Biology 3201 Grading Standards
June 2006

Pre-Marking Appraisal

The examination was considered fair and had sufficient coverage of each unit of study and each level of cognitive learning. The following decisions were made by the marking board:

Item # 4 –   Both A and B were accepted as an answer for this item. The most common medicinal use of marijuana for treating Parkinson's disease is to control skeletal muscles. However, the most common medicinal use for marijuana is to control pain. The board concluded that both alternatives are possible answers because a person with Parkinson's disease could take marijuana to control pain.

Item # 58 –   Both A and B were accepted as an answer for this item. The word "best" implies there is one better answer than another but it was determined that this question was not specific enough to discriminate the better choice. If the stage of fetal development had been identified then one answer could have been chosen.

Post Marking Report

a) Marking Standard and Consistency

Marker reliability was checked by obtaining a random sample of 50 papers. On the first marking day, these 50 papers were marked and the value for each question was recorded on a separate sheet of paper. The 50 papers were put back into the original stack of papers to be corrected over the next week. Throughout the marking period, these reliability papers were corrected by the markers, the two values were compared and if there were discrepancies in the marks, the chief marker would discuss and review the scoring with the individual marker.

b) Summary

Overall performance in the Biology 3201 examination improved from June 2005 to June 2006. As in past years, however, performance was lower for items that assessed outcomes from core Labs and STSE units. Core Labs and STSE units enrich and enhance material in each unit of the course. It is essential that teachers complete all core labs and STSE units to ensure that students are prepared for the examination. On provincial examinations, core Lab and STSE outcomes are often assessed at higher levels of learning. Teachers, therefore, should assess these areas of the course in a similar manner throughout the school year.

Teachers should also encourage students to read questions carefully and critically. Very often on the provincial examination, errors occur because students fail to read the whole question. If they read the complete question or read it several times, they are less likely to misinterpret the item and are more likely to perform better.

c) **Commentary on Responses**

**Part I – Selected Response - Total Value: 75%**

Item #53 –   Students did not perform well on this item because of a common misconception. Many students believe that a codon refers to mRNA only, but it actually refers to DNA and mRNA.

Item # 57 –   Students did not perform well on this item. The item requires students to revert the given mRNA sequence to DNA, make the deletion at the required point, and then use the amino acid table to determine the polypeptide sequence. Many students made an error at some stage of this multi-step process.

Item # 71 –   Students did not perform well on this item. The item requires students to use the homozygous dominant genotype and the heterozygous dominant genotype in their calculation because they both express the dominant trait. Most students only selected the homozygous dominant genotype.
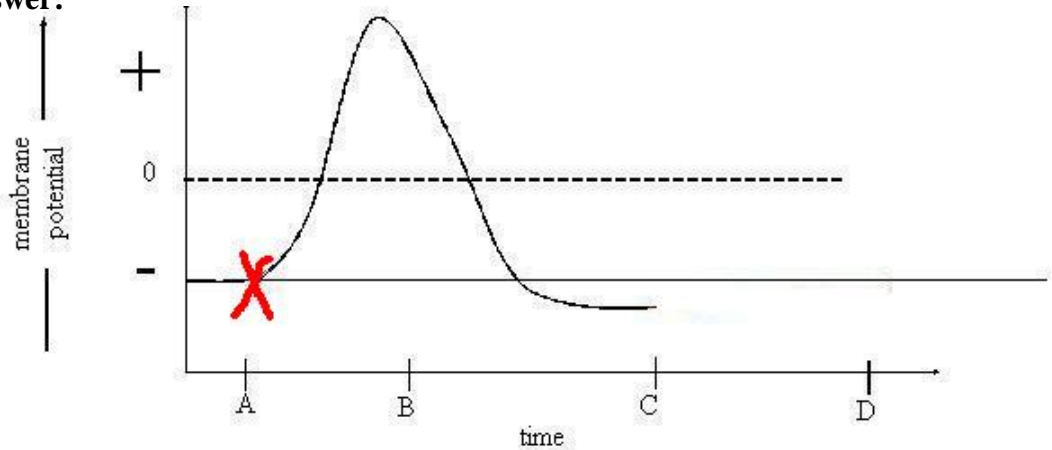
Part II – Constructed Response - Total Value: 25%

