Science 10 Life Science
Item-level Response Report - Multiple Choice (Provincial Level)

British Columbia All Schools June /2006

Provincial Science 10 Item-Level Response Reports include data for all BC students who wrote the exam in June 2006 (about 32,300 students). Both public and independent schools are included. The Science 10 June 2006 (Life Science) provincial Item-Level Response Report displays the proportion of students who made errors on each test item and a description of the misconception.

Form	Item #	Question type	Number of Students who Responded to the Item	Percentage of Students who Answered Incorrectly	Specific Curricular Aspect that Needs Attention [>20% selected incorrect response]
A	1	MT	5450	48	• Students confused the term “mitosis” with “meiosis”.
A	2	MT	5435	46	• Students confused the term “meiosis” with “mitosis”.
A	3	MT	5474	19	N/A
A	4	MT	5471	19	N/A
A	5	MT	5467	9	N/A
A	6	TF	5477	40	• Students did not understand the function of the ribosomes and their location within the cell.
A	7	MC	5470	52	• Students incorrectly answered that centrioles are found in large numbers in muscle cells; did not understand the function of centrioles.
A	8	TF	5473	52	• Students did not understand the direction of water movement during osmosis; chose the answer opposite to the direction that water molecules move during osmosis.
A	9	MC	5472	46	• Students did not understand that human cells do not

					have cell walls, and therefore would not be affected by penicillin's action.
A	10	TF	5476	48	• Students did not understand how the surface area to volume ratio changes as cell size decreases.
A	11	TF	5479	42	• Students did not understand the term "cytokinesis"; confused "cytokinesis" with "mitosis".
A	12	MC	5474	58	• Students were unable to correctly identify the stage of mitosis from a diagram; mistook metaphase with prophase in a diagram.
A	13	MC	5473	46	• Students were unable to correctly describe the events that occur during prophase from a diagram; did not understand the processes that occur during prophase.
A	14	MC	5470	32	*
A	15	TF	5471	32	• Students did not understand that a host is needed for a virus's survival and reproduction.
A	16	MC	5476	38	• Students incorrectly answered that a graph showed that nicotine reduces the oxygen content of fetal blood; misinterpreted a bar graph that did not contain enough information to answer the question.
A	17	MC	5477	4	N/A
A	18	TF	5480	10	N/A
A	19	TF	5480	28	• Students did not understand how to complete a Punnett square and interpret the percent probability of a certain trait.
A	20	MC	5474	44	• Students were unable to complete a Punnett square for a hybrid cross and/or were unable to write the correct ratio of dominant to recessive phenotypes

					from a hybrid cross.
A	21	TF	5475	22	• Students did not understand the term “codominance”; did not understand that there are three different phenotypes in codominance.
A	22	MC	5478	46	• Students incorrectly identified the genotypes of the parents of a cross in pea plants when given the genotypes of the offspring produced from the cross; correctly identified the genotype of the recessive parent, but incorrectly identified the genotype of the dominant parent.
A	23	MC	5472	41	*
A	24	MC	5466	43	• Students did not understand how to complete a Punnett square and/or write a genotypic ratio.
A	25	MC	5474	45	• Students did not understand how to complete a Punnett square involving the blood type alleles; did not understand the term “codominant”.
A	26	MC	5474	56	• Students did not understand the term “sex-linked inheritance”; mistook incomplete dominance with sex-linked inheritance.
A	27	MC	5463	51	• Students did not understand the terms “homozygous dominant” or “heterozygous”.
A	28	MC	5473	48	• Students did not understand how to determine the percent probability for a cross involving incomplete dominance.
A	29	MC	5474	23	*
B	1	MT	4763	9	N/A
B	2	MT	4743	33	*

