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) We identified general reasons that responses might differ among students. Those reasons included (i) use of different decision rules, (ii) different familiarity with the evidence, and (iii) inherent uncertainty in some statements.

2. (A) (B) The statements were framed around material that would be found in most biology texts.

3. (A) (B) The class responses reflected what would be expected of people with a strong adherence to scientific knowledge

4. (A) (B) A major reason for using the survey and illustrating the class responses was to motivate use of the scientific method.

Demos, videos, and similar ilk

5-10 (6 pts) Match the demo/video/example to the lecture subject as specifically as possible. The demo/video/example is deliberately not described in full detail. If a demo was not used, choose (E)

        (A) Scientific method   (B) Models (general)   (C) Condoms   (D) DWI   (E) None

5. (A) (B)(C) (D) (E)   Mouthwash

6. (A) (B)(C) (D) (E)   Lamp

7. (A) (B)(C) (D) (E)   Coin flip

8. (A) (B)(C) (D) (E)   Slogans, phonebook picture

9. (A) (B)(C) (D) (E)   Baby oil

10. (A) (B)(C) (D) (E)   Reciting the alphabet backwards

Scientific method (SM)

11-15 (10 pts) The following description of a process can be compared to the scientific method (the initial goal is underlined):

Your electric fan quits running on a hot day and <u>you want to find out why it is no longer running</u>. You first consider that the power to the entire house has gone off. A check of the refrigerator light indicates that it still functions, so the house power has not gone off. Having failed with that possibility, you then consider that the fan is on an electrical circuit in the house for which the fuse has blown. (Thus the socket in which the fan is plugged may no longer have electricity even though the house does have electricity.) You unplug the fan and try your electric hairdryer in the same socket. The hairdryer runs, so that explanation also fails. In view of this second failure, you then proceed to another guess, that the fan motor has burned out. You go to the store to get a new fan.

Each question below lifts text from this paragraph. Indicate which element of the scientific method applies to the quote. Your options follow. You would select (A) if a the quote describes a new goal.

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

11. (A) (B) (C) (D) (E) (F) In view of this second failure, you then proceed to another guess

12. (A) (B) (C) (D) (E) (F) The hairdryer runs

13. (A) (B) (C) (D) (E) (F)   the fan is on an electrical circuit … for which the fuse has blown

14. (A) (B) (C) (D) (E) (F) the house power has not gone off

15. (A) (B) (C) (D) (E) (F) A check of the regrigerator light indicates that it still functions

16-20 (10 pts) The following description of a process can be at least partly mapped onto the scientific method (the initial goal is underlined):

> You wish to <u>do well on exams in a course</u>. Three exams are given during the semester. For the first exam, you prepare by studying lecture notes only. Your score of 71 is not to your liking, so you try another method of preparation. Your new plan is both to read the book and study the lecture notes. Your score on the second exam is 80 – an improvement but still not to your liking. For the third exam you merely study exams from previous years. Your score goes to 93, and you are satisfied.

Each question lifts text from this paragraph. Indicate which element of the scientific method applies to the quote. Your options follow. You would select (A) if the quote describes a new goal.

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

16. (A) (B) (C) (D) (E) (F) you prepare by studying lecture notes only

17. (A) (B) (C) (D) (E) (F) read the book and study the lecture notes

18. (A) (B) (C) (D) (E) (F)   still not to your liking

19. (A) (B) (C) (D) (E) (F) you try another method of preparation

20. (A) (B) (C) (D) (E) (F) Your score on the second exam is 80

21-23 (5 pts). Suppose a drug is declared safe after being subjected to the scientific method (SM) in a clinical trial. It is later discovered that the drug is not safe. Which of the following SM elements could *in principle* account for the change in understanding of drug safety? (A) – true/can account for, (B) – false/cannot account for

    21. (A)(B) Models: the human subjects used in the trial had major limitations that were not apparent initially

    22. (A)(B) Data: the data obtained for testing drug safety were flawed.

