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BIOLOGY

ENERGY TRANSFERS IN & BETWEEN ORGANISMS

Level & Board	AQA (A-LEVEL)
TOPIC:	RESPIREATION
PAPER TYPE:	QUESTION PAPER - 1
TOTAL QUESTIONS	6
TOTAL MARKS	28

Respiration - 1

1.

(a) Explain the glycolysis process. **(4)**

(b) A Krebs cycle process is inhibited by malonate.

Describe the reason behind malonate's reduction in a respiring cell's oxygen intake. **(2)**

2.

(a) Lactate is produced in muscles during extended exercise from pyruvate.

Describe how the process of converting pyruvate to lactate permits anaerobic respiration to continue producing ATP. **(2)**

3.

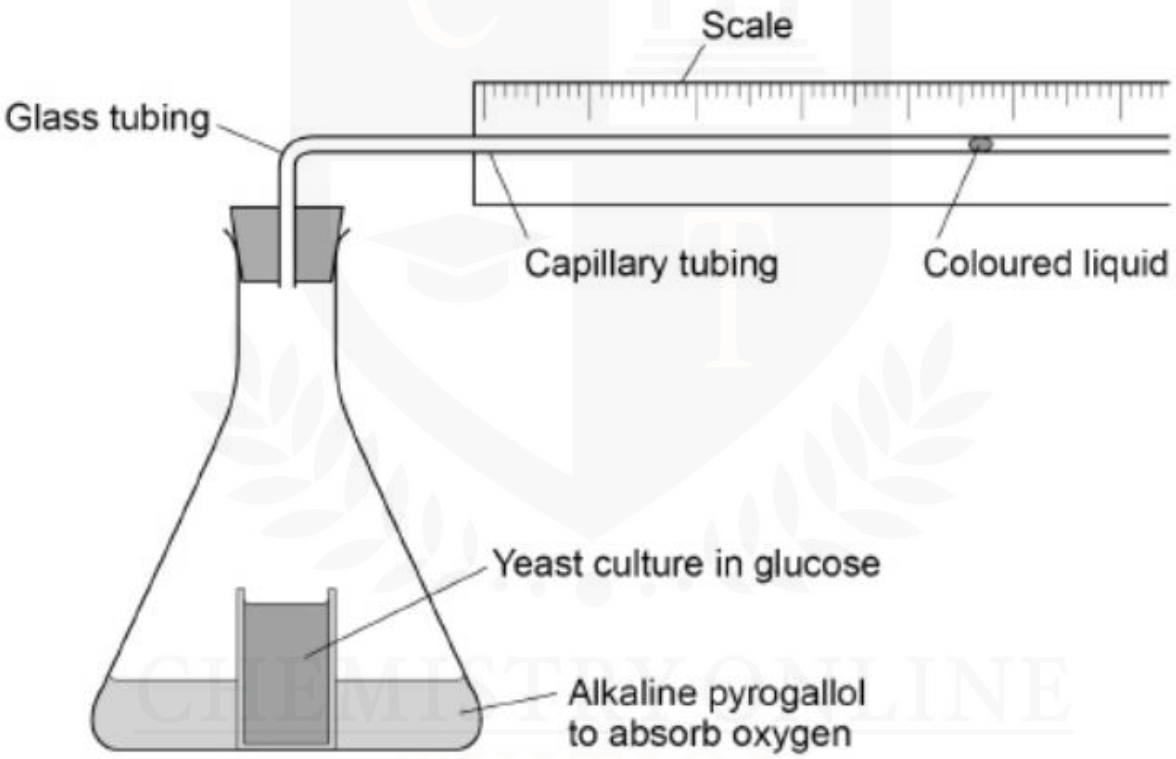
Anaerobic or aerobic respiration is possible in yeast cells. A student measured the rate of respiration in yeast using the apparatus depicted in Figure 1.

After leaving the apparatus for an hour, she did the following:

• placed the flask in a water bath to bring the yeast culture to a steady temperature; and

• began her examination.

Figure 1



(a) Give an example of why it was crucial that the student step away from the device for an hour once the yeast culture had stabilized at a certain temperature. **(1)**

(b) As she looked into it, the colored liquid shifted to the right.

Justify its movement to the right. **(2)**

(c) The colored liquid moved 1.5 cm in a day, the student discovered. The capillary tubing lumen, or hole, had a diameter of 1 mm.

