This is a Class 1 exam

Lebanon Evangelical School
for Boys and Girls
Loueizeh - Baabda

Stage Exam 03
FEB2023

Do NOT write in this box. Your MARK will be placed here.

Subject :	Biology
Class :	9B and 9C
Teacher :	Christine Khalil
Duration :	1 hour

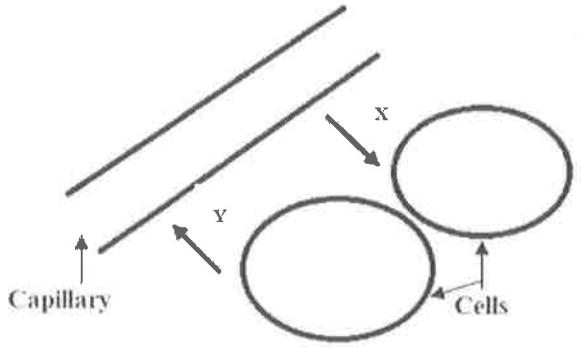
Please write your answers on a separate paper.

Your name :		*Time taken to complete exam*
Your Class :		
Exam Room :		
How many sheets, including cover sheet :		

- Do not open this paper until the teacher in charge instructs you to do so.
- The most important thing to remember in taking an exam is NEVER PANIC.
- If you are caught cheating in this exam, you will be awarded zero for ALL exams that are taken on this day.

Exercise 1 (4 points)

Organs of the body are made up of tissues, which in turn are made up of cells.
The document below shows the exchange of respiratory gases at the level of tissues (cells).



Indicate, by referring to the document, the true or false statement(s). Justify your answer in each case.

1- Gas X is oxygen gas. (1)

2- Gas Y is carbon dioxide gas. (1)

3- The color of blood which leaves the organ is bright red. (1)

4- The chemical equation that explains the change in the color of blood after leaving the organ:

oxyhemoglobin $\longrightarrow$ oxygen + hemoglobin (1)

Exercise 2 (6.5 points)

Nitrogen dioxide (NO_2) is a gas polluting the atmosphere. It is mainly released during the combustion of fossil fuels (coal, crude oil, ...). A study is performed to determine the effect of air pollution by NO_2 on the frequency of respiratory diseases. The obtained results are represented in the following document.

Level of NO_2 air pollution	1 Low pollution	2 Moderate pollution	3 High pollution
Frequency of respiratory diseases per 100 hospitalized patients	6	11	16

1. Pose the problem at the origin of this study. (1)

2. Construct the histogram (bar graph) showing the variation of the frequency of respiratory diseases as a function of the level of NO_2 air pollution. (2)
3. a. Analyze the obtained results. (1)

   b. What can you conclude? (1)
4. Indicate the pathway of the inhaled air through the respiratory passages reaching the pulmonary alveoli. (1.5)

Exercise 3 (7.5 points)

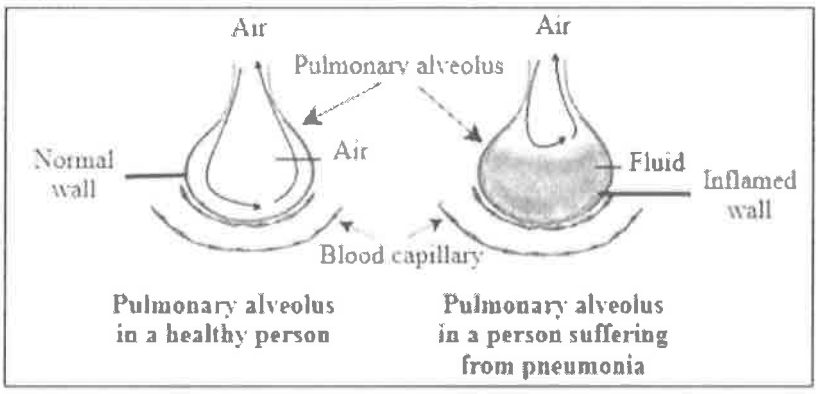
Pneumonia is an acute respiratory infection that affects the lungs. These latter are made up of small sacs called alveoli which fill with air when a healthy person breathes. In case of pneumonia, the alveoli become inflamed and filled with fluid, which leads to breathing difficulties.

Document 1

1. Pick out, from document 1, the consequences of pneumonia. (1)
2. Name the gases exchanged at the level of the pulmonary alveoli. (1)
3. List the characteristics that make the alveoli an efficient surface for gas exchange. (1.5)

Document 2 represents the aspect of the pulmonary alveolus in a healthy person and in another suffering from pneumonia.

4. Compare the aspect of the pulmonary alveolus in a healthy person to that in a person suffering from pneumonia, document 2. (2)
5. Explain why the gaseous exchange at the level of the alveoli is reduced in a person suffering from pneumonia. (2)



Document 2

Exercise 4 (7 points)

Blood circulates in blood vessels throughout the body. Some people suffer from anemia which is a blood disorder. The most common symptoms of this disorder are: shortness of breath, fatigue, pale skin, etc.

