

**A = True, B = False** unless stated otherwise *italicized statements are true*

Upload your name, your username (which is your vandal email address up to @) and answers such as 1.A, 2.F, 3.H, ....

to the exam4 upload column in BbLearn. You may upload them directly as text or as a Word or Excel file, but everything should be in a single row that looks something like (with your name in place of mine):

Bull James, jbull1234, 1.A, 2.D, 3.F, ... (up to and including #62).

### Short video on the 'alternative theory' for the corona virus epidemic

**1-4 (7 pts)** What features of proper or improper science were evident in the video that dismissed a viral cause of the covid epidemic, as discussed in class? **A = True, B = False**

The speaker:

- 1 **(A)(B)** avoided addressing evidence from other researchers that supported a viral epidemic
- 2 **(A)(B)** used vague correlations to support his alternative model
- 3 **(A)(B)** provided his own data that refuted a viral epidemic interpretation
- 4 **(A)(B)** referred to several papers by independent researchers supporting a non-viral interpretation

### How the research system works

*We noted that the flow of events from research to the public involved 3 steps: (i) conducting the research itself, (ii) publication of the research, and (iii) dissemination of the research by media.*

**5-9 (8 pts)** What points were made about this process? **A = True, B = False**

- 5 **(A)(B)** The main incentive to exaggerate the importance of research findings is by the researcher (in step i); journals and media (steps ii and iii) lack a reason to inflate significance.
- 6 **(A)(B)** In step (ii), vetting research to ensure quality is well established in several journals with long-standing reputations, but not necessarily in many newly established journals.
- 7 **(A)(B)** The John Oliver video was especially critical of step (iii) in this process.
- 8 **(A)(B)** The bogus chocolate study exposed the lack of vetting in step (iii) of this process.
- 9 **(A)(B)** The point was made that exaggeration of research significance in this 3-step process was equivalent to fraud and fake news.

### Infectious Disease ( A = True, B = False)

**10-13 (6pts)** Various questions on disease

- 10 **(A)(B)** The corona virus causing covid-19 is the first virus in over 60 years to emerge from outside humans (e.g., wildlife) and establish itself in the human population.
- 11 **(A)(B)** The  $R_0$  value for a disease is measured with high accuracy and is typically presented as a single value (not a range) to represent a disease's spread across different environmental conditions.
- 12 **(A)(B)** The initial spread of an infectious disease in a sensitive population is a geometric process; this process is revealed as a line on a log plot of the number of new cases over time.
- 13 **(A)(B)** The current epidemiological models for covid-19 are able to tell us precisely how the epidemic will proceed under different social distancing practices.

**14-19 (10 pts)** An infectious disease's  $R_0$  tells us what or can be used for which of the following?

- 14 **(A)(B)** It is a measure of how sick a person gets when contracting the disease
- 15 **(A)(B)** To eradicate a disease with a vaccine, fewer people need to be vaccinated for a disease with a high  $R_0$  than for a disease with a low  $R_0$ .
- 16 **(A)(B)** The epidemic threshold is the value of  $R_0$  for which the number of infected individuals doubles every year.
- 17 **(A)(B)** If  $R_0$  exceeds 0, it means that the disease can expand epidemically in the human population.
- 18 **(A)(B)**  $R_0$  tells us how much of the population needs to be vaccinated to eradicate a disease.
- 19 **(A)(B)**  $R_0$  tells us how much of the population will eventually be infected in the absence of a vaccine.

## Confirmation Bias

- 20-25. (10 pts) Which are examples (or consequences) of probable confirmation bias? Some of these were not explicitly presented, so you need to apply your understanding. **A= true, B = false**
- 20. (A)(B) People unconsciously and selectively read articles that conform to their pre-existing attitudes/opinions.
  - 21. (A)(B) When asked to select a random odd number between 1 and 10, most people choose the number 7.
  - 22. (A)(B) Researchers studying brain volume as a measure of intelligence were more careful to estimate the full volume of skulls from their own race than of skulls from races they deemed inferior.
  - 23. (A)(B) Prosecutors identify a prime suspect and then marshal evidence in favor of that suspect while ignoring contrary evidence.
  - 24. (A)(B) A car salesman addressing a prospective buyer highlights strong points of the car while omitting negative points.
  - 25. (A)(B) Two groups with different initial views can read the same material and become even more entrenched on their initial views.

## Tragedy of the Commons

26-29 (10 pts) Which of the following paragraphs describe a tragedy of the commons (ToC) conflict or outcome?

