



## **AP<sup>®</sup> Biology 2005 Scoring Guidelines Form B**

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**Question 1**

**Part (a)** (6 points maximum)

Answer must include at least one environmental point (*how*) and one survivorship point (*why*) to reach the 3-point maximum for each behavior.

Students were instructed to choose TWO types of behavior

**Taxis/Kinesis**

*How:* Identification of environmental stimulus/trigger (e.g., light, moisture, pH, nutrients, temperature)

*Why:* Adaptiveness of response (e.g., escape from predators, find food, avoid desiccation)

**Migration**

*How:* Identification of environmental stimulus/trigger (e.g., changes in light/dark cycle, nutrients, temperature, ecological changes/catastrophes)

*Why:* Adaptiveness of response (e.g., access to food, water, nutrients, temperature tolerance)

**Courtship**

*How:* Identification of environmental stimulus/trigger (e.g., changes in light/dark cycle, nutrients, temperature, ecological changes/catastrophes)

*Why:* Adaptiveness of response (e.g., mated pair has better access to food, water, nutrients, temperature tolerance) increasing survival of parents and/or offspring

**Part (b)** (2 points maximum per curve)

The justifications are required for any credit to be awarded.

“Large” and “small” assignments for herbivores are interchangeable if the appropriate justification is provided in the essay. Partial credit for stating that curve A is the predator was awarded in essays that stated the predator readily switched between large and small herbivores as its prey.

Curve A

- large herbivore
- population not affected by predators in curve C
- food sources constantly available; eats different food than small herbivore

Curve B

- small herbivore
- largest population size
- short generation time
- population decreases as predator increases

Curve C

- predator
- smallest population size
- increase of predators follows increase of herbivores; increase of predators drives decrease of herbivores

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**Question 2**

NOTE: Every point awarded must answer *how*. To earn a point, a *mechanism* must be described for each adaptation.

**Flowering Plants** (6 points maximum)

<b>Flower</b> (2 points maximum)	<b>Fruit/Seed</b> (2 points maximum)	<b>Broad Leaves</b> (2 points maximum)
Structure for reproduction involving animal vectors to fertilize	Food enhances dispersal by animals (fruit)	Greater surface for energy capture
Pollination—comparison to nonangiosperm	Dormancy enhances survival (seed)	Enhanced photosynthetic activity: more chloroplasts; more photosystem energy harvest; more photosynthetic cells
Pollination—comparison to flagellated sperm	Structure enhances dispersal; embryo protected within seed (seed coat)	Must include mention of increased light energy harvest (e.g., no points for improved gas exchange, stomata, transpiration)
Pollination—comparison to wind-blown pollen	Endosperm (food for embryo)	
Genetic diversity—cross pollination		
Color and odor attracts specific pollinators		

**Flatworms** (6 points maximum)

<b>Three Germ Layers</b> (2 points maximum)	<b>Bilateral Symmetry</b> (2 points maximum)	<b>Cephalization</b> (2 points maximum)
Elaboration of organ systems: digestive, reproductive, excretory	Elaboration of body form: A/P; d/v; L/R	Elaboration of sensory organs
Specialization of cells	Forward movement facilitated	Centralized nervous system
		More sophisticated responses to stimuli
		Consequence of bilateral symmetry

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**Question 2 (continued)**

**Segmented Worms** (6 points maximum)

<b>Segmentation</b> (2 points maximum)	<b>Coelom</b> (2 points maximum)	<b>Complete Digestive System</b> (2 points maximum)
Compartments = efficient regional specializations possible; expression of homeotic genes	Elaboration of organs	Regions of specialization
Development of muscular movement	Separation of internal organs from body tube	Improved processing of food: continuous throughput of materials
Repetition of body parts	Development of muscular movement	
	Hydrostatic skeleton	

**Reptiles** (6 points maximum)

<b>Amniotic Eggs</b> (2 points maximum)	<b>Waterproof Skin</b> (2 points maximum)	<b>Well-developed Lungs</b> (2 points maximum)
Not necessary to return to water for reproduction	Prevents drying out on land	Better able to exchange gas with atmosphere
Protection for embryo/leathery shell	Mechanical/chemical protection of body	Adaptation to terrestrial habitats; gas exchange with <i>air</i> instead of water
Prevents desiccation of embryo (shell)	Permits adaptations to land habitats	Internal, folded up inside body—moist gas exchange surface does not dry out, also protected from damage
More efficient reproduction: internal fertilization; fewer gametes required	No points for survival in water unless linked to reduced water loss on land	Necessary consequence of waterproof skin
Embryonic membranes: food supply stored in yolk; amnion protecting embryo from mechanical damage		No points for holding breath or breathing underwater
New hatchlings more fully developed		

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**Question 3**

NOTE: To receive 10 points, a student must earn at least 1 transcription point and 1 translation point from parts (a), (b), or (c).

