

**Grading Standards
Biology 3201
June 2007**

Pre-Marking Appraisal

The June 2007 biology exam was considered a fair exam, well designed, and of reasonable length and difficulty.

Post Marking Report

Marking Standard and Consistency

Marker reliability was checked by obtaining a random sample of 50 papers that went through the marker panel and marks were assigned to each question on a separate sheet of paper. The 50 exams were put back into the original stack of exams and corrected again when they appeared. The two values were compared and if there were discrepancies, the chief marker would review the scoring with the individual marker.

Throughout the marking process there were statistical analysis ran on item data to enhance reliability and consistency of marking.

Each marker also made on-going notes regarding partial marks and scoring for their particular question. Whenever a non-common error occurred, it was scored by consensus of the board and made note of, for scoring consistency.

Summary

Overall performance in the Biology 3201 examination was slightly lower in June 2007 than in June 2006. As in past years performance was lower for items that assessed outcomes at higher cognitive levels. It is important that students be exposed to higher order questioning throughout the year.

Very often it appeared students did not read questions carefully and critically.

Commentary on Responses

Part I – Selected Response – Total Value: 75%

- Item # 6: Acetylcholine was selected slightly more frequently than the correct answer. Most students recognized acetylcholine because it is referenced in the text as a common neurotransmitter but it is not the most common excitatory neurotransmitter in the brain.
- Item # 8: This question was based on a core laboratory. Students had an equal selection of the Achilles reflex and the Babinski reflex as their answer. It is clear in the laboratory procedure as to where to strike or stroke various parts of the body to attain the Achilles reflex. Stroking the bottom of the feet will give a reaction but not a Babinski reflex unless there is neurological damage.
- Item # 31: The selection of choice “A – blocked oviducts” as the incorrect answer arose from the phrase in the stem “unable to have children”. Students did not recognize the other symptom (painful menstruation) used in the stem to direct them to the correct choice.
- Item # 42: The key word in this question was “girl” which required that students look to the Product Rule or Punnett Square section that deals with girls only and not all genotypes.

Part II - Constructed Responses – Total Value: 25%

Value

2% 76.(a) Describe two differences between nerve responses and endocrine responses.

Answer:

Nerve Response	Endocrine Response
Nerve responses are fast.	Endocrine responses are slower in comparison to nerve responses.
Nerve responses require ions & neurotransmitters.	Endocrine responses require hormones.
Nerve responses require the nervous system to create responses.	Endocrine responses require the circulatory system.
Nerve responses require a threshold to occur.	Endocrine responses do not require any threshold value.
Nerve responses are of a short duration.	Endocrine responses are longer lasting.
Nerve responses are direct from nervous system to an effector.	Endocrine responses are indirect in that a second messenger may have to be used or one gland has to stimulate another gland to produce a response.

Scoring

1 mark for each difference. If students made reference to one response but not the other, 0.5 marks were given. For example, stating that “nerve responses require the use of the nervous system” but not following with the other difference.

Commentary on Response

The word “responses” appeared to have distracted students in this question. Students tended to answer the question from a perspective of the differences between the two “systems”. A large number of these differences between systems were accepted by the marker.

Common Error

The most common error was not to make clear differences in the responses but to give an answer that had a variety of characteristics of each system.

Value

3% 76. (b) A person exhibits increased appetite, muscle weakness, increased metabolic rate, excessive heat production, sweating and warm skin. What is the probable cause of this condition and give two ways it can be treated?

Answer:

Excess secretion of thyroxin from the thyroid gland (hyperthyroidism) /Graves' Disease

Methods of treatment

1. Surgically remove part of the thyroid gland.
2. Use anti-thyroid drugs to suppress the production of thyroxin.
3. Use radioactive iodine to help destroy an overactive area of the thyroid gland.
4. Injection of thyroid hormones.
5. Reduce iodinated salt in the diet.

Scoring

1 mark for the cause. 0.5 marks were given if the student indicated that there was a problem with the thyroid gland. 1 mark for each treatment method.

Commentary on Response

If students chose the wrong condition, this reduced their chances of getting the treatment methods correct, thereby losing marks. Many students did not attempt this question, which reduced the overall average on this item.

Common Errors

The most common error was to give the incorrect cause of the symptoms. Pregnancy and diabetes were given as answers but these choices did not account for all the symptoms listed.

