

Name of the Student: _____

Max. Marks : 17 Marks

Time : 17 Minutes

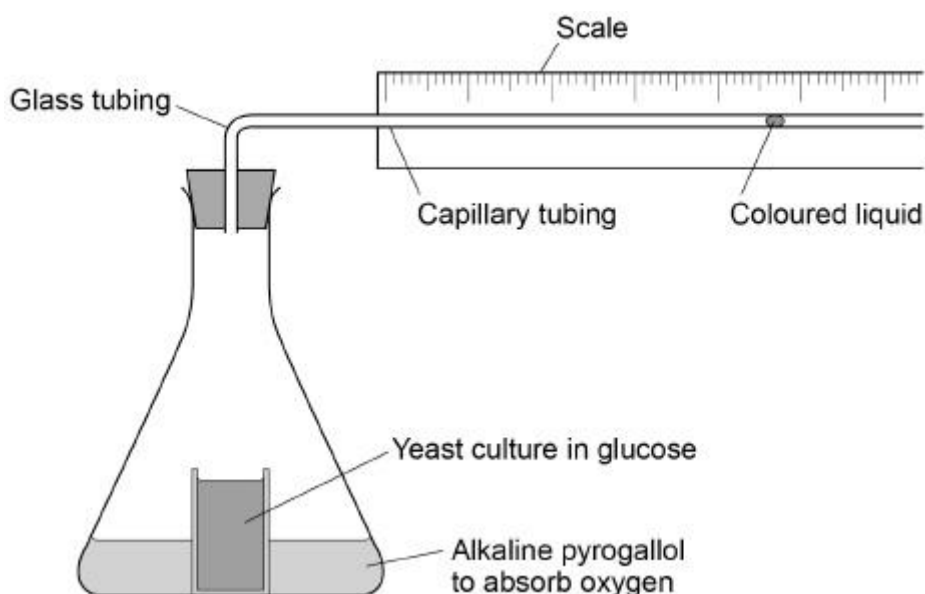
Q1.

Yeast cells can respire aerobically or anaerobically. A student used the apparatus shown in **Figure 1** to measure the rate of respiration in yeast.

She:

- positioned the flask in a water bath so that the yeast culture reached a constant temperature
- then left the apparatus for one hour before starting her investigation.

Figure 1



- (a) Suggest **one** reason why it was important that the student left the apparatus for one hour after the yeast culture reached a constant temperature.

(1)

- (b) During her investigation, the coloured liquid moved to the right.

Explain why it moved to the right.

(2)

- (c) The student found that the coloured liquid moved 1.5 cm in 24 hours. The diameter of the lumen (hole) of the capillary tubing was 1 mm.

The volume of a capillary tubing is given by $\pi r^2 l$, where π is 3.14 and l = length.

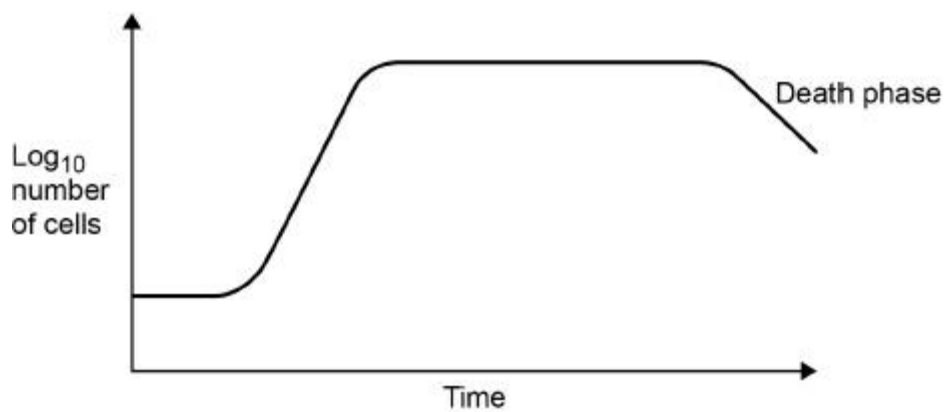
Calculate the volume of gas produced in $\text{cm}^3 \text{ hour}^{-1}$.
Show your working.

Answer = _____ $\text{cm}^3 \text{ hour}^{-1}$

(2)

Figure 2 shows a typical population growth curve for yeast under laboratory conditions.

Figure 2



- (d) Explain why a log scale is used to record the number of cells.

(1)

- (e) Many yeast cells die during the death phase.

Suggest **one** reason why.

(1)

- (f) The following equation can be used to make predictions of the growth in the population of yeast cells under ideal laboratory conditions.

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

X_t = the population after a certain time

X_0 = the population at the start

$e = 2.72$ (base of natural logarithm)

r = growth rate

t = time period in hours over which r applies

A population of 2000 yeast cells was left for 10 hours.

The value for the growth rate was 0.5

Assuming no yeast cells died, calculate the predicted size of the population after 10 hours.
Show your working.

