The information in this booklet is intended to be helpful for both teachers and students. Teachers are encouraged to make this information available to all students.
The intent of the *Examination Specifications* is to convey to the classroom teacher and student how the Biology 12 curriculum will be tested on the provincial examinations. The Table of Specifications provides percentage weightings for each of the curriculum organizers as well as the cognitive levels that are applied to questions. A detailed description of examinable material within each curriculum organizer will be found in the curriculum section of the *Biology 11 and 12 Integrated Resource Package (IRP), 1996* and in Appendix A of that package.

### Replaces All Previous Versions of Biology 12 Examination Specifications

1. The Biology 12 Provincial Examinations conform to the curriculum organizers of the *Biology 11 and 12 Integrated Resource Package, 1996*. Teachers should thoroughly familiarize themselves with the contents of this package.

2. As outlined in the Introduction of the IRP, an understanding of how the diverse body systems are integrated to maintain homeostasis is a fundamental part of Biology 12.

3. The prescribed learning outcomes O4 and O5 assume an understanding of negative feedback.

4. The following prescribed learning outcomes will **not** be assessed on the provincial examinations:
   - F1–5 cancer
   - I8 demonstrate the correct use of the dissection microscope
   - J3 demonstrate safe and correct dissection techniques
   - J10 demonstrate the correct use of the compound microscope
   - K5 demonstrate the measurement of blood pressure.

5. Electronic devices, including dictionaries and pagers, are **not** permitted in the examination room.

It is expected that there will be a difference between school marks and provincial examination marks for individual students. Some students perform better on classroom tests and others on provincial examinations. School assessment measures performance on all curricular outcomes, whereas provincial examinations may only evaluate performance on a sample of these outcomes. The provincial examination represents 40% of the student’s final letter grade and the classroom mark represents 60%.

### Acknowledgement

The Assessment Department wishes to acknowledge the contribution of British Columbia teachers in the preparation and review of this document.
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BIOLOGY 12

DESCRIPTION OF THE PROVINCIAL EXAMINATION

The Table of Specifications (page 2) outlines the curriculum organizers, sub-organizers, and the cognitive level emphases covered on the provincial examination. A detailed description of examinable material within each curriculum organizer may be found in the Biology 11 and 12 Integrated Resource Package, 1996.

The provincial examination is divided into two parts:

PART A: Multiple-choice questions worth 75% of the examination (67 marks).

PART B: Written-response questions worth 25% of the examination (23 marks).

The number of written-response questions may vary from one examination to the next depending on the value of each question; however, the total marks for the written-response section will remain the same.

Where appropriate, answers or part-answers, may be presented in point-form. Half marks may be awarded in the marking of written-response questions.

The time allowed for the provincial examination is two hours. Students may, however, take up to 30 minutes of additional time to finish.
## BIOLOGY 12

### TABLE OF SPECIFICATIONS FOR THE PROVINCIAL EXAMINATION

<table>
<thead>
<tr>
<th>ORGANIZERS</th>
<th>SUB-ORGANIZERS</th>
<th>CURRICULUM</th>
<th>COGNITIVE LEVEL</th>
<th>TOTAL MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Knowledge</td>
<td>Understanding and Application</td>
</tr>
<tr>
<td>Cell Biology</td>
<td></td>
<td></td>
<td>A Cell Structure</td>
<td>&lt;——— 5 ————&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B/C Cell Compounds / Biological Molecules</td>
<td>&lt;——— 7 ————&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>D DNA</td>
<td>&lt;——— 4 ————&gt;</td>
<td></td>
</tr>
<tr>
<td>Cell Processes and Applications</td>
<td></td>
<td>E Protein Synthesis</td>
<td>&lt;——— 4 ————&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>F Cancer</td>
<td>&lt;——— 0 ————&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>G Transport Across Cell Membrane</td>
<td>&lt;——— 6 ————&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>H Enzymes</td>
<td>&lt;——— 6 ————&gt;</td>
<td></td>
</tr>
<tr>
<td>Human Biology</td>
<td></td>
<td>I Digestive System</td>
<td>&lt;——— 9 ————&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>J/K Circulatory System: Circulation and Blood / Heart Structure and Function</td>
<td>&lt;——— 13 ————&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>L Respiratory System</td>
<td>&lt;——— 7 ————&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>M/N Nervous System: Neuron, Impulse Generation and Reflex Arc / Divisions of the Nervous System and the Brain</td>
<td>&lt;——— 10 ————&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>O Urinary System</td>
<td>&lt;——— 9 ————&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P Reproductive System</td>
<td>&lt;——— 10 ————&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TOTAL</td>
<td>20</td>
</tr>
</tbody>
</table>

