

Genetics test 1:

1. Inosine is a nitrogenous base that might be found on:
  - a. rRNA
  - b. tRNA**
  - c. mRNA
  - d. DNA
  - e. None of the above
  
2. the <sup>difference</sup> distinction between leading and lagging strands is the result of:
  - a. the antiparallel nature of double stranded DNA**
  - b. the need to prime replication with RNA
  - c. the fact that DNA polymerase reads the DNA in a ~~5' to 3'~~ direction
  - d. both A and C contribute
  - e. none of the above
  
3. crossing over occurs during:
  - a. prophase I**
  - b. metaphase I
  - c. anaphase I
  - d. prophase II
  - e. metaphase II
  
4. which of the following is a component of the splicesome?
  - a. snRNPs**
  - b. peptidyl transferases
  - c. topoisomerases
  - d. kinases
  - e. cyclases
  
5. which of the following descriptions incorrect concerning the genetic code
  - a. it is ambiguous** - *unambiguous*
  - b. it is triplet
  - c. it is redundant
  - d. it is comma-less
  - e. it is nearly universal
  
6. arrange the following in the order of their action during DNA replication E. coli  
(1) DNA polymerase I; (2) DNA polymerase III; (3) DNA primase; (4) DNA gyrase; (5) DNA helicase:
  - a. 1,2,3,4,5
  - b. 2,5,4,3,1
  - c. **5,4,3,2,1**
  - d. 4,5,3,2,1
  - e. 3,2,1,5,4

~~5, 4, 3, 2, 1~~  
5, 4, 3, 2, 1.

7. a particular triplet of base in the coding sequence of template DNA is AAA. The anticodon on the tRNA that bind mRNA coden is: *mRNA on: UUU*  
*AAA*
- TTT
  - UUA
  - UUU
  - AAA**
  - Either UAA or TAA depend on the wobble in the 1<sup>st</sup> base
8. how do cells at the completion of meiosis compare with cells that have replicated their DNA and are just about to begin meiosis?
- they have twice the amount of cytoplasm and half the amount of DNA
  - they have half the number of chromosome and half the amount of DNA
  - they have the same number of chromosomes and half the amount of DNA
  - they have half the number of chromosomes and 1/4 the amount of DNA**
  - they have the amount of cytoplasm and twice the amount of DNA
9. which of the following nitrogenous bases would not be expected to be found in tRNA molecule:
- adenine
  - inosine
  - thymine**
  - cytosine
  - guanine
10. during translation amino acyl tRNA synthetase functions by:
- directing to biding of the codon to the anticodon
  - catalyzing the peptide bond formation
  - charging the tRNA**
  - discharging the tRNA
  - recognizing the small ribosomal subunit
11. in prokaryotes, the RNA polymerase attach to the \_\_\_\_ to begin transcription:
- initiation codon - *AUG for translation*
  - shine-dalgarno sequence - *UTR*
  - promoter** → *Promoter UTR Initiation*
  - 5' UTR
  - 3' UTR
12. which of following statements is true?
- ~~A~~ heterochromatin is composed of DNA, while euchromatin is made of DNA and RNA
  - both heterochromatin and euchromatin are found outside the nucleus
  - C** heterochromatin is highly condense, while euchromatin is less compact
  - euchromatin is not transcribed while heterochromatin is transcribed
  - only euchromatin is visible under the light microscope

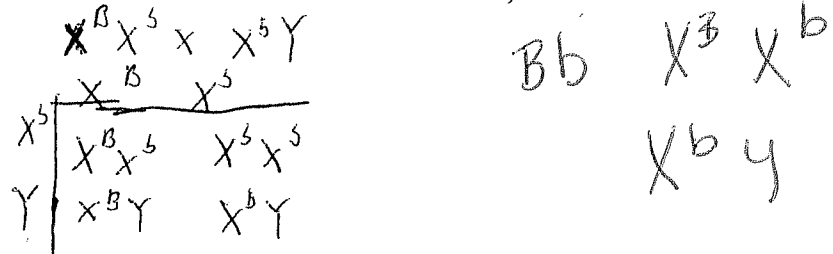
13. how many unique gametes could be produced through independent assortment by an individual with the genotype AsBbCcDdEd?

