

Reading Comprehension 1

• Paragraph: A butterfly begins life as a tiny egg on a leaf. Inside the egg grows a caterpillar, which soon hatches and starts eating the plant around it. After growing quickly, the caterpillar forms a chrysalis, where its body is reorganized into the adult stage. When the transformation is complete, the butterfly emerges, dries its wings, and flies away to feed on nectar and lay new eggs. This repeating sequence is called a life cycle and helps butterflies survive from one generation to the next.

– **Question:** What is the first stage of a butterfly's life cycle?

- Option A: Caterpillar
- Option B: Chrysalis
- Option C: Egg
- Option D: Adult butterfly

– Correct Answer: C

– **Question:** Why does the caterpillar eat so much?

- Option A: To store energy for the chrysalis stage
- Option B: To avoid predators
- Option C: To dry its wings
- Option D: To make nectar

– Correct Answer: A

– **Question:** Where does the butterfly emerge from?

- Option A: An egg
- Option B: A chrysalis
- Option C: A flower
- Option D: A leaf vein

– Correct Answer: B

– **Question:** What do adult butterflies mainly eat?

- Option A: Leaves
- Option B: Nectar
- Option C: Soil
- Option D: Caterpillars

– Correct Answer: B

– **Question:** The term "life cycle" in this paragraph refers to...

- Option A: The length of a butterfly's wings

- Option B: The repeating sequence of stages from egg to adult
 - Option C: The plants butterflies visit
 - Option D: Seasonal weather changes
 - Correct Answer: B
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Reading Comprehension 2

• Paragraph: Many cities promote recycling to reduce the amount of waste sent to landfills. Recycling involves collecting materials such as paper, glass, metals, and certain plastics, processing them, and turning them into new products. This practice saves natural resources, lowers energy use compared with producing goods from raw materials, and decreases greenhouse-gas emissions. However, contamination—like food scraps mixed with clean paper—can cause entire batches to be discarded, so correct sorting is essential for recycling programs to succeed.

– **Question:** Which material is commonly collected for recycling?

- Option A: Food scraps
- Option B: Metal cans
- Option C: Garden soil
- Option D: Ceramics only

– Correct Answer: B

– **Question:** One main environmental benefit of recycling is...

- Option A: Increasing landfill size
- Option B: Saving natural resources
- Option C: Raising energy consumption
- Option D: Producing more raw materials

– Correct Answer: B

– **Question:** What problem can contamination cause?

- Option A: Lower energy use
- Option B: Discarding whole recycling batches
- Option C: Higher paper quality
- Option D: Faster processing times

– Correct Answer: B

– **Question:** Which of these actions helps recycling succeed?

- Option A: Mixing glass with food waste
- Option B: Correctly sorting materials

- Option C: Burning plastic bottles
- Option D: Burying metals in soil

– Correct Answer: B

– **Question:** Compared with making products from raw resources, recycling usually...

- Option A: Requires more energy
- Option B: Uses less energy
- Option C: Generates no emissions at all
- Option D: Needs no processing facilities

– Correct Answer: B

Reading Comprehension 3

• Paragraph: Photosynthesis in most plants follows the C3 pathway, where carbon dioxide is fixed by the enzyme RuBisCO inside mesophyll cells. In hot, dry climates, C4 plants such as maize have evolved an additional step: they first capture CO₂ into four-carbon molecules in outer cells, then shuttle it to bundle-sheath cells for the Calvin cycle. This adaptation limits photorespiration and improves water-use efficiency. Consequently, C4 crops often outperform C3 crops in tropical environments.

– **Question:** Which enzyme fixes CO₂ in the C3 pathway?

- Option A: ATP synthase
- Option B: RuBisCO
- Option C: Chlorophyll
- Option D: Amylase

– Correct Answer: B

– **Question:** The term “bundle-sheath cells” appears in...

- Option A: C3 plants only
- Option B: C4 plants only
- Option C: Both C3 and C4 plants
- Option D: Neither plant type

– Correct Answer: C

– **Question:** Why do C4 plants waste less water?