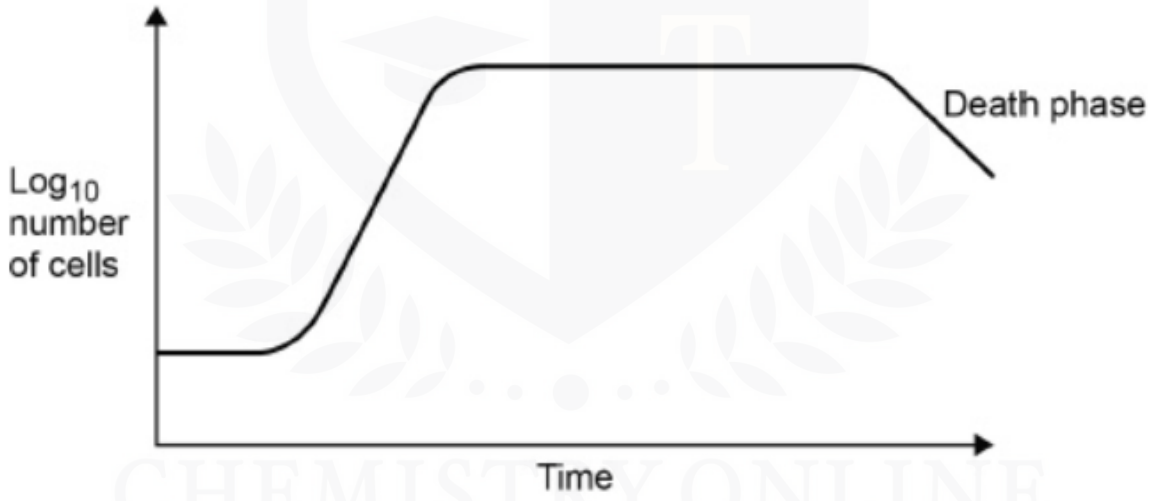
A capillary tubing volume is calculated as πr2l, where l is its length and π equals 3.14.

Determine the gas production volume in cm^3 $hour^{-1}$.

Display your work. **(2)**

A typical population growth curve for yeast grown in a lab setting is shown in Figure 2.

Figure 2



(d) Justify the usage of a log scale to record the number of cells**. (1)**

4.

(a) The death phase is when a lot of yeast cells perish.

Give one explanation for this. **(1)**

(b) Under ideal laboratory conditions, one may forecast the growth in the population of yeast cells using the following equation.

$$X_t = X_0 e^{rt}$$

X_t represents the population at a given moment.

X_0 is the initial population.

e = 2.72 is the natural logarithm's base.

R is the growth rate.

t = the amount of time in hours that r is applicable

For ten hours, 2000 yeast cells were left in the population.

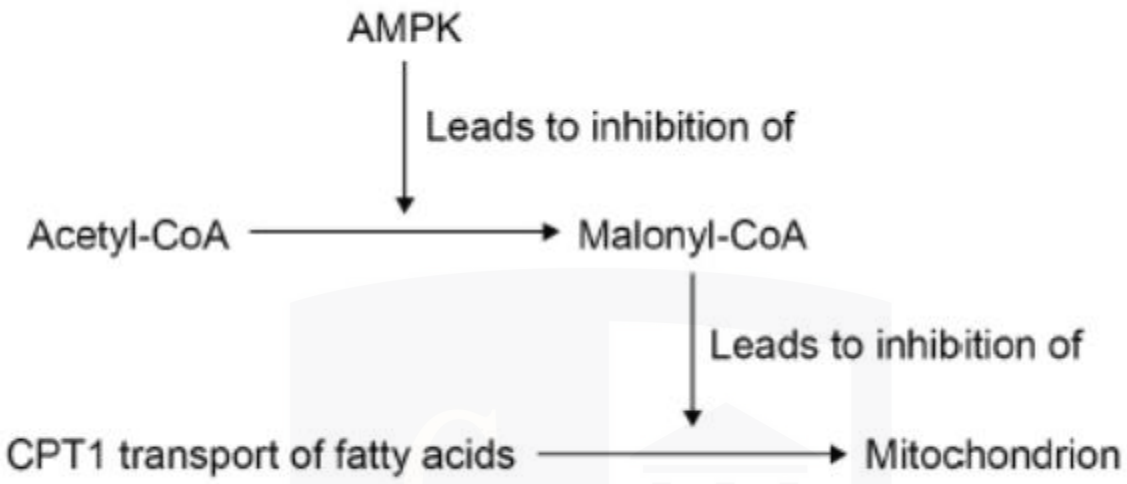
The growth rate had a value of 0.5.

