THE STATE EDUCATION DEPARTMENT / THE UNIVERSITY OF THE STATE OF NEW YORK
89 Washington Avenue
Room 675 EBA
Albany, NY 12234

David Abrams, Assistant Commissioner
Office for Standards, Assessment and Reporting
(518) 473-7880 (518) 473-7737 (fax)

March 2004

TO: District Superintendents
Superintendents of Public School Districts
Principals of Public and Nonpublic Schools
Administrators of Nonpublic and Charter Schools
Science Coordinators
Living Environment Teachers

FROM: David Abrams

SUBJECT: **Part D of the Regents Examination in Living Environment**

The Regents Examination in Living Environment is designed to provide a measure of students' attainment of the New York State Learning Standards in Science, as defined by the *New York State Learning Standards for Mathematics, Science and Technology* and the *Living Environment Core Curriculum.* The Regents Examination in Living Environment, which is made available to schools three times each year: January, June and August, has contained three parts (A, B, and C), consisting of multiple-choice and open-ended questions.

In September 2002, the Office of State Assessment notified schools that beginning in June 2004 the Regents Examination in Living Environment will include a fourth part, Part D. Part D will consist of multiple-choice and open-ended questions that will be based on at least three of the four required Living Environment laboratory activities disseminated to living environment teachers in September 2002. These laboratory activities are:

- Laboratory Activity #1—Relationships and Biodiversity
- Laboratory Activity #2—Making Connections
- Laboratory Activity #3—The Beaks of Finches
- Laboratory Activity #5—Diffusion Through a Membrane*

* Please note that Laboratory Activity #4 remains under development and has not been released to living environment teachers.

Schools were encouraged to use these laboratory activities during the 2002 – 2003 school year to meet the State mandated laboratory requirement. Section 100.5(b)(7)(iv)(d) states that in order for students to be eligible to take a Regents Examination in Science they must complete 1200 minutes of actual hands-on laboratory experience and complete written reports of those laboratory activities in a format specified by the school. The 1200 minutes of laboratory experience must be in addition to the required classroom instruction time associated with earning one unit of credit in science.

Samples of the types of questions that will be included in Part D of the Regents Examination in Living Environment are enclosed. The total raw score on the Regents Examination in Living Environment will remain at 85. Part D will account for approximately15% of the total raw score. The test specifications for the entire test along with these sample questions for Part D are available on the Department's website at http://www.emsc.nysed.gov/ciai/mst/sci.html.

Further details related to the implementation and test administration of Part D of the Regents Examination in Living Environment will be included in the *Information Booklet for Administering and Scoring Regents Examinations in the Sciences* that will be sent to administrators prior to the June 2004 test administration period. For more information, please contact the Office of State Assessment at emscassessinfo@mail.nysed.gov or the Office of Curriculum, Instruction and Instructional Technology at emscurric@mail.nysed.gov.

Enclosure

LIVING ENVIRONMENT REGENTS EXAMINATION

PART D – SAMPLE QUESTIONS

WINTER 2004

The University of the State of New York
THE STATE EDUCATION DEPARTMENT
The Office of State Assessment
Albany, New York 12234

Living Environment Part D: Sample Questions

Beginning with the June 2004 administration, the Regents Examination in Living Environment will include a new section, Part D. The questions on Part D will consist of a combination of multiple-choice and open-ended questions related to at least three of the four required living environment laboratory activities and will comprise approximately 15% of the examination.

These sample questions are provided to help teachers and students become familiar with the format of questions for this part of the examination. They provide examples of ways the required laboratory experiences may be assessed. A rating guide is also included.

Sample Items Related to Lab Activity #1: *Relationships and Biodiversity*

1 In the *Relationships and Biodiversity* laboratory activity, students were instructed to use a clean dropper to place each of four different samples of plant extracts on the chromatography paper. A student used the same dropper for each sample without cleaning it between each use. State one way this student's final chromatogram would be different from a chromatogram that resulted from using the correct procedure. [1]

2 State one reason that safety goggles were required during the indicator test for enzyme *M*. [1]

Base your answers to questions 3 through 6 on the information and data table below and on your knowledge of biology.

