Answer every question (1-70) with a single bubble. If not specified otherwise, assume
A = True/yes   B =False/no
Motivation (day-1 survey and discussion of it)

1-4. (5 pts) The following options pertain to the survey given on day 1, in which the class responded to statements read aloud. The survey results were graphed as histograms with 7 categories per statement (from 'definitely true' to 'definitely false'). Which of the following are true about the patterns observed or the conclusions we drew?

1. (A) (B) There was a strong consensus in the class on the likely truth (or falsity) of most statements that proposed things that science cannot disprove (e.g., aliens have landed, communication with dead).

2. (A) (B) The primary purpose of the survey was to test your background in science.

3. (A) (B) Many people scored it plausible that events occurred or phenomena exist for which there is no scientific evidence.

4. (A) (B) In contrast to what might be expected for statements on political, religious, or moral issues, there was no strong bimodality on any of the Bio301d statements. (Strong bimodality means that approximately half the class was extremely believing but the other half extremely disbelieving.)

Scientific method

5-9 (5 pts). In the book, a common method of designing advertisements was said to resemble the scientific method. Which steps from that example illustrate each of the five elements of the scientific method? The options are slightly modified from the book for clarity. If you are unfamiliar with the book, you can probably still work it out.

Use these 5 answers as your list
of choices in 5-9 below:

(A) Alternative forms of the same advertisement

(B) Adopting the most successful form of the ad for general distribution and use

(C) Deciding which ad gives you the most responses

(D) Improve sales by using the most effective advertisement design

(E) Number of responses to each ad in trials

5. Goal: (A) (B) (C) (D) (E)
6. Model(s):   (A) (B) (C) (D) (E)
7. Data: (A) (B) (C) (D) (E)
8. Evaluation: (A) (B) (C) (D) (E)
9. Revision: (A) (B) (C) (D) (E)

10-25. Indicate which elements of the Sci Met. are present. The goal is underlined.
A= indicated, B = not indicated.

10-13. (5pts) A company sets out to make a laundry stain remover that removes stains well. They use the latest enzyme biology to develop a mix that acts on stains using 3 different chemistries. A year after marketing their product, the company changes the mix because of a patent dispute with another company that makes one of the enzymes.

10. (A) (B) Model
11. (A) (B) Data
12. (A) (B) Evaluation
13. (A) (B) Revision

14-17. (5pts) Joe Nameless is hired by a publishing house to increase the productivity of employees with desk jobs. He decides to do this by instigating fear, by firing the 3 least productive workers. He measures the amount of printer paper used by each employee and fires the three with the lowest usage. A month later he measures paper usage and finds that it has doubled over the previous measurement, so he is satisfied.

14. (A) (B) Model
15. (A) (B) Data
16. (A) (B) Evaluation
17. (A) (B) Revision

A= indicated, B = not indicated.

18-21. (5pts) Professors at universities are often researchers, well-skilled in the scientific method. Their goal in the classroom is to efficiently teach students to think and to understand the subject material. Rather surprisingly, few professors employ the scientific method toward their teaching practices. Thus, although they observe how well students are learning the material from exam scores, and they are accordingly pleased or displeased with that evidence of performance, they do not adopt new teaching methods when faced with disappointing student performance.

      18. (A) (B) Model
      19. (A) (B) Data
      20. (A) (B) Evaluation
      21. (A) (B) Revision

22-25. (5pts) Professor J's objective is to keep his students entertained. For class on Friday he wears his pants backwards. When he observes that none of the students comments or seems to notice, he decides he is being too subtle. So on Monday he comes to class in a diaper.

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

26-28. (5pts) Preti-Green claims that its goal is to provide customers with a low-maintenance, low water lawn. To do this, it has its own variety of grass and mix of soil microbes that it plants after killing the customer's existing vegetation cover. However, PretiGreen requires payment immediately after getting the new lawn established, and the company never returns to former customers to find out if the lawn is indeed low-maintenance, low water, nor does it ever change its grass variety or mix of microbes.

