NAME _____

SID _____

The University of California, Berkeley
Department of Integrative Biology

IB35AC: Human Biological Variation

Exam 2, 50 points

19 November 2015

INSTRUCTIONS:

1. **Print** your name and SID atop the front page of this exam LEGIBLY.
2. Make sure that your exam has 6 double-sided pages. There are twelve pages to this exam.
3. **Print** your name and student identification number on your answer sheet form LEGIBLY.
4. **Mark the VERSION (A or B) of your midterm in the "exam version" box of your answer sheet.**
5. Questions must be answered on the answer sheet with a #2 pencil or a blue or black ink pen.
6. **Be sure to complete and sign the honor code on the back of this page.**
7. You may qualify your answer to any question by writing, in ink, next to the question on the question sheet (NOT the answer sheet). However, INCORRECT QUALIFICATION WILL RESULT IN THE LOSS OF POINTS **EVEN IF THE ANSWER IS CORRECTLY MARKED**!
8. IF you qualify a question and want us to consider it, you must indicate which questions you are qualifying at the bottom of this cover page AND turn your exam booklet (this packet of paper) in with your scantron.
9. The most important thing that you can do is to READ AND REREAD EACH QUESTION CAREFULLY before answering. Choose the BEST answer. Answer only what is asked.

QUALIFICATION BOX

Do you have any qualifications you want us to consider? Check the box if yes: ☐
And be sure to turn in this exam booklet at the end of the exam period.

Exam question numbers with qualifications: _____

You need to make sure that we can easily discern qualifications from notes you may have written to yourself. You also need to make sure that we can read your full name at the top of this page of your exam.

NAME _____
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Exam 2 Honor Code
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As a member of the UC Berkeley community,
I act with honesty, integrity, and respect for others.

Your signature:

Be sure to sign the honor code.

Instructions for Questions # 1-50

A. Follow instructions on the answer sheet.
B. Print your name and student identification number on the answer sheet.
C. Write on the answer sheet (in the exam version box) which version of the exam you are using.
D. Use a #2 pencil or a black or blue ink pen on the answer sheet.
E. On True/False questions, mark "A" for True and "B" for False.
F. On Multiple Choice questions, mark the appropriate answer.
G. THERE IS ONLY ONE BEST ANSWER FOR EACH QUESTION.
H. You may qualify your answers by writing your qualification next to the appropriate question. DO NOT WRITE QUALIFICATIONS ON YOUR ANSWER SHEET. Incorrect qualifications will result in loss of points even if the answer is correctly entered on the answer sheet.
I. Start with answer space #1 on the answer sheet. Check that you end this section with space #50 on the answer sheet.
J. Each question is worth 1 point. There are 50 possible points.

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1. An evolutionary mismatch is a trait that:
    a. Is not symmetrical.
    b. Does not match up with your other traits.
    c. Has never had an evolutionary advantage.
    d. Was originally disadvantageous, and now is neutral.
    e. Was originally advantageous but now confers a disadvantage.

2. Obesogens are NOT known to:
    a. affect the number of fat cells an individual develops
    b. affect the amount of fat stored in fat cells
    c. exist in plastics
    d. alter the gut microbiome

3. During the lecture on obesity, Prof. Hlusko introduced the concept of "epigenetics". What are epigenetic effects?
    a. Heritable changes in gene function that come about without a change in the DNA sequence.
    b. Non-genetic influences on phenotypic variation that occur during puberty.
    c. The genetic differences between children that have the same mother but different fathers.
    d. The diversity of bacteria in the gut of obese versus non-obese people
    e. The chemicals in plastics and pesticides that mimic human hormones.

4. The microbes that inhabit the human gut have been found to be irrelevant to a person's propensity towards being overweight.
    a. True
    b. False

5. The ABO blood group is:
    a. Monogenic
    b. Polygenic
    c. Obesogenic
    d. Trigenic

6. Why is it that within the ABO blood group, O is the universal blood (not plasma) donor and not A or B?
    a. Red blood cells of the O type lack the A and/or B antigens on the surface of the cell, and therefore are not perceived as foreign to the immune system of a person with any of the four ABO blood types.
    b. The A antigens on the surface of the B red blood cells evoke an immune reaction in people with the AB blood type.
    c. The A and B antigens on the surface of the O red blood cells are recognized as "self" by the immune systems of people with A, B, or AB blood types.

