Mock Exam 3
Raut BY 123

1. If a plant is true breeding for a dominant trait then,
    a. If the plant were allowed to self-pollinate, the dominant and recessive traits would consistently appear in a 3:1 ratio among the progeny
    b. The plant is heterozygous for the trait
    c. If the plant were crossed with a heterozygote, one-half of the progeny would show the dominant trait, and one-half would show the recessive trait
    d. If the plant were allowed to self-pollinate, all of the progeny would have the dominant trait
    e. The variety is unable to mutate
2. A= big apples; R= red apples; a=small apples; r=yellow apples. You have one tree that produces big yellow apples and another tree that produces small red apples. When the two are crossed, you find that half of the new trees produce big red apples and half produce big yellow apples. What are the genotypes of the parents?
    a. AArr and aaRr
    b. Aarr and aaRr
    c. AARrand Aarr
    d. AaRr and AaRr
    e. AaRr and aarr
3. Following a SsYy x SsYy cross, what percentage of the offspring are predicted to have a genotype that is heterozygous for both characteristics?
    a. 4/16
    b. 2/16
    c. 1/16
    d. 3/16
4. Two heterozygotes (F_1) were created which contain two independently-assorting traits and interbred. Of their total of progeny obtained from a dihybrid cross which resemble their F_1 parents, which fraction will be true-breeding?
    a. 1/16
    b. 1/8
    c. 1/9
    d. 3/16
    e. ½
5. Throw this question out
6. You are attempting to create a true-breeding variety of hamster which has dark pigments at the tips of the ears, face, and limbs. However, you're having a hard time establishing reproducible results during the hot summer months. Your conclusion is that:
    a. The gene for your trait must be involved in an epistatic relationship with another
    b. The trait is influenced through a polygenic mechanism

c. Environmental effects are influencing the activity of the allele's protein
d. Codominance of several genes cause disproportionate lethality in the desired offspring which die in the heat
e. The parental lines are not true-breeding

7. In dogs, black (B) is dominant to chestnut (b), and solid color (S) is dominant to spotted (s). What are the genotypes of the parents in a mating that produced 3/8 black solid, 3/8 black spotted, 1/8 chestnut solid, 1/8 chestnut spotted puppies? (Hint: try to find the genotypes of the puppies first)
   a. BBSs x Bbss
   b. BbSs x Bbss
   c. BbSS x BbSs
   d. BbSS x bbSs
   e. Bbss x bbss
8. John and Elizabeth just had their first child, Tommy. Both John and Elizabeth are brown eyed but baby Tommy is blue eyed. John and Elizabeth also have free earlobes but baby Tommy has attached earlobes. Knowing that brown eyes (B) are dominant to blue (b) and free earlobes (A) are dominant to attached earlobes (a), what is the probability that their next child will have blue eyes and free earlobes?
   a. 1/16
   b. 9/16
   c. ¾
   d. 3/16
   e. ¼
9. A woman with type O blood is expecting a child. Her husband is type A. Both the woman's father and her husband's father had type B blood. What is the probability that the child will have type O blood?
   a. 0%
   b. 25%
   c. 50%
   d. 75%
   e. It cannot be determined from the given information
10. A mother with type B blood has two children, one with type A blood and one with type O blood. Her husband has type O blood. Which of the following could you conclude from this information?
   a. The husband could not have fathered either child
   b. The husband could have fathered both children
   c. The husband must be the father of the child with type O blood and could be the father of the type A child
   d. Neither the mother nor the husband could be the biological parent of the type A child
   e. The husband could be the father of the child with type O blood, but not the type A child
11. In most mammals dosage compensation is achieved by random inactivation of one of the X chromosomes in the somatic cells of females. However, in the

marsupials activation is non random, and it is the X chromosome that is inherited from the father (the paternal X) that is preferentially inactivated in all somatic cells of females. What are the consequences of this for x-linked traits in marsupials?

a. Heterozygous females will not be somatic mosaics but will show one phenotype or the other
b. Both male and female heterozygotes will be somatic mosaics
c. Heterozygous females will not occur
d. None of the above

12. What is the probability that a male will inherit an x-linked recessive allele from his father?
    a. 0%
    b. 25%
    c. 50%
    d. 75%
    e. 100%
13. In werewolves, pointy ears (P) are dominant over round ears (p). The gene is on the X chromosome. A certain female werewolf has pointy ears even though her father had round ears. What percentage of her sons will have round ears if she mates with a werewolf with round ears?
    a. 25%
    b. 50%
    c. 75%
    d. 0%
    e. 100%
14. A woman is red-green color blind. What can we conclude, if anything, about her father?
    a. He has two Y chromosomes
    b. He is red-green color blind
    c. There is a 50% probability that he has normal vision
    d. There is too little information to tell
    e. None of the above
15. A woman is a carrier for red-green color blindness, a sex-linked trait. Her husband is normal (not-color blind) for this trait. What are the chances that their newborn daughter will be red-green color blind?
    a. 75%
    b. 100%
    c. 0%
    d. 50%
    e. 25%
16. Hemophilia is a sex-linked disorder. The daughter of a father with hemophilia and a carrier mother has a ____ probability of having hemophilia
    a. 0%
    b. 100%
    c. 33%
    d. 25%