- a. 4
- b. 8
- c. 16
- d. 32
- e. 1/64

$2^n =$  ~~16~~  
 $2^5 = 32$   $2^5$

14. red-green color blindness is inherited as a recessive X linked trait. What is the probability that the next child of a phenotypically normal woman, who has already had one color-blind son, and who is married to a color-blind man, will be color blind:

- a. 0
- b. 1/4
- c. 1/2
- d. 2/3
- e. 1



15. which of the following could not happen?

- a. a male has the same X chromosome as his paternal grandfather
- b. a male has the same X chromosomes as his maternal grandfather
- c. a female has the same X chromosomes as her maternal grandmother
- d. a female has the same X chromosome as her maternal great-great-grandmother
- e. all of the above

16. The last amino acid translated in eukaryotes is always:

- a. arginine
- b. methionine
- c. lysine
- d. proline
- e. there is not consistent amino acid translated last

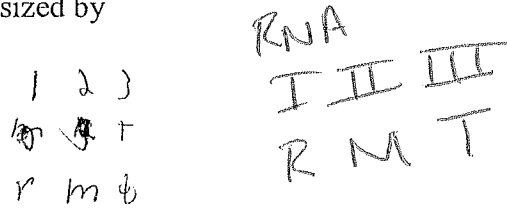
17. 10% of a DNA molecule represents adenine containing nucleotides. What % of nucleotides contain cytosine:

- a. 10
- b. 80
- c. 40
- d. 25
- e. None of the above

10A	100
10C	-20
20	80
	2 = 40

18. mRNA in eukaryotes is synthesized by

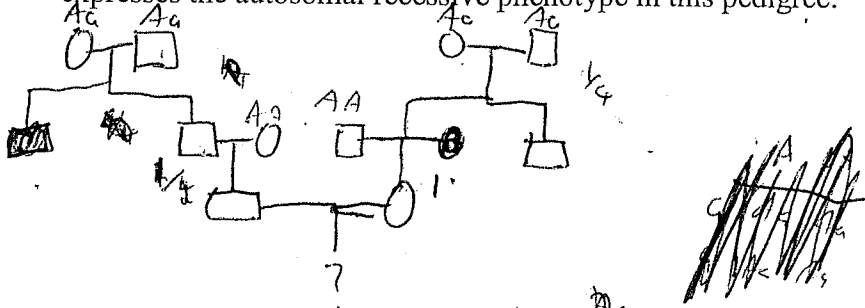
- a. RNA polymerase
- b. RNA polymerase I
- c. RNA polymerase II
- d. RNA polymerase III
- e. all of the above



independ

autosomal aa  
sex link x

19. if individual III mates with III 2 what is the probability their first offspring expresses the autosomal recessive phenotype in this pedigree:



Aa a  
AA Aa  
Aa aa

AA  
A AA Aa  
a Aa aa

- a. 1/36
- b. 1/12**
- c. 1/24
- d. 3/32
- e. None of the above

~~AA Aa~~  
~~Aa Aa~~  
~~aa Aa~~

$\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$   
 $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$   
 $\frac{1}{8} + \frac{1}{8} = \frac{1}{4}$

20. Which the following have no origin replication in its DNA?

- a. eukaryote
- b. prokaryote
- c. plasmid
- d. phage
- e. all of them have origin replication**

21. if the cross  $AaBBccddEe \times AaBbCcDdEe$  is made, what probability that an offspring  $AaBbCcDdEe$  arises?

- a. 1/32**
- b. 243/1024
- c. 1
- d. 0
- e. none of the above

$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{32}$

22. if the cross  $AaBBccddEe \times AaBbCcDdEe$  is made, what probability that an offspring  $AaBbCcDdEe$  arises?