**A = is a ToC conflict or outcome, B = is not (except for #29)**

- 26. (A)(B) Sharks will sometimes hunt cooperatively (in schools) to catch the fish they eat. As more sharks join the group, the fish have a harder time escaping and are thus easier to catch. Furthermore, the benefit works so that, not only does a large school of sharks catch more fish than a small school, but individual sharks catch more food in larger schools than in smaller schools. Indicate whether this property of schooling qualifies as a ToC conflict.
- 27. (A)(B) We are currently in a viral epidemic in which the (corona) virus can easily spread via person-person contact. Local governments have enacted place stay-at-home orders and encourage people to avoid contact activities that may spread the virus. If everyone adheres to these orders, the epidemic will wane and everyone will be safe. In fact, if only a few individuals violate the orders, the epidemic will also wane. But many people don't wish to give up their personal freedoms and are violating the order, leading to a continuing epidemic. Indicate whether this situation qualifies as a ToC.
- 28. (A)(B) Rabies is a virus that people can get from dogs, bats, raccoons, and other wild animals who are infected. If a person develops rabies, the death rate is virtually 100%. However, people who are infected with rabies essentially never infect other people – human infection is invariably from a non-human. A vaccine against rabies exists, but few people choose to get the vaccine prior to an exposure because the risk of infection is so low. As a consequence, most people remain unvaccinated against rabies. Indicate whether this lack of vaccination against rabies qualifies as a ToC.
- 29. (A)(B)(C) You organize group projects in a class you teach. You assign 6 students per group, but you wish to structure the group projects to minimize a ToC. Your concern is that some members of a group will let others in the group do most of the work, will take credit for work they did not do, and that many hard-working students will get discouraged by the free-loaders and not work their best. You contemplate how to structure the credit given to students within groups to avoid a ToC. Which design – A, B, or C – will best avoid or minimize a ToC? In all designs, you will evaluate the group project, but you also know the contributions of each member to the group. The designs differ in how that grade is apportioned among the group members based on the project's grade and on their contributions. The students will be told in advance how grades will be assigned.
  - (A) You give the project grade to each group member, regardless of how much they contributed.
  - (B) You give the project grade to each of the 5 top-performing group members and a letter grade lower to the least productive member.
  - (C) You give each group member a grade according to their contribution, only weakly tied to the project grade. Thus, a high-performing member can get an A despite the group project getting only a C.

**30-33 (5 pts)** The following paragraph describes a potential ToC conflict . Answer the questions that follow them.  
**A = true B = false**

Wheat farmers have the goal of making enough money to pay the bills. The market price of wheat is an important determinant of profits that benefits all of them when the price is high. When the per-pound wheat price is stable for many years and then drops greatly (because good weather produces a surplus), farmers respond by increasing production and converting more land to production – each individual farmer hopes to offset the drop in per-pound prices by increasing the amount of wheat sold. But all farmers respond in the same way, so the total wheat harvest increases, and wheat prices drop even further. Then all farmers are financially worse off than if the wheat harvest had remained the same.

- 30 (A)(B)** A communal resource is described – it is the market price of wheat
- 31 (A)(B)** Selfish interests of individuals are described – attempting to compensate wheat price declines by increasing production
- 32 (A)(B)** The problem does not describe a tragedy of the commons because the initial drop in price is due to weather, not selfish interests.
- 33 (A)(B)** It cannot be decided if the problem describes a tragedy of the commons because the consumer benefit of wheat prices is not considered in the problem.

### Other Conflict and Deliberate Bias

**34-26 (2 pts each).** Arguments indicative of bias. Identify the bias in the following questions using options (A)-(I). Only one answer per question, but an answer may be used once, never, or used on several questions. (I) is none of the others.

(A) defend an unfalsifiable model	(D) build causation from correlation	(G) identify trivial flaws in an opponent's model
(B) use 'either-or' arguments	(E) require refutation of all alternatives	(H) post hoc rationalization of unexpected outcomes
(C) appeal to authority	(F) use anecdotes as evidence of generality	(I) None of A-H

- 34.** Pet psychics defend the legitimacy of their profession in court by claiming (correctly) that no scientific evidence can show their communications with dogs and cats are not real.  
 (A) (B) (C) (D) (E) (F) (G) (H) (I)
- 35.** A lawsuit against the University of California at Berkeley argues that the university actively discriminates against women applicants in all of its programs because the acceptance rate across the university is higher for men than for women.  
 (A) (B) (C) (D) (E) (F) (G) (H) (I)
- 36.** A lawyer argues that the city should not continue to fluoridate the water to prevent tooth decay because he knows 2 teenage residents with high levels of tooth decay.  
 (A) (B) (C) (D) (E) (F) (G) (H) (I)
- 37.** After first agreeing to the tests, but then upon seeing the results, supporters of FC argue that the test results are meaningless because the testing environment is intimidating.  
 (A) (B) (C) (D) (E) (F) (G) (H) (I)
- 38.** A study is intentionally designed to have small samples to increase the chance appearance of 'significant' outcomes that are, in reality, not unexpected.  
 (A) (B) (C) (D) (E) (F) (G) (H) (I)
- 39.** A company defends its health product against negative evidence obtained by independent researchers, arguing that those researchers have failed to show there is absolutely no benefit of the health product.  
 (A) (B) (C) (D) (E) (F) (G) (H) (I)

