Name: ANSWER KEY Teacher: _____

2A2B Human Biological Science 2012 /40

Scientific Method Quantitative Test

No ½ marks.

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.

e.g Caffeine ~~use~~ consumption will (1) increase the heart rate of an individual. (1).

(2 marks)

b) Name the independent variable.

Use of caffeine Taglet

(1 mark)

c) Name the dependent variable.

Heart rate

(1 mark)

d) Name TWO controlled variables.

- Both groups given 15 minutes rest
- Both groups randomly picked.
- One caffeine tablet each.
- 5 minute gap after tablet before pulse taken.

(2 mark)

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

- Repeat experiment a number of times
- Increase sample size.

(2 marks)

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

Resembles the drug (1) but does not contain the active component (or independent variable) (1) ! It reduces psycological affect (1) Allows comparison (1)

(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

subtract one mark for each of the following.

a) Graph this data on the graph paper provided. Not a line graph. No suitable (5 marks)
heading. Axis not labelled. No units of measure given. dots not joined by ruler. Not neat.
independent variable not on horizontal axis.

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

- An increase in blood alcohol consumption increases the average reaction time.
- ~~Reduces~~ There are more likely to be traffic accidents if people are drinking & driving.

(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 290 ±5 ms must have

(ii) 0.11 g/100mL 470 ±5 ms

(2 marks)

d) Which of your predictions in the question above are you more confident about? Explain why. (1) (1)

0.07, because this was an interpretation, not an extrapolation and the data was already given.

(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.

All not tired. All equally good eyesight. No other chemicals in body. same reaction time test. Age. Any Gender (3)

(3 marks)

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

Reduces error, increases accury, reduces individual effect. allows detection of outliers.

any 2 ✓

(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	100	550
	2	90	560
	3	100	550
	4	110	600
Normal food	5	90	400
	6	100	450
	7	100	460
	8	110	410

a) Write a suitable hypothesis for this experiment.

Growth hormone will ~~rate~~ increase the mass of chickens.

(2 marks)

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

Breed of chicken. Amount of food. Amount of exercise. Health of chickens. All started at same age. same dose of hormone for test group. (3 marks)

c) Name the independent variable.

Growth hormone.

(1 mark)

d) Name the dependent variable.

Mass (Not Growth) (or Not Growth rate) (1 mark)

e) What conclusions can be drawn from this experiment?

~~If men eat chicken they will grow~~ Growth hormone does increase the Mass of Chickens. or The hypothesis is supported by the results. (2 marks)

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

A sample group that is the same as the test group in ~~test~~ all ways except that it does not have the independent variable applied to it (1)

~~If allows comparison~~ (1)

Chickens 5, 6, 7, 8