The values shown in this table are approximate and may fluctuate.

Examination configuration: 67 marks in multiple-choice format
23 marks in written-response format
DESCRIPTION OF COGNITIVE LEVELS

The following three cognitive levels are based on a modified version of Bloom’s taxonomy (Taxonomy of Educational Objectives, Bloom et al., 1956). Bloom’s taxonomy describes six cognitive categories: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. For ease of classification, the six cognitive categories have been collapsed into three.

Knowledge

Knowledge is defined as including those behaviours and test situations that emphasize the remembering, either by recognition or recall, of ideas, material, or phenomena. Incorporated at this level is knowledge of terminology, specific facts (dates, events, persons, etc.), conventions, classifications and categories, criteria, methods of inquiry, principles and generalizations, theories and structures.

Understanding and Application

Understanding refers to responses that represent a comprehension of the literal message contained in a communication. This means that the student is able to interpret or extrapolate. Interpretation involves the reordering of ideas (inferences, generalizations, or summaries). Extrapolation includes estimating or predicting based on an understanding of trends or tendencies.

Application requires the student to apply an appropriate abstraction (theory, principle, idea, method) to a new situation.

Higher Mental Processes

Included at this thought level are the processes of analysis, synthesis, and evaluation.

Analysis involves the ability to recognize unstated assumptions, to distinguish facts from hypotheses, to distinguish conclusions from statements that support them, to recognize which facts or assumptions are essential to a main thesis or to the argument in support of that thesis, and to distinguish cause-effect relationships from other sequential relationships.

Synthesis involves the production of a unique communication, the ability to propose ways of testing hypotheses, the ability to design an experiment, the ability to formulate and modify hypotheses, and the ability to make generalizations.

Evaluation is defined as the making of judgments about the value of ideas, solutions, and methods. It involves the use of criteria as well as standards for appraising the extent to which details are accurate, effective, economical, or satisfying. Evaluation involves the ability to apply given criteria to judgments of work done, to indicate logical fallacies in arguments, and to compare major theories and generalizations.

Questions at the higher mental processes level subsume both knowledge and understanding and application levels.
**TERMINOLOGY**

The following is a list of terms which may be used in the construction of items for the Biology 12 examinations in order to increase clarity and brevity. While the terms are not specifically stated in the Prescribed Learning Outcomes, they are considered central to both the instruction and examination of Biology 12.

**Biological Molecules**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADP</td>
<td>hydrolysis</td>
<td>phosphate</td>
<td></td>
</tr>
<tr>
<td>covalent bond</td>
<td>ion</td>
<td>polar molecule</td>
<td></td>
</tr>
<tr>
<td>dehydration synthesis</td>
<td>ionic bond</td>
<td>polymer</td>
<td></td>
</tr>
<tr>
<td>deoxyribose</td>
<td>maltose</td>
<td>peptide bond</td>
<td></td>
</tr>
<tr>
<td>dipeptide</td>
<td>monomer</td>
<td>polypeptide</td>
<td></td>
</tr>
<tr>
<td>fats</td>
<td>nitrogenous base</td>
<td>specific heat capacity</td>
<td></td>
</tr>
<tr>
<td>glycerol</td>
<td>oils</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*In addition, students will be expected to be able to recognize, but not draw, the following structural diagrams:*