**Parts (a), (b), and (c)** (9 points maximum)

**Part (a)**

<b>Transcription</b>	<b>Translation</b>
<ul style="list-style-type: none"> <li>• DNA template</li> <li>• complimentary RNA (base-pairing)</li> <li>• RNA produced by RNA polymerase</li> <li>• promoter region/TATA box</li> <li>• transcription factors</li> <li>• DNA unwound (partially, temporarily)</li> <li>• posttranscriptional processing</li> </ul>	<ul style="list-style-type: none"> <li>• mRNA template</li> <li>• codon/anticodon</li> <li>• tRNA carries amino acid</li> <li>• role of ribosome</li> <li>• initiation (fMet, Shine-Delgarno)</li> <li>• elongation (peptide bond formation)</li> <li>• termination description</li> </ul>

**Part (b)**

NOTE: Students must provide specific similarity AND explanation to earn a point.

<b>Similarity</b>	<b>Explanation</b>	
	<b>Transcription</b>	<b>Translation</b>
• base pairing	DNA–RNA, specific base examples	mRNA–tRNA (codon–anticodon), specific base examples
• polymer formed	RNA	polypeptide
• specialized protein	RNA polymerase	initiation factors, etc.
• specific start sites	promoter/TATA	initiation (start) codon

**Part (c)**

NOTE: Students must provide specific difference AND explanation to earn a point.

<b>Difference</b>	<b>Explanation</b>	
	<b>Transcription</b>	<b>Translation</b>
• location in cell (eukaryote)	nucleus	cytoplasm, rough ER
• product	RNA	polypeptide
• template	DNA	mRNA
• purpose	transfer information	make proteins
• enzymes	RNA polymerase	peptide bond-forming enzyme (peptidyl transferase)

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**Question 3 (continued)**

**Part (d)** (3 points maximum)

- Folding
- Cleavage
- Chemical modification
- Elaboration—specifics of folding, chaperones, types of bonds, role of Golgi, incorporation into existing molecular arrays, etc.

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**Question 4**

**Part (a)** (3 points maximum)

- Orientation of axes, labels, scales, units.
- Data points (one mistake permitted) and line drawn.
- Determine molar concentration of potato cells. (Note: This point must be read from graph. It should fall into the range of 0.25 to 0.4 *M*.)

**Part (b)** (4 points maximum)

Components of water potential (1 point maximum)

- Pressure potential AND solute/osmotic potential/( $\psi = \psi_p + \psi_s$ )

Importance of water potential/as related to water movement (3 points maximum)

- Ensures water moves into plant root.
- Helps movement of water within plant.
- Factor involved in transpiration.
- Cell wall allows for increased pressure (turgor pressure).
- Pressure might counteract osmolarity.

**Part (c)** (4 points maximum)

	<b>Prediction</b>	<b>Explanation</b>	
0.0 <i>M</i>	Gain water/mass Swell/burst/lyse	<ul style="list-style-type: none"> <li>• Cell is hypertonic to sucrose solution.</li> <li>• Sucrose solution is hypotonic to cell.</li> <li>• Water potential is greater in 0.0 <i>M</i> environment.</li> <li>• No cell wall.</li> <li>• Cell moving toward equilibrium (isotonic).</li> </ul>	2 points maximum
1.0 <i>M</i>	Lose water/mass Shrivel/crenate	<ul style="list-style-type: none"> <li>• Cell is hypotonic to sucrose solution.</li> <li>• Sucrose solution is hypertonic to cell.</li> <li>• Water potential is greater inside animal cell.</li> <li>• Cell moving toward equilibrium (isotonic).</li> </ul>	2 points maximum