



CLASS 9 SCIENCE — CHAPTER 11

REPRODUCTION: HOW LIFE CONTINUES



New *Exploration* Science Textbook | 2026–27

I've based these notes on the **Chapter 11 material from the supplied Class 9 Science *Exploration* textbook**. The chapter covers asexual and sexual reproduction, reproduction in plants and animals, human reproduction, menstrual cycle, pregnancy and reproductive health.



1. WHAT IS REPRODUCTION?



Definition

Reproduction is the biological process by which organisms produce new individuals of their own kind.

Examples:



Plants produce new plants.



Cats produce kittens.



Birds produce young ones.



Humans produce offspring.



2. WHY IS REPRODUCTION IMPORTANT?

Every organism has a limited life span.

Eventually, older organisms die.

Reproduction ensures that:



New individuals are produced.



Species continue from one generation to the next.



Genetic information is passed to offspring.

Therefore:



Reproduction ensures continuity of life.



3. TWO MAIN TYPES OF REPRODUCTION

There are two major types:

1 Asexual reproduction

2 Sexual reproduction



4. ASEXUAL REPRODUCTION



Definition

Asexual reproduction is reproduction involving a single parent.

Generally, the offspring produced are genetically very similar or identical to the parent.

Important features:



One parent



Little or no genetic variation in the offspring



Usually rapid

 Common in many simple organisms and plants

5. EXAMPLES OF ASEYUAL REPRODUCTION

Examples include:

 Bacteria

 Amoeba

 Yeast

 Hydra

 Some fungi

 Many plants

6. VEGETATIVE PROPAGATION

In vegetative propagation, new plants develop from:

 Roots

 Stems

 Leaves

rather than from seeds.

Examples:

 Potato

 Ginger

 Money plant

 Sugarcane

 Bryophyllum

7. VEGETATIVE PROPAGATION IN POTATO

Potato is an underground stem.

It has small structures called:

 **Eyes**

Each suitable eye can develop into a new plant.

Therefore:

Potato → Eye → New plant

8. GINGER

Ginger has an underground stem called a:

Rhizome

Buds on the rhizome can grow into new shoots.

Therefore:

Ginger rhizome → Bud → New plant

9. STEM CUTTINGS

A piece of stem can be cut from a plant and placed under suitable conditions.

It may develop:

 Roots

 Shoots

and grow into a new plant.

Examples include:

 Money plant

 Sugarcane

10. BRYOPHYLLUM

Bryophyllum can produce tiny plantlets along the edges of its leaves.

These plantlets can detach and grow into new plants.

★ **Leaf → Plantlets → New plants**

11. ARTIFICIAL VEGETATIVE PROPAGATION

Farmers and gardeners use several methods.

 **Cutting**

 **Grafting**

 **Layering**

 **Tissue culture**

These methods allow useful plants to be multiplied efficiently.



12. CUTTING

A portion of a plant is cut and placed under suitable conditions.

It develops roots and grows into a new plant.

Example:



Rose



13. GRAFTING

In grafting:



A stem piece from one plant is attached to a rooted plant of another suitable plant.

The two parts are protected until they join.

Why use grafting?

It can combine desirable characteristics of two plants.



14. LAYERING

A flexible branch is bent towards the ground.

Part of it is covered with soil.

Roots develop from the covered portion.

It can then be separated and grown as a new plant.



15. TISSUE CULTURE

Tissue culture is a method of producing many plants from a small amount of plant tissue under controlled conditions.

Advantages:

 Many plants can be produced.

 Multiplication is rapid.

 Plants can be produced from selected material.

The chapter connects tissue culture with banana cultivation and agricultural support through KVKs and ICAR.

16. BUDDING

In budding, a small outgrowth called a:

Bud

develops on the parent organism.

The bud grows and eventually separates.

Examples:

 Yeast

 Hydra

17. BUDDING IN YEAST

A small bud appears on the yeast cell.

The nucleus divides.

The bud grows.

Eventually, it separates from the parent cell.