Value

3% 77. (a) Describe three differences between human egg cells and sperm cells

Answer:

Egg	Sperm
Very large in comparison to the sperm	Very small in comparison to the egg
Contains all organelles necessary for life	Contains few but not enough organelles to survive long
Non-motile	Motile
Has about one day energy reserve	Has both internal & external energy source
Contains over 100,000 mitochondria	Contains less than 100 mitochondria
Short life span	Longer life span
No acrosome	Acrosome present

Scoring

1 mark was given for each difference. 0.5 marks were given if one difference was given but not the other. For example, stating that “sperm are motile” but not following with the other difference.

Common Error

Students did not complete the difference in a characteristic.

Value

2% 77. (b) Give two reasons why underdeveloped countries have high birth rates.

Answer:

1. People are under-educated and lack birth control knowledge.
2. People lack money and cannot afford the cost of purchasing birth control.
3. There is a high infant mortality rate due to inadequate or non-existent medical technology so natality rate will be high for replacement purposes.
4. Cultural or religious values prevent the use of birth control methods.

Scoring

1 mark for each reason. 0.5 marks were given if the student used a term and did not support it well in relation to high birth rates.

Value

2 % 77. (c) Vinblastine is a standard therapeutic drug used in the treatment of cancer. It prevents the formation of spindle fibres during mitosis.

(i) How does this drug affect chromosome movement?

Answer:

Spindle fibres are essential in the movement and separation of chromosomes during mitosis. If the spindle fibres do not form, the chromosomes cannot move to metaphase.

Scoring

1 mark for the answer. 0.5 marks were given if students referenced that mitosis was stopped.

Commentary on Response

The link of spindle fibres and chromosome movement was not answered as well as expected.

Common Error

Students said that the drug slowed the chromosome movement.

(ii) Why is the drug effective in the treatment of cancer?

Answer:

Cancer cells are rapidly dividing cells. If the spindle fibres are prevented from forming, the cell cannot divide, it dies and the cancer cell growth is stopped.

Scoring

1 mark for the answer. 0.5 marks were given if they only said it killed the cell or that cancer cells grew fast.

Commentary on Response

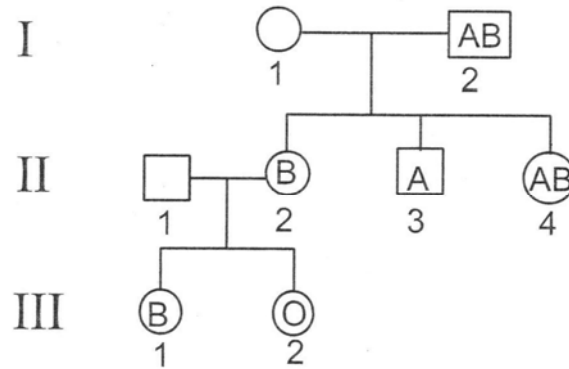
Students did not reference the fact that cancer cells grow very rapidly and that spindle fibres are essential in the division of any cell.

Common Error

Students did not make the connection between spindle fibres being used for chromosome separation and cell division.

Value

2% 78. (a) The pedigree below shows the human blood types for three generations of a family. What is one possible genotype of individual 1-I? Explain.



Answer:

Possible genotypes are $I^A i$ or $I^B i$

For III-2 to be 'O' blood type, both parents (II-1 & II-2) must be heterozygous so that leaves II-2 to be $I^B i$. To be $I^B i$, and one parent already being 'AB', the other parent has to be $I^B i$ or $I^A i$.

Scoring

0.5 marks for the genotype and 1.5 marks for the explanation. 0.5 marks were also given to students who worked correctly back to generation II but were incorrect in determining the genotype in generation I. Also, students were given 0.5 % if a phenotype with genotypic words were used such as heterozygous type A.

Commentary on Response

This question did not score well because of its higher degree of difficulty. The concept of pedigree charts and blood types were linked together and the students had to work backwards for two generations. This was a higher order question that required students to start at generation III and work backwards. Students were not always successful with working back to generation I and tended to stop at generation II.

Common Error

Students would give a phenotype rather than a genotype. Also, students would stop at generation II assuming they had the answer. Some students looked at this as a pedigree chart only inferring that it was sex-linked.