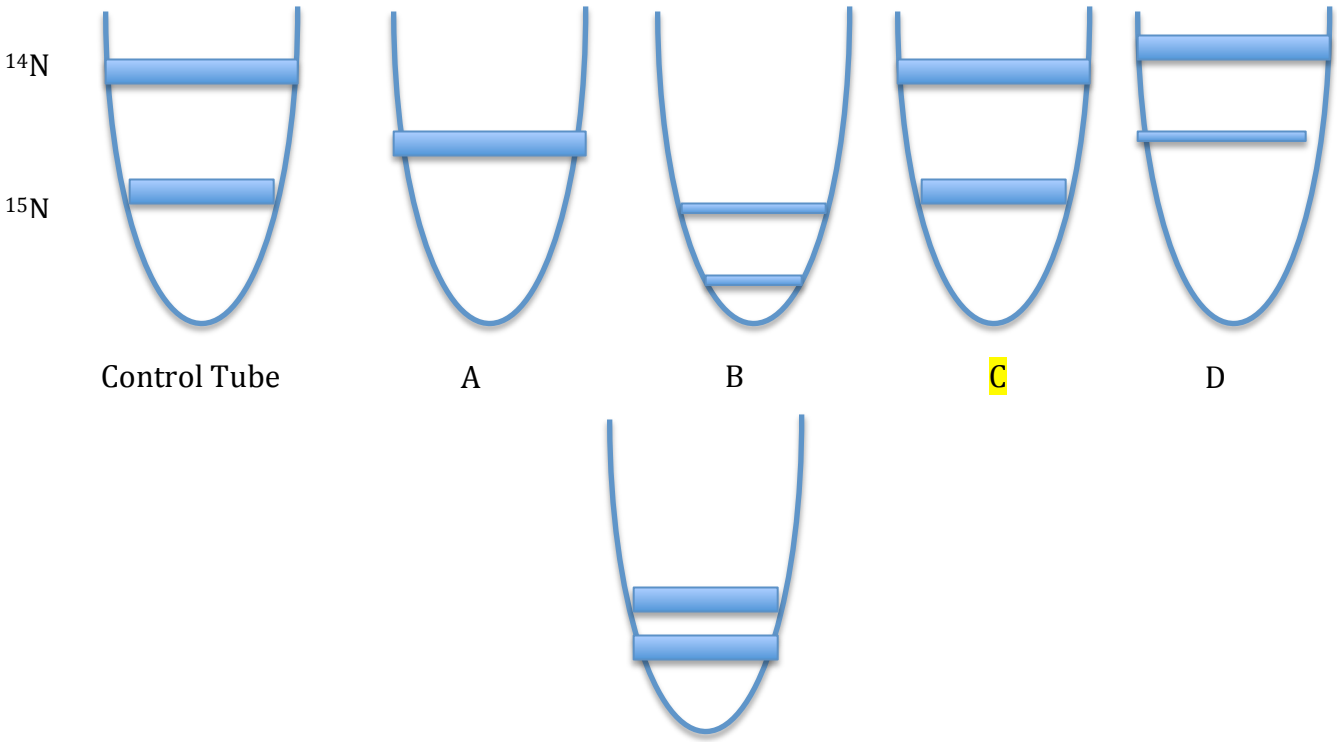
e. 50%

17. An affected male and a normal female have four children: two affected daughters and two normal sons. Each of the affected daughters (and their normal husbands) produced affected sons and affected daughters. The couple's normal sons married normal women and had all normal children. What is the most likely mode of inheritance for this trait?
    a. Autosomal dominant
    b. Autosomal recessive
    c. Sex-linked dominant
    d. Sex-linked recessive
    e. It cannot be determined
18. How many Barr bodies would be observed in the nucleus of an XYY individual?
    a. 1
    b. 2
    c. 3
    d. 0
19. Can a male be a carrier for a sex-linked disease?
    a. Yes, if the trait is recessive
    b. Yes, if the male's father and mother were carriers
    c. No, males only have a single copy of sex-linked genes
    d. None of the above
20. With a microscope, you examine some somatic cells from a woman and notice that each nucleus has two Barr bodies. What can you infer about the sex chromosomes about the sex chromosomes in this individual?
    a. She is XX
    b. She is XXY but the Y chromosome lacks the SRY gene
    c. She is XXXX
    d. She is XXX
    e. None of the above
21. Four genes (A,B,C, and D) are on the same chromosome. The recombination frequencies are as follows: A-B 19%, B-C 14%, A-C 5%, B-D 2%, A-D 21%, C-D 16%. Based on this information, which sequence of genes is correct?
    a. ACBD
    b. ACDB
    c. ABCD
    d. ADBC
    e. ABDC
22. Gene A is normally found on chromosome number 15 in humans. If amniocentesis reveals fetal cells containing gene A on chromosome 17, but not 15, the best explanation would be that:
    a. Base substitution occurred either during gametogenesis or in the mitotic divisions following fertilization
    b. An inverstion of gene A occurred on chromosome 15
    c. At least one parent probably had a genetic syndrome
    d. Translocation occurred