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATP</td>
<td>hemoglobin</td>
<td>polysaccharide</td>
<td></td>
</tr>
<tr>
<td>DNA</td>
<td>monosaccharide</td>
<td>ribose</td>
<td></td>
</tr>
<tr>
<td>disaccharide</td>
<td>neutral fat</td>
<td>RNA</td>
<td></td>
</tr>
<tr>
<td>glucose</td>
<td>phospholipid</td>
<td>steroids</td>
<td></td>
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</table>

**Cell Structure and Function**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>cell wall</td>
<td>cytoplasm</td>
<td>polysome</td>
<td></td>
</tr>
<tr>
<td>cellular respiration</td>
<td>flagella</td>
<td>secretion</td>
<td></td>
</tr>
<tr>
<td>chloroplasts</td>
<td>nuclear membrane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>chromatin</td>
<td>nuclear pores</td>
<td></td>
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</table>

**Cell Membrane Function**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>bilayer</td>
<td>hydrophilic</td>
<td>plasmolysis</td>
<td></td>
</tr>
<tr>
<td>concentration gradient</td>
<td>hydrophobic</td>
<td>solute</td>
<td></td>
</tr>
<tr>
<td>crenation</td>
<td>lysis</td>
<td>solvent</td>
<td></td>
</tr>
<tr>
<td>facilitated diffusion</td>
<td>permeable</td>
<td>tonicity</td>
<td></td>
</tr>
<tr>
<td>glycolipids</td>
<td>plasma membrane</td>
<td>turgor</td>
<td></td>
</tr>
<tr>
<td>glycoproteins</td>
<td>osmotic pressure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Experimental Design

<table>
<thead>
<tr>
<th>Conclusion</th>
<th>Experimental group</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Hypothesis</td>
<td>Theory</td>
</tr>
<tr>
<td>Control group</td>
<td>Independent variable</td>
<td>Validity</td>
</tr>
<tr>
<td>Dependent variable</td>
<td>Procedure</td>
<td></td>
</tr>
<tr>
<td>Experiment</td>
<td>Reliability</td>
<td></td>
</tr>
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</table>

### DNA and Protein Synthesis

<table>
<thead>
<tr>
<th>Adenine</th>
<th>Gene mutation</th>
<th>Sugar-phosphate backbone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticodon</td>
<td>Genetic code</td>
<td>Template</td>
</tr>
<tr>
<td>Carcinogen</td>
<td>Guanine</td>
<td>Termination</td>
</tr>
<tr>
<td>Chromosome mutation</td>
<td>Initiation</td>
<td>Thymine</td>
</tr>
<tr>
<td>Cytosine</td>
<td>Radiation</td>
<td>Uracil</td>
</tr>
<tr>
<td>Deoxyribose</td>
<td>Semiconservative replication</td>
<td>Virus</td>
</tr>
<tr>
<td>Elongation</td>
<td>Start / stop codons</td>
<td>X ray</td>
</tr>
</tbody>
</table>

### Human Biology

<table>
<thead>
<tr>
<th>Endocrine gland</th>
<th>Homeostatic mechanism</th>
<th>Tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homeostasis</td>
<td>Negative feedback</td>
<td>Tissue fluid</td>
</tr>
</tbody>
</table>

### Digestion

<table>
<thead>
<tr>
<th>Chemical digestion</th>
<th>Lacteal</th>
<th>Pepsinogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digestive tract</td>
<td>Microvilli</td>
<td>Physical digestion</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>Mucus</td>
<td>Surface area</td>
</tr>
<tr>
<td>Hydrolytic enzymes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Blood and Circulation