Sequence:

Parent cell → Bud → Growth → Separation → New individual



18. BUDDING IN HYDRA

In Hydra:

A small outgrowth develops on the body.

It grows gradually.

When fully developed, it separates from the parent.

Hydra → Bud → Young Hydra



19. SPORE FORMATION

Some fungi reproduce through:

Spores

Examples:



Rhizopus



Aspergillus

Spores are:

- ♦ Small
 - ♦ Lightweight
 - ♦ Produced in large numbers
 - ♦ Easily carried by air
-



20. GERMINATION OF SPORES

When spores reach a suitable environment with:



Moisture



Suitable temperature



Nutrients

they germinate and develop into new individuals.



21. MITOSIS AND ASEXUAL REPRODUCTION

In the asexual examples discussed, reproduction generally involves:

Mitosis

Mitosis maintains the chromosome number.

The daughter cells receive essentially the same genetic information as the parent cell.

Therefore, offspring may be called:

Clones



22. ASEXUAL REPRODUCTION — ADVANTAGES



Fast

Many organisms can reproduce quickly.



No partner required

Only one parent is needed.

Useful in agriculture

Plants with desirable characteristics can be multiplied.

23. LIMITATION OF ASEXUAL REPRODUCTION

Because offspring are genetically very similar:

Genetic variation is limited.

If a disease or environmental change affects the parent, genetically similar offspring may also be vulnerable.

24. PASTEUR AND PRE-EXISTING LIFE

Scientists once debated whether living organisms could arise spontaneously from non-living material.

Louis Pasteur

His experiments supported the idea that:

New life comes from pre-existing life.

His work also contributed to the development of germ theory and practices such as sterilisation.

25. SEXUAL REPRODUCTION

Definition

Sexual reproduction involves the contribution of genetic material through:

Male and female gametes

It generally involves two individuals.

The offspring show:

 **Genetic variation**

26. GAMETES

Gametes are reproductive cells.

Examples:

Male gamete

 Sperm

Female gamete

 Egg / ovum

Gametes contain:

Half the chromosome number

of the body cells.

27. MEIOSIS

Meiosis is a special type of cell division that produces gametes.

Its important role is:

Reducing the chromosome number by half.

For humans:

Body cell:

46 chromosomes

Gamete:

23 chromosomes



28. FERTILISATION

During fertilisation:

Male gamete + Female gamete



Zygote

The chromosome number is restored.

For humans:

23 + 23 = 46



29. SEXUAL REPRODUCTION AND VARIATION

Sexual reproduction produces new combinations of genetic material.

Therefore:



Children may differ from parents.



Brothers and sisters may differ from one another.



Variation can help populations adapt to changing environments.

Over many generations, variation can contribute to:

Evolution

30. REPRODUCTION IN FLOWERING PLANTS

The:

Flower

is the reproductive structure of a flowering plant.

The main parts involved are:

 Sepal

 Petal

♂ Stamen

♀ Pistil

31. SEPALS

Sepals are usually green and leaf-like.

Function:

 Protect the flower when it is still in the bud stage.

32. PETALS

Petals are often:

 Colourful

 Fragrant

Function:

They help attract pollinators such as:

 Bees

 Butterflies

 Birds



33. STAMEN

The stamen is the:

Male reproductive part of a flower.

It consists of:



Filament

and



Anther



34. ANTHER

The anther produces:

Pollen grains

Pollen grains contain the male reproductive cells/gametes.



35. PISTIL

The pistil is the:

Female reproductive part of a flower.

It consists of:

 **Stigma**

 **Style**

 **Ovary**

36. STIGMA

The stigma is the part that:

Receives pollen grains.

It is located at the top of the pistil.

37. STYLE

The style connects:

Stigma → Ovary

A pollen tube grows through the style towards the ovary after compatible pollen germinates.

38. OVARY

The ovary contains:

Ovules

The ovules contain the female reproductive structures.

After fertilisation:

Ovule → Seed



39. POLLINATION



Definition

Pollination is the transfer of pollen from the anther to the stigma.