e. Crossing over occurred during synapsis of meiosis I in one parent's gametes

23. It is proposed that a certain disorder affecting the inner ear is caused by mitochondrial DNA. Which of the following observations would be the most decisive evidence against this idea?
    a. Fathers with the disorder pass it on to all their children, but mothers with the disorder to not pass it along
    b. Females and males have the disorder in equal numbers
    c. Mothers pass the disorder on to their offspring, but fathers do not
    d. The precise cause of the disorder is found to involve the nervous system
    e. All of the above would be evidence against mitochondrial inheritance of this condition
24. Because polymerization of nucleotides is an endergonic process, energy is required for it to occur DNA polymerase uses what as its energy source?
    a. ATP
    b. The nucleotides themselves
    c. Entropy created from protein digestion
    d. Both A and C
    e. Both B and C
25. T2 phage is grown in E.coli with radioactive phosphorus and then allowed to infect other E. coli. The culture is blended to separate the viral coats from the bacterial cells and then centrifuged. Which of the following statements best describes the expected results of such an experiment?
    a. Both viral and bacterial DNA molecules are labeled; radioactivity is found in the liquid above the pellet
    b. Viral DNA is labeled; radioactivity is found in the pellet
    c. Viral proteins are labeled; radioactivity is found in the liquid but not in the pellet
    d. Both viral and bacterial proteins are labeled; radioactivity is present in both the liquid and the pellet
    e. The virus destroyed the bacteria; no pellet is formed
26. A sample of DNA is composed of 14% Cytosine. How much Thymine is present in the sample?
    a. 28%
    b. 72%
    c. 30%
    d. 50%
    e. None of the above
27. A sample of DNA with a higher percentage of _____ bonds would require a higher temperature to break the strands apart?
    a. A-T
    b. C-G
    c. Phosphodiester
    d. Both A and C
    e. Both B and C

28. You are trying to test your hypothesis that DNA replication is conservative- that is, that the strands join together to make a new DNA molecule, and the parental strands then rejoin. You take a sample of E.coli grown in a medium containing only heavy nitrogen (^{15}N) and transfer it to a medium containing light nitrogen (^{14}N). After allowing time for only one DNA replication, you centrifuge a sample and compare the density band(s) formed to the bands formed from bacteria grown on either normal ^{14}N or ^{15}N medium. Which band location would support your hypothesis of conservative DNA replication?



A

29. If the following structures were put in order from smallest to largest, which structure would be in the middle of that size range?
    a. Looped domain
    b. Histone
    c. Nucleosome
    d. 30-nm fiber
    e. metaphase chromosome
30. DNA polymerase adds nucleotides to the _____ of the leading strands, and to the ____ of the lagging strands
    a. 5' end… 3' end

b. 5’ end… 5’ end
c. 3’ end… 5’ end
d. 3’ end… 3’ end
e. Sugar group… phosphate group

31. An organism has a disease in which they cannot produce the enzyme ligase. What would be an effect of this disease?
    a. Replication of the leading strand could not occur
    b. Replication of the lagging strand could not occur
    c. Nucleotide excision repair could not occur
    d. Both A and C
    e. Both B and C
32. After formation of a replication bubble which of the following is the correct sequence of enzymes used for the synthesis of the lagging DNA strand?
    a. Helicases, primase, DNA polymerase, ligase
    b. Ligase, primase, DNA polymerases, helicases
    c. Primase, helicases, DNA polymerases, ligase
    d. Helicases, primase, ligase, DNA polymerases
    e. Helicases, DNA polymerases, primase, ligase
33. Which set of enzymes is involved in nucleotide excision repair?
    a. Nuclease, DNA polymerase, primase
    b. Ligase, nuclease, primase
    c. Hydrolase, nuclease, ligase
    d. Nuclease, DNA polymerase, ligase
    e. DNA polymerase, helicase primase
34. The complementary strand for 5’TACGCATTAG3’ is:
    a. 5’ ATGCGTAATC 3’
    b. 5’ CTAATGCGTA 3’
    c. 5’ AUGCGUAAUG 3’
    d. 5’ CUAAUGCGUA 3’
    e. None of the above
35. How does DNA synthesis along the lagging strand differ from that on the leading strand?
    a. Nucleotides are added to the 5’ end instead of the 3’ end
    b. Synthesis on the lagging strand occurs in the opposite direction of that on the leading strand
    c. An RNA primer is needed on the lagging strand but not the leading strand
    d. Okazaki fragments, which each grow 5’→ 3’, must be joined along the lagging strand
    e. Okazaki fragments, which each grow 3’ → 5’, must be joined along the lagging strand
36. How many nucleotides are needed to code for a protein with 450 amino acids?
    a. At least 150
    b. At least 300
    c. At least 450