<table>
<thead>
<tr>
<th>Albumin</th>
<th>Elastic fibres</th>
<th>Net pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial</td>
<td>Fibrin</td>
<td>Pacemaker</td>
</tr>
<tr>
<td>Capillary bed</td>
<td>Formed elements</td>
<td>Pulse</td>
</tr>
<tr>
<td>Cardiac cycle</td>
<td>Globulin</td>
<td>Stem cell</td>
</tr>
<tr>
<td>Cardiac output</td>
<td>Lymph</td>
<td>Systole</td>
</tr>
<tr>
<td>Cross-sectional area</td>
<td>Lymphocytes</td>
<td>Thoracic</td>
</tr>
<tr>
<td>Diastole</td>
<td>Macrophage</td>
<td>Venous</td>
</tr>
</tbody>
</table>
### Respiration

- aortic bodies
- carbonic anhydrase
- carotid bodies
- expiration
- inspiration
- intercostal (rib) muscles
- internal / external respiration equations
- nasal cavity
- respiratory centre
- stretch receptors

### Excretion

- anti-diuretic
- diuretic
- excretion
- metabolic waste
- nitrogenous wastes
- osmotic gradient
- reabsorption
- tubular excretion

### Nervous System

- acetylcholine
- acetylcholinesterase
- axon membrane
- contractile proteins
- cranial nerves
- dorsal-root ganglion
- downswing
- excitatory neurotransmitters
- inhibitory neurotransmitters
- integration
- meninges
- nodes of Ranvier
- noradrenalin
- polarity
- refractory period
- saltatory transmission
- Schwann cells
- spinal nerves
- synaptic ending
- threshold value
- upswing

### Reproduction

- ejaculation
- endometrium
- erectile tissue
- follicle-stimulating hormone (FSH)
- follicular phase
- gonadotrophic releasing hormone (GnRH)
- human chorionic gonadotropin (HCG)
- luteal phase
- luteinizing hormone (LH)
- menstruation
- oogenesis
- ovulation
- progesterone
- proliferative phase
- prostaglandins
- scrotum
- secretory phase
- spermatogenesis

### System-related Words

- cardiac
- cerebral
- endocrine
- gastric
- hepatic
- neural
- pulmonary
- renal
- respiratory
- vascular

### Process Words

- compare (similarities and differences)
- contrast (differences only)
- describe
- explain
- facilitate (help)
- relative (relatively high or low)
EXPERIMENTAL DESIGN QUESTION
FOR THE 2004/05 SCHOOL YEAR

Past provincial examinations have included items which require students to “collect, display and interpret data,” (learning outcome G7). Learning outcome H7, “devise an experiment using the scientific method,” has not yet been examined. Beginning in the 2004/05 school year, students should expect to be examined on this topic.

The K–12 Science Curriculum implicitly assumes that most modern scientific knowledge has been obtained through empirical experimentation. The scientific method assumes the following sequential steps:

1. Observing natural phenomena which leads to the clear statement of a question.
2. Researching information related to the question.
3. Using knowledge, experience, insight and imagination to formulate a hypothesis to serve a testable answer to the question.
4. Designing and carrying out a controlled, repeatable experiment to test the hypothesis.
5. Determining whether the data obtained support or reject the hypothesis.
6. Reporting the results to others.

In order to demonstrate comprehension of learning outcome H7, students should be able to:

1. Indicate how the above steps are applied to a scientific inquiry.
2. Design a controlled experiment where:
   - a hypothesis is produced (given a question)
   - procedures are implemented to test the hypothesis
   - a control is included which will serve as a known comparison to the resulting data.

Students should expect that this learning outcome may be applied to any of the concepts covered in the Biology 12 curriculum.

The following item (and key) is an example of a possible examination question based on this learning outcome. This item is worth 7 marks, covers curricular areas H6 / H7 / I2 / I4, and is an “understanding” level question.

