

Solutions

Each answer shows the steps, then the **result**.

2.1

- the **testis** makes sperm
- the **prostate gland** adds fluid to them

2.2

- fertilisation happens in the **oviduct**
- the embryo implants in the **uterus**, in its lining

2.3

- the **nucleus** of a sperm fuses with the **nucleus** of an egg cell
- the two haploid nuclei join, giving a **diploid zygote**

2.4

- the jelly coat surrounds and **protects** the egg cell
- as soon as one sperm has entered, the coat **changes**
- so that **no other sperm can get in**, which keeps the zygote diploid

2.5

- any **two** of: the sperm can **move itself** with its flagellum, while the egg cell cannot; **millions** of sperm are released at once, but usually only **one** egg a month; the egg cell has **energy stores** and a **jelly coat**, which the sperm does not

2.6

- the zygote divides by **mitosis**
- forming a **ball of cells**, the embryo, as it travels down the oviduct
- the embryo then **implants** into the lining of the uterus

3.1 B

- the egg cell is much larger, the sperm is the gamete that swims, and far more sperm are released than eggs
- A** has the egg swimming; **C** has the sizes the wrong way round; **D** has the numbers the wrong way round

3.2

(a)

- the **acrosome** contains enzymes that **digest** a way through the jelly coat, so the sperm nucleus can enter
- the **mitochondria** release **energy** by respiration, for swimming
- the **flagellum** beats, so the sperm can **swim** to the egg cell

(b)

- the **energy stores** in the cytoplasm feed the embryo until it implants and the placenta can supply it
- the **jelly coat** protects the egg cell, and **changes** once a sperm has entered
- so that no second sperm can enter, which keeps the chromosome number correct

3.3

(a)

- the **umbilical cord**
- the amniotic fluid **protects the fetus from knocks** and supports its weight

(b)

- from mother to fetus, any two of: **glucose, amino acids, oxygen**
- from fetus to mother, either: **carbon dioxide** or **urea**

(c)

- substances cross by **diffusion**, and a large surface area means **more can diffuse at once**
- a thin barrier gives a **short diffusion distance**, so diffusion is faster

(d)

- some **toxins** in tobacco smoke can **cross the placenta** into the fetus's blood
- carbon monoxide** binds to the fetus's haemoglobin, so its blood carries **less oxygen**
- so the fetus receives less oxygen for respiration and grows more slowly, giving a low birth mass