A student was told that three different plant species are very closely related. She was provided with a short segment of the same portion of the DNA molecule that coded for enzyme *X* from each of the three species.

Information Regarding Enzyme X

DNA sequence from plant species *A* Amino acid sequence for enzyme *X* coded for by that DNA	CAC Val	GTG His	GAC Leu
DNA sequence from plant species *B* Sequence of bases in mRNA produced by that DNA Amino acid sequence for enzyme *X* coded for by the DNA	CAT _____ Val	GTG _____ His	CAA _____ Val
DNA sequence from plant species *C* Sequence of bases in mRNA produced by that DNA Amino acid sequence for enzyme *X* coded for by the DNA	CAG GUC _____	GTA CAU _____	CAG GUC _____

3 The correct sequence of mRNA bases for plant species *B* is

(1) GUA CAC GUU
(2) GTA CAC GTT
(3) CAU GUG CAA
(4) TCG TGT ACC

4 Use the mRNA Codon Chart on the next page to determine the amino acid sequence for enzyme *X* in plant species *C* and record the sequence in the appropriate place in the data table. [1]

5 Is it possible to determine whether species *B* or species *C* is more closely related to species *A* by comparing the amino acid sequences that would result from the three given DNA sequences? Support your answer. [1]

6 Determine whether species *B* or species *C* appears more closely related to species *A*. Support your answer with data from the data table. (*Base your answer only on the DNA sequences provided* for enzyme *X* in these three plant species.) [1]

Universal Genetic Code Chart

Messenger RNA codons and the amino acids they code for.

FIRST BASE	SECOND BASE: U	SECOND BASE: C	SECOND BASE: A	SECOND BASE: G	THIRD BASE
U	UUU, UUC — PHE UUA, UUG — LEU	UCU, UCC, UCA, UCG — SER	UAU, UAC — TYR UAA, UAG — STOP	UGU, UGC — CYS UGA — STOP UGG — TRP	U C A G
C	CUU, CUC, CUA, CUG — LEU	CCU, CCC, CCA, CCG — PRO	CAU, CAC — HIS CAA, CAG — GLN	CGU, CGC, CHA, CGG — ARG	U C A G
A	AUU, AUC, AUA — ILE AUG — MET or START	ACU, ACC, ACA, ACG — THR	AAU, AAC — ASN AAA, AAG — LYS	AGU, AGC — SER AGA, AGG — ARG	U C A G
G	GUU, GUC, GUA, GUG — VAL	GCU, GCC, GCA, GCG — ALA	GAU, GAC — ASP GAA, GAG — GLU	GGU, GGC, GGA, GGG — GLY	U C A G

Sample Items Related to Lab Activity #2: *Making Connections*

Base your answers to questions 7 through 9 on the information and data table below and on your knowledge of biology.

In the Making Connections laboratory activity, a group of students obtained the following data:

Student Tested	Pulse Rate at Rest	Pulse Rate After Exercising
1	70	97
2	75	106
3	84	120
4	60	91
5	78	122

7 Explain how this change in pulse rate is associated with homeostasis in muscle cells. [1]

8 Identify the system of the human body whose functioning is represented by this data. [1]

9 Identify *one* other system of the human body whose functioning would be expected to be altered as a direct result of the exercise. Describe how this system would most likely be altered. [1]

Base your answers to question 10 and 11 on the information below and on your knowledge of biology.

