A Level Biology A

H420/01 Biological Processes

Question Set 5

5 (a) A student carried out an investigation into the production of CO_2 in five different species of yeast.

The yeast cells were placed in different environments and the CO_2 production was measured.

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

Conditions		Carbon dioxide produced (bubbles min^{-1})				
		Species				
		S. cerevisiae	*C. krusei*	*C. albidus*	*C. albicans*	*A. pullulans*
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_2 bubbles produced by *A. pullulans* in anaerobic conditions.

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

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

Show your working.

[3]

5 (b) Fig. 20 is a graph showing the mean values of the data from Table 20.

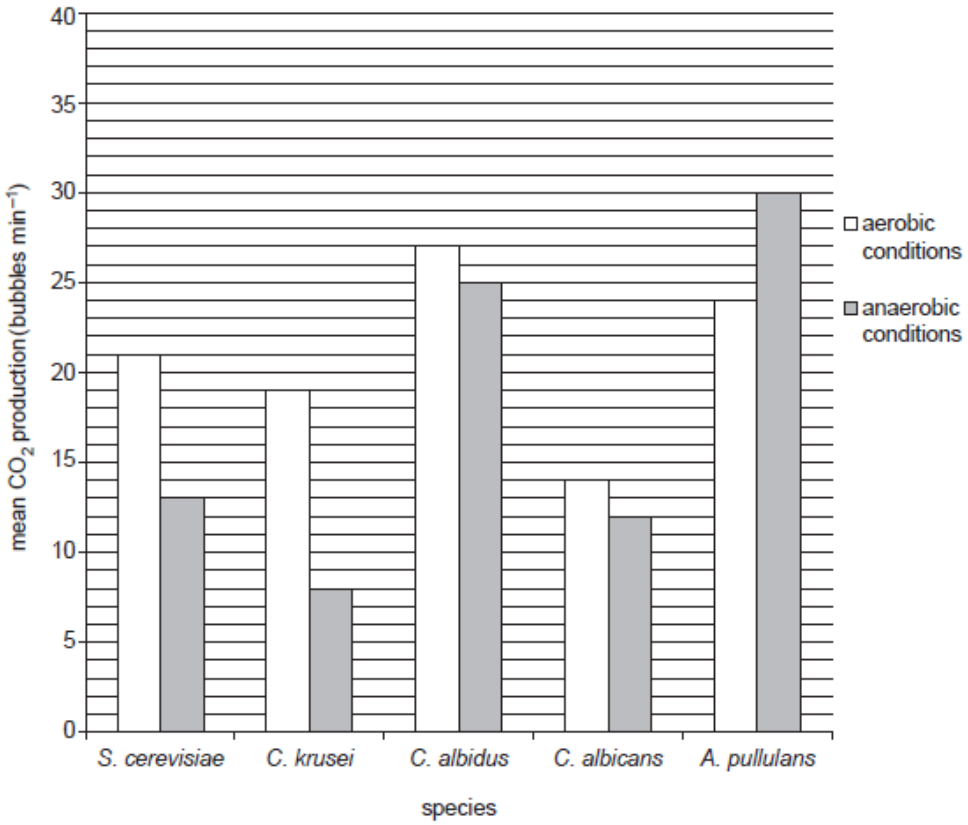

Fig. 20

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

[Answer on Fig. 20]

[2]

5 (c) Calculate the mean percentage change in CO_2 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 produed more CO_2 during aerobic respiration than anaerobic respiration.
2. There is a significant difference between the CO_2 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 problemswith 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