There are two major types:

1 Self-pollination

2 Cross-pollination



40. SELF-POLLINATION

Pollen is transferred to the stigma:



Of the same flower

or



Of another flower on the same plant.



41. CROSS-POLLINATION

Pollen is transferred from one plant to:



A flower on another plant of the same type.

Cross-pollination can increase genetic variation.



42. SELF VS CROSS-POLLINATION

Self-pollination

Same flower or same plant

Usually less variation

Pollen transfer within same plant

Cross-pollination

Another plant of the same type

Can produce greater variation

Pollen transferred between plants



43. POLLINATION BY WIND

Examples:

 Wheat

 Maize

 Rice

Wind-pollinated plants often produce:

Large quantities of lightweight pollen

Their stigmas may be adapted to catch pollen efficiently.



44. POLLINATION BY WATER

Examples:

 Vallisneria

 Hydrilla

Water currents carry pollen from one flower to another.



45. POLLINATION BY INSECTS

Examples:



Sunflower



Hibiscus



Marigold

Flowers may attract insects using:



Bright colours



Nectar



Fragrance

Pollen may be sticky or spiny so it attaches to insects.



46. POLLINATION BY BIRDS

Some birds can act as pollinators.

Examples include:



Sunbirds

They visit flowers for nectar and transfer pollen between flowers.



47. POLLEN GERMINATION

When compatible pollen lands on the stigma:



Pollen germinates.

It forms:

Pollen tube

The pollen tube grows through:

Stigma → Style → Ovary



48. FERTILISATION IN FLOWERING PLANTS

The male gamete travels through the pollen tube.

It reaches an ovule.

Then:

Male gamete + Female gamete



Fertilisation



Zygote



49. WHAT HAPPENS AFTER FERTILISATION?

This is extremely important.



Fertilised egg

→ **Zygote**

 **Zygote**

→ Embryo

 **Ovule**

→ Seed

 **Ovary**

→ Fruit

★ **Remember:**

OVULE → SEED

OVARY → FRUIT

50. SEED DISPERSAL

Seeds may be dispersed by:

 Wind

 Water

 Animals

Other natural mechanisms

Dispersal helps plants spread to new locations.

51. SEED GERMINATION

Seeds germinate when suitable conditions are available.

Important conditions include:



Water



Air/Oxygen



Suitable temperature



52. POLLINATION AND AGRICULTURE

Pollination is important for crop production.

The chapter compares wind- and insect-pollinated plants and connects reproduction with:



Crop production



Plant breeding



Improved varieties



53. PLANT BREEDING

Plant breeding can involve:



Selective breeding



Artificial hybridisation



Genetic engineering

The aim may be to develop plants with desirable characteristics such as:



Higher yield



Disease resistance



54. ARTIFICIAL HYBRIDISATION

In artificial hybridisation, scientists can control which plants provide pollen.

A typical process may involve:

- ❶ Removing stamens to prevent self-pollination.
 - ❷ Covering the flower to prevent unwanted pollen.
 - ❸ Collecting pollen from the selected plant.
 - ❹ Transferring the desired pollen to the stigma.
-

55. P. MAHESHWARI

 **P. Maheshwari**

He is known as the:

Father of Indian Embryology

His work included plant embryology and studies involving the development of plant embryos under laboratory conditions.

The chapter uses his work as an Indian scientific context for plant reproduction.

56. REPRODUCTION IN ANIMALS

Animals reproduce through sexual reproduction in many cases.

Fertilisation can occur in two ways:

- ❶ **External fertilisation**
 - ❷ **Internal fertilisation**
-



57. EXTERNAL FERTILISATION

Fertilisation takes place:

Outside the female body

It is common in:

 Frogs

 Many fish

Usually:

Female releases eggs.

Male releases sperm over the eggs.

Fertilisation occurs in the surrounding environment, commonly water.



58. WHY ARE MANY EGGS PRODUCED?

In external fertilisation:

 Many eggs may be:

 Washed away

 Eaten

 Not fertilised

Therefore, many eggs are produced to increase the possibility that some offspring survive.