1. a) State a hypothesis which could be used to design an experiment determining the effect of pH on the function of the digestive enzyme trypsin. (1 mark)

Response:

• Trypsin is more effective at hydrolyzing protein at a pH of 9.0 than at other pH levels. (1 mark)
b) Using any of the materials listed below, design an experimental procedure which could be used to test the hypothesis. (3 marks)

- A bottle containing trypsin solution.
- Five bottles, each containing solutions buffered to maintain the following pH levels (pH 3, 5, 7, 9 and 11).
- A bottle containing a protein solution of a known concentration.
- Test tubes and test tube rack.
- A device capable of measuring the concentration of protein in a solution.
- A water bath capable of maintaining the bottles at a constant temperature.

Response:
- Fill five of the test tubes with equal amounts of protein solution and trypsin.
- Add one of the five buffered solutions to each of the test tubes.
- Maintain the test tubes at 37°C for one hour (times may vary).
- Measure the resulting concentration of protein in each of the tubes.

c) What could be used as a control for this experiment? (1 mark)

Response:
- Test a second set of test tubes with protein and pH solutions but without trypsin. (1 mark)

d) What is the purpose of the control? (1 mark)

Response:
- To make sure that no other variables are causing the digestion of the protein. (1 mark)

e) What new substances will be found in the test tubes? (1 mark)

Response:
- peptide molecules (1 mark)
SAMPLE QUESTIONS

A: Cell Structure

Knowledge

1. What are chromosomes composed of?
   A. tRNA and DNA
   B. tRNA and lipids
   * C. DNA and proteins
   D. RNA and ribosomes

Understanding

2. How do the inner membrane of the mitochondria and the nuclear envelope differ?
   A. The nuclear envelope has pores and the mitochondrial membrane does not.
   B. The mitochondrial membrane is not permeable and the nuclear envelope is.
   * C. The mitochondrial membrane has many folds and the nuclear envelope does not.
   D. The nuclear envelope has two phospholipid layers and the mitochondrial membrane does not.

Higher Mental Processes

Use the following diagram to answer question 3.

3. What produces the molecules of which structure X is composed?
   A. nucleus
   B. vesicles
   * C. nucleolus
   D. lysosomes
B / C: Cell Compounds / Biological Molecules

Understanding

4. Which of the following diagrams represents glucose?

* A. 

B. 

C. 

D. 

Higher Mental Processes

5. Why do neutral fats not dissolve in water?

* A. Water is non-polar.

B. Water is polar and neutral fats are non-polar.

C. Neutral fats are polar and form hydrogen bonds with water.

D. Neutral fats break down into ions when combined with water.
Use the following diagram to answer question 6.

6. What does the diagram above represent?

* A. DNA replication
B. mRNA translation
C. mRNA elongation
D. DNA transcription

Higher Mental Processes

7. If 20% of the base molecules are guanine, how many thymine molecules are present in a DNA molecule with 1000 bases?

A. 200
* B. 300
C. 400
D. 600

E: Protein Synthesis

Knowledge

8. What is the role of ribosomes in protein synthesis?

A. to split the two strands of DNA apart
B. to check for and replace the faulty codons
C. to carry amino acids to the site of translation
* D. to provide a site for mRNA and tRNA to join together
Understanding

9. Give one role of each of the following nucleic acids in the production of an enzyme.  
(4 marks: 1 mark each)

DNA: ____________________________________________________________________________

mRNA: __________________________________________________________________________

rRNA: __________________________________________________________________________

tRNA: __________________________________________________________________________

Response:

DNA:
• contains sequence of bases that codes for the enzyme
• contains triplet code / blueprint / recipe / genetic code
• transcription
• produces mRNA

mRNA:
• transcribes DNA sequence and travels to the site of enzyme production in the cytoplasm
• involved in translation
• carries triplet code / genetic code / codon from nucleus to ribosome / endoplasmic reticulum

rRNA:
• involved in translation as a component of ribosomes (along with protein)
• attaches to tRNA / mRNA
• reads mRNA
• site of codon / anticodon matching

tRNA:
• carries specific amino acids to rRNA
• translation
• attaches to ribosome / rRNA
• contains anticodon
• matches mRNA codon
Higher Mental Processes

Use the following table to answer question 10.

