INTRODUCTION

1. Biological anthropology is
a) a science about human biological variation and human evolution
b) a science about the origin of life
c) a science about the diversity of life forms on Earth
d) a science about human genetics
e) a science about variation of human cultures

2. Anthropology is *holistic*. Word *holistic* means that
a) to understand humans we need to sequence their genome
b) to understand humans we need to understand their past
c) to understand humans we need to understand their relation to non-human primates
d) to understand humans we need to study all humans, their past and present, their culture and their biology

3. Which of the following is not a subfield of Anthropology?
a) cultural anthropology
b) archaeology
c) paleontology
d) biological anthropology
e) linguistics

THE BIOLOGICAL BASIS OF LIFE

4. Which of the following can be found in a prokaryotic cell?
a) a nucleus
b) ribosome
c) mitochondria
d) endoplasmic reticulum

5. Circular DNA molecule can be found in which part of eukaryotic cell?
a) ribosome
b) endoplasmic reticulum
c) mitochondria
d) nucleus
e) cytoplasm

6. Mitosis results in
a) 2 haploid cells
b) 2 diploid cells
c) 4 haploid cells
d) 4 diploid cells
e) 2 haploid and 2 diploid cells

7. The second phase of mitosis is called:
a) anaphase
b) telophase
c) prophase
d) metaphase

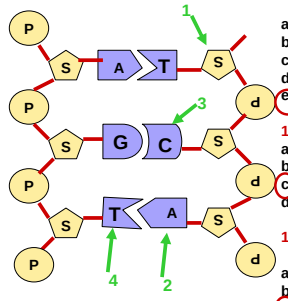
8. Which of the following is NOT true about proteins?
a) some of them serve as enzymes
b) they are found in every part of a living cell, i.e. nucleus, cytoplasm, mitochondria
c) they are three-dimensional molecules
d) they are made up of 38 different amino acids
e) some of them are present on the surface of red blood cells

9. Choose the complementary mRNA strand for TCA GAT DNA sequence
a) TCA GAA
b) UGA CTU
c) GAC UCG
d) AGU CUA
e) CUG AGC

10. Messenger RNA (mRNA)….
a) is a structural part of ribosome rRNA
b) carries genetic information from the nucleus to cytoplasm
c) initiates and directs chemical reactions enzymes
d) is a structural part of a chromosome histone
e) brings amino acids to mRNA tRNA

11. Which of the following theories explains the origin of eukaryotic cells?
a) mitosis-meiosis switch
b) genetic drift
c) inclusive fitness
d) Hardy-Weinberg
e) endosymbiotic theory

12. All enzymes have …
a) active centers that attract and bind other molecules
b) short DNA and RNA sequences
c) several subunits that are necessary for energy emission
d) circular and double-stranded DNA, called mtDNA
e) phosphate, sugar, and fat components



13. This diagram illustrates the structure of …
a) a protein
b) an RNA molecule
c) an enzyme
d) a chromosome
e) a DNA molecule

14. Arrow #1 is pointing at
a) amino acid
b) base
c) deoxyribose
d) phosphate

15. Arrows #2, 3, and 4 are all pointing at..
a) amino acids
b) backbone of the molecule
c) bases
d) active centers

16. How many bases of DNA code for 1 amino acid
a) 1
b) 2
c) 3 a codon
d) 4
e) 5

MENDELIAN GENETICS

17. Mary and her brother Tim are both homozygous recessive (dd). If their parents had another baby, what will be his/her genotype
a) definitely dd
b) definitely DD
c) either Dd or dd, but not DD
d) either DD or Dd, but not dd
e) either DD, Dd, or dd (all are possible)

18. Mr. Brown is homozygous dominant (KK), his son Mike is heterozygous (Kk).
What do we know about the genotype of Mrs. Brown?
a) Her genotype is definitely kk
b) her genotype is either kk or Kk
c) her genotype is either KK or Kk
d) her genotype is either KK, or Kk, or kk
e) Mr. Brown cannot be Mike's biological father

The genotype of Mr. Hocks is HH, bb, Kk, Nn, Oo, PP, rr, Gg,
The genotype of Mrs. Hocks is Hs, BB, kk, NN, Oo, Pp, rr, Gg
answer the questions 14-17 about Mr. and Mrs. Hocks:

19. How many unique gamete types can be produced by Mr. Hocks?
a) 4
b) 8
c) 16
d) 32
e) 64

20. What are the chances of Mr. and Mrs. Hocks having a child with BB in his genotype?
a) 1
b) 1/2
c) 1/4
d) 3/4
e) 0

21. What are the chances of Mr. and Mrs. Hocks having a child with Bb PP genotype?
a) 1
b) 1/2
c) 1/4
d) 3/4
e) 0

22. What are the chances of Mr. and Mrs. Hocks having a child with PP NN OO genotype?
a) 0
b) 1/2
c) 1/4
d) 1/8
e) 1/16

23. Anne has A blood group, her brother Mike has O blood, their mother has B blood
What is the genotype of their father?
a) OO
b) AO
c) BO
d) AB
e) Anne or Mike must have been adopted

24. Anne can donate her blood to…
a) Mike
b) her mother
c) her father
d) none of the family members can receive Anne's blood
e) any family member