59. INTERNAL FERTILISATION

Fertilisation occurs:

Inside the female body

It is common in:

 Reptiles

 Birds

 Mammals

Internal fertilisation generally provides greater protection to the developing embryo.



60. EXTERNAL VS INTERNAL FERTILISATION

External	Internal
Outside female body	Inside female body
Common in frogs/fish	Common in reptiles/birds/mammals
Often many eggs	Usually fewer eggs
Less protection to early stages	Greater protection



61. DEVELOPMENT IN ANIMALS

Different animals have different development strategies.

Some organisms:

 Produce many eggs.

Others:

 Produce fewer young ones and provide more parental care.



62. METAMORPHOSIS IN BUTTERFLY

Butterfly development:

Egg → Larva → Pupa → Adult

The larva is commonly called a:



Caterpillar

The adult butterfly is very different from the larva.

This transformation is called:

Metamorphosis



63. BIRD EGGS

Bird eggs contain:



Yolk

The yolk provides nutrients for the developing embryo.

The embryo develops inside the egg until hatching.



64. MAMMALS

In mammals:

The zygote develops inside the female body.

After birth, many mammals provide:



Breast milk

to their young.

This provides nutrition and supports early development.



65. HUMAN REPRODUCTION

Human reproduction involves:



Gamete formation



Fertilisation



Embryonic development



Pregnancy



Birth



66. MALE REPRODUCTIVE SYSTEM

Important organs include:



Testes



Vas deferens



Seminal vesicles



Prostate gland



Urethra



Penis



67. TESTES

The testes:

 **Produce sperm**

and

 **Produce male sex hormones.**

They are located in the:

Scrotum

The scrotum keeps the testes slightly cooler than body temperature, which is important for sperm production.

68. SPERM

A sperm cell is very small.

It has:

 **Head**

Contains genetic material.

 **Tail**

Helps the sperm move.

Millions of sperm are produced, and sperm are actively motile.

69. VAS DEFERENS

The vas deferens is a tube that:

Carries sperm

from the testes towards the reproductive tract.



70. SEMINAL VESICLES AND PROSTATE

These glands contribute fluids that:



Support sperm



Provide nourishment



Help form semen



71. FEMALE REPRODUCTIVE SYSTEM

Important organs include:



Ovaries



Oviducts / Fallopian tubes



Uterus



Cervix



Vagina



72. OVARIES

The ovaries:



Produce eggs

and

 **Produce female sex hormones.**



73. OVIDUCTS / FALLOPIAN TUBES

The oviducts connect the region of the ovaries with the uterus.

Fertilisation commonly occurs in the:

Oviduct / Fallopian tube



74. UTERUS

The uterus is the organ where:

The embryo/foetus develops during pregnancy.

Its inner lining becomes prepared to support implantation.



75. CERVIX

The cervix is the lower part of the uterus.

It connects:

Uterus → Vagina



76. VAGINA

The vagina:

- ◆ Receives sperm during sexual intercourse.
- ◆ Forms part of the birth canal.

- ◆ Provides a passage through which menstrual blood leaves the body.
-

77. GAMETOGENESIS

Definition

Gametogenesis is the formation of gametes.

In humans:

Testes → Sperm

Ovaries → Eggs

Gametogenesis involves meiosis.

Therefore:

46 chromosomes → 23 chromosomes

in human gametes.

78. SPERM VS EGG

Sperm

Very small

Produced in millions

Motile

Little stored nutrient

Has tail

Egg

Larger

Usually one mature egg is released at a time

Non-motile

Contains stored nutrients

No tail



79. OVULATION



Definition

Ovulation is the release of a mature egg from an ovary.

The released egg enters the:

Oviduct



80. HUMAN FERTILISATION

When a sperm successfully fuses with an egg:

Sperm + Egg



Zygote

The zygote begins dividing by mitosis.