d. At least 900
e. At least 1,350

37. A strand of mRNA is complementary to the _____ strand and identical to the _____ strand.
    a. Template, non-template
    b. Non-template, template
    c. Template, template
    d. None of the above
38. How is the template strand for a particular gene determined?
    a. It is the DNA strand that runs from the 5' → 3' direction
    b. It is the DNA strand that runs from the 3' → 5' direction
    c. It is established by the promoter
    d. It doesn't matter which strand is the template because they are complementary and will produce the same mRNA
    e. It is signaled by a polyadenylation sequence
39. A strand of non-template DNA reads 5' CATAGC 3' what are the corresponding codons on the mRNA strand?
    a. GTA, TCG
    b. CAU, AGC
    c. CAT, AGC
    d. GUA, UCG
    e. None of the above
40. Which of the following is needed to initiate transcription?
    I. RNA polymerase
    II. DNA polymerase
    III. Transcription factors
    IV. CAT box
    a. I, III, and IV
    b. II, III, and IV
    c. I and III only
    d. II and III only
    e. I, II, III, IV
41. T/F The strand of mRNA that is created through transcription is immediately taken to a ribosome for translation
42. Which of the following statements is false?
    a. In bacteria, proteins called transcription factors enhance the affinity of RNA polymerase to the promoter sites of genes
    b. In bacteria, transcription of a gene is initiated when the RNA polymerase by itself recognizes and binds to the promoter of the gene
    c. The initiation of gene transcription in eukaryotes requires the binding of proteins called transcription factors to the TATA box in the promoter region of a gene
    d. A relaxation of chromatin packing in eukaryotic cells can facilitate the binding of transcription factors to a promoter of a gene
    e. All of the listed response are correct

43. Which of the following enzymes works after transcription but before translation?
    a. Spliceosome
    b. Ribozyme
    c. Ligase
    d. Both A and C
    e. Both B and C
    f. Both A and B
44. T/F Introns are transcribed but not translated
45. A cell biologist found that two different proteins with largely different structures were translated from two different mRNAs. These mRNAs, however, were transcribed from the same template within the cell nucleus. Which mechanism below could best account for this?
    a. Different systems of DNA unpacking could result in two different mRNAs
    b. A point mutation might have altered the gene
    c. Exons from the same gene could be spliced in different ways to make different mRNAs
    d. Different transcription factors were involved in the transcription of the two mRNAs
    e. The wobble hypothesis
46. Which of the following is not true of an anticodon?
    a. It consists of three nucleotides
    b. It lines up in the 5' -> 3' direction along the 5' → 3' mRNA strand
    c. It extends from one loop of a tRNA molecule
    d. It may pair with more than one codon
    e. Its base uracil pairs with adenine
47. Place the following events in the synthesis of a polypeptide in the proper order
    I. A peptide bond forms
    II. An aminoacyl tRNA matches its anticodon to the codon in the A site
    III. A tRNA translocates from the A site to the P site, and an unattached tRNA exits from the E site
    IV. The large subunit attaches to the small subunit, with the initiator tRNA in the P site
    V. A small subunit binds to an mRNA and an initiator tRNA
    a. IV, V, III, II, I
    b. IV, V, II, I, III
    c. V, IV, III, II, I
    d. V, IV, I, II, III
    e. V, IV, II, I, III
48. A tRNA with the anticodon 3' UGU 5' could bind with the mRNA codon:
    a. 5' ACA 3'
    b. 5' ACG 3'
    c. 5' CCA 3'

d. Both A and B
e. Both B and C

49. How many aminoacyl tRNA synthetases are there?
    a. 46
    b. 20
    c. 1
    d. 3
    e. None of the above
50. The P site of a ribosome does which of the following?
    a. It holds the tRNA that is carrying the next amino acid to be added to the growing polypeptide chain
    b. It holds the tRNA carrying the growing peptide chain
    c. It helps unzip DNA during transcription
    d. It catalyzes the addition of amino acids to the tRNAs
    e. It recognizes the promoter during transcription initiation
51. The first amino acid inserted into a new polypeptide chain in eukaryotic cells is usually
    a. Leucine
    b. Glycine
    c. Valine
    d. Serine
    e. Methionine