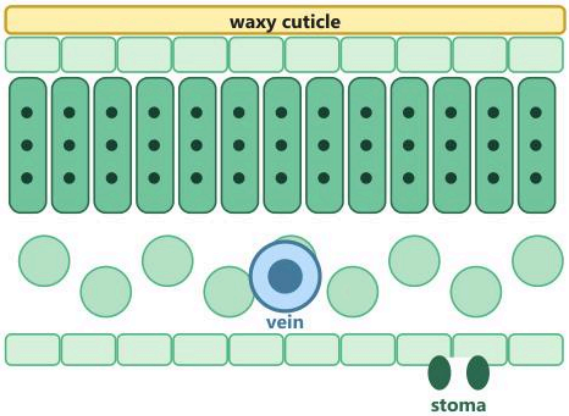
Leaf Structure and Function

Photosynthesis
Palisade cells near the top catch the most light.

Gas exchange
CO_2 in and O_2 out through stomata and air spaces.

Transpiration
Water vapour lost through stomata; pulls water up the xylem.

Cross-section of a leaf



Upper epidermis: thin, clear, lets light in
Palisade: many chloroplasts → MOST photosynthesis
Spongy: air spaces for gas exchange
Vascular bundle: xylem (water) + phloem (sugar)
Lower epidermis: stomata + guard cells
Stomata OPEN when guard cells are turgid (K^+ in, water in by osmosis); CLOSE when flaccid

Faster transpiration
High light, high temperature, wind, low humidity.

Night
Most stomata close: guard cells lose water.

Leaf shape
Broad and thin: big area and short diffusion distance.

FORMULA / KEY TERMS
- Guard cells turgid → stoma OPENS
- Guard cells flaccid → stoma CLOSES
- Potometer measures water UPTAKE (≈ transpiration rate)
- Wilting: water loss > water uptake

COMMON MISTAKE
❌ "Stomata close in daylight to save water."

✅ Usually stomata OPEN in light (K^+ moves in, water follows); they close in the dark or in drought.

QUICK CHECK (worked answers at the back, page 32)
1. Explain how a stoma opens in light.
2. State two conditions that increase the rate of transpiration.
3. Why are palisade cells packed with chloroplasts?

Nutrition in Plants

Equation

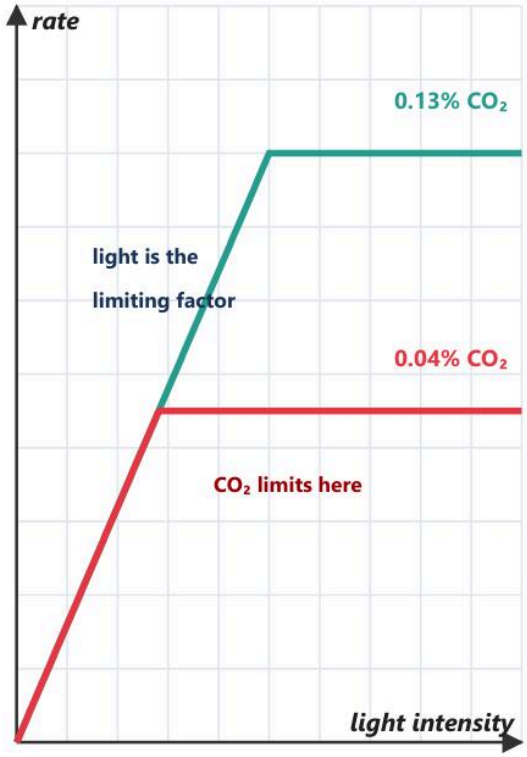
$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ (light + chlorophyll).

Light reaction

In grana: water split by light (photolysis) → O_2 released, energy captured.

Dark reaction

In stroma: CO_2 fixed into glucose (no light needed directly).



Macronutrients

N (proteins), P (DNA, roots), K (enzymes), Mg (chlorophyll), Ca, S.

Lack of N or Mg

Leaves turn yellow (chlorosis).

Greenhouse

Farmers raise light, CO_2 and temperature for more yield.

FORMULA / KEY TERMS

- **Limiting factor**: the factor in shortest supply limits the rate
- Compensation point: photosynthesis = respiration
- Iodine test: blue-black = starch present
- Destarch a plant: keep in the dark 48 h

COMMON MISTAKE

❌ "The oxygen released comes from carbon dioxide."

✅ The O_2 comes from WATER, split in the light reaction (photolysis).