81. DEVELOPMENT AFTER FERTILISATION

The sequence is:



Egg



Fertilisation



Zygote



 **Cell division**



 **Embryo**



 **Implantation**



 **Pregnancy**



82. IMPLANTATION

The developing embryo attaches to the:

Lining of the uterus

This process is called:

Implantation

Implantation marks the beginning of pregnancy in the chapter's description.



83. IVF

IVF stands for:

In Vitro Fertilisation

In IVF:



Egg

-

 Sperm

are combined outside the female body, usually in a laboratory dish.

After fertilisation, the developing embryo can be transferred to the uterus.

★ "Test tube baby" is a popular expression, but fertilisation actually occurs in a laboratory culture dish.



84. MENSTRUAL CYCLE

The menstrual cycle prepares the female reproductive system for a possible pregnancy.

If fertilisation does not occur:



Egg degenerates

and



Uterine lining is shed.

This is called:

Menstruation



85. MENSTRUATION



Definition

Menstruation is the periodic shedding of the thickened uterine lining through the vagina when pregnancy does not occur.



86. TYPICAL MENSTRUAL CYCLE

A typical cycle may be around:

28 days

But actual cycles commonly vary.

The chapter notes:

21–35 days

as a typical range.



87. DAYS 1–5



Menstruation

The thickened uterine lining is shed.



88. DAYS 6–14

The uterine lining begins rebuilding.

An egg matures.



89. AROUND DAY 14

In a typical 28-day cycle:

Ovulation

may occur around Day 14.



Important:

Day 14 is **not a universal rule**.

The timing varies between individuals and between cycles.



90. DAYS 15–28

The uterine lining becomes:



Thicker



Rich in blood vessels

It becomes suitable for implantation if fertilisation occurs.

If fertilisation does not happen:

Lining breaks down.

Then the next menstrual cycle begins.



91. MENSTRUATION VS OVULATION

Menstruation

Uterine lining is shed

Occurs at beginning of cycle

Happens when pregnancy has not begun

Ovulation

Mature egg is released

Occurs around the middle in a typical 28-day cycle

Makes an egg available for possible fertilisation



92. SEX CHROMOSOMES

Humans commonly have:

XX

or

XY

sex chromosomes.

The egg contributes:

X chromosome

Sperm may contribute:

X or Y chromosome

Therefore:

X + X = XX

X + Y = XY

93. IMPORTANT SOCIAL AND LEGAL POINT

The chapter discusses the serious social problem of:

Sex-selective abortion

Prenatal sex determination for non-medical reasons is prohibited by law in India.

The topic is connected with:

 Law

 Gender equality

 Respect for life

 Social responsibility



94. PREGNANCY

Human pregnancy lasts approximately:

9 months

It is commonly divided into:

1 First trimester

2 Second trimester

3 Third trimester



95. FIRST TRIMESTER

During the early stage:

 Zygote develops.

 Embryo forms.

Major organs begin developing.

From about the ninth week, the developing individual is generally referred to as a:

Foetus

in the chapter's terminology.



96. SECOND TRIMESTER

The foetus:

 Grows larger

 Becomes stronger

 Continues developing

The pregnant person may increasingly notice foetal movements.

97. THIRD TRIMESTER

The foetus:

 Grows rapidly

 Continues preparing for life outside the uterus

 Gains strength and body mass

98. CHILDBIRTH

During childbirth:

Uterine muscles contract strongly.

These contractions help move the baby through the:

Birth canal

Medical or surgical procedures may be used when necessary for safety.

99. AFTER BIRTH

Newborn babies need:

 Nutrition

 Warmth

 Timely vaccination

 Care and protection

Breastfeeding provides nutrition and protective factors during early life.

100. MOTHER'S HEALTH DURING PREGNANCY

Important factors include:

 Balanced nutrition

 Regular medical check-ups

 Appropriate light exercise

 Adequate rest

 Emotional support

 Family support

101. NUTRITION DURING PREGNANCY

A balanced diet should provide:

 Protein

 Vitamins

 Minerals

 Energy

 Water

Good nutrition supports the health of both the mother and developing baby.



102. ASHA WORKERS

ASHA workers are trained community health workers.

