

**A Level Biology A**  
**H420/01 Biological Processes**

**Question Set 5**

5 (a)

A student carried out an investigation into the production of CO<sub>2</sub> in five different species of yeast.

The yeast cells were placed in different environments and the CO<sub>2</sub> production was measured.

Table 20 shows the results of the experiment. The mean values for these data are also represented as a graph in Fig. 20.

Conditions		Carbon dioxide produced (bubbles min <sup>-1</sup> )				
		Species				
		<i>S. cerevisiae</i>	<i>C. krusei</i>	<i>C. albidus</i>	<i>C. albicans</i>	<i>A. pullulans</i>
Aerobic	Trial					
	1	23	18	34	12	22
	2	18	17	20	15	21
	3	23	19	32	26	24
	4	24	23	26	13	22
	5	25	19	28	14	26
	6	15	17	29	12	22
	7	16	19	20	15	25
	8	17	23	36	13	27
	9	23	19	20	10	27
	10	25	17	19	13	25
	11	25	16	34	11	25
	12	23	16	20	11	25
Standard deviation		4	2	7	4	2
Anaerobic	Trial					
	1	12	6	22	8	34
	2	10	9	29	22	36
	3	12	10	19	6	29
	4	13	12	34	12	32
	5	15	7	25	19	28
	6	9	8	19	10	26
	7	10	9	23	14	27
	8	15	10	27	9	29
	9	15	5	35	6	35
	10	14	7	26	7	20
	11	15	8	19	21	30
	12	11	9	25	13	34
Standard deviation		2	2	5	6	.....

Table 20

Using the information in Table 20, calculate the standard deviation for the number of CO<sub>2</sub> bubbles produced by *A. pullulans* in anaerobic conditions.

Write the answer into the space provided in Table 20. Give your answer to **one** significant figure.

$$SD = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

Show your working.

[3]

5 (b)

Fig. 20 is a graph showing the mean values of the data from Table 20.

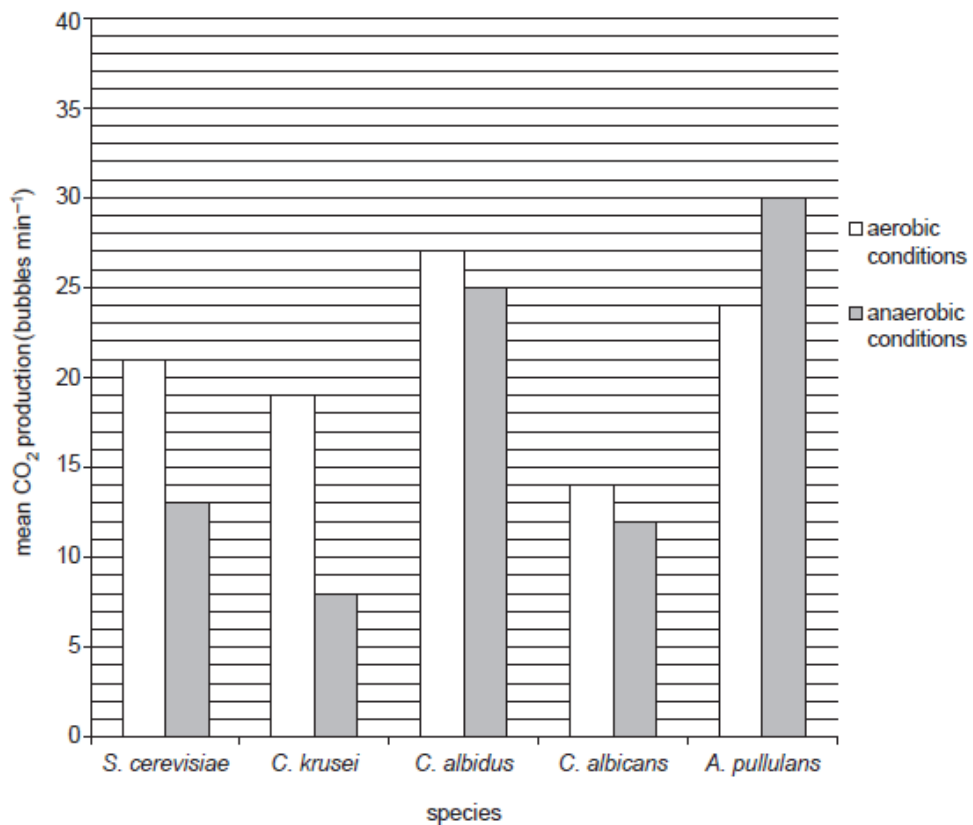


Fig. 20

Plot the standard deviations for all data on Fig. 20.

[Answer on Fig. 20]

[2]

- 5 (c) Calculate the mean percentage change in CO<sub>2</sub> production for *S. cerevisiae* when moving from anaerobic to aerobic respiration. Give your answer to **four** significant figures.

Show your working.

[3]

- 5 (d) (i) The student drew the following conclusions:

1. All the yeast I investigated produced more CO<sub>2</sub> during aerobic respiration than anaerobic respiration.
2. There is a significant difference between the CO<sub>2</sub> production in aerobic and anaerobic conditions in *C. albidus*.

[2]

For each conclusion, state and explain whether the student is correct.

- 5 (d) (ii) The student found the following definitions of errors in a text book:

**Random errors:**

mistakes during measurements caused by low-resolution equipment

**Systematic errors:**

repeated inaccurate measurements in the same direction caused by problems with equipment

Which type of error is suggested by the student's data? Justify your answer.

[1]

- 5 (e) Anaerobic respiration in yeast cells requires enzymes.

Which organelle is responsible for synthesising these enzymes?

[1]

**Total Marks for Question Set 5: 12**

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