7. What selective environment led to the persistence of the sickle cell trait in some human populations?
    a. The heterozygotes are conferred an advantage in oxygen binding efficiency, making it easier to run quickly in harsh conditions.
    b. Homozygotes are conferred an advantage in oxygen binding efficiency, making it easier to run quickly in harsh conditions.
    c. Heterozygotes are conferred an advantage because their highly "sickled" cells make it difficult for the malaria parasite to thrive.
    d. Heterozygotes are conferred an advantage because their blood chemistry is slightly altered, making it difficult for the malaria parasite to thrive.
    e. Heterozygotes and homozygotes are conferred an advantage because their "sickled" cells make it difficult for the malaria parasite to thrive.

8. Which of the following is not a proximate determinant of **natural** fertility?
    a. Use of contraceptives
    b. Age at menarche
    c. Length of gestation
    d. Waiting time to conception
    e. Probability of ectopic pregnancy

9. Which of the following hormones is NOT of importance to fertility:
    a. Testosterone
    b. Hepcidin
    c. Prolactin
    d. Progesterone
    e. All of these play a role in determining fertility.

10. This questions uses a comparison between two terms to test your comprehension. It is based on terms presented in the first fertility lecture. The idea is to figure out what the relationship is between the first word pair, and then find the word pair in the list that has a similar type of relationship. For example, the cranium is to the brain, as the ribs are to the lungs (bones protecting the organs they encapsulate). Now it is your turn: Oogenesis is to spermatogenesis as:
    a. The uterus is to the testes.
    b. The fallopian tubes are to the prostate gland.
    c. The ovaries are to the testes.
    d. The vagina is to the penis.

11. _____ conceptions spontaneously abort before a women knows she's pregnant, and _____ pregnancies end in miscarriage.
    a. About half of; about a quarter of
    b. Virtually no; only a few
    c. Almost all; only a few
    d. About 5% of; about 2.5% of
    e. Mittelschmerz; illegitimate

12. You are a doctor consulting with a woman who is pregnant. Which of the following women would you be the **least** concerned about the birth being problematical and/or the baby's health being at risk?
    a. a woman who is a carrier for the sickle cell trait and knows that her baby's father is too
    b. a woman who had severe rickets as a child
    c. an Rh- woman married to an Rh+ man, who has one Rh+ child and is now pregnant with a second child
    d. a 24 year old woman whose first pregnancy ended in miscarriage just days after her menses were late and pregnancy test results came back positive.

13. In a natural fertility population, you would expect the overall fertility rate to be higher when the waiting time to conception is _____ and the time added by fetal loss is _____.
    a. long; long
    b. short; short
    c. long; short
    d. short; long
    e. neither of these factors would affect fertility

14. The obstetrical dilemma most specifically refers to:
    a. The transition to obligate bipedalism and its effect on giving birth.
    b. The transition to obligate bipedalism and its effect on back health.
    c. The transition to obligate bipedalism and its effect on fecundity.
    d. The transition to obligate bipedalism and its effect on obesity.

15. Which of the following is the LEAST likely reason selection would have acted to produce hidden estrus in humans?
    a. Increased potential for pair bonding
    b. It makes human males more aggressive when competing for mates
    c. Increases paternal investment and paternal care of offspring
    d. Increased stability of family structure
    e. Selection did not act on this trait; it already exists in all primates

16. As you learned in the second fertility lecture by Marianne Brasil, contraceptive practices are not new or only characteristic of western societies. Of the examples she presented in class, which of the following is NOT an historical method of contraception?
    a. Silphium
    b. Cotton
    c. Coca-Cola
    d. Poppy seeds