3%   76.(a) The graph below shows the membrane potential of the inside of a neuron.
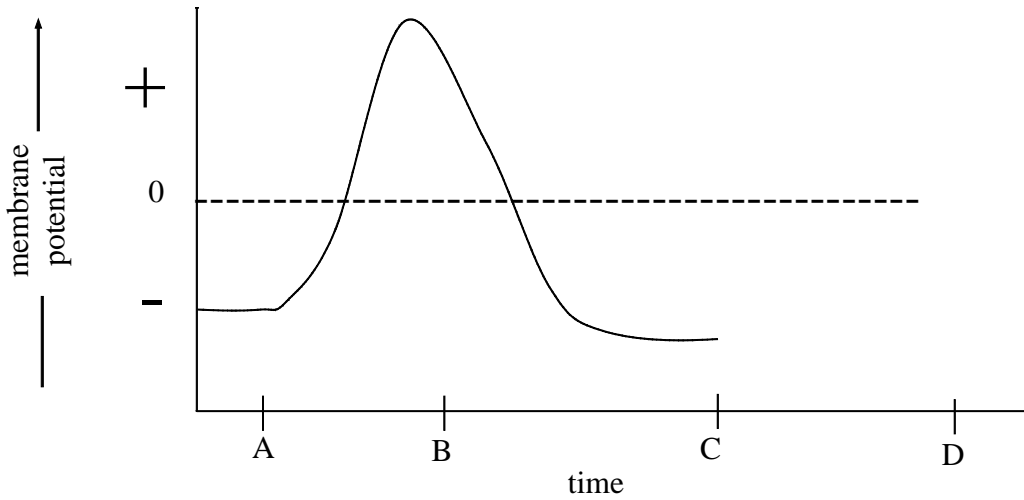
(i) Indicate on the graph, with ✕ when the neuron was stimulated. Justify your choice.

Answer:

1 mark - indicating the position of X

1½ marks   - The reversal of polarity (depolarization) begins at A and continues to B.
                  The change in polarity is caused by the sodium ions moving across the
                  membrane causing the inside to become more positive than negative.

Common Errors
Students:
- identified the top of the graph (B) as the point when the neuron was stimulated.
- identified that the point when the neuron was stimulated was when the membrane potential was zero.
- connected this graph to another graph used in unit 2 that shows the hormone levels of a human female during the menstrual cycle.

(ii)   Extend the graph above to show what the membrane potential would look like from time C to D, assuming there is no further stimulus.

Answer:
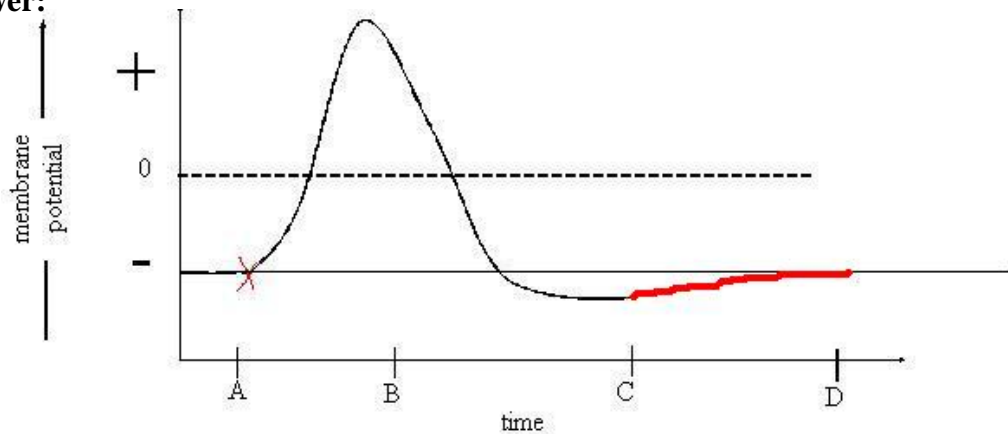
½ mark – extending the graph so that it returns to the original membrane potential

Commentary on Response
Many students did not answer this item.

Common Error
Students drew a straight line and did not extend it to its original membrane potential.

2% 76.(b) When humans consume excessive amounts of alcohol they lose their ability to reason, walk straight, and breathe normally. List two parts of the brain that are affected by alcohol consumption. Justify your choices.