QUICK CHECK (worked answers at the back, page 32)

1. Look at the graph. At low light intensity, what limits the rate? At high light intensity?
2. Why is a plant kept in the dark for 48 hours before a starch test?
3. Which mineral is needed to make chlorophyll?

BIOLOGY · FORM 5 · CHAPTER 6

Sexual Reproduction in Flowering Plants

Pollination

Pollen from anther to stigma (insects, wind, birds).

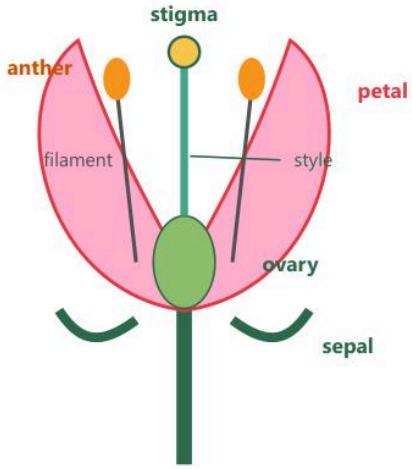
Pollen tube

Grows down the style; carries two male nuclei.

Double fertilisation

One male nucleus + egg → zygote; one + polar nuclei → endosperm.

Parts of a flower



Stamen (male) = anther + filament
Pistil (female) = stigma + style + ovary
Double fertilisation: sperm 1 + egg → zygote (2n)
sperm 2 + 2 polar nuclei → endosperm (3n)

After fertilisation

Ovule → seed, ovary → fruit, integument → seed coat.

Wind flowers

Small, no scent, light pollen, feathery stigma outside.

Insect flowers

Bright, scented, nectar, sticky pollen.

FORMULA / KEY TERMS

- Zygote (2n) → embryo
- Endosperm (3n) → food store in seed
- Self-pollination: same flower/plant
- Cross-pollination: different plant, same species → more variation

COMMON MISTAKE

❌ "Pollination and fertilisation are the same."

✅ Pollination = pollen reaches the stigma.
Fertilisation = nuclei fuse inside the ovule.

QUICK CHECK (worked answers at the back, page 33)

1. What does the ovary become after fertilisation?
2. Why is the endosperm triploid?
3. Give two features of a wind-pollinated flower.

BIOLOGY · FORM 5 · CHAPTER 8

Biodiversity

Five kingdoms

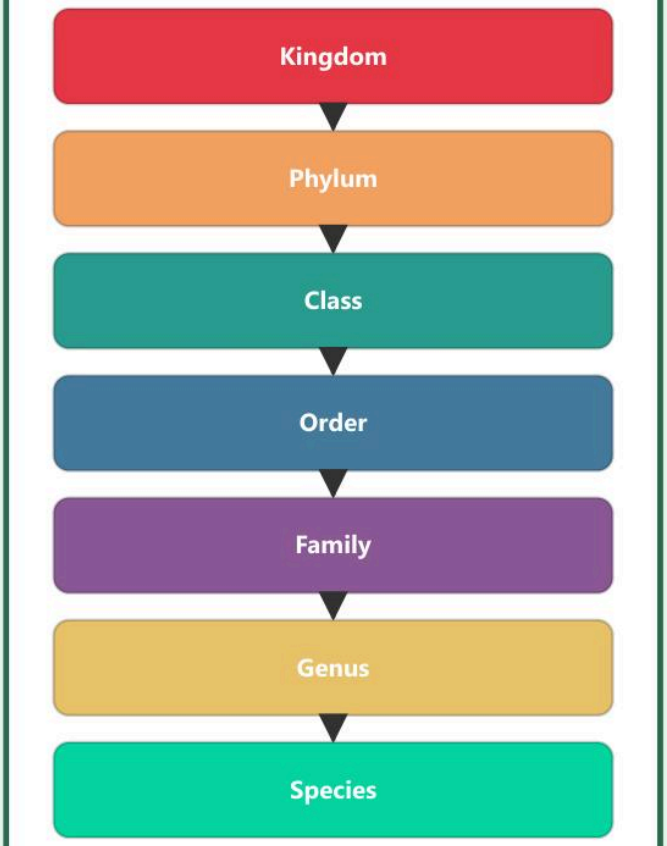
Monera, Protista, Fungi, Plantae, Animalia.

Binomial name

Genus + species, e.g. Homo sapiens (genus capital, species small, italic).

Dichotomous key

Pairs of choices to identify an organism.