They help promote:



Hygiene



Immunisation



Maternal care



Family planning



Safe delivery practices

They are particularly important in supporting communities in rural areas.



103. EMOTIONAL HEALTH

Pregnancy and childbirth involve major physical and emotional changes.

Support from:



Family



Healthcare workers



Community

can be important.

The chapter also recognises postpartum depression as a treatable condition for which support should be sought.



104. MENSTRUAL HYGIENE

Menstruation is:

A normal biological process.

Good menstrual hygiene includes:

-  Washing hands before and after changing products.
 -  Changing menstrual products regularly.
 -  Cleaning the genital area with water.
 -  Disposing of used products responsibly.
 -  Washing and completely drying reusable products before reuse.
-

105. SEXUALLY TRANSMITTED INFECTIONS

STIs are infections that can spread through sexual contact.

Examples mentioned in the chapter include:

-  Gonorrhoea
-  Syphilis
-  Herpes
-  Genital warts
-  HIV

HIV infection can eventually lead to AIDS if untreated.

106. PREVENTION OF STIs

 **Condoms**

Barrier methods can reduce the risk of STI transmission and pregnancy.

Testing

Appropriate medical testing helps identify infections.

Responsible decisions

Healthy relationships and informed choices are important.

107. CONTRACEPTION

Contraception refers to methods used to:

Prevent pregnancy.

The chapter discusses:

 Condoms/barrier methods

 Oral contraceptive pills

 IUDs such as Copper-T

 Surgical methods

108. ORAL CONTRACEPTIVE PILLS

Oral contraceptive pills use hormones to alter reproductive processes such as egg release.

They should be used according to appropriate medical guidance because side effects may occur.

109. IUD / COPPER-T

An IUD is placed inside the:

Uterus

Copper-T is one example.

It helps prevent pregnancy.



110. SURGICAL CONTRACEPTION

Surgical methods can prevent sperm and egg from meeting.

Examples include procedures involving:

Male reproductive tubes

or

Female fallopian tubes

These are generally considered permanent methods.



111. ASEXUAL VS SEXUAL REPRODUCTION

Asexual

One parent

Gametes not required

Usually rapid

Little genetic variation

Sexual

Genetic contributions from two individuals

Gametes involved

Generally more complex

Produces genetic variation

Offspring genetically similar/identical in examples

Offspring genetically different

Mitosis involved in examples

Meiosis + fertilisation



112. MITOSIS VS MEIOSIS

Mitosis 

Meiosis 

Maintains chromosome number

Halves chromosome number

Produces body cells in many contexts

Produces gametes

Daughter cells generally similar

Produces genetic variation

Important in growth and asexual reproduction

Important in sexual reproduction



113. SELF VS CROSS-POLLINATION

Self-pollination 

Cross-pollination 

Same flower/plant

Another plant of same type

Less genetic variation generally

Greater genetic variation possible

Pollen stays within plant

Pollen transferred between plants



114. EXTERNAL VS INTERNAL FERTILISATION

External 

Internal 

Outside female body

Inside female body

Common in frogs/fish Common in reptiles/birds/mammals

Often many eggs Usually fewer eggs

Less protection Greater protection



115. SPERM VS EGG

Sperm 🧬

Egg 🥚

Very small

Larger

Produced in millions

Fewer

Motile

Non-motile

Little stored nutrient

Stored
nutrients

Tail helps movement

No tail



116. IMPORTANT NUMERICAL / FACT-BASED VALUES

Human body cell:

46 chromosomes

Human gamete:

23 chromosomes

Fertilisation:

$23 + 23 = 46$ chromosomes

Typical menstrual cycle:

21–35 days

Common example:

28-day cycle

Typical ovulation in a 28-day cycle:

Around Day 14

Human pregnancy:

About 9 months



117. IMPORTANT SEQUENCES



Asexual reproduction

One parent → Mitosis → Genetically similar offspring



Sexual reproduction

Meiosis → Gametes → Fertilisation → Zygote → Variation



Flower reproduction

Flower → Stamen + Pistil → Pollen → Pollination → Fertilisation → Seed + Fruit



Human reproduction

Testes/Sperm + Ovary/Egg → Fertilisation → Zygote → Implantation → Pregnancy



118. IMPORTANT EXAM QUESTIONS

Q1. What is reproduction?