Answer: Any two of the following:

Cerebrum	Cerebellum	Medulla Oblongota
Receives input from sense organs, processes the information and then produces an output. Alcohol slows this processing ability making decisions more difficult to make.	Controls skeletal muscle coordination. Alcohol slows the coordination of the contracting and relaxing of individual muscles in walking making it difficult to walk straight	Breathing centre of the brain. Alcohol acts as a depressant and slows breathing rate making it more difficult to breathe

1 mark – identifying any two of the three parts above as parts of the brain that are affected by alcohol consumption

1 mark – describing how each part identified is affected by alcohol consumption based on the fact that humans lose their ability to reason, walk straight, and breathe normally

Common Errors
Students:
-   identified the hypothalamus as a part of the brain that is affected by alcohol consumption.
-   did not connect the part of the brain to the conditions outlined in the item.

5%   77.(a) A couple have been trying to have a baby for over a year. Tests have shown that the male's sperm are healthy and numerous.

(i)   What are two possible causes of the couple's inability to conceive?

Answer: Any two of the following:

1. ovulation did not occur
2. scar tissue in the oviducts
3. endometriosis
4. damaged eggs
5. vagina is very acidic
6. vas deferens are blocked

2 marks – one mark each for identifying any two causes above

Common Error
Students stated that the female was infertile but did not explain what could cause the infertility.

(ii)   What is one way to correct this problem without using reproductive technologies?

Answer: Any one of the following:

1. monitoring ovulation times to select the best time for conception
2. changes in lifestyle such as dieting or strenuous exercise
3. hormonal supplements
4. surgery
5. removing environmental factors that can damage the eggs
6. adoption

1 mark – one mark for identifying one of the above

Common Error
Students identified reproductive technologies, such as surrogate motherhood and superovulation.

(iii)   What are two ways to correct this problem using reproductive technologies?

Answer: Any two of the following:
1. superovulation
2. IVF
3. IVM
4. surrogate motherhood
5. artificial insemination

2 marks – one mark each for identifying any two reproductive technologies above

Common Error
Students identified adoption as a method of reproductive technology.

2%   77.(b) Give two reasons why using adult stem cells for therapeutic cloning may be
                considered more desirable than using embryonic stem cells.

    Answer: Adult stem cells are more readily available and in much larger quantities than
                embryonic stem cells. The sources are varied and much easier to extract.
                There are less ethical issues with using adult stem cells because when
                embryonic stem cells are used, the cell is no longer functional.

    2 marks – one mark each for identifying each reason above

Commentary on Response
Most students identified ethical issues associated with using embryonic stem cells as a
reason for using adult stem cells. A half mark was awarded if ethical/moral issues were
mentioned with no reference to stem cells.

Common Error
Students focused on embryonic stem cells rather than adult stem cells.

3%   78.(a) In a cross between two pea plants, 50% of the offspring were tall and 75% had
round seeds. If tallness (T) is dominant to dwarfness (t) and round seeds (R) are
dominant to wrinkled seeds (r), what are the genotypes of the parents? Show all
your workings.

Answer: The first Punnett Square to get 50% tall, would have to be:

	T	t
t	Tt	tt
t	Tt	tt

Therefore, the possible parental genotypes for height are Tt or tt.

The second Punnett Square to get 75% round seeds would have to be:

	R	r
R	RR	Rr
r	Rr	rr

Therefore, the only possible parental genotype for seed shape is Rr.

Thus the combination of the two Punnett Squares results in the parental
genotypes, TtRr and ttRr.

1 mark - ½ mark was awarded for each parent, TtRr and ttRr.

2 marks - 1 mark for showing each Punnett Square.
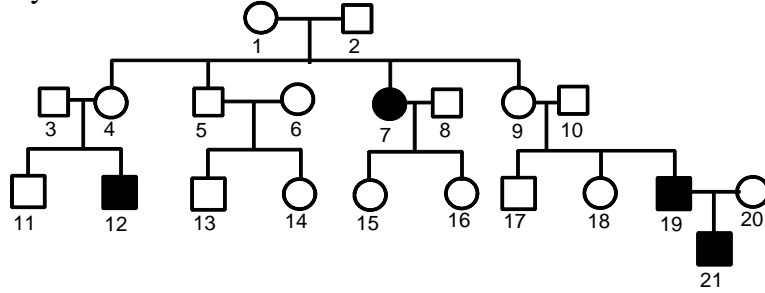
Common Errors
Students:
-   incorrectly calculated the gametic combinations from the parental genotypes.
-   used a dihybrid cross.