1. Pick out from the text two symptoms of anemia. (1)

The number of red blood cells and the level of hemoglobin in the blood are measured in a normal individual and in an anemic individual. The results are shown in the document below.

	Normal individual	Anemic individual
Number of red blood cells x 10^6/mm^3 of blood	4.5	3.5
Level of hemoglobin in the blood (g/dl)	13	7

2. State the role of hemoglobin. (1)
3. a. Compare the obtained results presented in the above document. (2)
   b. Conclude two characteristics of anemia. (1)
4. Explain why anemic people suffer from fatigue. (2)

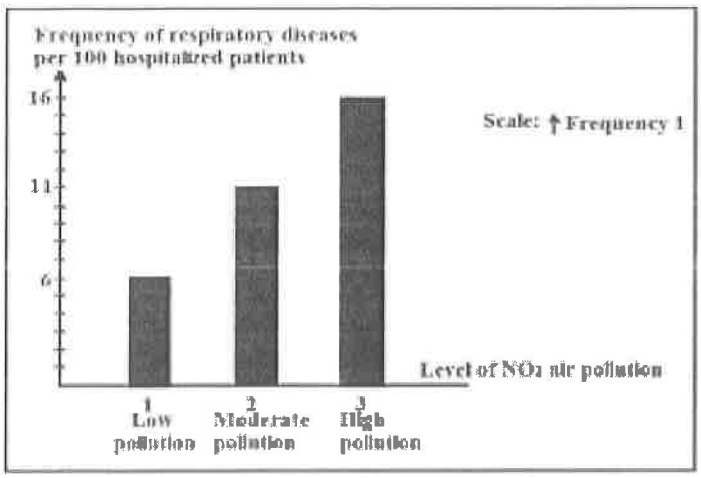
Correction of SE03 9BC

Exercise 1 (4 points)

1. True. (0.25) Oxygen diffuses from high concentration (in blood) to the cells (low concentration) where the cells are going to consume oxygen to produce energy. (0.75)
2. True. (0.25) Carbon dioxide is produced in the cells due to oxidation and diffuses from high concentration (cells) to the low concentration in the blood. (0.75)
3. False. (0.25) When it leaves the organ, the blood is poor in oxygen which makes its color dark red. (0.75)
4. True. (0.25) Oxyhemoglobin dissociates into hemoglobin and oxygen. Oxygen diffuses to the cells which lowers its concentration in the blood leading to the change in color to dark red. (0.75)

Exercise 2 (6.5 points)

1. What is the effect of air pollution by NO_2 on the frequency of respiratory diseases? (1)
2. Title (0.5) Scale (0.25) Figure (1.25)



Title: Histogram showing the variation of the frequency of respiratory diseases in function of the level of NO_2 air pollution

3. a. The frequency of respiratory diseases increases from 6 to 16 per 100 hospitalized patients as the level of NO_2 air pollution increases from level 1 (low pollution) to level 3 (high pollution). (1)
   b. Air pollution by NO_2 causes respiratory diseases. (1)

4. Nasal cavities. pharynx, larynx, trachea, bronchi, bronchioles, pulmonary alveoli (0.25 per name except alveoli)

Exercise 3 (7.5 points)

1. The alveoli become inflamed and filled with fluid, which leads to breathing difficulties (1).
2. Oxygen gas and carbon dioxide (0.5 each).
3. Large surface area of alveoli, thin wall of alveoli and capillaries, richness in blood vessels in which blood circulates slowly (0.5 each).
4. In a healthy person, the pulmonary alveolus has a normal wall and is filled with air, while that of the person suffering from pneumonia, the pulmonary alveolus has an inflamed wall and is filled with fluid and air. (2)
5. In the person suffering from pneumonia, the alveoli have an inflamed wall and are filled with fluid. Thus, the diffusion of oxygen gas from the alveolar air to the blood and that of carbon dioxide from the blood to the alveolar air become difficult and consequently gas exchange will be reduced. (2)

Exercise 4 (7 points)

1. The symptoms of anemia are shortness of breath, fatigue or pale skin. (1)
2. Hemoglobin transports the respiratory gases, oxygen gas and carbon dioxide. (0.5 each)
3. a. Both, the number of red blood cells (4.5 million/mm^3) and the level of hemoglobin (13 g/dl) in the blood of a normal individual are greater than those in an anemic individual which are 3.5 million/mm^3 of blood and 7 g/dl respectively.
   b. Anemia is characterized by deficiency in red blood cells and in hemoglobin. (0.5 each).

4. Oxygen gas is carried by hemoglobin molecule present in red blood cells. Anemic individuals have a low number of red blood cells and hemoglobin molecules. As a result, less oxygen gas is transported to the body cells by the blood. Consequently, a little amount of oxygen gas is consumed by the cells, resulting in low production of energy by cellular oxidation reaction. This is why the person suffers from fatigue. (2)