Evaluation is absent in this description. Which text quoted from this paragraph correctly explains why, or would allow you to know that evaluation is absent?
A = true, B = false

      26. (A)(B) PretiGreen requires payment immediately after getting the new lawn established
      27. (A)(B) The company never returns to former customers to find out if the lawn is low maintenance, low water
      28. (A)(B) Nor does it ever change is grass variety or mix of microbes

Models

29-32. (6pts) General points about models. Which are true?
A = true, B = false

      29. (A)(B) A model used successfully for one goal will not be useful for other goals.
      30. (A)(B) If a model is deemed useful for a goal, then it has no limitations for that goal
      31. (A)(B) By saying that all models are false, we mean that all models are ultimately rejected.
      32. (A)(B) A variety of models used for the same goal(s) may have overlapping strengths and limitations

33-36. (6pts) For FDA approval of a new drug for use in humans, the drug will have been tested in rodents, then dogs, and ultimately in people (in 3 phases of clinical trials). Which statements about models in this process are correct?
A = true, B = false

      33. (A)(B) The rodents tested are used as models of the people who will take the drug after market
      34. (A)(B) The dogs tested are used as models of the people who will take the drug after market
      35. (A)(B) The people tested in clinical trials are models of the people who will take the drug after market
      36. (A)(B) The rodents are considered abstract models of people because rodents are so different from people

37-40 (6pts). General points about models. Which are true? ACU = accuracy, convenience, uniformity
A = true, B = false

      37.(A)(B) A model judged useful because of accuracy will neither be uniform nor convenient for the same goal
      38.(A)(B) A model judged useful because of accuracy will also be at least uniform or convenient for the same goal
      39.(A)(B) Uniformity cannot apply to accurate models because accurate models must capture all the variety of the real world
      40.(A)(B) A model can be considered useful for only a single ACU property

41-43. (6pts) For which options is the limitation of the model likely important to the goal – could prevent attaining the goal?
A= the limitation could prevent attaining the goal; B= the limitation would NOT prevent attaining the goal

Question	Model	Goal	Limitation
41 (A) (B)	the demo car you drove at the dealer as a model of the same make of car you bought	to get the feel of how the car handles	the demo car had 500 miles on it and was blue; yours has 50 miles on it and is red
42 (A) (B)	a clinical trial of a heart drug	to know if the drug will reduce heart attacks in 60-year olds	the clinical trial used 30-year olds with no prior heart problems
43 (A) (B)	Bio301d exam 1 from 2011 and 2012	to get a sense of the difficulty of your 2013 Bio301d exam 1	even though the material taught in 2013 is the same as in 2012 and 2013, most questions in 2013 will not be the same as in 2011, 2012

Condom testing

44-46. (5pts) Which of the following are used as *models of sex between people* for at least one of these two goals: (i) determing whether a condom will remain intact during sex, or (ii) determining whether a condom will block disease transmission?

(A) = is a model of sex between people, (B) = is not a model of sex between people

> **44.(A)(B)** The airburst test

> **45. (A)(B)** Volunteer couples testing condoms

> **46. (A)(B)** the water leak test

47-50. (6 pts) For studies in which volunteers were used to test condom efficacy in blocking HIV transmission, which are true?

A = true, B = false

> **47. (A)(B)** Some HIV- participants 'consistently' using condoms converted to HIV+, but these conversions could not be necessarily attributed to condom failure. This inability to identify the role of condom failure in transmission is a limitation of the model used in those studies.

> **48. (A)(B)** The lack of uniformity, which generally applies to volunteers studies, prevented meaningful conclusions about condom efficacy.

> **49. (A)(B)** The studies used single, HIV- men and observed the rate of conversion to HIV+. A limitation of this study is therefore that it may not apply to couples, because single men may have different exposures than those in a relationship.

> **50. (A)(B)** The conversion rate for HIV- individuals in the 'inconsistent' condom use category was about 10%.