B	3	MT	4759	13	N/A
B	4	MT	4747	34	*
B	5	MT	4758	11	N/A
B	6	TF	4769	57	• Students incorrectly answered that plant and animal cells use a different organelle for cellular respiration.
B	7	MC	4760	69	• Students correctly understood that a cell's larger vacuole would affect the volume of the cytoplasm, but incorrectly answered that it would increase the volume, not decrease. • Students incorrectly answered that a cell's larger vacuole increases the cell's surface area.
B	8	MC	4761	51	*
B	9	MC	4762	44	• Students did not understand the processes that occur during metaphase; confused the process of prophase with metaphase.
B	10	MC	4760	39	*
B	11	MC	4763	55	• Students did not understand the term "diploid"; did not understand that the chromosome number is duplicated before mitosis occurs.
B	12	TF	4764	55	• Students incorrectly answered that a virus' protein coat is made up of its genetic material.
B	13	MC	4767	21	*
B	14	TF	4767	18	N/A
B	15	TF	4758	41	• Students did not understand the terms "asexual" or vegetative reproduction; did not understand that vegetative reproduction is a type of asexual reproduction in plants.
B	16	TF	4772	40	• Students did not understand the term "sex-linked

					disorder"; answered incorrectly that the gene for a sex-linked disorder is found on the Y chromosome, not the X.
B	17	MC	4770	50	• Students did not understand how to write a genotypic ratio for the offspring of a heterozygous cross; confused the term "genotypic ratio" with "phenotypic ratio".
B	18	MC	4766	35	*
B	19	MC	4764	55	• Students did not understand the term "homozygous dominant" or "dominant allele"; did not understand how to determine which phenotypes arise from different possible genotypes.
B	20	MC	4766	41	• Students did not understand how to complete a Punnett square for blood types; did not understand the term "codominant".
B	21	MC	4770	51	• Students did not understand that a person who has a dominant phenotype could be either homozygous or heterozygous with their genotype; students did not understand that there was not enough information given to answer the question.
B	22	MC	4767	54	• Students answered incorrectly that HH would be the best genotype to use for a cross to best reveal if a trait is homozygous dominant or heterozygous dominant, not hh. • Students answered incorrectly that Hh would be the best genotype to use for a cross to best reveal if a trait is homozygous dominant or heterozygous dominant, not hh.
B	23	MC	4766	36	• Students incorrectly answered that an article refuted

					the fact that the white-eyed mutation is negative for a fruit fly, when not enough information about the mutation was given.
B	24	MC	4760	38	• Students did not understand how to complete a Punnett square for a sex-linked trait; students were unable to interpret an article to determine that a statement was supported by the article.
B	25	MC	4755	51	• Students did not understand how to complete a Punnett square for a sex-linked trait; students were unable to interpret an article to determine that a statement was refuted by the article. • Students did not understand how to complete a Punnett square for a sex-linked trait; students were unable to interpret an article to determine that there was enough information given to refute a statement about the article.
B	26	MC	4770	17	N/A
B	27	TF	4768	16	N/A
B	28	TF	4770	5	N/A
B	29	TF	4765	31	• Students did not understand how bacteria can become resistant to antibiotics through undergoing mutation.
C	1	MT	5448	16	N/A
C	2	MT	5462	5	N/A
C	3	MT	5446	40	*
C	4	MT	5436	60	• Students incorrectly identified a ribosome from a diagram of an animal cell; mistook a ribosome for centrioles. • Students incorrectly identified a ribosome from a diagram of an animal cell; mistook a ribosome for

