Cors 236 Exam 2 (2022) : 43 questions, 4 pages

Answer every question (1-43) with a single letter. Put your answers on Canvas (Test 2_2022).

If not specified otherwise, assume A = True/yes B =False/no

If any part of a question/option is wrong, treat the entire question as wrong.
Where applicable, goals are underlined. Consider *italicized phrases to be true.*

General issues and points about models

1-9. (10 pts) Which are true? A = True, B = False

1. (A)(B) A model's limitations (differences from what it represents) cannot be identified until we know the goal.

2. (A)(B) Scientific progress is defined by finding models that have fewer total limitations than their predecessors

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

4. (A)(B) One way to overcome the limitations of a particular model is to use multiple models with non-overlapping limitations. This was a point of the condom testing material.

5 (A)(B) By saying that all models are false, we mean that all models are ultimately rejected.

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

7 (A)(B) Models that are considered accurate for what they represent tend to have fewer important limitations than inaccurate models.

8. (A)(B) Simple questions about the models used in a scientific study need not require a detailed knowledge of science yet can potentially expose weaknesses of the study

9. (A)(B) A model that is grossly inaccurate is rarely found useful in attaining a goal.

10-13. (4 pts) You are told by a government authority that a controversial GMO food is safe to eat, with no detrimental health effects. Which of the following questions that might be asked of this claim would address the scientific models used in reaching the government's claim? (A) would address the scientific models, (B) would not

10. (A)(B) What organisms were tested to decide the possible health effects?
11. (A)(B) How long were the organisms measured for health effects?
12. (A)(B) What kind of health effects were measured?
13. (A)(B) Who owns the patent rights to the GMO food?

14-16. (3pts) In searching for <u>a method of improving student exam performance</u> that could be used by any US college student, researchers tested whether eating sugary foods the 10 hours before an exam leads to higher scores. They gave one group of Cors236 students a honey-coated egg scramble before exam 1, and another group of Cors236 students were given egg scramble without honey before the same exam (*eggs are not a source of sugar, but honey is*). Exam scores were as follows: students who consumed the honey-coated scramble had an average 10 points lower than the students who had scramble without honey. The researchers concluded that consumption of sugary foods does not improve test performance for the average US student.

What are true about models in this example? A = True, B = False

14. (A)(B) The students in this cors236 class are used as models of other US students
15. (A)(B) Egg scramble alone is used as a model of sugary foods
16. (A)(B) Honey is used as a model of sugary foods

17. (3pts). 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.

18-20. (3 pts) Consider a clinical trial (using humans) to test a new drug or vaccine to decide its efficacy in the general population. Pick all that apply. (A) = True (B) = False

18. (A)(B) Suppose that the trial uses far fewer subjects than occur in the general population – the trial uses a sample but not all of the general population. We can conclude that the trials tell us how the drug is likely to perform in the general population, but outcomes in the trial may not fully reflect what will happen in the general population – the trial is an imperfect representation/model of what will happen in the general population.

19. (A)(B) Suppose that the trial uses far fewer subjects than occur in the general population -- the trial uses a sample but not all of the general population. The trials tell us exactly how the drug will perform in the general population. We can expect trial outcomes to be exactly the same as will occur in the entire general population.

20. (A)(B) Suppose that the trial uses the entire general population for a defined time interval. It is now fair to say that the trial tell us exactly how the drug will perform when the general population continues to use the drug beyond the trial's end. That is, we can expect trial outcomes to be exactly the same as will be experienced by the general population in the future.

21-23. (3 pts) Each of the following options compares two models for a particular goal. Choose (A) for options in which the *first model* (*in italics*) IS MORE ACCURATE than the **second model (bold)** for the <u>goal (underlined)</u>.

(A) is the more accurate

21. (A)(B) *Yeast* instead of **mice** in tests of whether <u>chemicals inhibit beer cultures</u> (which uses yeast)

22. (A)(B) *Humans accidentally exposed to dioxin* instead of **guinea pigs deliberately exposed to dioxin** in testing the <u>toxicity of dioxin for humans</u>

23. (A)(B) *High doses of a pesticide* fed to rats versus **low doses of the pesticide** fed to rats for testing whether <u>traces of the pesticide in food cause cancer.</u>

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

24-27 (4 pts) How might an unimpaired driver fail the SFST? (These would be limitations of the model.)

(A) a valid reason an unimpaired driver might fail

24. (A)(B) The driver has intrinsically poor balance.

25. (A)(B) The driver is poor at following instructions.

26. (A)(B) The driver had an ankle injury that affected their ability to walk but not to drive.

27. (A)(B) The instructions were not given clearly.

28-32. (5 pts) Which of the following options are true about DUI testing? A= True, B = False

28. (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 only subjectively.
29. (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.
30. (A)(B) A limitation of the SFST for measuring driver impairment is that there are no baseline data from the driver when known to be sober.
31. (A)(B) The SFST is administered to assess physical faculties (abilities) only.
32. (A)(B) The BAC and SFST tests can be considered overlapping models for assessing driver impairment in that the driver must fail both to be considered legally impaired.

Condom testing

33-35. (3pts). 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) (B) not a limitation for this goal

33. (A)(B) The airburst test does not generate the friction and wear that condoms typically experience during sex
34. (A)(B) The airburst test does not pick up small holes that would allow the passage of a microbe that causes an STD.
35. (A)(B) The airburst test provides a whole-condom measure of integrity

36-39. (4 pts) Studies described in class (and in the book) concluded that "condoms reduce rates of HIV transmission." Which are true? (A = true, B = false)

36. (A)(B) Those studies relied on tests that measured pore sizes in condoms
37. (A)(B) Those studies treated one condom as a model of condoms in other batches and other condom brands
38 (A)(B) The data used the imprecise categories of "consistent" condom users and "inconsistent" users among volunteers.
39. (A)(B) Those studies used volunteers in which both partners were already infected with HIV

Animal models of cancer (extrapolations)

An extrapolation is a model of the effect of something in a situation where we have data to its effect in a situation where we lack data. We (and the book) considered extrapolations across doses, species, and related hazards (e.g., related hazards might be different versions of the same type of molecule, or different kinds of radiation).

40-42. (3 pts) *Bruce Ames has argued that the rodent model of carcinogenesis (cancer testing of chemicals using rodents) may have serious flaws*. That challenge is based on a possibly faulty which?

(A) = a basis of Ames's claim of flaws (B) = not

40. (A)(B) extrapolation across species (rodents to humans)
41. (A)(B) extrapolation across doses
42. (A)(B) extrapolation across related hazards

43 (2 pts). Advice given to Austin, TX residents (circa 1985) was to avoid eating more than one fish a week from a local lake. It was based on a concern that fish had high doses of chlordane levels (chlordane was a pesticide used in termite treatment in much of the city). The advice that "eating one fish per week is OK but eating 2 or more per week is not OK" involves which of the following?

(A) extrapolation across species (fish to humans)

(B) extrapolation across doses

(C) extrapolation across related hazards

(D) None of (A)-(C)

A backup: In addition to inputting your answers to Canvas Test 2_2022, you may upload your answers to Canvas in a separate Word or pdf file as a backup. You upload this to **Test 2 upload file of answers.**