Reproduction is the biological process by which organisms produce new individuals of their own kind.

Q2. Name the two main types of reproduction.

Asexual and sexual reproduction.

Q3. What is asexual reproduction?

Reproduction involving one parent, usually producing genetically similar offspring.

Q4. What is vegetative propagation?

Production of new plants from vegetative parts such as stems, roots or leaves.

Q5. Give examples of vegetative propagation.

Potato, ginger, money plant, sugarcane and Bryophyllum.

Q6. What is budding?

Asexual reproduction in which a new individual develops as a bud on the parent.

Q7. Give two examples of budding.

Yeast and Hydra.

Q8. What is spore formation?

Asexual reproduction in which organisms produce spores that can germinate under favourable conditions.

Q9. What is sexual reproduction?

Reproduction involving gametes and genetic contributions from two individuals.

Q10. Why is meiosis important?

It reduces chromosome number by half in gametes.

Q11. What is pollination?

Transfer of pollen from anther to stigma.

Q12. What is fertilisation?

Fusion of male and female gametes.

Q13. What does the ovule become after fertilisation?

Seed.

Q14. What does the ovary become after fertilisation?

Fruit.

Q15. What is ovulation?

Release of a mature egg from an ovary.

Q16. What is implantation?

Attachment of the developing embryo to the uterine lining.

Q17. What is menstruation?

Shedding of the thickened uterine lining when pregnancy does not occur.

Q18. What is IVF?

In vitro fertilisation, in which egg and sperm are combined outside the female body in a laboratory and the resulting embryo may be transferred to the uterus.



119. COMPETENCY-BASED QUESTION

A farmer wants to produce many banana plants with desirable characteristics.

Which method could be useful?



Tissue culture

It allows many plants to be produced from selected plant tissue under controlled conditions.

120. COMPETENCY-BASED QUESTION

Why may asexually produced plants be vulnerable to the same disease?

Because their offspring are genetically very similar.

Therefore, if a disease affects the parent genotype:

Many offspring may also be susceptible.

121. COMPETENCY-BASED QUESTION

Why does sexual reproduction produce variation?

Because genetic material comes from two individuals and meiosis produces different combinations of chromosomes.

★ **Therefore:**

Sexual reproduction → Genetic variation

122. COMPETENCY-BASED QUESTION

Arrange the following:

Pollination

Zygote

Fertilisation

Pollen germination

Correct sequence:

Pollination → Pollen germination → Fertilisation → Zygote formation

123. COMPETENCY-BASED QUESTION

What happens after fertilisation in a flowering plant?

Answer:

Male and female gametes fuse.



Zygote forms.



Zygote develops into embryo.



Ovule becomes seed.



Ovary becomes fruit.

124. COMPETENCY-BASED QUESTION

Why does menstruation occur when fertilisation does not happen?

If fertilisation does not occur:

 Egg degenerates.

The thickened uterine lining is no longer needed to support implantation.

Therefore:

 **The uterine lining is shed as menstruation.**



125. COMPETENCY-BASED QUESTION

Is ovulation always on Day 14?

✗ No.

Day 14 is a typical estimate for a 28-day cycle.

Actual ovulation timing varies between individuals and cycles.



126. COMMON MISTAKES TO AVOID

✗ Mistake 1

Saying reproduction is only necessary for individual survival.

✓ Correct

Reproduction is essential for **continuity of the species**.

✗ Mistake 2

Saying all asexual reproduction occurs through seeds.

✓ Correct

Asexual reproduction can occur through:

🌱 Vegetative propagation

🌱 Budding

🍄 Spores

and other mechanisms.

✗ Mistake 3

Confusing pollination and fertilisation.

 Remember:

Pollination → **Pollen reaches stigma**

Fertilisation → **Gametes fuse**

 Mistake 4

Saying ovule becomes fruit.