17. For many European cultures the ideal number of children a woman gives birth to has changed dramatically over the last few centuries, and is generally declining. Which of the following is the most important factor that played into this according to scientists?
    a. Increased cost of living
    b. Increased value of education
    c. Increased value of women's time
    d. All of the above

18. Which of the following sex chromosome Karyotypes would indicate an individual with Turner Syndrome?
    a. XXX
    b. XX
    c. X
    d. XXY
    e. XYY

19. For mammals in which females are homogametic, only one of the sex chromosomes is active in each cell.
    a. True
    b. False

20. Barr bodies are
    a. The bundled up inactivated copies of the x chromosome in human females.
    b. The toned, fit bodies of individuals who work out using the Barr Method.
    c. The name for inactivated DNA that is present in the Y chromosome.
    d. The second line of defense against viral pathogens.
    e. A and C

21. Which of the following phenotypes is binary (i.e. it only comes in two categories)?
    a. genetic sex
    b. gonadal sex
    c. phenotypic sex
    d. gender
    e. none of these are always binary

22. Which of the following biological phenomenon do calico cats best demonstrate?
    a. The homozygous effect
    b. X-chromosome inactivation
    c. codominance
    d. Hardy-Weinberg equilibrium
    e. feline adorableness

23. Not all source material is equal. What is the BEST way to determine whether or not a source is 'good'?
    a. If it has a lot of references in its bibliography
    b. If the journal is peer reviewed
    c. If it has a lot of figures and tables
    d. If the article includes multivariate statistics
    e. If the author has a PhD

24. When writing scientifically, each paragraph should ideally:
    a. use jargon to establish intellectual authority
    b. put the main point late in each paragraph in order to build suspense
    c. clearly state the argument and connect it to the broader topic
    d. include as many sources as possible, regardless of quality
    e. cite the author's other publications to improve their chances for a promotion (if the author is your GSI)

25. For this question, read the following two-sentence excerpt from one of Prof. Hlusko's research articles. Below this short excerpt, we present three sentences each from a hypothetical paper written about the history of toothpicks. Which of these, if any, is an example of plagiarism?

> "Next to the use of lithics [stone tools], the use of toothpicks by hominids is potentially one of the most persistent behaviors visible in the archaeological record. As Turner (1988) puts it, interproximal wear grooves represent the earliest evidence of any hominid habit." (Hlusko, *Current Anthropology* 2003:738)

    a. "Next to the use of lithics [stone tools], the use of toothpicks by hominids is potentially one of the most persistent behaviors visible in the archaeological record" (Hlusko, 2003:738).
    b. In my opinion, Hlusko's (2003) argument that toothpicks may be evidence of a persistent behavior visible in the fossil record is brilliant.
    c. I would like to point out that, next to the use of lithics, toothpick use by hominids is potentially one of the most persistent behaviors visible in the archaeological record. In fact, interproximal wear grooves represent the earliest evidence of any hominid habit.
    d. b and c
    e. None of these are examples of plagiarism.

26. Our current understanding of concealed ovulation in humans was informed by a study within the discipline of sociobiology on what study populations?
    a. The Mennonites, a natural fertility population
    b. College students in northern Georgia in the 1950s
    c. White heterosexual German adults
    d. Strippers in the United States
    e. Travestis, the Brazilian prostitutes of São Paolo

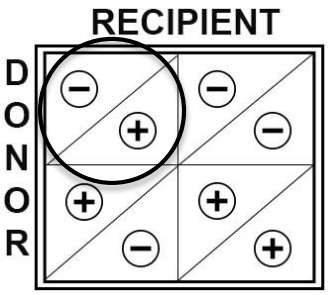
27. During the discussion of the three paper topics, you learned that the efficacy of the "genius" sperm bank relies most heavily on which of the following biological assumptions?
    a. Smarter people always have more kids. Therefore, you will get a "multiplier effect" if you increase the number of smart babies
    b. Intelligence is heritable and the father's contribution to this is enough to produce smarter babies
    c. Intelligence is heritable and the mother's contribution to this is enough to produce smarter babies
    d. Sperm from intelligent people is inherently more fertile and is better at producing viable pregnancies
    e. It relied on "matching" the genotype of the woman with a suitable man that had known intelligence genes that would interact well with the intelligence genes in the woman

