مسابقة في مادّة علوم الحياة والأرض
المدّة: ساعة واحدة

الاسم:
الرّقم:

Answer the following four exercises.

Exercise 1 (5 points) Cellular Divisions

Correct the following statements.

1. During prophase of mitosis, each chromosome is of one chromatid.

2. The homologous chromosomes separate during anaphase of mitosis.

3. At the end of mitosis, a mother cell gives four daughter cells.

4. Meiosis II is a reductional division.

5. Decondensation of chromosomes takes place during prophase of mitosis.

Exercise 2 (5 points) Respiratory Gas Exchange

The exchange of oxygen gas (O_2) and carbon dioxide (CO_2) takes place between alveolar air and blood. The document below represents the percentage of oxygen gas and carbon dioxide in the inhaled air and that in the exhaled air, as well as that in the blood entering and in the blood leaving the lungs.

1. Pick out from the adjacent document:

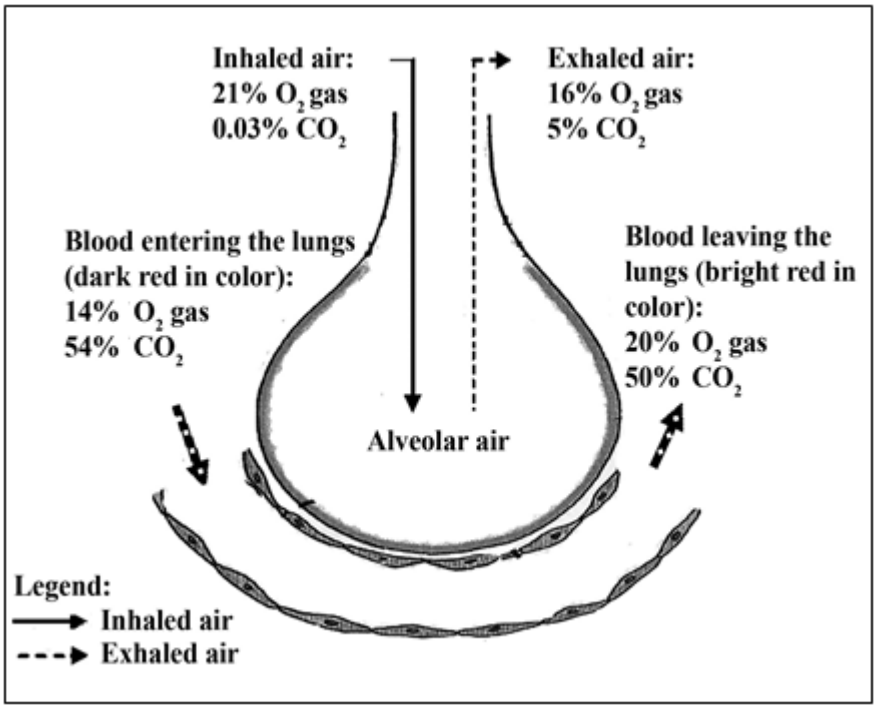
1-1. The color of blood entering the lungs.

1-2. The color of blood leaving the lungs.

2-1. Compare the composition of the inhaled air to that of the exhaled air in oxygen gas and carbon dioxide.

2-2. What do you conclude?

3. Show, by referring to the adjacent document, that the blood leaving the lungs is enriched in oxygen gas and impoverished in carbon dioxide.



4. Draw out the direction of the passage of oxygen gas and that of carbon dioxide at the level of the pulmonary alveoli.

Exercise 3 (5 points) Digestion of Sucrose

Sucrose is a non-reducing sugar formed of two simple sugars glucose and fructose. It is digested at the level of the digestive tube in the presence of a specific enzyme, sucrase.
In order to know if sucrose is digested by brewer's yeast, a unicellular fungus, the following experiment is performed:
In three test tubes A, B and C placed in a water-bath at 37°C, sucrose and water are put. Then, sucrase is added into tube B and brewer's yeast into tube C. These tubes are left in the water-bath for duration of 40 minutes.

1. Pose the problem at the origin of this experiment.

2. Pick out from the text:
2-1. the constituents of sucrose.
2-2. the specific enzyme for the digestion of sucrose.

3. Draw a table showing the conditions of this experiment.

The Fehling test permits the identification of reducing sugars such as simple sugars and disaccharides except sucrose. This test is performed on the three test tubes at the beginning and at the end of the experiment. The obtained results are represented in the adjacent document.

Tubes	A	B	C
At the beginning of the experiment	-	-	-
At the end of the experiment	-	+	+

(+): Presence of a reducing sugar
(-): Absence of a reducing sugar

4-1. Analyze the obtained results.
4-2. What do you conclude concerning the action of brewer's yeast on sucrose?

Exercise 4 (5 points) Transmission of an Autosomal Hereditary Trait

The cross between two pure lines of tomato plants, one having large fruits and the other having small fruits, gives 100% tomato plants having small fruits.

1. Specify the dominant allele and the recessive one.

2. Designate by symbols the corresponding alleles.

Two other crosses A and B are performed as shown in the following document.

	Cross			Results
A	Tomato plant having small fruits	**X**	Tomato plant having small fruits	75% Tomato plants having small fruits 25% Tomato plants having large fruits
B	Tomato plant having large fruits	**X**	Tomato plant having small fruits	50% Tomato plants having small fruits 50% Tomato plants having large fruits

3. Make a factorial analysis to verify the results of cross A.

4-1. Write the genotype of each parent in cross B. Justify the answer
4-2. Name cross B.