

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE

ADDITIONAL SCIENCE A

A154

Unit A154: Controlled Assessment

BIOLOGY A

A164

Unit A164: Controlled Assessment

Factors that affect the rate of fermentation

Information for Candidates (2)

To be issued to candidates **only** on completion of the data collection part of their practical investigation.

Marks from this specimen task must not be submitted to OCR.

These secondary data can be used as part of your practical investigation.

You can select the data that are useful for you.

Many breweries around the world are experimenting with the production of high ethanol beers.

Researchers in a Canadian brewery have been investigating fermentation in a strain of yeast, *Saccharomyces cerevisiae*, Strain 3001. When grown in a 10% glucose solution at 30°C, the researchers obtained the following results.

time in hours	ethanol concentration in g/dm ³
0	0
6	5
12	22
24	44
48	42
72	41
96	41
120	40

In a follow-up study, they investigated the ethanol production using the same type of yeast, grown in different concentrations of glucose solution at 30°C.

Some of their results are shown below.

time in hours	ethanol concentration in g/dm ³			
	10% glucose solution	20% glucose solution	30% glucose solution	40% glucose solution
0	0	0	0	0
6	5	4	2	0
12	22	17	7	5
24	44	48	34	22
48	42	52	67	37
72	41	54	83	42
96	41	53	84	42
120	40	51	85	41

Other researchers have been investigating the rate of yeast fermentation using different types of carbohydrate. Their results are shown below.

type of carbohydrate	mean rate of carbon dioxide production in cm^3/min
fructose	0.091
glucose	0.100
lactose	0.000
maltose	0.085
starch	0.000
sucrose	0.080

In a follow-up investigation on the fermentation of glucose, the following results were obtained.

% glucose concentration	mean rate of carbon dioxide production in cm^3/min
0	0.002
1	0.005
2	0.069
3	0.120
4	0.122
5	0.122

In a further investigation on the effect of temperature on the fermentation of glucose, the following results were obtained.

temperature in $^{\circ}\text{C}$	mean rate of carbon dioxide production in cm^3/min
0	0.002
10	0.062
20	0.120
30	0.235
40	0.237
50	0.202

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Page 3 Yeast Fermentation Tables © Data courtesy of the Institute of Brewing and Distilling: D'Amore T. Cambridge Prize Lecture, Improving Yeast Fermentation Performance, J. Inst. Brew., September-October, 1992, Vol, 98, pp. 376 & 380,
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