    23. (A)(B) Evaluation: even though the data and human subjects were sound and appropriate, the evaluation was flawed

24-27. (5 pts) Answer questions about which elements of the Sci Met. are present or why. The goal is <u>underlined.</u>

Joe Nameless is hired by a publishing house to <u>increase the productivity of employees with desk jobs</u>. He decides to do this by instigating fear, by firing unproductive workers. He measures the amount of printer paper used by each employee and fires the two with the lowest usage. A month later he measures paper usage and finds that it is nearly the same as before. So he fires the two remaining least productive workers. A month later he measures paper usage again.

Which statements are correct about revision in this description?

    24. (A) (B) Revision is present because Joe <u>twice</u> needs to fire unproductive workers– the first application of his model did not work.

    25. (A) (B) Revision is absent because Joe never changes his model of increasing worker productivity.

    26. (A) (B) Revision is present because his first evaluation leads him to reject his model.

    27. (A) (B) It is ambiguous whether revision is present, because the problem does not describe the actual data used.

28-31 (5pts) Which statements about the workings or dynamics of the scientific method are true?

    28. (A)(B) Without data, evaluation is not possible.

    29. (A)(B) Without evaluation, there can be no data

    30. (A)(B) After every evaluation, there is a revision

    31. (A)(B) If a model is not rejected by data, it is considered proven.

Models

32-35. (5pts) Consider physical models used to test the impact of seat belts on passenger injuries in a car accident. In which options would the <u>first model</u> (underlined) be considered the more uniform of the two models for this goal? (A) – first model is the more uniform (B) second model is the more uniform

    32. (A)(B) <u>Forced accidents using dummies in a lab setting</u> versus actual highway accidents

    33. (A)(B) <u>Computer simulations of accidents</u> versus highway accidents

    34. (A)(B) <u>All highway accidents</u> versus highway accidents in similar types of conditions and directions of impact

    35. (A)(B) <u>Highway accidents involving the same types of cars</u> versus all highway accidents

36, 37 For each goal-model combination, which one limitation would be the <u>most likely to prevent attainment of</u> the goal?

36. (3pts)
    <u>Goal</u>: to maximize your exam score in 2014
    <u>Model</u>: the 2011 exam as a model of the exam you will take in 2014
    <u>Limitations</u>:
        (A) The 2011 exam covers the same material as will the 2014 exam, but the new questions will be somewhat different
        (B) The 2011 exam is printed on white paper; the 2014 will be printed on yellow.
        (C) The 2014 exam covers different material
        (D) The 2014 exam will scramble the questions from 2011
        (E) The 2014 exam will be graded by different people than was the 2011 exam

37. (3pts)
    <u>Goal</u>: to lose weight in 2014
    <u>Model</u>: follow a diet used in a 2010 study that eliminates carbohydrates and confines you to meat and produce
    <u>Limitations</u>:
        (A) The year in which you apply the diet is not the same as the year of the study.
        (B) The produce and meat you eat in the diet will have come from different sources than what the participants ate
        (C) Participants in the study followed the diet approximately but not exactly
        (D) The study participants were seriously overweight at the start, but you are not
        (E) The study was done in Wisconsin, you live in Texas

38 (4pts). Two people are arguing about whether bacteria are useful models of human genetics. David says that bacteria are indeed useful models of humans, because *they are used to identify potential mutagens that might cause human cancer*. John says that *bacteria do not have counterparts for many human genes*, and so they are not useful models of many human processes controlled by genes, such as growth and development. Which of the following options are true as regards this disagreement. (Consider the *italicized phrases to be true*.)

    (A) David is wrong; John is right. Bacteria are so different genetically from humans that they are not useful models of human genetics in any fashion.

    (B) John is wrong; David is right. Bacteria are genetically similar enough to humans that we can study the same genetic processes in both.

    (C) They are both correct; each of their statements refers to a different goal, so bacteria can be a useful model of humans for one goal while not being a useful model for other goals.

    (D) Both are wrong because bacteria are not a model of humans at all.

39-42 (5pts). General points about models. Which are true? (not easy) **A = true, B = false**

    39.(A)(B) There is no restriction on whether an accurate model will also be convenient or uniform and vice versa. That is, whether a model is accurate, convenient, or uniform does not influence and is not influenced by any of the other properties.

    40.(A)(B) We have emphasized that, although the importance of a model's limitations depends on the goal in a strict sense, there is nonetheless a tendency that the importance of limitations is similar across different goals.