- Option A: They open stomata at night only
- Option B: They store CO₂ indefinitely

- Option C: They reduce photorespiration in hot climates
 - Option D: They have no chloroplasts in mesophyll cells
 - Correct Answer: C
 - **Question:** Maize outperforms wheat in the tropics mainly because maize...
 - Option A: Has deeper roots
 - Option B: Uses the C4 pathway
 - Option C: Contains more chlorophyll B
 - Option D: Fixes nitrogen from air
 - Correct Answer: B
 - **Question:** Photorespiration is best described as...
 - Option A: Light-driven sugar synthesis
 - Option B: Loss of fixed carbon as CO₂
 - Option C: Uptake of oxygen at night
 - Option D: Breakdown of chlorophyll pigments
 - Correct Answer: B
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Reading Comprehension 4

- Paragraph: Earth's lithosphere is divided into rigid tectonic plates that float on the viscous asthenosphere beneath them. When plates diverge at mid-ocean ridges, magma rises to form new crust. Convergent boundaries, in contrast, drive one plate beneath another in subduction zones, creating deep ocean trenches and volcanic arcs. Transform faults, such as California's San Andreas Fault, slide horizontally and can generate powerful earthquakes. Plate tectonics explains mountain building, seafloor spreading, and the distribution of many geological hazards.
- **Question:** New oceanic crust forms mainly at...
- Option A: Subduction zones
- Option B: Mid-ocean ridges
- Option C: Transform faults
- Option D: Hot desert basins
- Correct Answer: B
- **Question:** A convergent boundary typically produces...
- Option A: Rift valleys
- Option B: Deep trenches and volcanic arcs

- Option C: Horizontal fault motion only
 - Option D: Quiet seismic zones
 - Correct Answer: B
 - **Question:** Which U.S. fault is cited as a transform boundary?
 - Option A: New Madrid
 - Option B: Denali
 - Option C: San Andreas
 - Option D: Cascadia
 - Correct Answer: C
 - **Question:** Subduction involves one plate...
 - Option A: Sliding past another vertically
 - Option B: Moving upward onto another
 - Option C: Bending and descending beneath another
 - Option D: Breaking into smaller microplates exclusively
 - Correct Answer: C
 - **Question:** Plate tectonics helps scientists explain...
 - Option A: The composition of Earth's atmosphere
 - Option B: Locations of earthquakes and volcanoes
 - Option C: Lunar crater formation
 - Option D: Magnetic field reversals only
 - Correct Answer: B
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Reading Comprehension 5

• Paragraph: CRISPR-Cas9 is a genome-editing tool derived from a bacterial immune system. The Cas9 protein, guided by a short RNA sequence, binds to a complementary DNA target and introduces a double-strand break. Cells repair this break either by error-prone non-homologous end joining, which can disable a gene, or by precise homology-directed repair when a template is supplied. CRISPR's simplicity allows scientists to modify genes in plants, animals, and human cells, raising both therapeutic hopes and ethical debates.

- **Question:** CRISPR-Cas9 originates from...
- Option A: Viruses
- Option B: Fungi

- Option C: Bacteria
 - Option D: Human stem cells
 - Correct Answer: C

 - **Question:** What directs Cas9 to a specific DNA site?
 - Option A: A protein tag
 - Option B: A short RNA guide
 - Option C: A lipid envelope
 - Option D: A magnetic field
 - Correct Answer: B

 - **Question:** The cell's error-prone repair pathway is called...
 - Option A: Homology-directed repair
 - Option B: Non-homologous end joining
 - Option C: Base excision repair
 - Option D: Photoreactivation
 - Correct Answer: B

 - **Question:** Supplying a repair template enables...
 - Option A: Random mutations only
 - Option B: Precise gene edits
 - Option C: Protein translation
 - Option D: RNA splicing
 - Correct Answer: B

 - **Question:** Which topic is most debated about CRISPR?
 - Option A: Its cost in agriculture
 - Option B: Ethical concerns in human therapy
 - Option C: The colour of edited plants
 - Option D: Recycling DNA waste
 - Correct Answer: B
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Reading Comprehension 6

• Paragraph: In quantum physics, entanglement links two particles so that measuring the state of one instantly defines the state of the other, regardless of the distance between them. Einstein called the effect “spooky action at a distance,” yet experiments with entangled photons consistently violate Bell’s inequalities, supporting quantum mechanics. Entanglement underpins quantum cryptography and the promise of quantum computing,

where qubits can represent 0 and 1 simultaneously, enabling certain calculations to outpace classical computers.