Determine the estimated size of the population after ten hours, assuming that no yeast cells perished. Display your work. **(2)**

5.

(a) The enzyme known as AMP-activated protein kinase, or AMPK, controls several biological functions. Exercise causes AMPK to become active.

The graphic illustrates one result of AMPK activation during exercise.

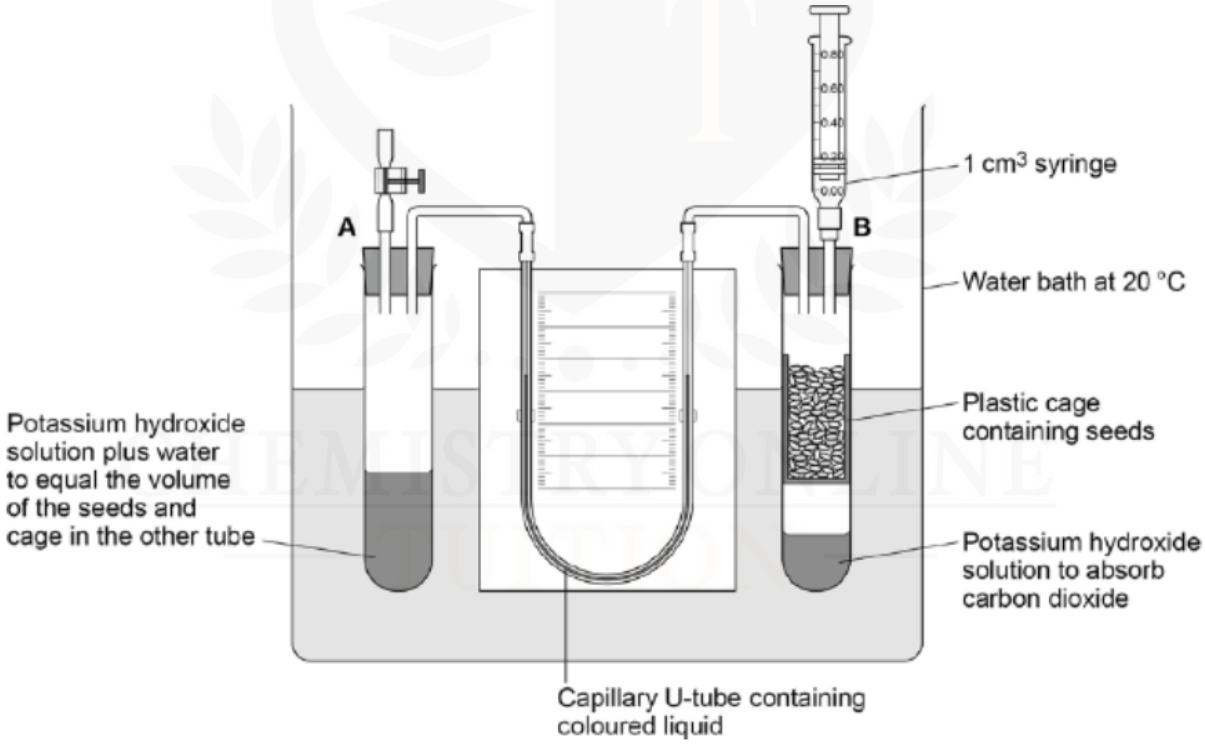


Fatty acid transportation into mitochondria is carried out by the channel protein CPT1.

Give an explanation of the advantages of activating AMPK during exercise using the above diagram. **(3)**

6.

The device used to measure the rate at which seeds use oxygen during aerobic respiration is depicted in the figure below.



(a) The syringe from tube B was taken out, and the tap connected to tube A was left open for the first ten minutes.

Provide three explanations for the equipment 10-minute leave. **(3)**

(b) Provide a suggestion and an explanation for the experiment's temperature of 20 °C. **(2)**

(c) The syringe was connected to tube B and the tap on tube A was shut after ten minutes. The syringe plunger was changed once every minute until the U-tube levels were constant. Next, the volume scale reading on the syringe was noted.

The table below displays the findings.

Time / minutes	Reading on syringe volume scale / cm^3
0	0.84
1	0.81
2	0.79
3	0.76
4	0.73
5	0.70
6	0.68
7	0.66
8	0.63
9	0.62
10	0.58

(d) The colored liquid in the tubing migrated in the direction of tube B during the experiment.

Describe the cause of this. **(3)**

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