IG.B3 Human Reproductive Systems and Fertilisation

Total Marks

EDEXCEL 4BI1 · Calculator allowed · about 40 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Label the diagram of the male and female human reproductive systems provided below. On the male side label: testes, sperm duct, prostate gland. On the female side label: ovary, oviduct (fallopian tube), uterus.

Figure (to be drawn): *Schematic diagram showing a sagittal section of female reproductive organs on the right (ovary, oviduct leading to uterus) and a simplified male outline on the left with testes in the scrotum, sperm duct leading from testes past a prostate gland into the urethra.*

(Total for Question 1 is 6 marks)

2 Identify the functions of the testes and of the sperm duct in the male reproductive system, as used in human reproduction.

(Total for Question 2 is 2 marks)

3 Describe the function of the prostate gland in the male reproductive system in the context of sperm transport and survival.

(Total for Question 3 is 1 mark)

4 State the function of the urethra in the male reproductive system as it relates to reproduction.

(Total for Question 4 is 1 mark)

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5 State the function of the penis in human reproduction.

(Total for Question 5 is 1 mark)

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6 Identify two functions of the ovaries in the female reproductive system relevant to fertilisation and early reproduction.

(Total for Question 6 is 2 marks)

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7 Describe the function of the oviduct (fallopian tube) in relation to the egg and fertilisation.

(Total for Question 7 is 2 marks)

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8 Describe the function of the uterus in the female reproductive system in the context of early development after fertilisation.

(Total for Question 8 is 2 marks)

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9 State the function of the cervix in the female reproductive tract.

(Total for Question 9 is 1 mark)

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10 State the function of the vagina in human reproduction.

(Total for Question 10 is 1 mark)

11 Compare the adaptations of sperm cells and egg cells. Give up to five distinct comparison points that link an adaptation to its function for each cell type where appropriate.

(Total for Question 11 is 5 marks)

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12 Identify two adaptations of the egg cell (ovum) that help it support fertilisation and early development, and give the function of each adaptation.

(Total for Question 12 is 2 marks)

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13 Define fertilisation in humans, stating what fuses and what is restored in terms of chromosome number.

(Total for Question 13 is 2 marks)

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14 Label the diagram again, this time marking these four structures: urethra, penis, cervix and vagina. One mark per correct label in the right position.

Figure (to be drawn): Same schematic as Question 1 showing male and female reproductive tracts; students are to label urethra and penis on the male side and cervix and vagina on the female side.

(Total for Question 14 is 4 marks)

15 State where fertilisation usually takes place in the human female reproductive system.

(Total for Question 15 is 1 mark)

Mark scheme · IG.B3 Human Reproductive Systems and Fertilisation

Question 1

- **B1** label correctly identifies testes on the male diagram
- **B1** label correctly identifies sperm duct on the male diagram
- **B1** label correctly identifies prostate gland on the male diagram
- **B1** label correctly identifies ovary on the female diagram
- **B1** label correctly identifies oviduct or fallopian tube on the female diagram
- **B1** label correctly identifies uterus on the female diagram
- **Answer: Labels: testes; sperm duct; prostate gland; ovary; oviduct (fallopian tube); uterus**

Question 2

- **B1** testes: produce sperm (or: site of sperm production)
- **B1** sperm duct: transports sperm from the testes to the urethra for ejaculation
- **Answer: Testes produce sperm; sperm duct transports sperm from the testes to the urethra**

Question 3

- **B1** produces fluid that mixes with sperm to form semen, providing nutrients or a medium that helps sperm survive and move
- **Answer: Produces fluid that adds to semen, providing nutrients and a medium to help sperm survive and move**

Question 4

- **B1** carries semen out of the body during ejaculation (also carries urine)
- **Answer: Carries semen out of the body during ejaculation (also carries urine)**

Question 5

- **B1** delivers semen into the female reproductive tract during sexual intercourse
- **Answer: Delivers semen into the female reproductive tract during sexual intercourse**

Question 6

- **B1** produce ova / eggs
- **B1** produce hormones such as oestrogen (or progesterone) (either hormone named earns the mark)
- **Answer: Ovaries produce ova (eggs) and produce hormones such as oestrogen**

Question 7

- **B1** carries the egg from the ovary towards the uterus
- **B1** is the usual site where fertilisation occurs (egg meets sperm) or provides a suitable environment for fertilisation to occur
- **Answer: Carries the egg from the ovary to the uterus and is the usual site where sperm meet the egg for fertilisation**

Question 8

- **B1** provides a muscular chamber where a fertilised egg can implant and the embryo can develop
- **B1** has a lining that supports and nourishes an early embryo (endometrium) prior to placental development
- **Answer: A muscular chamber where a fertilised egg can implant and the embryo can develop; its lining supports the early embryo**

Question 9

- **B1** acts as a narrow passage between the uterus and vagina, and can act as a barrier (e.g. mucus) or open during childbirth
- **Answer: A narrow passage between the uterus and vagina that can act as a barrier and opens at birth**

Question 10

- **B1** receives the penis and semen during sexual intercourse and provides a birth canal during childbirth
- **Answer: Receives semen during intercourse and serves as the birth canal**

Question 11

- **B1** sperm: tail (flagellum) for swimming/movement; egg: no tail, non-motile (contrast 1)
- **B1** sperm: many mitochondria in midpiece provide energy for movement; egg: fewer mitochondria, energy stored as food reserves for embryo (contrast 2)
- **B1** sperm: small and many to increase chance of reaching egg; egg: large and few, contains food store to support early development (contrast 3)
- **B1** sperm: acrosome contains enzymes to penetrate egg coats; egg: jelly coat or zona pellucida provides protection and species-specific binding (contrast 4)
- **B1** sperm: streamlined shape to reduce resistance when swimming; egg: spherical and large to contain cytoplasm and reserves for embryo (contrast 5)
- **Answer: Comparative points include: sperm have a tail for swimming whereas eggs are non-motile; sperm have many mitochondria in the midpiece for energy while eggs store food reserves for the embryo; sperm are small and produced in large numbers while eggs are large and few; sperm have an acrosome with enzymes to penetrate the egg, egg has a jelly coat/zona for protection and species recognition; sperm are streamlined, egg is spherical and contains cytoplasm and reserves.**

Question 12

- **B1** food store (yolk) is present to provide nutrients to the early embryo
- **B1** jelly coat (or zona pellucida) surrounds the egg to protect it and to be involved in species-specific sperm binding and blocking additional sperm after fertilisation
- **Answer: Food store to provide nutrients for early embryo development; jelly coat to protect the egg and help species-specific sperm binding and prevent polyspermy**

Question 13

- **B1** fusion of the nucleus of a sperm with the nucleus of an egg (ovum)
- **B1** restores the diploid chromosome number in the zygote (from haploid gametes)
- **Answer: Fusion of the sperm nucleus with the egg nucleus, restoring the diploid chromosome number in the resulting zygote**

Question 14

- **B1** label correctly identifies urethra in the male diagram
- **B1** label correctly identifies penis in the male diagram
- **B1** label correctly identifies cervix in the female diagram
- **B1** label correctly identifies vagina in the female diagram
- **Answer: Labels: urethra; penis; cervix; vagina**

Question 15

- **B1** the oviduct / fallopian tube
- **Answer: Usually in the oviduct (fallopian tube)**