28. During the discussion of the three paper topics, you learned Fallon Fox is the first, and so far only, professional athlete who has been or currently is openly transgender.
    a. True
    b. False

29. There is evidence for biological infanticide in the human species.
    a. True
    b. False

30. Which of the following is NOT a reason that female-female pairs of albatrosses form?
    a. high parental care requirements of albatross chicks
    b. female-biased sex ratio
    c. higher rates of aggression in males
    d. evolutionary drive to reproduce

31. Which of the following is a hypothesis for the evolutionary value of the act described by the circled box that was discussed in Whitney Reiner's sociobiology lecture?



    a. If this act is done between related individuals it may increase the donor's fitness
    b. The recipient may later return the favor ("tit for tat").
    c. There is no hypothesis for this behavior.
    d. A and B
    e. The donor is actually benefitting because they feel good about themselves for doing something for the recipient.

32. Our current understanding of sociobiology (the integrated model) says that humans:
    a. are blank slates
    b. behave exactly like chimpanzees
    c. are shaped entirely by genetics
    d. are shaped entirely by culture
    e. behave in ways shaped by the evolutionary past and the contemporary environment

33. Which of the following hypotheses most likely explains the increased prevalence of autoimmune disorders in westernized populations?
    a. Hygiene hypothesis
    b. Parasite hypothesis
    c. Naturalistic fallacy
    d. Maternal birth order hypothesis
    e. Thrifty phenotype hypothesis

34. A good example of the innate immune system's first line of defense is:
    a. Fever
    b. Phagocytes
    c. Memory T cells
    d. Mucus
    e. White blood cells

35. In which of these groups is an adaptive immune response present?
    a. Invertebrates
    b. Fungi
    c. Plants
    d. Vertebrates

FOR QUESTIONS 36 AND 37:
There are two populations, both characterized as being in a state of natural fertility and living in geographic regions that are high-risk for malaria and many other pathogens. There is essentially no western medical facilities available, so the people rely on very similar traditional medicinal practices. In population A, breastfeeding is commonly seen for children as old as four years. In population B, there is a taboo against breastfeeding a baby after its first tooth erupts (usually at 5 months of age).

36. The total fertility rate for population A is likely to be _____ than in population B because of the effect of _____.
    a. Higher; better nutrition
    b. Higher; lactational infecundability
    c. Lower; poorer nutrition
    d. Lower; lactational infecundability

37. Demographers have found that while the total fertility rate is different between these two populations, the number of children that survive to adulthood is the same. Which of the following is the most reasonable explanation for this?
    a. The offspring of population B are closer to each other in age and, as such, help take care of each other. Consequently, they are more likely to survive to adulthood.
    b. Siblings that are closer in age (such as in population B) are exposed to more pathogens, and consequently tend to have healthier immune systems. Therefore, they are more likely to survive childhood illness than are siblings born farther apart.
    c. Longer intervals between births results in siblings that were each raised as though they were an only child. This reduces their exposure to pathogens when they are young, which leads to higher survival rates.
    d. Extended breastfeeding provides the child with an extended time during which they benefit from passive immunity from their mothers, and therefore they are more likely to survive childhood illness and reach adulthood.
    e. Extended breastfeeding provides the child with an extended time during which they benefit from passive immunity from their mothers. Because active immunity cannot operate at the same time as passive immunity, these children have compromised immune systems and are less likely to reach adulthood.

