55 questions, 4 pages name_____(req'd)

Answer every question (1-55) with a single bubble. If not specified otherwise, assume

A = True/yes B =False/no

Italicized statements should be taken as true.

If any part of a question is wrong, treat the entire question as wrong.

Scientific Method (SM)

1-5. (10 pts) Which of the following are valid uses of, conclusions or outcomes from the SM? **(A) = True, (B) = False**

1. (A)(B) Measurements of sea level on the Gulf Coast taken this year are lower than normal; the average monthly measurements were almost 0.1 cm lower than normal in some areas. These observations prove that long term sea level rise is not going to be a problem on the Gulf Coast.

2. (A)(B) A poll revealed that 34% of the American public thinks that dinosaurs and early humans co-existed because fossil footprints of each were found in the same location. This widespread belief is appropriate evidence to support the claim that humans and dinosaurs lived at the same time.

3. (A)(B) This winter, the northeastern US received record amounts of snowfall, and average monthly temperatures were more than 2^{o}F lower than normal in some areas. These observations indicate that long term climate change is occurring.

4. (A)(B) Studies to test a model should be able to show that the model is right or wrong. If the study doesn't confirm that the model is either right or wrong, it has not been done correctly.

5. (A)(B) A teacher challenges the class attitude on the death penalty (that it is immoral) by claiming their views are not supported scientifically.

6-8. (5pts) A study looks at the health effects of drinking tea. Which of the following are possible valid outcomes/conclusions that could be drawn from such a study, assuming it is done properly? The model being tested is that drinking tea causes health problems. (Each option should be considered independently of other options.)

(A) is a possible valid outcome (B) is not

6. (A)(B) The study rejects the model.

7. (A)(B) The study fails to reject (and thus accepts) the model.

8. (A)(B) The study fails to reject the model; that outcome allows us to conclude that drinking tea does not cause health problems.

9-12. (8 pts) Using shortcuts. Which descriptions allow you to suspect a failure to adhere to proper scientific method (for the goal underlined)? Rely on the 'shortcuts' given in class for some of the questions.

(A) is suspicious -- likely not good SM (B) not suspicious – very possibly consistent with SM

9. (A)(B) A company with the goal of increasing its share of the market has never changed its operations or marketing plan in 30 years despite progressively losing market share.

10. (A)(B) A group trying to discredit the Big Bang theory on scientific grounds relies entirely on public attitudes for disproving the theory.

11. (A)(B) A group developing a model to predict weather keeps changing the model, even though the predictions are rarely accurate.

12. (A)(B) A forensic scientist argues that the evidence (s)he presents in trials is scientifically valid and based on the fact that the jury always returns a verdict agreeing with his/her testimony.

13-20. Below are paragraphs, each giving a description of a process with parallels to the scientific method. In the questions that follow each paragraph, you are asked to match a scientific method element with a quote taken from the paragraph. In each paragraph, the initial goal is underlined. You would select (A) if the quote describes a new goal. An option may be used once, none, or more than once – that is, not all elements are necessarily present.

13-16. (7pts) During political campaigns, candidates attempt to inspire people to vote for them. A candidate has many possible ways and methods to inspire the voters, but they can use only one or two on any specific audience at a time. To determine the best method for their goal, they try different methods on different audiences and then measure the responses of each audience. The method that yields the highest voter response is then chosen to replace the others for future audiences.

(A) Goal **(B)** Model **(C)** Data **(D)** Evaluation **(E)** Revision **(F)** None

13. (A) (B) (C) (D) (E) (F) the responses of each audience

14. (A) (B) (C) (D) (E) (F) is chosen to replace the others

15. (A) (B) (C) (D) (E) (F) can use only one or two

16. (A) (B) (C) (D) (E) (F) ways and methods to inspire the voters

17-20 (7pts) The boss of a residential cleaning service is trying to expand their client base by increasing client satisfaction. This service employs several individuals as cleaners, each sent to different addresses. Feedback from the client is used to judge the quality of the cleaner. The cleaners with the most favorable ratings are kept employed and those with unfavorable ratings are terminated. The business plan seems to be working, as the business is expanding its client base.

(A) Goal **(B)** Model **(C)** Data **(D)** Evaluation **(E)** Revision **(F)** None

17. (A) (B) (C) (D) (E) (F) feedback from the client

18. (A) (B) (C) (D) (E) (F) judge the quality of the cleaner

19. (A) (B) (C) (D) (E) (F) employs several individuals as cleaners

20. (A) (B) (C) (D) (E) (F) those with unfavorable ratings are terminated

21-24 (7 pts) In the following paragraph, indicate which elements of the Sci Met. are present for the goal given. The goal is underlined. Do not assume more than is given in the text. **(A) = Present (B) = Absent**

The government attempts to predict the geographical paths of hurricanes. It has an alphabetical set of names that are used for each tropical storm that develops during a year (all hurricanes start out as tropical storms). There is a different alphabetical list for each year, for 6 consecutive years, at which point the lists are reused in the same order. The names help the public keep track of the different storms and hurricanes.

21. (A)(B) Model **22. (A)(B)** Data **23. (A)(B)** Evaluation **24. (A)(B)** Revision

Models (general)

25-28. (7 pts) Which of the general points about models are true? **(A) = TRUE, (B) = FALSE**

25. (A)(B) We recognized 3 properties of models that reflect their possible strengths and limitations, ACU (accuracy, convenience, uniformity). Any single model is strong on only one of these properties. The successful application of the scientific method to any goal thus needs a different model with each property.

