** progesterone rises after ovulation (after day 14) because the corpus luteum forms and secretes progesterone
- **B1** progesterone maintains and further thickens the uterus lining for potential implantation
- **Answer: Progesterone rises after day 14 because the corpus luteum forms after ovulation and secretes progesterone, which maintains the uterus lining for possible implantation**

Question 7

- **B1** states that the pill contains synthetic oestrogen and progesterone (or progestogen)
- **B1** states that these hormones prevent the LH surge and ovulation by negative feedback on the pituitary
- **B1** notes that progesterone component also thickens cervical mucus, making sperm entry more difficult
- **Answer: The combined pill supplies oestrogen and progesterone to prevent the LH surge and so prevent ovulation, and progesterone thickens cervical mucus to reduce sperm entry**

Question 8

- **B1** states that fertility treatment uses FSH or FSH-containing drugs to stimulate the ovaries to mature multiple follicles
- **B1** states that this increases the number of eggs available for collection in IVF
- **B1** may mention that LH or hCG is then given to trigger ovulation at a controlled time for egg collection
- **Answer: FSH is given to stimulate the ovaries to mature several follicles so multiple eggs can be collected for IVF, and LH or hCG may be given to trigger ovulation at a controlled time**

Question 9

- **B1** states FSH is produced by the pituitary gland
- **B1** explains FSH stimulates growth and maturation of ovarian follicles and stimulates oestrogen production
- **Answer: FSH is produced by the pituitary gland and stimulates ovarian follicles to grow and mature and stimulates oestrogen production**

Question 10

- **B1** states LH is produced by the pituitary gland
- **B1** explains the LH surge triggers ovulation and formation of the corpus luteum
- **Answer: LH from the pituitary surges around day 14 to trigger ovulation and helps form the corpus luteum**

Question 11

- **B1** states oestrogen is produced by developing ovarian follicles
- **B1** explains oestrogen rebuilds the uterus lining and, at high levels just before ovulation, causes a positive feedback effect that leads to the LH surge
- **Answer: Oestrogen from developing follicles rebuilds the uterus lining and, when it peaks, causes positive feedback on the pituitary to trigger the LH surge**

Question 12

- **B1** states progesterone is produced by the corpus luteum after ovulation
- **B1** explains progesterone maintains the thickened uterus lining and, if fertilisation does not occur, progesterone levels fall leading to menstruation
- **Answer: Progesterone from the corpus luteum maintains the thickened uterus lining; if no fertilisation occurs progesterone falls and the lining is shed as menstruation**

Question 13

- **B1** correctly states that at day 7 oestrogen is relatively high and progesterone low, whereas at day 21 progesterone is relatively high and oestrogen lower than its pre-ovulation peak
- **B1** gives reason: progesterone is higher at day 21 because the corpus luteum formed after ovulation secretes progesterone
- **Answer: Day 7: higher oestrogen, low progesterone. Day 21: high progesterone. Progesterone is higher at day 21 because the corpus luteum formed after ovulation secretes progesterone**

Question 14

- **Level 1** (1-2): Basic statements about one or two hormones with limited linking to events in the cycle
- **Level 2** (3-4): Clear description of roles of several hormones and a correct sequence linking rising or falling hormone levels to ovulation and menstruation
- **Level 3** (5-6): Detailed explanation of interactions and feedback: includes FSH stimulating follicles and oestrogen production, high oestrogen causing LH surge leading to ovulation, corpus luteum producing progesterone to maintain lining, and falling progesterone causing menstruation
- **Indicative content:**
  - FSH is released by the pituitary and stimulates follicle growth in the ovary
  - Developing follicles secrete oestrogen which rebuilds the uterus lining and, when high, causes positive feedback to the pituitary resulting in the LH surge
  - The LH surge triggers ovulation, the release of the egg from the ovary
  - After ovulation the ruptured follicle becomes the corpus luteum which secretes progesterone (and some oestrogen)
  - Progesterone maintains the thickened, vascular uterus lining to allow implantation
  - If fertilisation does not occur the corpus luteum degenerates, progesterone and oestrogen fall and the lining is shed as menstruation