					mitochondria.
C	5	MT	5444	54	*
C	6	MC	5448	60	• Students answered incorrectly that as the concentration of oxygen (O2) surrounding a cell increases, the rate of diffusion of O2 into the cell decreases. • Students did not understand that as the concentration of oxygen (O2) surrounding a cell increases, so does the diffusion of O2 into the cell.
C	7	MC	5458	50	• Students answered correctly that a nucleus and a mitochondrion would be found in a plant cell, but did not include a ribosome.
C	8	TF	5460	34	• Students did not understand how a cell's surface area and volume change as a spherical cell increases in size.
C	9	MC	5456	67	• Students answered incorrectly that chromosomes becoming distinct does not occur during prophase, but chromosomes duplicating does. • Students answered incorrectly that the nuclear membrane disappearing does not occur during prophase, but chromosome duplication does.
C	10	MC	5449	48	• Students were unable to correctly identify the stage of mitosis from an illustration of mitosis; mistook anaphase with metaphase in a diagram.
C	11	MC	5462	24	*
C	12	MC	5455	25	*
C	13	TF	5462	49	• Students incorrectly answered that a virus's protein

					coat directs the production of more viruses, not its genetic material (DNA).
C	14	MC	5449	54	• Students did not understand the process by which nicotine passes into the fetal bloodstream; confused diffusion with cellular respiration. • Students did not understand the process by which nicotine passes into the fetal bloodstream; confused diffusion with osmosis.
C	15	TF	5456	45	• Students did not understand the term “budding”; confused the process of budding with vegetative reproduction.
C	16	MC	5457	51	• Students did not understand the terms “diploid” or “haploid”; did not understand the products of meiosis.
C	17	MC	5458	36	*
C	18	TF	5467	14	N/A
C	19	MC	5448	69	• Students answered correctly that crossing two hybrids with a phenotypic ratio of 1:2:1 would be representative of codominance and incomplete dominance, but also incorrectly included sex-linked inheritance. • Students did not understand the terms “codominance”, “incomplete dominance” or “hybrid”; answered incorrectly that crossing two hybrids with a phenotypic ratio of 1:2:1 would be representative of complete dominance, not codominance or incomplete dominance.
C	20	MC	5461	47	• Students did not understand the term codominance; confused codominance with incomplete dominance.

C	21	MC	5467	35	• Students did not understand how to complete a Punnett square involving the blood type alleles and/or figure out the percent probability of different blood types from a cross; did not understand the term “codominant”.
C	22	MC	5465	45	*
C	23	MC	5451	42	*
C	24	MC	5458	49	• Students did not understand the term incomplete dominance; confused an example of codominance with incomplete dominance.
C	25	MC	5448	69	• Students did not understand how to determine the genotypes of the parents when given the phenotypic and genotypic ratio of the offspring produced. • Students did not understand how to determine the genotypes of the parents when given the phenotypic and genotypic ratio of the offspring produced; answered correctly for the genotype of one parent, but incorrectly for the other.
C	26	TF	5464	13	N/A
C	27	TF	5461	33	• Students did not understand that a mutation such as antibiotic resistance is positive for the bacteria.
C	28	TF	5465	6	N/A
C	29	TF	5465	9	N/A
D	1	MT	5135	13	N/A
D	2	MT	5113	34	*
D	3	MT	5123	19	N/A
D	4	MT	5117	21	*
D	5	MT	5122	41	• Students did not understand the function of a ribosome; mistook a ribosome for the mitochondria

					on a diagram of an animal cell.
D	6	MC	5121	66	• Students answered correctly that water movement into a tube through a membrane permeable to water was due to a salt solution in the tube and water outside the tube initially, but did not consider that the solution outside the tube could also be a less concentrated salt solution than the salt solution inside. • Students did not understand how to explain the water movement inside a tube from a solution outside, which are separated by a membrane permeable only to water.
D	7	MC	5135	15	N/A
D	8	TF	5128	40	• Students did not understand the term cytokinesis; confused cytokinesis with mitosis.
D	9	MC	5130	53	• Students did not understand the processes that occur during mitosis; incorrectly answered that the daughter cells will separate after the chromosomes are lined up in the middle of the cell, attached to the spindle fibres.
D	10	MC	5123	66	• Students confused the term “cell cycle” with mitosis; incorrectly answered that the cell cycle and mitosis are both 100 minutes long.
D	11	MC	5137	18	N/A
D	12	MC	5136	21	*
D	13	MC	5136	50	• Students did not understand that the placenta is completely permeable to all substances contained in the mother’s blood; answered incorrectly that the mother’s blood, containing the drug, could flow into the unborn baby if a pregnant woman is prescribed a