Value

4%

- (ii) What is the chance that the couple's next child will have a widow's peak and short fingers? Show workings.

Answer:

Probability is 25 % or $\frac{1}{4}$

To get a widow's peak and short fingers, you need one dominant allele for each trait. Thus, it must be WS. There is only one genotype in the Punnett Square.

	Ws	Ws
wS	WwSs	WwSs
ws	Wwss	Wwss

Scoring

0.5 marks for the probability or chance, 1.5 marks for the workings. If students produced a wrong parental genotype to start their reasoning and performed the cross properly, 1.5 marks given for process.

Common Error

Students interpreted the words "couple's next child" as a prompt to multiply $\frac{1}{4}$ by $\frac{1}{2}$ to get $\frac{1}{8}$.

Value

2% 78. (c) Give two reasons why the moose population on the island of Newfoundland might differ from the moose population in Labrador.

Answer:

1. Newfoundland moose may undergo genetic drift from a “founder effect/population” population. Only 6 moose were introduced to insular Newfoundland. Founder effect can cause an over representation or under representation of alleles for this small group.
2. Newfoundland moose may also undergo genetic drift from “bottleneck effect”. The introduction of 6 moose is the same as founder effect.
3. There is no gene flow in this population so the allele frequencies will not change. Labrador moose can migrate to other provinces, breed and allow allele frequencies to change.
4. There is inbreeding occurring in this population since the original population size was very small. Inbreeding does not change allele frequencies.
5. Artificial selection brought on by hunting animals could cause allele frequency shifts.
6. Habitat isolation, biological barriers (pre- and post-zygotic barrier) could be occurring on the island of Newfoundland.

Scoring

1 mark for each reason. 0.5 marks were given if the student used one part of the answer but did not make the reference to Labrador.

Commentary on Response

This question had a variety of possible answers but students did clearly state the differences. Most students recognized that Newfoundland was an island but did not explain how geographic isolation would bring about an effect.

Common Error

Many students stated that there was a size difference between the populations.

Value

2% 79. (a) Lake Vostok is a large freshwater lake buried below four kilometers of ice in Antarctica. The extreme conditions in the lake appear to be quite different from all other parts of Earth. Some scientists are seeking approval to insert a robot probe from the surface of Earth down into the lake to obtain a sample of water. Give two reasons why scientists want a sample of water from Lake Vostok.

Answer:

1. Extremophiles may exist in this lake that may contain bacteria with new restriction endonucleases. These can be used in genetic engineering.
2. The water may contain life forms that are representative of early life forms on Earth which can bring insight into the evolution of organisms.
3. The water may contain gases that were present in Earth's early atmosphere. This will allow scientists to make better assumptions about the early atmosphere.

Scoring

1 mark was given for each reason. 0.5 marks were given if the student made reference to outer space research.

Commentary on Response

Those students who did well on this question would have read the STSE relating to this outcome.

Value

2% 79. (b) The half life of uranium-235 is 713 million years. What fraction of the U-235 remains in the fossil after 2139 million years? Show workings.

Answer:

There are two ways to solve this problem. The first method is to determine how many half life events have occurred by dividing 2139 by 713 to find three half lives. The student would then multiply $\frac{1}{2}$ three times to get $\frac{1}{8}$. The second method is to use the half life formula

$$N_f = N_o \left(\frac{1}{2} \right)^{\frac{t}{h}}$$

Scoring

0.5 marks were given for the fraction or percent and 1.5 was given for showing the method.

Commentary on Response

Percentages were also accepted in this question.

Common Error

There were a noticeable number of students who wrote the three $\frac{1}{2}$'s out on paper and came up with $\frac{1}{6}$. Another common error was to divide 713 by 2139 and come up with $\frac{1}{3}$.