4%   78.(b) The pedigree below shows the occurrence of the recessive genetic disorder, PKU, in a family.

(i)   If the allele for PKU is n, what are the genotypes of individuals 7 and 20?

Answer: individual 7: nn   individual 20: Nn

2 marks - one mark each for the genotypes

Common Error
Students identified PKU as a sex-linked trait and therefore did not realize that individual 20 was a carrier, Nn.

(ii)   Is individual 3 a carrier of PKU? Explain why or why not.

Answer: Yes. For individual 12 to have PKU one recessive allele must come from both parents (individuals 3 and 4). Since neither parent showed the PKU condition (no blackened square or circle), then individual 3 must be a carrier.

1 mark – Yes

1 mark – explanation above

Common Error
Students identified PKU as a sex-linked trait.

2% 78.(c) Some farms in Newfoundland and Labrador are growing genetically modified tomato plants that contain antifreeze protein from cold water fish.

(i) Why would farmers want to do this?

Answer: Any one of the following answers:
1. This would extend the growing season.
2. Tomato plants could survive an early frost.
3. It would be a unique product that gave the farmer a marketing advantage.
4. There would be more ripening time for the fruit.

1 mark - one mark for identifying one of the above

Common Errors
Students:
- indicated that the insertion of the protein made the product more nutritious or made it more attractive (red, juicy, etc).
- referred to the antifreeze protein acting as a pesticide that would prevent insects from eating the tomato plants. This would reduce the use of pesticides on tomatoes.

(ii) Describe one way in which genetic engineering can be used to do this.

Answer: Any one of the following:
1. using a DNA particle gun to fire microscopic DNA coated particles into the plant cell
2. using viral or bacterial vectors to deliver the gene
3. using restriction enzyme to splice the gene into the plants DNA

1 mark - one mark for identifying one of the above

Commentary on Response
Partial marks were awarded when reference was made to one way above without any support for the genetic engineering technique.

Common Errors
Students:
- did not support the genetic engineering technique identified.
- identified GMO's, GMF's, PCR reactions, gel electrophoresis, or the Human Genome Project as a genetic engineering procedure.

2%   79.(a) If a polar bear mated with a black bear, give two reasons why the offspring would not be viable, fertile individuals.

Answer: Any two of the following:

1. Hybrid inviability – the hybrid offspring of two different species do not mature normally and usually die in the embryonic stage of development.
2. Hybrid sterility – the embryo does survive, grow to maturity but is unable to reproduce.
3. The incompatibility in the number, gene loci or size of chromosomes between the two species.
4. There is a noticeable difference in the size of the bears so a black bear female carrying a polar bear embryo may die from being too small to deliver the cub.

2 marks – one mark each for identifying any two reasons above

Commentary on Response
The underlying idea in this question is about post-zygotic barriers. Many students only gave one answer.

Common Error
Students referenced pre-zygotic barriers (habitat isolation, geographical separation), mechanical isolation and environmental differences.

2%   79.(b) An island contains a breeding population of moose. Recently, a white moose was born on the island. This also happened twenty years ago. If no animals have ever entered or left the island, give two reasons for the occurrence of the white moose.

Answer:
The white fur was due to the random mating of two heterozygous moose each carrying the recessive allele for white fur.
The occurrence of white fur was due to a random mutation of the gene responsible for pigmentation.

2 marks – one mark each for identifying the reasons above

Commentary on Response
Many students only gave one reason.

Common Errors
Students:
- stated that the moose changed to suit its environment.
- believed the moose mated with other species to get this color.
- believed that since Newfoundland is an island, the population experienced genetic drift.