					drug.
D	14	TF	5132	35	• Students confused a diagram of meiosis with mitosis; did not understand the term “mitosis”.
D	15	TF	5131	44	• Students did not understand the term “budding”; confused an example of budding with binary fission.
D	16	MC	5136	66	• Students did not understand the term “vegetative reproduction”; mistook a picture of vegetative reproduction with budding.
D	17	MC	5129	58	• Students read an article and answered incorrectly that when bacteria exchanged genetic material with each other it was fragmentation, not sexual reproduction.
D	18	TF	5137	22	• Students did not understand the term “heterozygous”; did not understand how to recognize a heterozygous-heterozygous cross from a completed Punnett square.
D	19	TF	5135	26	• Students did not understand the term “homozygous”; confused a heterozygous genotype with homozygous.
D	20	TF	5138	25	• Students did not understand how to interpret the phenotypes of the offspring of a cross, when given the genotypes of the offspring in a Punnett square.
D	21	MC	5134	46	• Students did not understand the term “hybrid”; confused a hybrid with an organism with two dominant alleles for a trait.
D	22	TF	5138	29	• Students did not understand the term “heterozygous”; did not understand how to calculate

					the probability of a phenotype of the offspring of a heterozygous-heterozygous cross; possibly did not understand how to complete a Punnett square when given the phenotypes of the parents.
D	23	MC	5127	50	• Students answered correctly that a phenotypic ratio of 1:2:1 would be representative of a cross involving codominance, but did not include incomplete dominance.
D	24	MC	5138	13	N/A
D	25	MC	5134	23	*
D	26	MC	5134	46	*
D	27	MC	5138	76	• Students did not understand how to complete a Punnett square for a sex-linked trait, and/or how to interpret the Punnett square for the probability of having a son with the sex-linked trait. • Students did not understand how to complete a Punnett square for a sex-linked trait; likely incorrectly answered the question for the probability that their next offspring will have the sex-linked disease, not the probability that their next son will have the disease.
D	28	MC	5126	60	• Students did not understand how to complete a Punnett square and interpret the percents of the different genotypes to compare different crosses, and/or did not understand the term “heterozygous genotype”; correctly answered that two crosses have the same probability of producing a heterozygous genotype, but incorrectly chose a third cross.
D	29	TF	5136	9	N/A
E	1	MT	5674	43	• Students confused the term “mitosis” with “meiosis”.

E	2	MT	5663	41	• Students confused the term “meiosis” with “mitosis”.
E	3	MT	5693	15	N/A
E	4	MT	5691	15	N/A
E	5	MT	5693	6	N/A
E	6	TF	5700	33	• Students did not understand the function of the ribosomes and their location within the cell.
E	7	MC	5691	47	• Students incorrectly answered that centrioles are found in large numbers in muscle cells; did not understand the function of centrioles.
E	8	TF	5690	48	• Students did not understand the direction of water movement during osmosis; chose the answer opposite to the direction that water molecules move during osmosis.
E	9	MC	5691	42	• Students did not understand that human cells do not have cell walls, and therefore would not be affected by penicillin’s action.
E	10	TF	5689	46	• Students did not understand how the surface area to volume ratio changes as cell size decreases.
E	11	TF	5692	38	• Students did not understand the term “cytokinesis”; confused “cytokinesis” with “mitosis”.
E	12	MC	5687	53	• Students were unable to correctly identify the stage of mitosis from a diagram; mistook metaphase with prophase in a diagram.
E	13	MC	5689	44	• Students were unable to correctly describe the events that occur during prophase from a diagram; did not understand the processes that occur during prophase.