<table>
<thead>
<tr>
<th>mRNA Codon</th>
<th>Amino Acid Coded for</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCU</td>
<td>proline</td>
</tr>
<tr>
<td>CCC</td>
<td>proline</td>
</tr>
<tr>
<td>CCA</td>
<td>proline</td>
</tr>
<tr>
<td>CCG</td>
<td>proline</td>
</tr>
</tbody>
</table>

10. Which of the following mutations will **not** result in the incorporation of the amino acid proline in a protein?

A. a mutation of the DNA from G A A to G G A  
B. the use of a G G U anticodon during translation  
C. a substitution error changing the DNA from G G G to G G T  
* D. the substitution of the first base in the DNA triplet for proline

G: Transport Across Cell Membrane

Knowledge

11. List four factors that would affect the rate of diffusion of molecules crossing a cell membrane.  

(4 marks)

Response:

- size of molecule  
- electrical charge  
- mass of molecule diffusing  
- cytoplasmic streaming (cyclosis)  
- number of protein pores / carriers  
- pressure (e.g., blood / atmospheric / hydrostatic)  
- temperature / speed of molecules / kinetic energy  
- concentration gradient / tonicity / osmotic pressure  
- specific hormonal effects (e.g., ADH, thyroxin, insulin)  
- chemical composition of the molecule (e.g., lipid solubility)  
- chemical and physical properties of the cell membrane (permeability)  

\[\text{any four for } 1 \text{ mark each}\]
Understanding

12. If a 0.9% solution is isotonic to a certain type of animal cell, the cell will lose mass if it is placed in which of the following liquids?

A. 0.5% salt solution  
B. 0.9% salt solution  
*C. 1.2% salt solution  
D. distilled (pure) water

Higher Mental Processes

Use the following diagram to answer question 13.

13. Which of the following represents the part of a cell membrane that requires the breakdown of ATP for the transport of sodium ions?

A. W  
B. X  
C. Y  
* D. Z

H: Enzymes

Understanding

14. Which hormone increases the rate at which cells release energy from carbohydrates?

A. ATP  
B. ADH  
* C. thyroxin  
D. aldosterone
Higher Mental Processes

15. An experiment was set up to measure the effect of temperature on catalase, an enzyme found in the liver that breaks down hydrogen peroxide into water and oxygen gas. Four labelled test tubes, each containing similar amounts of catalase and 2 mL of hydrogen peroxide, were incubated at different temperatures.

Which of the following matches each test tube with its correct temperature?

<table>
<thead>
<tr>
<th></th>
<th>W</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>70°C</td>
<td>37°C</td>
<td>20°C</td>
<td>5°C</td>
</tr>
<tr>
<td>B.</td>
<td>5°C</td>
<td>20°C</td>
<td>37°C</td>
<td>70°C</td>
</tr>
<tr>
<td>*</td>
<td>70°C</td>
<td>5°C</td>
<td>20°C</td>
<td>37°C</td>
</tr>
<tr>
<td>D.</td>
<td>5°C</td>
<td>70°C</td>
<td>37°C</td>
<td>20°C</td>
</tr>
</tbody>
</table>

I: Digestive System

Knowledge

16. Which structure secretes digestive enzymes and bicarbonate ions?

A. liver
B. stomach
* C. pancreas
D. small intestine
Understanding

17. A bacterial infection inhibits the absorption of water in the digestive system. Where is the infection located?

A. liver  
B. stomach  
C. duodenum  
* D. large intestine

Higher Mental Processes

Use the following information to answer question 18.

- Bacteria cells are destroyed.
- Amylase becomes denatured.
- Pepsinogen becomes activated.
- Trypsinogen changes into trypsin.