26. (A)(B) One way to overcome a model's limitations is to gather data that avoid the limitations.

27. (A)(B) The usefulness of a goal depends on the model. In practice, if a model is found to be inadequate for one goal, we tend to look for another goal that suits it better. Science is a method of finding progressively better goals.

28. (A)(B) One-to-many, many-to-one. When pursuing one goal, we may at first use many different models (e.g., the airburst test and water-leak test of condoms), but eventually, we will converge on using just a single model for achieving that goal

Condom Testing (ABT is 'airburst test')

29-35. (12 pts) Themes from and general points about condom testing. Which major points were made from the condom-testing lectures? **(A) True (B) False**

29. (A)(B) The manufacturing goals used to ensure condom quality only indirectly match the personal goals people have in using condoms.

30. (A)(B) Because of the importance of condom quality for public health, the methods (models) used for condom testing are stronger on model accuracy than on convenience.

31. (A)(B) Several mechanical models are used to test condoms because the different models have overlapping strengths.

32. (A)(B) Although of limited convenience, volunteer studies are sometimes used to test batches of condoms before sale.

33. (A)(B) The ABT has been found to predict breakage during sex only moderately well.

34. (A)(B) Of a condom sold in a store, there is about a 5% chance it has been individually tested with the ABT

35. (A)(B) The ABT is considered strong on uniformity because all the condoms in a batch are made from the same material.

DWI

(SFST is the standardized field sobriety test, BAC is blood alcohol concentration)

36-38 (6pts) A Widmark plot has been used to back calculate the BAC of drivers at the time they were stopped. What are important limitations of using a Widmark plot as an estimate of a person's BAC when they were stopped (the goal)?

(A) True and answers the question **(B) False and/or does not answer the question**

36. (A)(B) It does not measure driving impairment

37. (A)(B) It does not account for food in the stomach

38. (A)(B) It does not account individual differences in alcohol metabolism

39-43. (9 pts) Which of the following options are true about DWI testing? **(A) = TRUE (B) = False**

39. (A) (B) The fact that the BAC *can be measured to within 2% of the true value (at least in blood)* means that it is a more accurate model of driving performance than the SFST, which is measured subjectively.

40. (A) (B) A limitation of using the same BAC threshold in all drivers to measure actual impairment is that not everyone is equally impaired at the same alcohol concentration.

41. (A) (B) A limitation of the SFST for measuring driver impairment is that some drivers may have practiced the SFST and thus be more likely to pass it than other drivers at the same level of impairment.

42. (A) (B) A driver's 'normal use of mental faculties' can be assessed in the SFST.

43. (A) (B) For the goal of assessing whether a driver is actually impaired (as opposed to legally impaired), the SFST is a more accurate model of performance than is the BAC

Extrapolation

44-47. (7 pts) General points about extrapolations to assess risk of exposures. Which are true? **(A) = TRUE**

44. (A) (B) We use an extrapolation when data do not exist for some exposures of interest

45. (A) (B) Models of extrapolation are used to replace the data we have, because the models are superior to data

46. (A) (B) To assume there was no effect of increasing exposure would be to avoid use of any extrapolation

47. (A) (B) Extrapolations are often used by the government to set acceptable exposure levels of agents that we may know little about.

48. (3 pts) A tire company wonders how the tread of its tires is reduced with miles driven. Tests on new tires show that the rate of tread loss on a new tire is 1/16" per 10,000 miles. The tire can lose 5/16" of tread before it will no longer pass State inspections. On the basis of this, the company claims that the tire is good for 50,000 miles. What type of extrapolation, if any, underlies this calculated mileage of the tire?

(A) linear **(B)** threshold **(C)** decelerating **(D)** accelerating **(E)** None

49-51 (6 pts). Greg Mengden keeps deadly snakes as a hobby. He has a black mamba, reputed as one of the world's deadliest snakes. To know how best to handle the snake, he makes measurements on how fast the snake can crawl at each of 3 temperatures, in the following table:

Temperatue (^oC)	speed (ft/10 seconds)
10	1
15	3
20	5
30	not measured

One day, Greg's house (and thus the snake) is unusually warm -- 30^oC -- and the snake gets out of its cage. From his work on the other temperatures, Greg guesses the warm snake can move at 9 feet per 10 seconds, and thus should still be easy to manage. However, he discovers that the warm snake actually crawls at close to 20 feet per 10 seconds, so fast that Greg is almost bitten when trying to get it back in its cage.

Which of the following questions are true **(A) = true, (B) = false.**

49. (A)(B) Greg used an extrapolation when guessing what the snake speed would be at 30^o.

50. (A)(B) Greg assumed a linear relationship of snake speed with temperature in his guess

51. (A)(B) Across all temperatures including 30^o, the actual snake speed followed a linear relationship

52-54. (4 pts) Four graphs of extrapolation were illustrated in lecture and the book. To which types of extrapolation do all the graphs apply? **(A) =** the graphs apply **(B) =** the graphs do not apply

52.(A)(B) extrapolation across species

53.(A)(B) extrapolation across doses

54.(A)(B) extrapolation across related hazards

55. (4 pts) Key code **A**. Bubble **A** on 55 of your scantron to indicate which version of the test you have; do not fill in any other bubbles. Correctly bubble in your EID and name in the appropriate blanks, and put your name on the first page of this exam form.