– **Question:** Entanglement implies that two particles...

- Option A: Occupy the same space always
- Option B: Share correlated states even when separated
- Option C: Lose all measurable properties
- Option D: Repel each other strongly

– Correct Answer: B

– **Question:** What test is used to verify entanglement experimentally?

- Option A: Rutherford scattering
- Option B: Bell's inequalities
- Option C: Ohm's law
- Option D: Doppler shift

– Correct Answer: B

– **Question:** Einstein's phrase for entanglement was...

- Option A: Cosmic ballet
- Option B: Spooky action at a distance
- Option C: Relativistic drag
- Option D: Quantum vacuum

– Correct Answer: B

– **Question:** A qubit differs from a classical bit because a qubit can...

- Option A: Store larger files
- Option B: Be both 0 and 1 simultaneously
- Option C: Consume no energy
- Option D: Function only at high temperatures

– Correct Answer: B

– **Question:** One practical use of entanglement today is...

- Option A: Quantum cryptography
- Option B: Petrol refining
- Option C: Photosynthesis enhancement
- Option D: Mechanical clock timing

– Correct Answer: A

Reading Comprehension 7

▪ Paragraph: Climate feedback loops amplify or dampen initial temperature changes. A well-known positive feedback involves Arctic sea ice: as global temperatures rise, ice melts, exposing darker ocean water that absorbs more solar energy and accelerates warming. Conversely, some clouds can act as negative feedback by reflecting sunlight back into space. Understanding the net impact of competing feedbacks remains one of the largest uncertainties in predicting future climate scenarios.

– **Question:** A positive climate feedback...

- Option A: Reduces the initial temperature change
- Option B: Amplifies the initial temperature change
- Option C: Has no effect on temperature
- Option D: Always cools the planet

– Correct Answer: B

– **Question:** Melting sea ice leads to further warming because...

- Option A: Ice releases greenhouse gases
- Option B: Darker water absorbs more sunlight
- Option C: Oceans emit sulphur compounds
- Option D: Polar bears migrate south

– Correct Answer: B

– **Question:** Certain low-level clouds can serve as...

- Option A: Positive feedback only
- Option B: Negative feedback by reflecting light
- Option C: Heat sources
- Option D: Indicators of volcanic eruptions

– Correct Answer: B

– **Question:** The phrase “largest uncertainties” refers to...

- Option A: Weather forecasts next week
- Option B: Predicting the net effect of feedbacks
- Option C: Calculating Earth’s current radius
- Option D: Measuring sea-level pressure today

– Correct Answer: B

– **Question:** Which of the following is not a feedback mechanism?

- Option A: Ice-albedo effect
- Option B: Greenhouse gas emissions from human industry (trick)
- Option C: Water-vapour amplification
- Option D: Cloud-albedo changes

– Correct Answer: B

Reading Comprehension 8

• Paragraph: In machine learning, overfitting occurs when a model captures noise in the training data instead of the underlying pattern. Such a model performs excellently on the samples it has seen but poorly on new, unseen data. Common remedies include cross-validation, regularization techniques like L2 weight decay, and gathering more diverse training examples. Monitoring the gap between training and validation error during epochs is a standard practice to detect overfitting early.

– **Question:** Overfitting is best described as a model that...

- Option A: Under-represents the training data
- Option B: Memorizes noise instead of true patterns
- Option C: Generalizes well
- Option D: Has zero parameters

– Correct Answer: B

– **Question:** Which practice helps detect overfitting?