51-53. (5pts) For which model/goal combinations did we suggest that the limitations were serious enough that the model was not useful?   ABT = airburst test, WLT = water leak test

> **(A) = limitations render the model useless for goal**

> **(B) = limitations do not render the model usless**

> > **51. (A)(B)** Goal: detect small pores   Model: ABT

> > **52. (A)(B)** Goal: measure condom flexibility   Model: ABT

> > **53. (A)(B)** Goal: measure STD transmission   Model: volunteers

DWI testing

(BAC = blood alcohol concentration; SFST = standardized field sobriety test)

54-57 (6pts). Which of the following options are true about the SFST?

A = true, B = false

54. (A)(B) The fact that the SFST can be administered on the roadside and without equipment renders it a *convenient* model (of the three ACU properties).

55. (A)(B) Two tests (walk and turn, one leg stand) are administered to assess both physical AND mental faculties.

56. (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.

57. (A)(B). A person's performance when sober is used to provide a baseline for their performance when stopped.

58-60. (4pts) Which limitations (or other considerations) are relevant/important to 'back calculations' of blood alcohol concentration (BAC) as a model to determine whether a driver exceeded 0.08% when stopped by the police. (The goal is to <u>determine whether someone exceeded 0.08% at the time they were stopped</u> driving)?

(A) – the limitation is relevant/important
(B) – the limitation is not relevant/important

58.(A)(B) The back-calculated BAC does not measure driving performance.

59.(A)(B) The back calculation formula (the curve) is a model based on data gathered under idealized conditions and has been shown to be violated under conditions that would apply to many drivers.

60.(A)(B) The back calculated BAC as currently done would necessarily be wrong if the driver's true BAC remained constant at 0.04% from the time stopped to the time tested hours later.

Extrapolation

61-64. (2.5 pts each) Which shape of extrapolation relationship is indicated? If no extrapolation is indicated, use (E).

61. In an attempt to deal with it's financial shortfalls, a company institutes a furlow program in which its employees are forced to take off two weeks, unpaid, during a 4-month period. The company saves $1M doing this. The company then proposes to institute a four week furlow during the next 4 months so that it can save $2M. What type of extrapolation, if any, is assumed in the proposed financial impact of the new furlow?

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

62. A company has marketed a product that contains a substance that has since been found to be harmful to people in high doses. At 10 times the dose in the product, approximately half (50%) of the exposed subjects develop skin rashes for 2 days. A company representative assures the public that there is no harm from the dose in the product. What type of extrapolation, if any, underlies this claim?

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

63. A tire company wonders how the tread of its tires is reduced with miles driven. Tests show that the rate of tread loss on a new tire is 1/16" per 10,000 miles. However, measurements on older tires show that, when the tire has 50,000 miles, the rate of tread loss has increased to 1/8" per 10,000 miles. What type of extrapolation, if any, underlies this change in the rate of tread loss with age/mileage of the tire?

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

64. As a young boy, Bruce Levin bakes a cake. Faced with a time crunch, he decides to double the cooking temperature to cut the cooking time in half. What type of extrapolation, if any, underlies this calculation of expected cooking time from a change in temperature?

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

65-66. (3 pts each) For the following 2 questions, indicate the types of extrapolations, if any.

65. The rat poison d-CON is sold in pellets. For financial reasons, the company worked on mice. Experiments using mice were used to measure how much toxin is must be ingested to kill 99.9% mice. The company marketed a pellet that achieves the same dose per body weight in a rat as in their mice and claims that it will kill 99.9% of rats. What type of extrapolation, if any, is used by the company in making its claim?

A) dose   B) species   C) related hazards   D) None

66. Bruce Ames has noted that the cancer test using rodents is flawed because it artificially inflates cancer rates in rodents. That is, cancers may appear in the rodents because the test is flawed rather than because the compound being tested causes cancer in rodents. Which extrapolation(s) underlie(s) the basis of his concern (as in the book)?

A) dose   B) species   C) related hazards   D) None

67-69. (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

      67.(A)(B) extrapolation across species

      68.(A)(B) extrapolation across doses

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

70 (4 pts) Key code A. Bubble A on #70 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.