Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2A2B Human Biological Science 2012 /40

Scientific Method Quantitative Test

1. In an experiment designed to test the hypothesis that caffeine increases heart rate, a biologist carried out the following experiment.

⬩ She randomly selected 100 adults from a population.

⬩ She divided the group into two equal subgroups, again selecting the individuals at random.

⬩ Each group was allowed 15 minutes rest and then she measured each person’s heart rate, recording an average for the group.

⬩ Each individual in one group was given a caffeine tablet and 5 minutes later had his/her heart rate measured again. A new average heart rate was calculated for this group.

⬩ Each individual in the second group was given a tablet, which contained no caffeine, a placebo.

⬩ These individuals then had their heart rates measured and averaged as in the first group.

Using the above experiment, answer the following questions.

a) Write a possible hypothesis for the experiment.

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(2 marks)

b) Name the independent variable.

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(1 mark)

c) Name the dependent variable.

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(1 mark)

d) Name TWO controlled variables.

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(2 mark)

e) Describe two ways experimental error could be reduced in this experiment.

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(2 marks)

f) Describe what a placebo is. Explain why it was used in the experiment.

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(4 marks)

2. An investigator was examining possible factors which might contribute to traffic accidents. One of the factors examined was the effect of alcohol consumption on people’s reaction times.

The table below shows the average reaction times of a group of people after they had consumed various amounts of alcohol.

|  |  |
| --- | --- |
| Blood alcohol concentration (g/100mL) | Average reaction time (ms) |
| 0.04 | 250 |
| 0.06 | 265 |
| 0.08 | 312 |
| 0.09 | 364 |
| 0.10 | 422 |

a) Graph this data on the graph paper provided. (5 marks)

b) What conclusions can the investigator make from these results? How can this be applied to traffic accidents?

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(3 marks)

c) Using your graph, predict the reaction time of a person who had a blood alcohol concentration of

(i) 0.07 g/100mL \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(ii) 0.11 g/100mL \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(2 marks)

d) Which of your predictions in the question above are you more confident about? Explain why.

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(2 marks)

e) List THREE considerations the investigator would have needed to make in selecting the volunteers for his experiment so that his results could be regarded as valid.

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(3 marks)

f) The reaction time is listed in the table as an average. Give TWO reasons why this was necessary.

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(2 marks)

3. A poultry farmer wanted to see if he could increase the mass of chickens faster by using Growth Hormone. Eight chickens were raised in a laboratory. Four chickens were fed food containing Growth Hormone supplement and four others were fed with normal poultry food. The hormone treatment began when the chickens were two weeks old.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Chicken # | Mass (g)  2 weeks after hatching | Mass (g)  8 weeks after hatching |
| Growth Hormone in food | 1  2  3  4 | 100  90  100  110 | 550  560  550  600 |
| Normal food | 5  6  7  8 | 90  100  100  110 | 400  450  460  410 |

a) Write a suitable hypothesis for this experiment.

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(2 marks)

b) Name THREE variables that should be controlled in this experiment.

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(3 marks)

c) Name the independent variable.

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(1 mark)

d) Name the dependent variable.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(1 mark)

e) What conclusions can be drawn from this experiment?

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(2 marks)

f) Explain what a control group is and list the chickens in the control group.

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(2 marks)