    41. (A)(B) Models that are considered <u>accurate</u> for what they represent tend to have fewer important limitations than inaccurate models.

    42. (A)(B) In the course of scientific progress, less accurate models tend to be replaced by more accurate ones.

43-46. (6pts) For which options is the limitation of the model likely important to the goal – could prevent attaining the goal?
A= the limitation would likely prevent attaining the goal

Question	Goal	Model	Limitation
43 (A) (B)	to know how the truck handles in deep mud	the test drive at the dealer's of the truck you will buy	the test drive was confined to pavement
44 (A)(B)	to know if the brakes work well	the test drive at the dealer's of the truck you will buy	the test drive was confined to pavement
45 (A) (B)	to get a good exam score in 2014	Memorizing the answers to Bio301d exam 1 from 2011-2013 without learning the principles	even though the material taught in 2014 is the same as in 2011-2013, most questions in 2014 will not be the same as in 2011-2013
46 (A) (B)	to identify the perpetrator	DNA from a cigarette butt at a crime scene as a model of the perpetrator	the butt is highly portable and could have been planted there; the butt could have been left there before the crime

Condom testing

47-50. (5pts). What are limitations of the airburst test as a model of sex to predict whether a condom will stay intact during sex?
(A) – is a limitation relevant to this goal (underlined)

47. (A)(B) The airburst test does not generate the friction and wear that condoms typically experience during sex

48. (A)(B) The airburst test does not pick up small holes that would allow the passage of a microbe that causes an STD.

49. (A)(B) The airburst test is not conducted at body temperature and moisture that match sex.

50. (A)(B) The airburst test does not provide a whole-condom measure of integrity.

51-54. (4 pts). For which goals are the limitations of the airburst test so serious that we would consider the test not useful?

(A) -- not useful

51. (A)(B) Do viruses and bacteria pass through an intact condom?

52. (A)(B) Do condoms break during sex?

53. (A)(B) Do condoms reduce sensitivity?

54. (A)(B) Is latex irritating or abrasive to either partner?

55-60. (7 pts) Studies described in class concluded that "condoms reduce rates of HIV transmission." Which are true?
(**A = true, B = false**)

55. (A)(B) Those studies relied on tests that measured pore sizes in condoms

56. (A)(B) Those studies used randomized trials in which known HIV-infected individuals are paired with uninfected partners

57. (A)(B) Those studies treat one condom (or condom brand) as a model of other condoms (brands)

58. (A)(B) The data measured differences in HIV transmission rates observed between the imprecise categories of "consistent" condom **use**rs and "inconsistent" users.

59. (A)(B) Those studies relied on condom performance in mechanical tests

60. (A)(B) Those studies used volunteers in which both partners were already infected with HIV

DWI testing

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

61- 65 (6 pts). Which are limitations of using a Widmark plot <u>as a model of breath BAC</u> at the time a driver was stopped? (*The Widmark plot is used for back-calculating a BAC from a BAC measured long after the driver is stopped*.)

(A) – is both true and is a limitation of the model

    61. (A)(B) The BAC does not measure driver impairment.

    62. (A)(B) The standard Widmark plot is not obtained from subjects under normal conditions (e.g., with food in their stomachs)

    63. (A)(B) The BAC measured in breath can differ from the BAC measured in blood

    64. (A)(B) No baseline data are obtained for how fast different individuals metabolize alcohol

    65. (A)(B) The Widmark curve is not an accurate model of driving performance.

66-69. (5pts) Which of the following options are true about the SFST?

(A) = true

    66. (A)(B) The fact that officers provide the same instructions each time the SFST is administered renders it a *convenient* model (among the three ACU properties).

    67. (A)(B) The horizontal gaze nystagmus (HGN) test is administered to test mental faculties, whereas the other two tests (walk and turn, one leg stand) are administered to assess only physical faculties (coordination).

    68. (A)(B) Starting the 'walk and turn' test before being instructed to do so is considered evidence of impairment.

    69. (A)(B) The SFST includes such tasks as counting backwards and touching one's nose while eyes are closed.

70 (4 pts) <u>Key code A</u>. 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.