TABLE 1
BIOLOGY 3201 ITEM ANALYSIS
SELECTED RESPONSE (PART I)

Item	Answer	Responses			
		A	B	C	D
		%	%	%	%
1	D	26.3	7.0	1.0	65.5
2	A	77.7	6.8	5.3	10.1
3	C	5.4	11.1	79.8	3.6
4	D	4.9	5.2	7.9	82.0
5	B	26.4	63.8	8.6	1.0
6	B	29.8	28.2	24.4	17.6
7	B	8.6	23.8	39.3	28.2
8	B	44.4	44.2	6.6	4.6
9	A	64.1	11.8	6.9	17.1
10	C	5.7	17.3	73.1	3.7
11	A	38.0	5.0	29.3	27.7
12	C	9.3	20.7	60.9	8.9
13	C	2.8	4.0	83.6	9.4
14	A	73.1	7.6	8.4	10.8
15	C	3.5	24.2	47.2	25.1
16	B	5.2	79.3	9.9	5.5
17	B	20.0	58.0	8.9	13.1
18	D	26.9	9.9	4.7	58.4
19	C	13.8	18.8	56.5	10.7
20	A	76.8	10.6	1.4	11.0
21	D	12.0	10.2	11.1	66.5
22	A	64.1	17.9	12.7	5.3
23	B	30.3	28.7	33.7	6.9
24	A	62.7	3.6	30.0	3.6

Item	Answer	Responses			
		A	B	C	D
		%	%	%	%
25	C	1.0	6.4	92.2	0.4
26	A	65.0	7.3	26.4	1.1
27	A	50.0	14.6	33.3	2.1
28	D	14.9	12.7	17.3	55.1
29	B	14.2	60.1	17.5	8.1
30	D	14.8	20.3	19.3	45.5
31	C	46.0	2.6	46.7	4.7
32	C	12.4	10.1	43.2	34.2
33	C	15.4	26.9	47.1	10.6
34	C	9.3	18.9	62.4	9.1
35	B	0.5	87.7	2.2	9.5
36	B	27.6	64.5	5.7	2.2
37	D	2.2	10.7	25.8	61.3
38	B	6.7	86.5	4.4	2.4
39	A	65.9	6.4	26.9	0.7
40	D	3.5	13.9	20.2	62.4
41	C	9.4	16.7	56.5	17.3
42	B	6.4	32.9	57.7	2.8
43	B	13.7	69.9	13.9	2.3
44	A	40.0	21.1	29.4	9.2
45	D	24.9	21.8	7.2	45.9
46	C	11.2	6.4	75.7	6.5
47	D	16.2	13.5	7.3	62.9
48	D	12.1	7.0	11.2	69.2
49	B	1.3	96.2	0.8	1.6
50	B	8.3	78.6	5.6	7.4
51	A	41.7	22.7	15.7	19.8

Item	Answer	Responses			
		A	B	C	D
		%	%	%	%
52	B	7.5	78.6	7.1	6.7
53	B	24.2	59.0	14.1	2.6
54	C	4.2	3.8	21.8	70.1
55	B	14.5	57.0	6.3	22.1
56	D	6.2	2.2	19.5	71.9
57	C	10.4	15.8	67.5	6.1
58	C	13.7	14.1	44.8	27.3
59	D	9.4	30.4	13.1	46.8
60	C	2.9	6.6	85.9	4.5
61	D	2.9	7.6	18.3	71.0
62	A	62.5	31.8	5.1	0.6
63	A	32.9	25.0	36.8	5.1
64	A	60.1	24.2	6.4	9.1
65	A	76.7	5.1	12.7	5.4
66	B	9.2	70.7	16.7	3.2
67	C	7.5	9.9	70.4	12.0
68	C	8.3	8.4	73.0	10.1
69	A	67.1	1.5	28.0	3.3
70	A	49.1	16.7	18.9	14.9
71	D	13.0	12.1	10.2	64.7
72	C	5.0	20.6	64.1	10.0
73	A	64.6	8.9	11.0	15.5
74	C	15.7	23.1	53.8	7.1
75	B	10.0	43.3	39.4	7.0

NOTE: Percentages may not add to 100% due to multiple responses or missing values.

**BIOLOGY 3201 ITEM ANALYSIS
CONSTRUCTED RESPONSE (PART II)**

Item	Number of Students Completing Item	Value	Average
76 (a)	3433	2	1.2
76 (b)	3433	3	1.4
77 (a)	3433	3	2.4
77 (b)	3433	2	1.8
77 (c)	3433	2	1.2
78 (a)	3433	2	0.7
78 (b)	3433	5	3.1
78 (c)	3433	2	1.3
79 (a)	3433	2	1.2
79 (b)	3433	2	1.1