Microorganisms

Bacteria, fungi, protozoa, algae, viruses: decomposers, food, disease.

MY Malaysia

Mega-diverse country: rainforest, mangroves, coral reefs.

Threats

Logging, pollution, hunting, invasive species → extinction.

FORMULA / KEY TERMS

- **Species**: can breed and give fertile offspring
- Hierarchy: Kingdom → Phylum → Class → Order → Family → Genus → Species
- Virus: not a cell; reproduces only inside host cells
- Conservation: national parks, laws, gene banks

COMMON MISTAKE

❌ "homo Sapiens" or "Homo Sapiens"

✅ Homo sapiens: Genus with a capital, species in small letters, both in italics (underline when handwritten).

QUICK CHECK (worked answers at the back, page 33)

1. Write the classification levels from kingdom to species.
2. Give two rules for writing a scientific name.
3. Give one useful and one harmful role of bacteria.

Inheritance

Gene + allele

Gene: DNA unit for one trait. Alleles: different forms (T, t).

Dominant

Shows even with one copy (T).

Recessive

Shows only when there are two copies (tt).

Monohybrid cross: Tt × Tt

T = tall (dominant) · t = dwarf (recessive)

	T	t
T	TT	Tt
t	Tt	tt

Genotype ratio 1 TT : 2 Tt : 1 tt
Phenotype ratio 3 tall : 1 dwarf
Dihybrid (AaBb × AaBb) → 9 : 3 : 3 : 1
Sex: XX female, XY male (father decides)
Colour blindness: X-linked recessive (X^c)

Genotype

The alleles (TT, Tt, tt). Phenotype: what you see (tall).

Blood groups

I^A and I^B are codominant; I^O recessive.

Diseases

Thalassaemia, haemophilia (X-linked), colour blindness (X-linked).

FORMULA / KEY TERMS

- **Homozygous**: two same alleles (TT or tt)
- **Heterozygous**: two different alleles (Tt)
- Monohybrid Tt × Tt → 3 : 1
- Test cross: unknown × tt

COMMON MISTAKE

❌ "A recessive allele is a weaker or harmful gene."

✅ Recessive only means it is HIDDEN when the dominant allele is present.

QUICK CHECK (worked answers at the back, page 33)

1. Two heterozygous tall plants (Tt) are crossed. What fraction of offspring are dwarf?
2. Why do more men than women have colour blindness?
3. A man with blood group AB and a woman with group O have children. What blood groups are possible?

BIOLOGY · FORM 5 · CHAPTER 13

Genetic Technology

Genetic engineering

Moving a useful gene into another organism (GMO).

Medicine

Insulin, growth hormone, vaccines from bacteria.

Crops

Pest-resistant, drought-tolerant, Golden Rice (vitamin A).

1. **Cut the gene out**
restriction enzyme (e.g. human insulin gene)

2. **Cut the plasmid**
same restriction enzyme → sticky ends

3. **Join them**
DNA ligase → recombinant plasmid

4. **Put into bacterium**
bacterium copies itself many times

5. **Bacteria make insulin**
harvest, purify, give to diabetics

DNA profiling

Forensics, paternity tests: DNA fingerprints compared.

Cloning

Identical copies; tissue culture in plants.

Issues

Safety, allergies, gene spread, ethics, labelling.

FORMULA / KEY TERMS

- **Restriction enzyme** = DNA "scissors"
- **DNA ligase** = DNA "glue"
- **Plasmid** = small ring of DNA in bacteria (vector)
- **GMO** = genetically modified organism

COMMON MISTAKE

❌ "Genetic engineering and cloning are the same."

✅ Genetic engineering CHANGES the DNA; cloning makes identical COPIES of the same DNA.

QUICK CHECK (worked answers at the back, page 34)

1. Name the enzyme that cuts DNA at a specific site.
2. Give two uses of DNA profiling.
3. Give one advantage and one concern about GM crops.

Worked Answers (3/4)

Form 5 Chapter 4: Transport in Plants

1. The ring removes the phloem; sugar moving down from the leaves cannot pass, so it collects above the cut; cells there swell.
2. Transpiration pull (helped by cohesion and adhesion).
3. By osmosis: cell sap is more concentrated than soil water, so water moves in through the partially permeable membrane.

Form 5 Chapter 5: Response in Plants

1. Auxin collects on the shaded side; cells there elongate more than on the lit side, so the shoot curves towards the light.
2. Ethylene.
3. Mimosa pudica (semalu) leaves fold when touched; some flowers open in light and close at night.