 Correct:

Ovule → **Seed**

Ovary → **Fruit**

 Mistake 5

Saying meiosis doubles chromosome number.

 Correct:

Meiosis halves chromosome number.

 Mistake 6

Saying menstruation and ovulation are the same.

 Correct:

Menstruation → **Uterine lining is shed**

Ovulation → **Mature egg is released**

 Mistake 7

Saying pregnancy always begins immediately after fertilisation.

✅ **Correct:**

The developing embryo must undergo early development and then:

Implant in the uterine lining.

127. QUICK REVISION

 Reproduction → Continuity of life.

 Asexual → One parent.

 Asexual offspring → Genetically similar/identical in the examples studied.

 Asexual reproduction → Usually rapid.

 Vegetative propagation → New plant from vegetative part.

 Yeast → Budding.

 Hydra → Budding.

 Rhizopus → Spore formation.

 Mitosis → Maintains chromosome number.

 Sexual reproduction → Gametes + genetic variation.

 Meiosis → Produces haploid gametes.

 Flower → Reproductive organ of flowering plants.

♂ Stamen → Male part.

♀ Pistil → Female part.

 Anther → Produces pollen.

 Stigma → Receives pollen.

 Ovary → Contains ovules.

 Pollination → Transfer of pollen to stigma.

 Fertilisation → Fusion of gametes.

 Ovule → Seed.

 Ovary → Fruit.

 External fertilisation → Outside female body.

 Internal fertilisation → Inside female body.

 Human body cell → 46 chromosomes.

 Human gamete → 23 chromosomes.

 Ovulation → Release of mature egg.

 Implantation → Embryo attaches to uterine lining.

 Menstruation → Shedding of uterine lining.

 Pregnancy → About 9 months.

 Reproductive health → Hygiene + responsible choices + STI prevention.



128. MEMORY TRICKS



ASEXUAL

ONE → MITOSIS → CLONE

One parent



Mitosis



Genetically similar offspring

SEXUAL

MEIOSIS → GAMETE → FERTILISATION → ZYGOTE → VARIATION

FLOWER

STAMEN = MALE

PISTIL = FEMALE

AFTER FERTILISATION

OVULE → SEED

OVARY → FRUIT

POLLINATION

ANther → STIGma

Think:

Pollen travels from ANTHER to STIGMA.

HUMAN REPRODUCTION

SPERM + EGG → ZYGOTE → IMPLANTATION → PREGNANCY

MENSTRUAL CYCLE

**MENSTRUATION → GROWTH → OVULATION →
PREPARATION → MENSTRUATION**

129. COMPLETE CHAPTER FLOWCHART

ASEXUAL REPRODUCTION

One Parent



Mitosis



Genetically Similar Offspring



Rapid Multiplication

SEXUAL REPRODUCTION

Meiosis



Male + Female Gametes



Fertilisation



Zygote



Development



New Individual



Genetic Variation



FLOWERING PLANT

Anther



Pollen



Pollination



Stigma



Pollen Tube



Ovule



Fertilisation



Zygote



Embryo



Seed

And:

Ovary → Fruit



HUMAN

Testes → Sperm

•

Ovary → Egg



Fertilisation



Zygote



Cell Division



Embryo



Implantation



Pregnancy



Foetus



Birth

130. CHAPTER 11 — FINAL TAKEAWAY

Reproduction ensures that life continues from one generation to the next. 

Asexual reproduction

One parent → Fast → Genetically similar offspring

Sexual reproduction

Gametes → Fertilisation → Variation

In flowering plants

Pollination → Pollen tube → Fertilisation → Seed + Fruit

In animals

External or internal fertilisation → Development → New individual

In humans

Gamete formation → Fertilisation → Implantation → Pregnancy → Birth

Reproductive health

Hygiene + Nutrition + Medical care + STI prevention + Responsible choices

The central idea of Chapter 11 is:

 **Reproduction keeps life continuing, while sexual reproduction introduces variation that can help populations adapt over generations.**