18. How many of the above result from the action of gastric juice?

A. one  
B. two  
* C. three  
D. four

J / K: Circulatory System: Circulation and Blood / Heart Structure and Function

Knowledge

19. What blood vessels have thin, permeable walls?

A. veins  
B. venules  
C. arterioles  
* D. capillaries
Understanding

20. What structure prevents blood from moving back into the left ventricle?

A. the cardiac sphincter  
B. the chordae tendineae  
C. the atrioventricular valve  
* D. the aortic semilunar valve

Higher Mental Processes

Use the following graph to answer question 21.

[Graph showing blood pressure over time with points W, X, Y, Z labeled.]

21. The graph shows changes in blood pressure in the aorta over time. Which letter would indicate when ventricular systole is occurring?

A. W  
B. X  
* C. Y  
D. Z

L: Respiratory System

Knowledge

22. What traps particles and moves them up the trachea?

A. villi and mucus  
* B. mucus and cilia  
C. alveoli and villi  
D. cilia and alveoli
Understanding

23. Which of the following substances, formed during internal respiration, counteracts a decrease in blood pH?

A. oxyhemoglobin
B. carbonic anhydrase
C. reduced hemoglobin
D. carbaminohemoglobin

Higher Mental Processes

Use the following diagram to answer question 24.

24. Which of the following pairs of reactions occurs most frequently in the blood surrounding the structure shown?

A. \( \text{Hb} + \text{O}_2 \rightarrow \text{HbO}_2 \) and \( \text{HHb} \rightarrow \text{Hb} + \text{H}^+ \)
B. \( \text{HbO}_2 \rightarrow \text{Hb} + \text{O}_2 \) and \( \text{Hb} + \text{H}^+ \rightarrow \text{HHb} \)
C. \( \text{H}^+ + \text{Hb} \rightarrow \text{HHb} \) and \( \text{H}_2\text{CO}_3 \rightarrow \text{HCO}_3^- + \text{H}^+ \)
D. \( \text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3 \) and \( \text{H}_2\text{CO}_3 \rightarrow \text{HCO}_3^- + \text{H}^+ \)

M / N: Nervous System: Neuron, Impulse Generation and Reflex Arc / Divisions of the Nervous System and the Brain

Knowledge

25. How do neurotransmitters move across the synaptic cleft?

A. by osmosis
B. by diffusion
C. by active transport
D. by facilitated transport
Understanding

26. What results from stimulation of the parasympathetic nervous system?

A. the pupils to dilate
B. peristalsis to decrease
C. the bronchioles to dilate
* D. the heart rate to decrease

Higher Mental Processes

Use the following diagram to answer question 27.

27. Which labelled structure is responsible for increasing body temperature as a result of infection?

A. W
B. X
C. Y
* D. Z

O: Urinary System

Knowledge

28. The collecting ducts are located in which of the following structures?

A. ureter
B. urethra
C. renal pelvis
* D. renal medulla
Understanding

29. Which structure absorbs glucose by active transport?
   A. glomerulus  
   B. collecting duct  
   C. Bowman’s capsule  
   * D. proximal convoluted tubule

Higher Mental Processes

30. Which of the following results from damage to the glomeruli?
   A. excess glucose in the urine  
   * B. red blood cells in the filtrate  
   C. an increase of urea in the renal cortex  
   D. a decrease of nitrogenous waste in the filtrate

P: Reproductive System

Knowledge

31. Where does spermatogenesis occur?
   A. interstitial cells  
   B. seminal vesicles  
   * C. seminiferous tubules  
   D. ductus (vas) deferens
Use the following diagram to answer question 32.

Use the following diagram to answer question 33.

32. Which labelled structure secretes hormones that cause the changes that occur in the female body during puberty?

A. W  
*B. X  
C. Y  
D. Z  

33. What do the secretions from structure X cause?

A. uterine lining to slough off  
B. ovaries to produce a mature egg  
*C. uterine lining to produce a thick mucus  
D. production of human chorionic gonadotropin (HCG)