Form 5 Chapter 6: Sexual Reproduction in Flowering Plants

1. The fruit.
2. It forms from one male nucleus (n) fusing with two polar nuclei (n + n): 3n.
3. Any two: small dull petals; no scent or nectar; large feathery stigmas hanging out; lots of light, smooth pollen; long filaments.

Form 5 Chapter 7: Adaptations of Plants in Different Habitats

1. Pneumatophores stick up above the waterlogged mud and take in air through lenticels.
2. Any two: leaves reduced to spines; thick waxy cuticle; few sunken stomata; stomata open at night.
3. The lower surface touches the water; gas exchange can only happen with the air above.

Form 5 Chapter 8: Biodiversity

1. Kingdom, phylum, class, order, family, genus, species.
2. Genus starts with a capital letter, species with a small letter; written in italics (or underlined separately when handwritten).
3. Useful: decomposers / yoghurt / nitrogen fixation. Harmful: cause diseases such as cholera or tuberculosis; spoil food.

Form 5 Chapter 9: Ecosystem

1. Frog or snake (they eat primary consumers).
2. Population = (40 × 50) ÷ 10 = 200.
3. About 90% of energy is lost at each level (respiration, heat, waste), so too little is left for more levels.

Form 5 Chapter 10: Environmental Sustainability

1. Nitrates/phosphates make algae grow fast; algae die; bacteria decomposing them use up dissolved oxygen (high BOD); fish die from lack of oxygen.
2. Any two: soil erosion; flash floods; loss of habitat and species; more CO_2 / global warming; less rainfall.
3. Sulphur dioxide (or nitrogen oxides).

Form 5 Chapter 11: Inheritance

1. Tt × Tt → TT, Tt, Tt, tt: 1/4 (25%) are dwarf.
2. The allele is on the X chromosome. Men (XY) have one X, so one recessive allele shows; women need two.
3. $I^A I^B \times I^O I^O \rightarrow I^A I^O$ or $I^B I^O$: group A or group B (50% each).

Form 5 Chapter 12: Variation

1. Blood group: discontinuous. Body mass: continuous. Fingerprint type (arch/loop/whorl): discontinuous.
2. Crossing over in prophase I; independent assortment of chromosomes in metaphase I.
3. Non-disjunction in meiosis gives an extra chromosome 21 (47 chromosomes).

Key Terms: English – Bahasa Melayu (2/2)

Form 5. Use the English words in your DLP answers; the BM words help when you read BM books or past papers.

English	Bahasa Melayu
meristem	meristem
primary growth	pertumbuhan primer
secondary growth	pertumbuhan sekunder
annual ring	gelang tahunan
stoma / stomata	stoma / liang stoma
guard cell	sel pengawal
palisade mesophyll	mesofil palisad
spongy mesophyll	mesofil berspan
transpiration	transpirasi
photosynthesis	fotosintesis
limiting factor	faktor pengehad
chlorophyll	klorofil
macronutrient	makronutrien
xylem	xilem
phloem	floem
translocation	translokasi
root pressure	tekanan akar
tropism	tropisme
auxin	auksin
pollination	pendebungaan
pollen tube	tiub debunga
double fertilisation	persenyawaan ganda dua
endosperm	endosperma
ovary	ovari
xerophyte	xerofit
hydrophyte	hidrofit
halophyte	halofit
biodiversity	biodiversiti
kingdom	alam
species	spesies
dichotomous key	kekunci dikotomi
producer	pengeluar
consumer	pengguna
decomposer	pengurai
food web	siratan makanan
habitat	habitat
population	populasi
eutrophication	eutrofikasi
greenhouse effect	kesan rumah hijau
sustainable	lestari
gene	gen
allele	alel
dominant	dominan
recessive	resesif
genotype	genotip
phenotype	fenotip
mutation	mutasi
variation	variasi
genetic engineering	kejuruteraan genetik
DNA profiling	pemprofilan DNA

Suka sampel ini?

Nota SPM Sains & Matematik

Set DLP English (5 subjek + bonus)

- Nota Tingkatan 4 dan 5 untuk subjek yang dipilih
- Fizik: modul PhysiXplosion T4 + Magnatron T5 dengan skema jawapan
- Set DLP: nota infografik Biology, Chemistry, Physics, Maths, Add Maths + 150 soalan ramalan DLP

RM29.90

BELI SEKARANG >

nightmew.com/p/nota-spm-sains · FPX online banking · download serta-merta