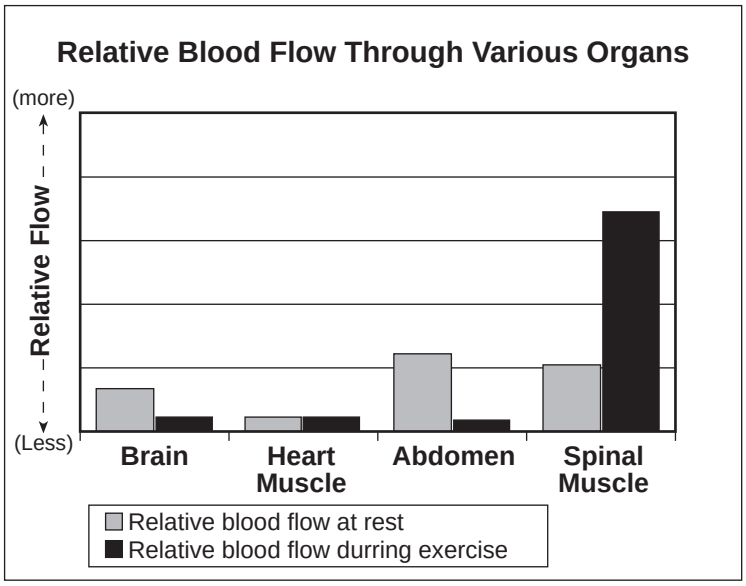
A biology class performed an investigation to determine the influence of exercise on pulse rate. During the investigation, one group of twelve students, Group *A*, counted how many times they could squeeze a clothespin in a 1-minute period, then exercised for 4 minutes, and repeated the clothespin squeeze for an additional 1 minute. Another group of twelve students, Group *B*, also counted how many times they could squeeze a clothespin in a 1-minute period, but then they rested for 4 minutes, and repeated the clothespin squeeze for an additional 1 minute. The data table below shows the average results obtained by the students.

Effect of Exercise on Number of Clothespin Squeezes

Groups of Student	Average Number of Clothespin Squeezes During First Minute	Average Number of Clothespin Squeezes During Second Minute
Group A (exercise)	75	79
Group B (rest)	74	68

10 State *two* specific examples from the description of the investigation and the data table that support this investigation being a well-designed experiment. [2]

11 The chart below shows relative blood flow through various organs during exercise and at rest.



Using information from both the data table and the chart, explain how muscle fatigue and blood circulation could account for the results the students obtained. [2]

Sample Items Related to Lab Activity #5: *Diffusion Through a Membrane*

Base your answers to questions 12 and 13 on the diagrams below and on your knowledge of biology.

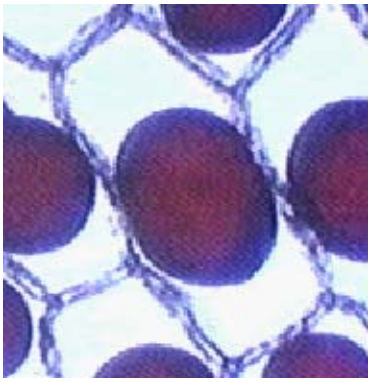


Diagram 1: red onion cells

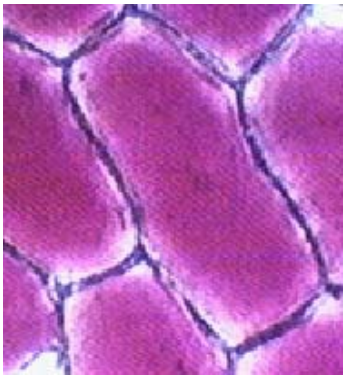


Diagram 2: red onion cells

12 Describe how to prepare a wet-mount slide of red onion cells with the cell membrane shrinking away from the cell wall, as shown in diagram 1. The following materials are available: microscope slide, pipettes, cover slips, paper towels, water, salt solution, and red onion sections. [3]

13 List the laboratory procedures to follow that would cause the cells in diagram 1 to resemble the cells in diagram 2. [2]

---

14 A student places an artificial cell, similar to the one used in the laboratory activity *Diffusion Through a Membrane*, in a beaker containing water. The artificial cell contains starch and sugar. A starch indicator is added to the water in the beaker. Explain how the student will know if the starch is able to diffuse out of the artificial cell. [1]

Scoring Guide for Sample Part D Questions

1 Allow 1 credit for stating one way the student's final chromatogram would be different from a chromatogram that resulted from using the correct procedure. Acceptable responses include, but are not limited to:

— The number of bands could be different.
— The size of the spots would differ.

2 Allow 1 credit for stating one reason that safety goggles were required during the indicator test for enzyme *M*. Acceptable responses include, but are not limited to:

— Some of the chemicals might splash into the student's eyes.
— It is a laboratory requirement that goggles be worn whenever chemicals are used in the lab.

3 **1**

4 Allow 1 credit for **Val His Val**

5 Allow 1 credit for indicating that it is not possible to determine whether species *B* or species *C* is more closely related to species *A* by comparing the amino acid sequences, and providing an explanation that supports this response. Acceptable responses include, but are not limited to:

— The amino acid sequences do not make it possible to determine whether species *B* or species *C* is more closely related to species *A*, because both *A* and *B*, and *A* and *C* only differ by one amino acid.