38. In the eighteenth and nineteenth centuries, one of the great mysteries that captivated early citizens of the United States was "who built all those earthen mounds?" After numerous people investigated, and the science of archaeology was begun, the answer turned out to be:
    a. Aliens
    b. The Lost Tribe of Israel
    c. A northern range expansion of the Aztec
    d. Native Americans known as the Inuit
    e. Native Americans known as the Mississippians

39. Twentieth century scientists in the United States were respected for developing the concept of _____ to account for the various human races, as they were defined then.
    a. Eugenics
    b. Empiricism
    c. Monogeny
    d. Oligogeny
    e. Polygeny

40. Samuel Morton studied the cranial capacities of hundreds of people in order to demonstrate that intellectual differences between races could be quantitatively assessed using physical characteristics of the brain, focusing primarily on brain size. While his research methods had a number of serious flaws, which of the following was not one of them?
    a. Assumed a strong correlation between brain size and intelligence
    b. Ignored the influence that body size has on brain size
    c. Did not account for the sex composition of his samples
    d. Was inconsistent in applying analytical caution, such as with how he estimated averages
    e. Was sloppy and careless in how he measured cranial capacity

41. The Army tests for intelligence, conducted during World War I by Robert Yerkes, are a good example of how extremely large datasets can overcome faulty methodology to yield biologically meaningful results.
    a. True
    b. False

42. The United States of America has never required people to pass an intelligence test as a requirement for entry/immigration.
    a. Trues
    b. False

43. While the eugenics movement in the United States sought to prohibit people deemed intellectually inferior from reproducing, the eugenics movement in England:
    a. Sought to have intelligent women marry men of lower intelligence in order to have children of average intellectual capacity
    b. Sought to identify children who needed extra help in school
    c. Sought to keep immigrants from eastern European countries from immigrating in large numbers to the United Kingdom
    d. Sought to encourage men and women of "high quality" to have many children
    e. Sought to also keep people of inferior looks from reproducing

44. Which of the following organisms have helped researchers learn about the genetics behind human pigmentation?
    a. California Thrasher
    b. Dung beetles
    c. Zebra fish
    d. Pangolins
    e. Zebras

45. Thinking back to your first discussion section related to the book Living Color, skin color in humans is not sexually dimorphic.
    a. True
    b. False

46. Which of the following statements about artificial and natural flavors is false?
    a. Artificial and natural flavors taste alike because they are identical on a molecular level.
    b. Companies often use natural flavorings because they are much better for you than artificial flavorings.
    a. Natural flavorings are not always better, especially because they are significantly less regulated than artificial flavorings.
    b. When processed foods are manufactured with natural flavors it is often simply because the word "natural" appeals to shoppers and makes an item seem more healthy than it actually is.
    c. All of the above are false.

47. In your second discussion section related to the book Living Color, you and your classmates read a number of abstracts. These were abstracts of scientific papers that investigated how infants perceive differences between people from different races. Generally speaking, these studies found that:
    a. Infants are increasingly sensitive to facial features as they age no matter the race of the person they are looking at.
    b. Infants are increasingly sensitive to the facial features of their parents' race as they age, and decreasingly sensitive to the facial features of other races.
    c. Infants are most sensitive to the differences between races during their first 6 months of life.
    d. Infants cannot focus on facial features and cannot differentiate between people visually until they are about 9 months old.

48. One of your reading assignments was a chapter from Matt Ridley's book Genome: The Autobiography of a Species in 23 Chapters. In this, Ridley describes how the DAX and SRY genes interact to determine the biological sex of a person, and numerous other examples of how the X and Y chromosomes interrelate. How would you best describe Ridley's characterization of the evolutionary relationship between the two sex chromosomes?
    a. In synergy
    b. In tandem
    c. In conflict

Be sure to turn the page for the last two questions.

49. In the shorter of the two videos you were assigned to watch in conjunction with the lecture on immunity, you learned how the human immune system can create about 10 billion different antibodies. Critical to this process are two genes that combine the various V(D)J segments in various combinations. What are the names of these two genes?
    a. MC1R and MC2R
    b. Rag1 and Rag2
    c. Major Histocompatibility Complex 1 and 2
    d. T-cell and B-cell
    e. IGF-1 and IGF-2

50. The very first publication by the Smithsonian Institution was an extensive investigation into:
    a. Immigration policy
    b. Water pollution
    c. Maternal mortality
    d. Polygeny
    e. Earthen mounds

You made it to the end of the exam… congratulations!