TABLE 1

BIOLOGY 3201 ITEM ANALYSIS
SELECTEDRESPONSE (PART I)

Item	Answer	Responses			
		A	**B**	**C**	**D**
		%	**%**	**%**	**%**
1	D	11.6	5.6	14.9	67.8
2	B	2.1	77.3	7.0	13.5
3	C	2.2	30.2	64.7	2.8
4	Aor B	45.3	35.2	11.7	7.5
5	A	56.2	31.8	6.2	5.8
6	D	2.6	6.9	21.9	68.7
7	C	12.1	6.2	77.0	4.6
8	D	7.2	2.8	21.4	68.5
9	D	4.0	2.0	28.3	65.6
10	D	12.2	10.8	14.4	62.6
11	C	5.7	14.5	72.2	7.7
12	A	64.4	14.8	18.9	1.8
13	D	3.1	10.9	1.0	85.0
14	B	7.0	89.5	2.0	1.4
15	A	40.8	22.0	28.8	8.3
16	B	17.3	72.0	7.9	2.8
17	C	18.3	18.2	45.0	18.2
18	D	24.2	26.4	1.6	47.7
19	B	12.1	61.0	25.5	1.4
20	B	14.6	57.9	14.7	12.7
21	B	7.3	66.6	16.3	9.7
22	D	17.9	4.9	19.3	57.7
23	B	18.0	69.9	5.2	6.7

Item	Answer	Responses			
		A	B	C	D
		%	%	%	%
24	B	8.3	71.1	16.0	4.5
25	D	19.5	13.7	5.2	61.6
26	A	37.4	30.4	18.0	14.1
27	A	91.9	0.9	0.3	6.8
28	A	90.1	1.5	6.4	1.9
29	B	10.5	63.9	20.4	5.1
30	D	5.3	43.7	4.8	46.0
31	B	7.1	62.5	12.6	17.7
32	C	16.9	16.7	62.5	3.4
33	B	20.5	47.9	31.0	0.5
34	D	31.2	1.1	7.9	59.8
35	B	9.1	64.5	15.1	11.3
36	A	85.7	6.5	5.9	1.9
37	B	12.4	83.6	1.4	2.5
38	C	6.8	12.4	74.4	6.4
39	B	6.1	87.9	5.0	1.0
40	A	71.6	6.7	12.6	9.0
41	B	28.4	62.5	5.9	3.2
42	B	9.5	76.7	11.6	2.2
43	C	36.7	8.4	35.0	19.8
44	C	24.6	8.0	51.5	15.8
45	D	9.7	2.7	32.1	55.2
46	B	15.6	42.0	10.3	31.9
47	C	16.9	11.7	43.3	28.0
48	C	12.6	14.5	57.8	14.9
49	B	5.2	81.7	10.2	2.9
50	B	12.4	45.6	27.8	14.0
51	B	14.5	66.4	4.8	14.2

Item	Answer	Responses			
		A	B	C	D
		%	%	%	%
52	C	9.1	10.1	53.2	27.5
53	A	43.0	11.5	36.4	9.0
54	B	3.0	69.5	8.0	19.4
55	B	10.4	64.1	19.9	5.5
56	B	8.6	63.2	23.0	5.1
57	B	35.8	32.6	10.8	20.6
58	A or B	47.6	24.6	26.0	1.8
59	C	8.4	20.2	54.8	16.6
60	B	28.5	64.8	3.5	3.1
61	D	3.7	10.1	38.0	48.2
62	B	9.6	70.0	11.7	8.6
63	B	6.6	61.6	4.9	26.8
64	D	1.6	4.2	3.9	90.3
65	A	74.9	15.1	6.9	3.0
66	A	51.8	9.2	21.2	17.6
67	C	4.5	16.1	65.4	14.0
68	B	3.8	61.4	14.2	20.6
69	D	43.2	17.9	8.6	29.9
70	A	46.4	8.2	14.1	31.0
71	D	14.0	24.2	35.7	25.8
72	B	3.9	49.5	8.6	37.9
73	C	5.8	4.1	77.9	11.9
74	B	25.2	32.9	26.0	15.5
75	C	20.4	10.0	47.9	21.1

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

TABLE 2
BIOLOGY 3201 ITEM ANALYSIS
CONSTRUCTEDRESPONSE (PART II)

Item	Number of Students Completing Item	Value	Average
76 (a)	3544	3	2.1
76 (b)	3544	2	1.5
77 (a)	3544	5	4.1
77 (b)	3544	2	0.5
78 (a)	3544	3	1.7
78 (b)	3544	4	2.2
78 (c)	3544	2	1.0
79 (a)	3544	2	0.8
79 (b)	3544	2	0.9