Allow credit for an answer that is consistent with the student's response to question 4.

6 Allow 1 credit for using data from the data table to indicate whether species *B* or species *C* appears to be more closely related to species *A*. Acceptable responses include but are not limited to:

— Species *A* and *B* are the closest because they have only three differences in their DNA code, while species *A* and *C* have four differences.
— Species *A* and *B* are more closely related because there are not as many differences between their DNA sequences as there are between species *A* and *C*.

7 Allow 1 credit for explaining how this change in pulse rate is associated with homeostasis in muscle cells. Acceptable responses include but are not limited to:

— Muscle cells produce more carbon dioxide when they are active than when they are not very active. The increased blood flow carries away the extra carbon dioxide to the lungs, where it can be excreted.
— Muscle cells use more oxygen when they are active than when they are not very active. An increased circulation rate brings more oxygen to the muscle cells.
— Muscle cells produce more heat when they are active than when they are not very active. The increased blood flow helps carry away the excess heat to the skin, where it is lost to the surroundings.

8 Allow 1 credit for indicating that the functioning of the circulatory system is represented by the data.

9 Allow 1 credit for identifying one other system of the human body whose functioning would be expected to be altered as a direct result of the exercise *and* how it would be most likely be altered. Acceptable responses include, but are not limited to:

— respiratory system – increase the intake of oxygen
— respiratory system – increase the exhalation of carbon dioxide
— excretory system – increased sweating

10 Allow a maximum of 2 credits, 1 credit for each of two specific examples that support this investigation being a well-designed experiment. Acceptable responses include but are not limited to:

— It has two groups for comparison (experimental and control).
— It is a controlled experiment.
— Each group did exactly the same thing except for the exercise/rest part.
— Each group contained the same number of students.

11 Allow a maximum of 2 credits, 1 credit for indicating that muscle fatigue and/or waste buildup was the reason for group *A*'s results, and 1 credit for indicating that increased circulation from exercise was the reason for group *B's* results.

Example of a 2-credit response:

> The squeezing caused the muscles to become tired as waste products of muscle activity built up. The increased circulation shown in the second table (blood flow to skeletal muscle during exercise) helped the students in group *B* carry the wastes away from their muscle cells so they could continue to function efficiently. Students in group *A* did not increase their circulation rate, so the wastes interfered with the ability to keep squeezing the clothespin.

12 Allow a maximum of 3 credits for correctly describing how to prepare a slide showing red onion cells with the cell membrane shrinking away from the cell wall. The responses must include:

- a simple description of how the onion cells will be obtained

- a description of how a wet-mount slide is made
- an indication that salt solution must be used

Acceptable 3-credit responses include, but are not limited to:

— Break the onion piece and peel off the skin. Put it on a slide and add water. Add a coverslip. Place a piece of paper towel on the edge of the coverslip and add salt solution to the other side. After adding a few drops of salt solution, use a microscope to observe the slide.
— From the onion section obtain a piece of onion skin and put it on a slide. Use a pipette to add some salt solution, then add a coverslip on the onion skin.

13 Allow a maximum of 2 credits for listing the procedures that should be followed to cause the cells in diagram 1 to resemble the cells in diagram 2. The responses must include:

- adding water to the slide[1]
- using a technique that will cause the salt to be rinsed away and replaced with water [1].

Acceptable 2-credit responses include, but are not limited to:

— Remove the slide from the microscope then place a piece of paper towel on the edge of the coverslip and add distilled water (or just water) to the other side. After adding many drops of water put the slide back on the microscope to observe the change. If necessary, repeat the process adding even more water.
— Remove the slide from the microscope, remove the coverslip and carefully rinse the onion skin with water to remove the salt, put the coverslip back on the slide.

14 Allow 1 credit for explaining how the student will know if the starch is able to diffuse out of the artificial cell. Acceptable responses include but are not limited to:

— If the starch diffuses out, the indicator solution will turn black or blueblack.
— If the starch is able to diffuse out, the starch indicator will change color.