25. What is Anne's genotype?
a) AA
b) AO
c) either AA or AO
d) AB
e) impossible to tell

Recessive allele a codes for Type I diabetes. Homozygous recessive individuals (aa) develop insulin dependant diabetes very early in life. Answer questions below

26. In the city of Rio de Janeiro 9 out of 100 children are born with the Type I diabetes (have aa genotype). *Assume that the population of Rio de Janeiro is at Hardy-Weinberg equilibrium*. Estimate fr(a).
a) fr(a) = 0.3
b) fr(a) = 0.1
c)fr(a) = 0.06
d)fr(a) = 0.09
e)fr(a) = 0.03

27. Estimate the frequency of heterozygotes in the same population:
a) fr(Aa) = 0.42
b) fr(Aa) = 0.21
c) fr(Aa) = 0.5
d) fr(Aa) = 0.7

28. Estimate the frequency of dominant homozygotes (AA) in the same population:
a) 0.49 b) 0.91 c) 0.6 d) 0.4

Dominant allele T codes for Tuskerger's disease. In a population of Kiev frequency of T allele is 0.1
Assume that the population of Kiev is mating randomly and answer questions below:
29. fr(t) =

a) 1 b) 0.81 c) 0.9 d) 0.01 e) 0.1

30. How many babies are born with Tuskerger's disease (have either TT or Tt genotype) among 100 newborns?
a) 1 b) 9 c) 18 d) 19 e) 81

31. Among 1500 New Yorkers
100 had genotype MM,
100 had genotype MN,
1300 had genotype NN.
What is the frequency of M allele in the population of New York?

a)0.066
b) 0.1
c) 0.258
d) 0.2
e) none of the above

(2x#MM+#MN)/(2xtotal) =

=(2x100+100)/(2x1500) = (200+100)/3000 =
=300/3000 = 0.1

FORCES OF EVOLUTION

Towns Tot'ma and Kirillov are of approximately the same size (100,000 people each). Frequencies of Z and z alleles in each of these towns are as follows:
Tot'ma: fr(Z) = 0.8,
Kirillov: fr(Z) = 0.6,

32. These two towns used to be separated by a forest. Recently, however, a road was built connecting these two towns and the populations of Tot'ma and Kirillov began mating randomly. How will fr(Z) change in To'tma?
a) will become 0.9
b) will become 0.7
c) will become 0.5
d) will remain 0.3
e) will become 0.1

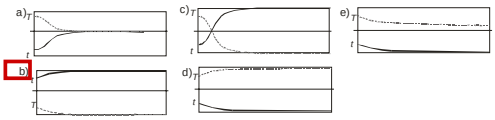
33. What evolutionary force is affecting allele frequencies in Kirillov and Tot'ma?
a) balancing selection
b) genetic drift
c) gene flow
d) disruptive selection
e) random mating

Dominant allele T codes for Tuskerger's disease. Children born with TT or Tt genotype usually die before their first birthday. In a population of Kiev frequency of T allele is 0.1

34. What type of natural selection is operating on Tuskerger's disease in modern Kiev? (Fitness of Tuskerger's children is 0, fitness of non- Tuskerger's children is 1)

a) directional selection for the dominant phenotype
b) directional selection for the recessive phenotype
c) balancing selection
d) stabilizing selection

35. How will the frequency of t allele change under this selection?

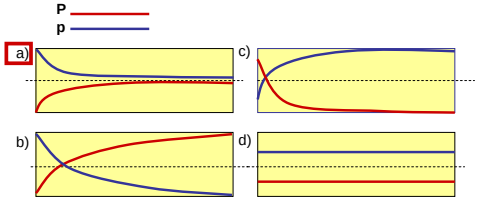


People with genotype Pp have a greater resistance to of viral infections than PP and pp homozygotes. Therefore, more Pp individuals survive better to the reproductive age.

36. What type of natural selection is affecting this population?

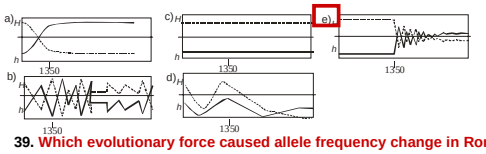
a)directional selection for the dominant phenotype
b)directional selection for the recessive phenotype
c)genetic drift
d)balancing selection
e)gene flow

37. Which chart reflects the projected allele frequency change?



A large randomly mating population of Rome was struck by an epidemic of cholera in AD 1350 resulting in 80% mortality. Before the epidemic, frequency of h allele, responsible for hitchhikers thumbs, was 0.2. After the epidemic the population recovered within a few generations.

38. Which of the following charts illustrates the most accurately allele frequency changes before and after the epidemic?



39. Which evolutionary force caused allele frequency change in Rome after AD 1350?

a) founder effect
b) bottle neck
c) gene flow
d) stabilizing selection
e) directional selection for the recessive phenotype

40. Which of the following is an example of human biological adaptation to the frequent malaria infection in tropical Africa?

a) high frequency of sickle-cell anemia
b) high frequency of Tay-Sachs disease
c) lactose intolerance
d) dark skin color

41. Albinism is determined by a recessive allele *a*. Among Hopi albino males do not participate in long hunting expeditions. They stay at the base camp and frequently mate with wives of other males and father more children than other males in a Hopi community.
What type of evolutionary force is affecting frequency of allele *a* in the described group?

a) disruptive selection
b) genetic drift
c) random mating
d) gene flow
e) directional selection for recessive phenotype