Unit 27 · Applications of Zoology

ANSWER KEY · FOR TEACHERS

Full marks 31

Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. ICSI
2. surrogate
3. autograft
4. isograft
5. amniocentesis
6. transgenic
7. pisciculture
8. hypophysation

K · 4

Each carries 0.5 mark.

2 Label the diagram

1. Crops on dikes fed by pond mud
2. Ducks or pigs on the dike
3. Pond water fertilized
4. Plankton grows fast

K · 2

Each carries 0.5 mark.

3 Multiple choice

i. **c.** tissue typing (HLA typing) — K · 1

HLA typing compares the identity proteins on the two people's cells: the closer they match, the less the recipient's immune system will attack the organ. (The blood group is matched too.)

ii. **a.** silver carp — K · 1

Silver carp was brought from Japan. Naini, rohu and asla are native.

iii. **b.** to make several follicles ripen, so several eggs can be collected — U · 1

FSH (follicle-stimulating hormone) makes follicles grow: given in large doses, it makes **several eggs ripen at once** (superovulation). Progesterone, not FSH, prepares the uterus lining.

iv. **c.** to correct the soil's acidity and improve the water's quality — U · 1

Lime **neutralizes acid** in the pond's soil and water, kills parasites, and releases nutrients so plankton grows well.

v. **b.** because immunosuppressant drugs make them catch infections easily — A · 1

The drugs that stop rejection **weaken the whole immune system**, so ordinary infections can become dangerous. Avoiding crowds and sick people lowers the chance of catching one.

4 Short answers

a. K · 2

ANSWER

Any two: to find **chromosomal abnormalities** such as Down syndrome (karyotype); to find **neural tube defects** such as spina bifida (a high **alpha-fetoprotein** level); to find inherited **metabolic diseases** (missing enzymes, as in Tay–Sachs); to test for **single-gene disorders** such as sickle cell anemia, thalassemia, hemophilia or cystic fibrosis (DNA tests).

MARKING SCHEME

✓ A first correct purpose.
✓ A second correct purpose.

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b. MARKING SCHEME U · 2

✓ The egg and sperm providers' genes.
✓ The embryo is made by IVF first; the surrogate only carries it.

c. MARKING SCHEME A · 2

✓ Rejection depends on how well the HLA types match.
✓ Siblings share parents, so they are more likely to match.

d. MARKING SCHEME U · 3

✓ Several carp species reared together in one pond.
✓ Each feeds on a different food at a different level.
✓ They use all the pond's food without competing, so production is higher.

5 Long answers

a. ANSWER U · 4

1. **Suppression** of the natural cycle, then **superovulation**: daily **FSH** injections for about 8–14 days ripen several eggs at once.
2. **Egg retrieval** with a thin needle through the vaginal wall, guided by **ultrasound**; **sperm collection** and washing.
3. **Fertilization** in a dish of nutrient medium, or **ICSI** (a single sperm injected into each egg); **progesterone** is given to prepare the uterus.
4. **Embryo culture** for 3–6 days (a blastocyst by day 5), then **transfer** of one or two embryos into the uterus through a catheter.

MARKING SCHEME

✓ Suppression and superovulation with FSH.
✓ Egg retrieval by ultrasound-guided needle; sperm collected and washed.
✓ Fertilization in a dish or by ICSI; progesterone given.
✓ Embryos cultured 3–6 days and one or two transferred to the uterus.

b. ANSWER A · 4

Rejection: the recipient's immune system recognizes the donated organ's **HLA** proteins as foreign and its **T lymphocytes** and antibodies attack it.
Prevention (any three):

- **Tissue typing**: matching the donor's and recipient's **HLA** types and blood groups before the transplant.
- **Family donors**, especially brothers and sisters, more likely to match.
- **Immunosuppressive drugs** (tacrolimus, cyclosporine, mycophenolate), usually for life.
- In bone marrow transplants, destroying the recipient's own marrow first with **chemotherapy or radiation**; **artificial** parts, which carry no HLA.

MARKING SCHEME

✓ Rejection: the immune system attacks the organ's foreign HLA.
✓ A first way to prevent it (e.g. tissue typing).
✓ A second (e.g. immunosuppressive drugs).
✓ A third (e.g. family donors, marrow destroyed first, artificial parts).

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6 Think

ANSWER HA · 3

In nature, the rush of **monsoon floodwater** is the signal that makes a carp's **pituitary** release its **gonadotropins**.

In a **still pond** that signal never comes, so the hormones aren't released and the ripe eggs and milt stay in.

Pituitary extract from another fish supplies these **gonadotropins** directly, so the ovaries release their eggs and the testes their milt (hypophysation).

MARKING SCHEME

- ✓ Flowing floodwater normally triggers the pituitary to release gonadotropins.
- ✓ A still pond gives no signal, so no release.
- ✓ The extract supplies the gonadotropins directly, so the fish spawn.

7 Activity: Visit a fish pond or poultry farm

(not marked)

WHAT STUDENTS SHOULD FIND

Answers vary. A carp pond usually has several **carp species** together (composite culture), fed on rice bran and oil cake with manure to grow plankton; a poultry farm keeps layers or broilers on bought feed, with **vaccination** against diseases such as Ranikhet (Newcastle disease). Integrated farms use **animal droppings to fertilize the pond** and **pond mud for crops**, so the waste of one part feeds another.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	10	11	7	3	**31**

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