**40-43. (6 pts)** What is p-hacking, how is it manifested, or where was it encountered? **A = true B=False**

- 40 (A)(B)** It is a form of bias that usually arises in the design and conduct of a study rather than in evaluation and analysis.
- 41 (A)(B)** It is an accepted method of analyzing complicated data.
- 42 (A)(B)** It was illustrated in the analysis of Facilitated Communication test data.
- 43 (A)(B)** It was central to getting apparent statistical significance in the bogus study of chocolate

**44-53 (18 pts).** For each of the following statements, you are to classify the nature of the bias referenced – at what step it occurs. You have the options (A)-(F). The last option (F) is used for cases that do not fit any of the other options. Note that your options depend on a familiarity with the tables in Chap 25. One answer per question; an option may be used more than once or not at all.

- (A)** Signatures of untrustworthiness or indicators of bias in articles and verbal arguments
  - (B)** Ways to bias the scientific process outside the scientific conduct of a study (in the political and social acceptance realm)
  - (C)** Ways to bias science: in the design and conduct of a study
  - (D)** Ways to bias science: after the data are gathered, in evaluation, analysis and presentation
  - (E)** Ways to protect against or reduce bias
  - (F)** None – not tied to bias or protecting against bias
- 44. (A)(B)(C)(D)(E)(F)** Monsanto threatens to sue Fox News to prevent airing of a story about one of their products
- 45. (A)(B)(C)(D)(E)(F)** Doug Biklen tells the interviewer that no amount of negative evidence warrants abandoning FC.
- 46. (A)(B)(C)(D)(E)(F)** A health researcher secretly lets patients in the control group know they did not receive the treatment
- 47. (A)(B)(C)(D)(E)(F)** A drug company publishes the protocol for its clinical trial in advance of the study.
- 48. (A)(B)(C)(D)(E)(F)** A company marketing herbal remedies lobbies a Congressional committee to allow their products to be marketed without the need for testing.
- 49. (A)(B)(C)(D)(E)(F)** A company marketing herbal remedies advertises with testimonials to increase the consumer appeal of its product
- 50. (A)(B)(C)(D)(E)(F)** In addressing skeptics, a psychic describes one instance in which their predictions proved highly accurate.
- 51. (A)(B)(C)(D)(E)(F)** A scientific study presents alternative interpretations of the results
- 52. (A)(B)(C)(D)(E)(F)** A company testing one of their promising cosmetics studies the effect of the cosmetic on cancer but intentionally avoids looking at the effect of the cosmetic on reproduction.
- 53. (A)(B)(C)(D)(E)(F)** The journal reviewing a scientific study for publication sends the paper for peer review before deciding to accept the paper.

### Trustworthy sources

**54-57. (4 pts)** The following text is lifted from a website that advertises something called magnetized water.

The aim of the present study was to investigate the beneficial effects of magnetized water for human and animals. Magnetized water has been found effective in alleviating colds, coughs, bronchitis, all types of fever and more, arthritis pain, reducing blood pressure, recovering quickly from a stroke, and helpful in the regularization of women's menses. Also, treatment with magnetic water was very effective in breaking up kidney and gall bladder stones into small particles. The water also prevented further formation of stones in the kidneys and gallbladder. Magnetic water may prevent aging and fatigue by increasing the cell membrane permeability.

Which of the following indicators of trustworthiness is/are present?

**A = this indicator is present B = absent**

- 54. (A)(B)** Claims are modest.
- 55. (A)(B)** Uncertainties are noted
- 56. (A)(B)** Work replicated by independent sources is described
- 57. (A)(B)** A balanced presentation of alternative explanations is offered

**58. (A)(B)(C)(D) (4 pts)** In the following list, the **most important** factor influencing you to categorize a research article as trustworthy science is which? One answer only.

- (A) Industrial support for the study
- (B) The authors have a reputation for high-quality, unbiased research
- (C) Enthusiasm for the results is announced by politicians
- (D) The article keeps the story highly simplified, omitting uncertainties and alternative explanations, so that it is easy to understand.

**FC video part 2**

**59-61 (5pts) A= true, B = false**

**59. (A)(B)** Biklen raised objections to the tests of FC on the grounds that the testing environment was intimidating. The controls in the tests of FC (in which the facilitator and child were shown the same picture and the typing got the right answer) can be used to discredit his objection, but the video did not mention this point.

**60. (A)(B)** The video showed several responses of individuals who challenged or did not accept the test results. The gist of those responses can be anticipated by vested interests of the individuals.

**61. (A)(B)** Several parents were unwilling to accept the evidence against FC. As evidence of their bias (as and mentioned in class), some used anecdotes to support their continued belief in FC.

**62. (3 pts) (A)** Fill in **bubble A** on 62 to indicate your key. Likewise follow the formatting instructions for the upload.