

# Biology | Higher Level | Paper 1A

11 May 2026 | 2 hours [Paper 1A and Paper 1B]

Maximum mark for Paper 1A: 40 marks | Answer all questions | Calculator required

## MARK SCHEME — Paper 1A

Q	Answer	Reasoning
1	B	Water's higher thermal conductivity draws heat away from the body faster than air, requiring better insulation.
2	B	DNA contains deoxyribose — a 5-carbon sugar with H (not OH) at the 2' carbon position.
3	D	Unsaturated fatty acids (C=C double bonds) create kinks, preventing tight packing, giving a lower melting point and liquid state at room temperature.
4	D	One peptide bond forms between two amino acids via condensation, releasing one water molecule. No ATP is produced.
5	C	Anabolic reactions are endergonic — products have higher energy than reactants, with an activation energy peak shown in Graph C.
6	B	Non-competitive inhibitors reduce $V_{max}$ but do not affect $K_m$ — the inhibited curve plateaus lower than the uninhibited curve.
7	C	Both aerobic and anaerobic respiration begin with glycolysis, which releases ATP from glucose.
8	B	NADPH is produced in the light-dependent reactions and passes reducing power to the light-independent reactions — box B.
9	C	Stage X (~55 degrees C) is the annealing stage, where primers bind to complementary single-stranded DNA.
10	C	During translation, two tRNA molecules occupy the A and P sites simultaneously on the large subunit of the ribosome.
11	A	CRISPR-Cas9 acts as molecular scissors guided by RNA to cut and replace specific bases in a target gene.
12	B	Printed L-M line ~20 mm; actual size = 10 $\mu\text{m}$ = 0.01 mm. Magnification = 20 divided by 0.01 = x2000.
13	B	Freeze-fracture splits the membrane bilayer, revealing the internal arrangement of proteins and lipids within membranes.
14	B	Point N is where facilitated diffusion plateaus — all carrier/channel proteins are occupied (saturated).
15	A	Clathrin coats vesicles forming via endocytosis and helps pinch them off from the cell surface membrane.
16	D	Both striated and cardiac muscle have light (I) and dark (A) bands; only cardiac muscle cells are branched.
17	D	The diagram shows a hormone entering the cell and directly affecting transcription — characteristic of a steroid hormone like oestradiol.

Q	Answer	Reasoning
18	A	An action potential causes Ca <sup>2+</sup> influx into the presynaptic terminal, triggering vesicle fusion and neurotransmitter release into the synaptic cleft.
19	A	Gene expression is regulated by transcription factors that bind to the promoter region and switch off transcription.
20	D	Epigenetic imprinting from the mother's milk can switch growth genes on or off depending on the maternal species.
21	C	Garden valerian ( <i>Valeriana officinalis</i> ) and longspur seablush ( <i>Valeriana ciliosa</i> ) share the genus name <i>Valeriana</i> .
22	A	Environmental DNA (eDNA) collected from habitats is matched to barcode libraries to identify which species inhabit that area.
23	C	The expiratory reserve volume is the extra air forcefully exhaled below normal tidal expiration — shown by arrow C going toward near-zero volume.
24	C	Region X is at the venous end of the capillary — lower blood pressure here allows tissue fluid to be reabsorbed back into capillaries.
25	C	Titin is an elastic protein acting as a molecular spring connecting myosin to the Z-disc, preventing overstretching of the sarcomere.
26	A	Nerves contain bundles of axons (nerve fibres), which can be myelinated or unmyelinated, from motor neurons.
27	D	Skoog and Miller used auxin and cytokinin — high auxin:cytokinin promotes roots; high cytokinin:auxin promotes shoots.
28	A	The innate immune system is non-specific (responds broadly — I and II). Memory cells belong to the adaptive immune system only.
29	A	Paternal mitochondria from the sperm midpiece enter the egg at fertilization and are present in the early zygote.
30	C	A cross between two homozygous parents in incomplete dominance gives 100% heterozygous offspring with a blended phenotype.
31	C	Height shows continuous/bell-shaped variation indicating polygenic inheritance (multiple genes) plus environmental influences such as nutrition.
32	B	Glucose is actively reabsorbed via sodium-glucose cotransporters into surrounding blood capillaries in the proximal convoluted tubule.
33	B	Sympatric speciation occurs within the same geographic area; reproductive isolation arises via behavioural or other non-geographic barriers.
34	A	In situ conservation means protecting the species in its natural habitat — protecting coastal forests directly reduces fire risk.
35	D	X = annual rainfall (hot deserts have low rainfall; tropical rainforests high); Y = mean annual temperature.
36	C	Allelopathy involves plants releasing inhibitory chemicals — these substances can be applied as natural herbicides to control weeds.
37	A	Primary production by autotrophs is always greater than secondary production by heterotrophs due to energy loss at each trophic level.

Q	Answer	Reasoning
38	D	Sexual selection: females choose mates by appearance — bright plumage signals genetic fitness, so females preferentially mate with colourful males.
39	B	Hardy-Weinberg requires a large population and random mating. Varying survival rates = natural selection, which violates equilibrium. So I and III only.
40	A	Permafrost melting releases organic matter. Decomposition by microbes then releases methane (CH <sub>4</sub> ), a potent greenhouse gas, completing the positive feedback loop.

Note: For Q12, verify the printed L-M line measurement on your copy. If the line measures ~20 mm, magnification = x2000 (B). Adjust accordingly.

End of Mark Scheme — Biology HL Paper 1A