

Answer every question (1-41) with a single letter. Answering with no letter or two letters will result in no credit.

Put your answers on Canvas (Test 2\_2023).

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. Note that an answer statement might be correct but the statement not answer the question (hence the answer would be false).

## Models (general)

1-5. (5 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 goal (underlined).

(A) the first model is the more accurate (B) the **second model** is the more accurate

1. (A)(B) *Rats* instead of **mice** in tests of a poison designed to kill mice.
2. (A)(B) *An exact calculation (to 5 decimals) of the salt concentration in pudding* versus a **personal taste test of the pudding** for deciding whether people will think the pudding is too salty.
3. (A)(B) *High doses of a chemical* versus **low doses of the chemical fed to rats** for testing whether minute amounts of the chemical in food cause cancer.
4. (A)(B) *Bacteria* versus **mice** to measure a chemical's ability to cause cancer in mammals.
5. (A)(B) The *airburst test* instead of **volunteers** in testing whether condoms break during sex.

6-9 (4 pts) You have a runny nose, itchy eyes, and sore throat. You want to feel better, get relief. You suspect that the problem is allergies, so you decide to try taking an antihistamine, as they often relieve allergy symptoms in other people. You choose Claritin (one of several antihistamine drugs). You have no prior experience with Claritin, but you decide to try it because you've heard of others who got relief with it, and you guess that one antihistamine is as good as another.

(A) True (B) False

6. (A)(B) Attributing allergies to your symptoms is a model of what's wrong with you
7. (A)(B) Use of an antihistamine is a model of how to get relief
8. (A)(B) Claritin is used here as a model of the different antihistamines you might take.
9. (A)(B) You are using the responses of others as a model of your own expected response.

10-13 (4 pts) How might your score on an exam be a seriously flawed model of your mastery of the material covered by the exam? For this exam, suppose that there was a time limit to test not only whether you knew the material but also whether you had mastered the material well enough to answer questions rapidly.

Which options identify a reason why your score would not reflect your mastery, as intended by the design of the test? (A) = True

10. (A)(B) You were sick during the test and scored well below what you would have scored had you been well.
11. (A)(B) You shifted your answers on the form halfway through the questions, so that the machine read different answers than you intended.
12. (A)(B) Before submitting your exam, you thought more about 4 of the questions and changed your answers to reflect your deeper thoughts.
13. (A)(B) You did not finish all questions because you ran out of time.

**14-16 (4 pts)** In trying to develop an advertisement strategy that will increase nationwide sales of a company's 30 kinds of perfume products, advertisers tested a video commercial shown during a football game and also tested a massive mail campaign using a glossy brochure; the number of mail recipients was adjusted so that the same amount of money was spent on the video commercial as on the mailing. One type of perfume was shown in the football TV commercial and a different type was shown in the brochure so that the effect of each advertisement could be distinguished based on product sales (the two perfumes had different names). In the month following the advertisement releases, sales of the perfume shown in the football commercial increased 7%, whereas sales of the perfume shown in the mailed picture increased 3%. The advertisers concluded that, per dollar spent, advertising in football games will be a better way for the company to sell any of its 30 kinds of perfumes than will be advertising by mail.

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

14. (A)(B) The people who purchased the perfumes in the month following the commercials are used as models of future buyers
15. (A)(B) The name of perfume shown in the football advertisement is used as a model of the name of any of the 30 perfumes the company has to sell.
16. (A)(B) The perfumes shown in the two kinds of advertisements are used here as models of anything and everything the company might sell, not just perfumes.

**17-20 (5 pts)** You are told by a company that its allergy drug is safe for people to take based on a number of tests/trials they conducted. Which of the following questions that might be asked of this claim would address the scientific models used in reaching the company's claim that the drug is safe?

(A) would address the scientific models, (B) would not

17. (A)(B) Was the drug tested in people to decide its possible health effects?
18. (A)(B) Is this drug the company's first marketed product?
19. (A)(B) What kind of possible harmful effects were measured in the tests?
20. (A)(B) Is the drug now manufactured with the same chemistry as was used for the trials?

### **Models in DUI** (BAC = blood alcohol concentration, SFST = Standardized Field Sobriety Test)

**21-23. (4 pts)** Class included a demonstration with a breathalyzer. Which of the following are points that the demo was used to illustrate? NOTE: a statement must both be correct AND address a point of the demo for the question to be considered TRUE. (A) = True

21. (A) (B) The demo was used to show that a BAC measured in breath need not match the true blood alcohol concentration.
22. (A) (B) The demo was used to show that a BAC measured in blood is not an accurate model of driving performance.
23. (A) (B) The demo was used to show that the time course of the true BAC differs from that of the back-calculated BAC (back calculations use a Widmark plot).

