Brookwood High School Science Olympiad Invitational
Disease Detectives Test
January 14th 2017

School & Team Name: _____ Student Names: _____

1. Name up to 4 pathogenic bacteria that can contaminate food and cause illness. Also specify the example of illness each bacteria causes (8 points):

2. Pathogenic bacteria are divided into two main groups Gram negative and Gram positive, based on

_____ . (2 points)

3. _____ forming bacteria are temperature resistant and are special problems for the food industry. It is not always possible to apply enough heat during food processing to kill these? (2 points)

4. A food that is pasteurized doesn't have to be stored properly afterwards.
True or False? (1 point)

5. Describe active, herd, and passive immunity (6 points):

1) **Active immunity:**

2) **Herd or Community immunity:**

3) **Passive immunity:**

6. Describe two main differences between cohort and case-control studies (4 points):

7. The proportion of people who tested negative and don't have the disease over all people without the disease and tested (1 point):

a) specificity
b) sensitivity
c) positive predictive value
d) negative predictive value

8. The probability that a person who tests positive actually has the disease is (1 point):

a) specificity
b) sensitivity
c) positive predictive value
d) negative predictive value

9. The probability that a person who tests negative does not have the disease is (1 point):

a) specificity
b) sensitivity
c) positive predictive value
d) negative predictive value

10. A study in which children are randomly assigned to receive either a newly formulated vaccine or the currently available vaccine, and are followed to monitor for side effects and effectiveness of each vaccine, is an example of which type(s) of study? (4 points)

a) Experimental
b) Observational
c) Cohort
d) Case-control
e) Clinical trial

11. The Iowa Women's Health Study, in which researchers enrolled 41,837 women in 1986 and collected exposure and lifestyle information to assess the relationship between these factors and subsequent occurrence of cancer, is an example of which type(s) of study? (4 points)

a) Experimental
b) Observational
c) Cohort
d) Case-control
e) Clinical trial

12. British investigators conducted a study to compare measles-mumps-rubella (MMR) vaccine history among 1,294 children with pervasive development disorder (e.g., autism and Asperger's syndrome) and 4,469 children without such disorders. (They found no association.) This is an example of which type(s) of study? (4 points)

a) Experimental
b) Observational
c) Cohort
d) Case-control
e) Clinical trial

13. What does MMWR stands for; a series published by CDC on weekly basis (2 points): (tiebreaker)

14. Come up with 5 simple steps that can be followed to lower the risk of foodborne illnesses (10 points):

15. Name the two brilliant scientists who established the germ theory of disease that each infectious disease is caused by a specific bacterium or other microorganisms (4 points): (tiebreaker)

16. Calculate the ***odds ratio*** given the following data and interpret the result in your own words. (2 points)

Ill/Sick	Ate Watermelon	Did not eat Watermelon	Total
Yes	69	111	180
No	5	120	125
Total	74	231	305

17. Kate collected the following data from the cafeteria and the sick children. She found that 105 students ate at the cafeteria on Friday, January 13, 2017. Calculate the ***relative risk*** and interpret the result in your own words (2 points):

Ate Spinach Salad	Got sick	Did not get sick
Yes	26	29
No	6	44

18. A study was conducted to determine the association between obesity and cardiovascular disease (CVD). The data was split between people less than 50 years old and people 50 years old or greater. Use the data from the charts below and the ***Cochran-Mantel-Haenszel method to estimate the odds ratio*** (5 points):

< 50	**CVD**	**No CVD**	**Total**		**> 50**	**CVD**	**No CVD**	**Total**
Obesity	15	96	**111**		**Obesity**	44	160	**204**
No Obesity	44	465	**509**		**No Obesity**	26	180	**206**
Total	59	561	**620**		**Total**	70	340	**410**

19. New challenges to food safety are continuing emerge, come up with ***2 food safety challenges*** that food industry, FDA and/or CDC are facing currently (4 points):

20. What is the difference between foodborne illnesses that are classified as ***intoxication*** and those that are classified as an ***infections***? (4 points) (tiebreaker)

21. Information below is based on an outbreak of gastroenteritis following a church supper, Oswego, New York, April 1940. Of the 80 persons attending the supper, 75 were interviewed. Forty-six met the case definition. Attack rates were calculated for those who did and did not eat each of the 6 food items.

a) ***Calculate the attack rates*** by food items served at the church supper. (3 points)

	# of people who ate				***# of people who did not eat***		
Food Item	***Sick***	***Total***	***Attack Rate%***		***Sick***	***Total***	***Attack Rate%***
Baked Ham	29	46			17	29	
Spinach	26	43			20	32	
Mashed Potatoes	23	37			23	37	
Brown Bread	18	27			28	48	
Vanilla Ice cream	43	54			3	21	
Fruit Salad	4	6			42	69	

Excludes one person who was unsure of consumption.

b) Find out most likely vehicle for the illness by looking at the attack rates. Create 2x2 table for the food item which caused the illness and ***calculate the relative risk***. (2 points)

	Sick	***Well***	***Total***	***Attack Rate%***
Ate Food Item				
Did Not eat Food Item				
Total				

RR =

c) ***Calculate the statistical significance using the chi-square (χ^2) test*** to determine that the relative risk (of getting sick by eating the food item) could have occurred by chance alone or not. (5 points)

HINT: The chi-square tests compare the observed numbers with the expected numbers. And below theoretical p values for the chi-square distribution to compare with the answer value.

Chi-square value	Probability (p)
≥ 10.83	≤ 0.001
≥ 6.64	≤ 0.01
≥ 3.84	≤ 0.05
< 3.84	> 0.05

χ^2 =

22. Looking for a ***dose response*** is particularly important in outbreaks where cases and the comparison group were exposed to the same risk factors. What is a ***dose response?*** (2 points) (tiebreaker)

Kitchen Food Safety Violations – You can find hints for Q: 5 here ☺