- Option A: Ignoring validation data
- Option B: Tracking training-validation error gap
- Option C: Using only one large epoch
- Option D: Scaling inputs randomly after training

– Correct Answer: B

– **Question:** L2 weight decay is a form of...

- Option A: Data augmentation
- Option B: Regularization
- Option C: Gradient explosion
- Option D: Feature scaling

– Correct Answer: B

– **Question:** Gathering more varied data generally...

- Option A: Increases overfitting
- Option B: Decreases model capacity
- Option C: Improves generalization
- Option D: Lowers sample diversity

– Correct Answer: C

– **Question:** A sign of overfitting during training is...

- Option A: Validation loss decreasing steadily
- Option B: Training loss plummeting while validation loss rises (trick)

- Option C: Equal losses on both sets
 - Option D: High bias and low variance
 - Correct Answer: B
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Reading Comprehension 9

• Paragraph: Bayesian inference updates the probability of a hypothesis as new evidence arrives. Starting with a prior belief, the observer multiplies it by the likelihood of the observed data under that hypothesis, then normalizes to obtain the posterior probability. This framework formally balances prior knowledge and incoming information, making it valuable in fields from medical diagnosis to autonomous-vehicle perception. However, computing posteriors exactly can be intractable for complex models, so approximations such as Markov-chain Monte Carlo or variational inference are often employed.

– **Question:** The initial belief in Bayesian inference is called the...

- Option A: Likelihood
- Option B: Prior
- Option C: Posterior
- Option D: Evidence

– Correct Answer: B

– **Question:** Posterior probability combines prior and...

- Option A: Random noise
- Option B: Likelihood
- Option C: Gradient descent
- Option D: Hyperparameters

– Correct Answer: B

– **Question:** Bayesian methods are useful in autonomous vehicles for...

- Option A: Updating perception with new sensor data
- Option B: Designing fuel injectors
- Option C: Cooling the engine
- Option D: Painting car bodies

– Correct Answer: A

– **Question:** Exact posterior calculation may be impossible because...

- Option A: Data are always noisy
- Option B: Models can be mathematically complex

- Option C: Priors cannot be chosen
 - Option D: Probability is subjective
 - Correct Answer: B
 - **Question:** Markov-chain Monte Carlo is primarily an...
 - Option A: Optimization algorithm
 - Option B: Approximation technique for posteriors
 - Option C: Encryption method
 - Option D: Image filter
 - Correct Answer: B
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Reading Comprehension 10

• Paragraph: Gravitational waves are ripples in spacetime produced by accelerating masses, predicted by Einstein's general relativity. When two black holes spiral together and merge, they radiate energy outward as waves that stretch and compress space itself. The Laser Interferometer Gravitational-Wave Observatory (LIGO) detects these minute distortions using laser beams in long vacuum arms; the first direct observation in 2015 confirmed a century-old theory. Gravitational-wave astronomy now enables scientists to study cosmic events invisible to traditional telescopes.

- **Question:** Gravitational waves were first directly detected in...
- Option A: 1915
- Option B: 1969
- Option C: 2015
- Option D: 2025
- Correct Answer: C
- **Question:** Which instrument detected the waves?
- Option A: Hubble Space Telescope
- Option B: CERN's Large Hadron Collider
- Option C: LIGO
- Option D: Voyager 1
- Correct Answer: C
- **Question:** Gravitational waves arise when...
- Option A: A star shines steadily
- Option B: Masses accelerate, like merging black holes

- Option C: Planets align in a straight line
- Option D: Light passes through a prism

– Correct Answer: B

– **Question:** According to Einstein, these waves are ripples in...

- Option A: Magnetic fields
- Option B: Spacetime
- Option C: Solar wind
- Option D: Dark matter halos

– Correct Answer: B

– **Question:** A key advantage of gravitational-wave astronomy is that it...

- Option A: Uses no electricity
- Option B: Reveals events invisible to light-based telescopes
- Option C: Replaces all electromagnetic observations
- Option D: Eliminates scientific uncertainty

– Correct Answer: B