- a. 27/128**
- b. 1/32
- c. 243/1024
- d. 1/32
- e. none of the above

Aa  
A AAa  
a Aa aa  
 $\frac{3}{4}$

B  
B Bb  
b Bb bb  
 $\frac{3}{4}$

Cc  
C CCc  
c Cc cc  
 $\frac{3}{4}$

Dd  
D DDd  
d Dd dd  
 $\frac{3}{4}$

Ee  
E EEe  
e Ee ee  
 $\frac{3}{4}$

$\frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} = \frac{243}{1024} \times 2109$

23. DNA and RNA are synthesized?

- a. 5' to 3'**

- b. 3' to 5'
- c. 5' to 3' and 3' to 5' respectively
- d. 3' to 5' and 5' to 3' respectively
- d. none of these

24. Telomerase is unnecessary in bacteria

- a. because mRNA is polycistronic
- b. because mRNA is monocistronic
- c. because DNA molecules are circular ✓
- d. because DNA molecules are linear
- e. because they are unicellular

25. Meselson and Stahl demonstrated that replication was semi-conservative by first growing bacteria in media only containing heavy nitrogen and then transferring them to media contain light nitrogen. How many bacterial generations were necessary to demonstrate that replication not conservative:

- a. 1
- b. 2
- c. 3
- d. 4
- e. 5

26. DNA polymerase I has important function in prokaryotes, it:

- a. remove the RNA primer.
- b. repair thymine dimmers
- c. is responsible for most of the polymerization of new DNA
- d. prime the DNA for synthesis
- e. none of these

27. if you were going to test cross an individual with phenotype A\_B\_ what genotype would you use to as the mate:

- a. AABB
- b. AAbb
- c. aaBB
- d. aabb
- e. either A or D

28. AUG is the codon for methionine. This has special significance because:

- a. Methimine is an essential amino acid
- b. AUG is the first codon translated, hence eukaryotic polypeptide always initially begin with methionine
- c. AUG also serve as a stop codon
- d. inosine isn the anticodon allow this alternatively code for formyl-methionine
- e. none of these

the following 3 recessive markers are known in lab mice:

X

h = hotfoot  
o = observe  
wa = waved

A trihybrid of unknown origin is testcrossed, producing the following offspring

h, o, wa	357
h, o +	74
wa	66
o	79
wild type	343
h, wa	61
o, wa	11
h	9

total = 1000

no

h  
o h wa  
+ + +

h	o	wa
h	o	+
wa	+	+
o	+	+
+	+	+
<del>h</del>	<del>wa</del>	<del>+</del>
<del>o</del>	<del>wa</del>	<del>+</del>
h	+	+

29. what are linkage groups in the trihybrid being test crossed:

- a. h ++ and + w o
- b. +++ and h w o**
- c. ++ o and h w +
- d. none of the above

30. what is the order of the loci:

- a. h w o
- b. w h o**
- c. w o h
- d. none of the above

h o wa  
h o +  
wa + +  
o + +  
+ + +  
h wa +  
o wa +  
h + +

31. what is the map distance between loci h and w

- a. 16.0**
- b. 15.5
- c. 32.0
- d. 16.3
- e. none of the above

32. what is the map distance between loci h and w

- a. 16.0**
- b. 15.5
- c. 32.0
- d. 16.3
- e. none of the above

33. what is the map distance between w and o:

- a. 16.0
- b. 15.5
- c. 32.0**
- d. 16.3
- e. none of the above

h/o	wa
+/+	+

R o wa +  
h + +

$$COC = 20$$

34. what is the interference:

- a. 0.03156
- b. 0.04297
- c. **0.21875**
- d. 0.78125
- e. none of the above

$$0.78125 = 1 -$$

$$COC = \frac{\text{Observed dc}}{\text{expected dc}} \quad 20$$

$$\text{exp DC} = \frac{16}{100} \times \frac{16}{100} \times 1000 = 25.6$$

35. what is the coincidence:

- a. 0.03156
- b. 0.04297
- c. 0.21875
- d. **0.78125**
- e. none of the above

In the garden pea, orange pods are recessive to green pods, and sensitivity to pea mosaic virus is recessive to resistance to the virus. A plant with orange pods and sensitivity to the virus was crossed with a true breeding plant with green pods and resistance to the virus.

