11.4 Sexual Reproduction

Mark Schemes

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

To be used by all students preparing for DP IB Biology HL
Students of other boards may also find this useful

1

The correct answer is **B**.

Primary spermatocytes form by differentiation from **spermatogonia**, not spermatids (statement III is therefore incorrect). Spermatids form later on when secondary spermatocytes divide in meiosis II.

2

The correct answer is **C**.

Oogenesis begins before birth when the cells of the **germinal epithelium divide by mitosis** (III) to form oogonia cells.

The **oogonia enter meiosis I** (I) before birth.

Meiosis I is completed when **FSH stimulates primary follicles to mature and divide** (IV) at puberty. Meiosis I results in one secondary oocyte and a small daughter cell known as a polar body.

The **secondary oocyte** enters meiosis II and is then **released from the ovary during ovulation** (II).

Meiosis II is completed (V) just before fertilisation in the moment between a sperm entering the oocyte and the gamete nuclei fusing.

3

The correct answer is **A**.

The cortical granules release **enzymes** by exocytosis; these enzymes digest the binding proteins on the cell surface of the ovum, preventing the sperm cells from binding, as well as causing the zona pellucida to harden.

4

The correct answer is **A**.

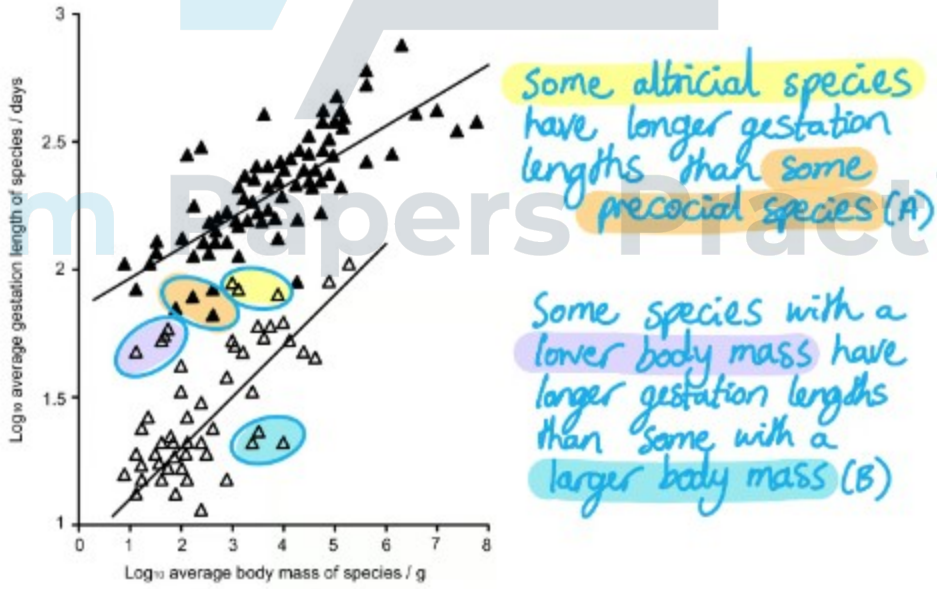
A 48–hour-old embryo will contain around **4 cells** (B), the newly forming embryo is located in the **oviduct**, or fallopian tube (C), and the blastocyst is **not actively moved** through the uterus (D).

5

The correct answer is **C**.

You need to be sure that any conclusion that you draw from data is true for all of the data points provided.

D is an explanation for the pattern shown, and cannot be concluded with confidence from this data alone.



6

The correct answer is **B**.

hCG is released by the embryo itself (I) during the early weeks of pregnancy.

The embryo stops secreting hCG after around 10 weeks of gestation, at which point the placenta stimulates the secretion of oestrogen and progesterone instead (III); if secretion of these hormones decreases too much there is a risk of miscarriage.

7

The correct answer is **D**.

hCG **inhibits** loss of the uterus lining (**C** is therefore incorrect) **and** stimulates the corpus luteum to release hormones.

Progesterone **inhibits** oxytocin production (**B** is incorrect).

Oestrogen inhibits progesterone production (leading to a rise in oxytocin levels) **and increases** the sensitivity of the uterus walls to oxytocin (**C** is incorrect).

Oxytocin **stimulates muscle contractions** in the uterus walls and does not affect the cervix (**A** and **C** are incorrect).

8

The correct answer is **D**. Antibodies are large proteins, so cannot directly cross the placental barrier, instead of crossing by a mechanism called endocytosis.

Carbon dioxide and urea do not move from mother to foetus (A), but from **foetus to mother** across the placenta.

The foetus surface area to volume ratio becomes **smaller** as it grows (B).

Oxytocin is released by the pituitary gland (C), while the placenta releases **oestrogen and progesterone**.

9

The correct answer is **C**. The increased levels of oestrogen pollution in our waterways are an example of an unforeseen consequence that a full risk analysis might have predicted.

This is part of the Nature of Science (NOS) component of the IB course.

Whether or not **A** and **D** are seen as risks would be a matter of subjective opinion.

B is a correct statement, but in itself is not a reason to carry out a risk analysis.

10

The correct answer is **B**

The **epididymis** is a structure alongside the testis in which sperm are stored once they have matured, and would therefore not be part of a testis cross-section (C1 is incorrect).

Leydig cells are found in the spaces between the seminiferous tubules, not within them (C2 and D2 are incorrect).

The layer that surrounds the seminiferous tubules contains undifferentiated cells and is known as the **germinal** (as in 'germ' cell) **epithelium** (A3 and C3 are incorrect).

The cell labelled **4** is still associated with the Sertoli cell, telling us that it is a **spermatid** rather than a **mature sperm** (A4 and D4 are incorrect).

Spermatocytes are found closer to the germinal epithelium and do not have the familiar sperm-like cell structure shown here (C4 is incorrect).