Answer = _____

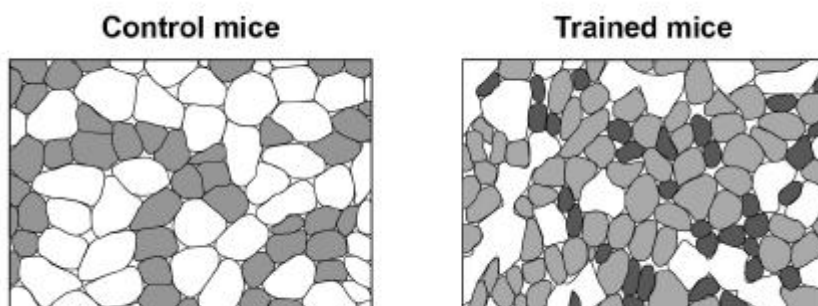
(2)

(Total 9 marks)

Q2.

Scientists investigated the effect of regular exercise on skeletal muscle fibres in mice. The scientists compared the muscle fibres of mice after six weeks of regular exercise (trained mice) with those of mice that had not exercised (control mice). The scientists stained the muscle fibres from both sets of mice to show succinic acid dehydrogenase activity. The darker the stain the greater the succinic acid dehydrogenase activity.

The diagram below shows a typical set of results they obtained.



- (a) Succinic acid dehydrogenase is an enzyme used in the Krebs cycle.

Suggest **one** reason for the difference in the staining between the muscle fibres of the control mice and the trained mice.

(1)

- (b) The scientists then compared the length of time that the control mice and the trained mice could carry out prolonged exercise. The trained mice were able to exercise for a longer time period than control mice.

Explain why.

(3)

- (c) The scientists determined the mean diameter of muscle fibres in trained mice using an optical microscope to examine sections of muscle tissue. The circular area (πr^2) of one field of view was 1.25 mm^2 . The diameter of this area was equal to the diameter of 15 muscle fibres.

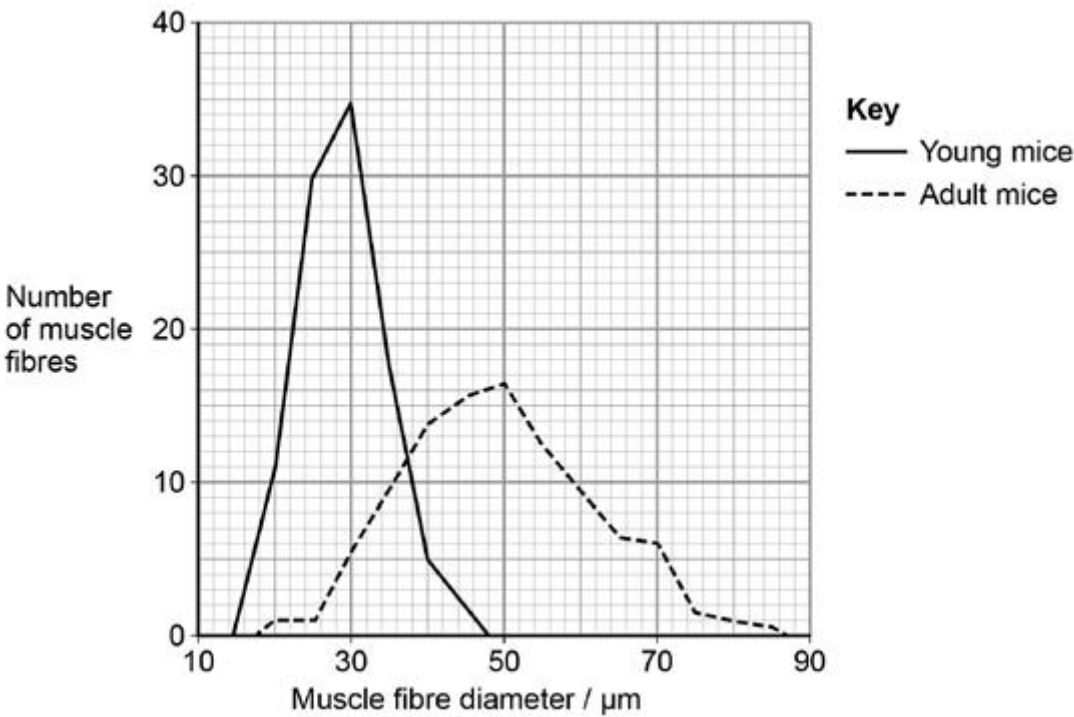
Using this information, calculate the mean diameter in μm (micrometres) of muscle fibres in this section of tissue.

Answer _____ μm

(2)

- (d) The scientists also compared the diameter of samples of muscle fibres taken from young mice and adult mice.

Some of their results are shown in the graph.



Describe **two** differences between these samples of muscle fibres.

1. _____

2. _____

(2)

(Total 8 marks)