The F1 plants were than test crossed and the following results were obtained:

- 160 orange pods, virus sensitive
- 165 green pods, virus resistant
- 36 orange pods, virus resistant
- 39 green pods, virus sensitive

> 400

$$\frac{(160-100)^2}{100} = 36 \quad \frac{(165-100)^2}{100} = 42.3$$

$$\frac{(36-100)^2}{100} = 40.9 \quad \frac{(39-100)^2}{100} = 129$$

36. calculate the appropriate chi-square value to test the hypothesis that the genes assort independently of each other:

- a. **156.5**
- b. 133.4
- c. 1.57
- d. 2.48
- e. None of the above

$$\chi^2 = \frac{(\text{observed} - \text{exp})^2}{\text{exp}}$$

37. calculate the map distance ( in cM) for the previous chi-squared problem:

- a. 14.7
- b. **18.8**
- c. 7.2
- d. 21.1
- e. none of the above

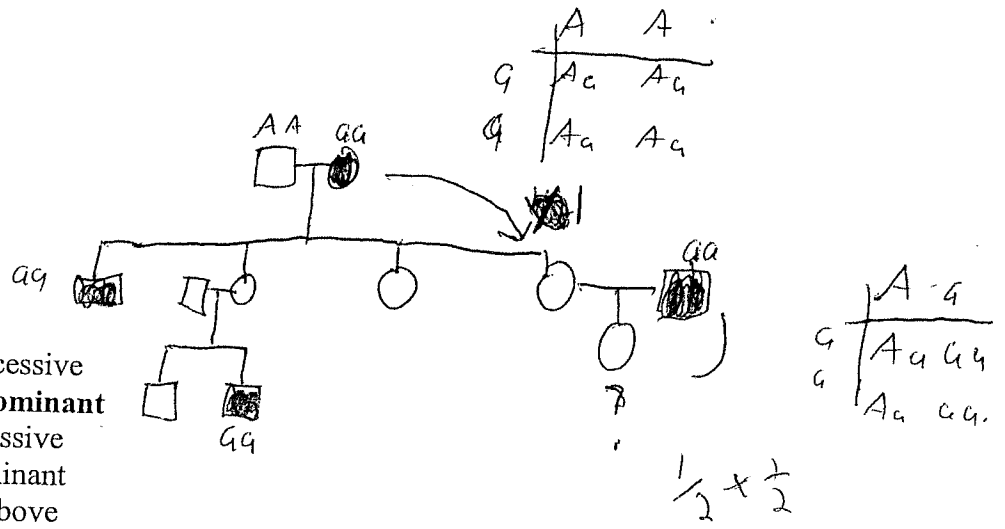
38. what would you calculate from the above chi-square analysis:

- a. the gene assort independent
- b. **this result would be obtain less than 1% of the time if the gene assort independently so that hypothesis should be reject.**
- c. linkage between have been proven
- d. a larger sample is necessary to make a definitive statement
- e. none of the above

39. the following pedigree show the pattern of inheritance of red-green color blindness in a family. What is the chance that female III- 3 has a son that is color blind if she mate with a normal non-color blind male?

- a.  $\frac{1}{2}$
- b.  $\frac{1}{4}$
- c.  $\frac{1}{6}$
- d.  $\frac{2}{3}$
- e. none of the above

40. what mode of inheritance would be indicated by the following pedigree



- a. autosomal recessive
- b. autosomal dominant**
- c. X-linked recessive
- d. X-linked dominant
- e. None of the above