E	14	MC	5695	28	*
E	15	TF	5690	32	• Students did not understand that a host is needed for a virus's survival and reproduction.
E	16	MC	5697	37	• Students incorrectly answered that a graph showed that nicotine reduces the oxygen content of fetal blood; misinterpreted a bar graph that did not contain enough information to answer the question.
E	17	MC	5699	5	N/A
E	18	TF	5700	9	N/A
E	19	TF	5697	24	• Students did not understand how to complete a Punnett square and interpret the percent probability of a certain trait.
E	20	MC	5688	47	• Students were unable to complete a Punnett square for a hybrid cross and/or were unable to write the correct ratio of dominant to recessive phenotypes from a hybrid cross.
E	21	TF	5697	22	• Students did not understand the term "codominance"; did not understand that there are three different phenotypes in codominance.
E	22	MC	5697	38	• Students incorrectly identified the genotypes of the parents of a cross in pea plants when given the genotypes of the offspring produced from the cross; correctly identified the genotype of the recessive parent, but incorrectly identified the genotype of the dominant parent.
E	23	MC	5699	40	*
E	24	MC	5691	36	• Students did not understand how to complete a Punnett square and/or write a genotypic ratio.

E	25	MC	5684	37	*
E	26	MC	5694	50	• Students did not understand the term “sex-linked inheritance”; mistook incomplete dominance with sex-linked inheritance.
E	27	MC	5690	48	• Students did not understand the terms “homozygous dominant” or “heterozygous”.
E	28	MC	5696	40	*
E	29	MC	5686	21	*
F	1	TF	5543	16	N/A
F	2	MC	5538	33	*
F	3	MC	5535	62	• The student misunderstood that oxygen production slowly decreased over time instead of completely stopping.
F	4	MC	5541	16	N/A
F	5	TF	5531	25	• Students mistook the cell membrane for the mitochondria; did not understand the function of mitochondria.
F	6	MT	5535	31	• Students did not understand the term “mitosis”; confused mitosis with meiosis.
F	7	MT	5531	33	• Students did not understand the term “meiosis”; confused meiosis with mitosis.
F	8	MT	5521	15	N/A
F	9	MT	5510	23	*
F	10	MT	5533	27	*
F	11	MC	5542	35	*
F	12	TF	5535	41	• Students did not understand that the rate of diffusion within cells limits cell size.
F	13	TF	5537	40	• Students did not understand how surface area and

					volume change relative to each other as a cell size increases.
F	14	TF	5539	17	N/A
F	15	MC	5531	29	• Students correctly understood that telophase was the final stage in mitosis, but did not understand the correct order of the other stages, and/or were not able to recognize the stages of mitosis from a diagram.
F	16	MC	5542	23	*
F	17	TF	5542	8	N/A
F	18	MC	5533	54	• Students correctly answered that genetic material divides during meiosis and mitosis, but incorrectly answered that it also occurs during cytokinesis.
F	19	MC	5530	39	*
F	20	MC	5533	42	*
F	21	MC	5539	44	• Students did not understand how errors may occur during the formation of sex cells; incorrectly answered that the chromosomes failed to duplicate, instead of the chromatid pair failing to separate.
F	22	TF	5531	32	• Students did not understand the terms “heterozygous” or “incomplete dominance”; incorrectly answered that heterozygous individuals do not have an intermediate phenotype in incomplete dominance.
F	23	MC	5537	31	*
F	24	MC	5541	18	N/A
F	25	MC	5534	50	• Students mistook the parents with the gametes in a Punnett square.
F	26	MC	5540	38	• Students chose the correct allele to show the

					dominant trait, but did not understand that only one allele was needed.
F	27	MC	5542	27	*
F	28	MC	5539	32	*
F	29	TF	5540	15	N/A

Note: '**N/A**' represents that there were fewer than 20% of the students who incorrectly answered the item; '*****' represents that there was no specific curricular aspect that needed attention since each of the incorrect answers has been chosen by less than 20% of the students.