3.1 Reproduction

Name: _____ Class: _____ Date: _____ **Total: 27 marks**

Objective

Build the skills to answer exam questions on **reproduction in plants and humans** : sexual and asexual reproduction, flowers and pollination, fertilisation, seeds and germination, human reproductive systems, the menstrual cycle and the placenta.

You must be able to:

- compare sexual and asexual reproduction
- compare insect-pollinated and wind-pollinated flowers
- describe the roles of hormones in the menstrual cycle
- analyse a germination investigation

1 Key knowledge and worked examples

Reproduction

idea	rule
sexual reproduction	two parents; gametes fuse at fertilisation; offspring vary
asexual reproduction	one parent; no gametes; offspring are clones (identical)
insect-pollinated flowers	large, coloured petals, scent and nectar; sticky stigma inside the flower; sticky pollen
wind-pollinated flowers	small dull petals; anthers and feathery stigmas hang outside; light, smooth pollen
menstrual cycle	about 28 days; bleeding from day 1; ovulation about day 14
percentage germination	seeds that germinated ÷ seeds planted ×100

Worked example 1: percentage germination. 18 of 25 seeds germinate. Find the percentage.

1. Known: 18 out of 25.

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2. Rule: germinated ÷ planted ×100.
3. Numbers: $18 \div 25 \times 100$.
4. Result: 72%.

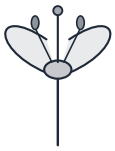
Worked example 2: the cycle. A woman's period starts on 3 March and her cycle is 28 days. Estimate the day she ovulates.

1. Known: day 1 is 3 March.
2. Rule: ovulation is about day 14.
3. Numbers: $3 + 13 = 16$.
4. Result: **about** 16 **March**.

Answer shapes: for a hormone, say where it is made and what it does.

2 Practice

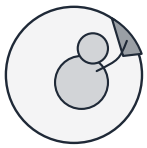
2.1 Name the male gamete of a flowering plant and the part of the flower where it is made. [2]



2.2 Give the **three** conditions that seeds need to germinate. [2]



2.3 Name **two** substances that pass from the mother to the fetus across the placenta. [2]



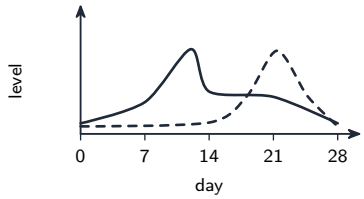
3 Exam-style questions

3.1 Describe what happens from pollination to the formation of a seed. [3]



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3.2 Explain the roles of oestrogen and progesterone in the menstrual cycle. [3]



3.3 A student puts 20 bean seeds into each of four tubes, A to D, and leaves them for 5 days. The conditions and results are shown.

(a) Calculate the percentage germination in tubes A and C. [3]



tube	conditions	germinated
A	water, air, 25 °C	18
B	dry, air, 25 °C	0
C	water, air, 4 °C	2
D	boiled water, oil layer, 25 °C	0

(b) Explain the results in tubes B and D. [3]

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(c) After 5 days the roots in tube A have a mean length of 24 mm, and in tube C 3 mm. Calculate the mean growth rate of the roots in tube A in mm per day, and explain why the roots in C grew more slowly. [3]

(d) Describe an investigation to find how temperature affects the percentage germination of bean seeds. [6]

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Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

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

2.1

- the pollen grain nucleus (male gamete)
- anther

2.2

- water, oxygen and warmth (a suitable temperature)

2.3

Any two (1 mark each): oxygen, glucose, amino acids, water, mineral ions, antibodies

3.1

- pollen lands on the stigma and a pollen tube grows down the style to an ovule
- the male nucleus fuses with the female nucleus (fertilisation), making a zygote
- the zygote becomes the embryo and the ovule becomes the seed; the ovary becomes the fruit

3.2

- oestrogen, from the ovary, makes the uterus lining grow
- progesterone keeps the uterus lining thick, ready for a fertilised egg
- when progesterone falls, the lining breaks down and bleeding starts

3.3

(a) A: $18 \div 20 \times 100 = \mathbf{90}\%$; C: $\mathbf{10}\%$

(b) B: no water, so enzymes cannot work and the seed cannot swell and grow; D: no oxygen, so no aerobic respiration; so no energy is released for growth

(c) $24 \div 5 = \mathbf{4.8}$ mm per day; at 4 °C enzymes work slowly, so respiration and growth are slow

(d) points to include:

- use the same number of seeds (e.g. 20) of the same type for each temperature (App)
- choose at least five temperatures, e.g. 5, 15, 25, 35, 45 °C, using incubators or fridges (App)
- give each group the same volume of water and access to air (App)
- leave for the same time, e.g. 5 days (K)
- count the seeds that have germinated (a root showing) and calculate the percentage (K)
- repeat with more seeds or more tubes and compare means (An)

Levels: **5–6** a full, logical answer with correct biology and correct terms; **3–4** several correct points, partly linked; **1–2** one or two relevant points.

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