**24-28. (5 pts)** General points about DUI models

- 24. (A) (B) The fact that the BAC can be measured to within 0.1% 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.
- 25. (A) (B) A limitation of using the same BAC threshold to decide impairment in all drivers is that not everyone is equally impaired at the same alcohol concentration.
- 26. (A) (B) A limitation of the SFST for measuring driver impairment is that there are no baseline data from the person when sober.
- 27. (A)(B) Model convenience is a more important consideration than accuracy in society's choice of which models to use for DUI determination.
- 28. (A)(B) The back calculation of BAC (using a Widmark plot) is a model based on data gathered under idealized conditions and is likely to be violated under conditions that would apply to many drivers.

**Condom testing** (ABT = airburst test)

**29-34 (6 pts)** General points about condom testing. (A) = True (B) = False

- 29. (A)(B) Convenience is a more important consideration than accuracy in society's choice of which models are used for testing condoms.
- 30. (A)(B) A limitation of condom tests using volunteers was illustrated by the fact that, when using volunteers to study the effect of condom use on HIV transmission, the participants could be classified only into the inexact categories of 'consistent' versus 'inconsistent' condom use.
- 31. (A)(B) No single model of condom testing is adequate for all goals. Our understanding of and confidence in condom quality and efficacy comes from a patchwork of overlapping models that have compensating strengths and limitations.
- 32. (A)(B) The ABT is considered an accurate model because we can know almost exactly how much air a condom holds before breaking
- 33. (A)(B) The ABT used for quality control (to identify bad batches) is a case in which one condom is considered a model of all condom brands.
- 34. (A)(B) The use of volunteers to test condom efficacy in blocking HIV transmission is a case in which one condom is considered a model of all condom brands.

**35-37 (3 pts)** Given the limitations of the ABT (noted in class) for quality control, which of the following are true about a batch of condoms that passes the ABT? (A) True (B) False

- 35. (A)(B) The condoms sold from that batch will have a known, low breakage rate during sex
- 36. (A)(B) The condoms sold from that batch will have a known STD transmission rate during sex
- 37. (A)(B) Approximately one tenth of the condoms sold from a batch will have been individually tested with the ABT

### Extrapolations (2 pts each)

**38.** A company has marketed a product that contains a substance that has since been found to be harmful for people in high doses. At 10 times the dose in the product, approximately half (50%) of the exposed subjects develop blurry vision for 2 days. A company representative assures the public that there is no harm to anyone from the dose in the product that is 1/10 of the dose known to cause blurry vision. What type of extrapolation from low to high dose, if any, underlies this claim?

- A) linear      B) threshold or accelerating      C) decelerating      D) None

**39.** A cigar company wonders how the dose of nicotine delivered to the smoker changes with the remaining length of cigar. Measurements show the following: (1) nicotine concentration from inhaled smoke is 3 mg per liter when the cigar is first started (full length); (ii) nicotine concentration remains at approximately 3 mg/liter for the first third of the cigar; (iii) the concentration increases to 5mg/liter as the second third of the cigar is smoked; (iv) the concentration increases to 10 mg/liter as the final third of the cigar is smoked. What type of extrapolation, if any, underlies this directly measured pattern of nicotine delivered per remaining length of cigar?

- A) linear      B) threshold or accelerating      C) decelerating      D) None

**40.** As a fisherman, Justin Olson, normally fishes with one baited hook per line. He usually catches 2 fish per hour. On his next trip, he puts two baited hooks per line and expects to catch 4 fish per hour. What type of extrapolation, if any, underlies this calculation of expected fish per hour from using two hooks?

- A) linear      B) threshold or accelerating      C) decelerating      D) None

**41.** The rat poison d-CON is sold in pellets; each pellet is large enough that a single rat will eat one and only one pellet. To save money, experiments using mice were used to determine lethal doses. The company found a dose that killed 90% of mice (dose X) and then discovered that double that dose (2X) would kill 99% of mice. Without doing more work, it calculated that 4 times the dose (4X) would kill 99.9% of mice. Since a rat weighs (on average) 10 times what a mouse weights, the company marketed a pellet with a dose at 40X and claims that it will kill 99.9% of rats. What type of extrapolation(s), if any, is/are used by the company in making its claim?

- A) dose extrapolation only  
B) species extrapolation only  
C) Both dose and species extrapolations  
D) None