

الاسم:
الرقم:

مسابقة في مادة علوم الحياة والأرض
المدة: ساعة واحدة

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 (O₂) and carbon dioxide (CO₂) takes place between alveolar air and blood. **Document 1** represents the percentage of oxygen gas and carbon dioxide in the inhaled air and that in the exhaled air.

	Inhaled air	Exhaled air
Percentage of oxygen gas	21	16
Percentage of carbon dioxide	0.03	5

Document 1

1-1. Compare, by referring to document 1, the composition of the inhaled air to that of the exhaled air in oxygen gas and carbon dioxide.

1-2. What do you conclude?

Document 2 shows the percentage of oxygen gas and carbon dioxide in the blood entering and leaving the lungs.

	Blood entering the lungs	Blood leaving the lungs
Percentage of oxygen gas	14	20
Percentage of carbon dioxide	54	50
Color of blood	Dark red	Bright red

Document 2

2-1. Pick out from document 2 the color of blood entering the lungs.

2-2. Pick out from document 2 the color of blood leaving the lungs.

3. Show, by referring to document 2, that the blood leaving the lungs is enriched in oxygen gas and impoverished (becomes poor) in carbon dioxide.

4. Draw out from both documents 1 and 2, 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.
- 2-1. Pick out from the text the constituents of sucrose.
- 2-2. Pick out from the text the specific enzyme for the digestion of sucrose.
3. Draw out the experimental condition that varies between tube B and tube C.

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 concerning the absence or presence of reducing sugars are represented in the adjacent document.

Tubes	A	B	C
At the beginning of the experiment	absence	absence	absence
At the end of the experiment	absence	presence	presence

- 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.