

ANSWER KEY EXAM 2, Spring 2017

Mean = 62.66, Stdev = 15.6, Median score = 64. A = 100-85, A- = 84-76, B+ = 75-73, B = 72-70, B- = 69-64, C+ = 63-58, C = 57-52, C- = 51-42, D+ = 41-40, D = 39-37, D- = 36-35 F = 34 or less. Range = 23-97.

VERSION A

1	D	6	B	11	E	16	C	21	C	26	D	31	C
2	D	7	B	12	C	17	A	22	A	27	E	32	C
3	C	8	E	13	A	18	D	23	D	28	C	33	E
4	E	9	C	14	E	19	E	24	D	29	B	34	C
5	C	10	E	15	B	20	E	25	B	30	B	35	D

VERSION B

1	B	6	C	11	E	16	C	21	D	26	C	31	B
2	B	7	E	12	D	17	D	22	B	27	E	32	C
3	A	8	E	13	B	18	B	23	C	28	B	33	C
4	E	9	D	14	E	19	A	24	A	29	C	34	D
5	D	10	E	15	A	20	E	25	A	30	D	35	A

Questions are the same on Version A and B but answers are shuffled.

Refer to the table above for Version A and Version B columns.

- 1) If synthesis starts semi-conservative then after 1st round all is N14N15, then conservative then 2 molecules of N14N15 and 2 of N15N15 (equal ratio). If synthesis starts conservative then after the 1st round ½ is N14N14 and ½ is N15N15, then semi-conservative is 2 molecules of N14N15 and 2 of N15N15 (equal ratio).
- 2) The double recombinants represent having two unlikely events (the probability of one unlikely event (crossover between loci 1 and 2) times the probability of another event (cross over between loci 2 and 3).
- 3) Rosalind Franklin performed the X-ray crystallography experiments
- 4) For each of the five loci there are 2 possibilities, thus 2⁵.
- 5) Fertilization increases ploidy and meiosis I decreases ploidy.
- 6) Mendel's law of segregation states each gamete should get one gene.
- 7) Tjian and Chamberlain are the UCB scientists.

CONTINUED

Biology 1A Spring 2017 Midterm Exam 2 Version A

- 8) If lagging strand synthesis doesn't occur then the cell would arrest in S phase and no spindles would attach. The C value of this cell would be 3C (intermediated between 2C and 4C).
- 9) For mitosis, cohesion holds the two sister chromatids together, spindle attachment to the kinetochore proteins form both MTOC creates the force for alignment and separation.
- 10) Mitosis does not occur in bacterial.
- 11) Cyclins and degradation activities vary. The levels of CDC28 do not vary, nor does the rate of synthesis of cyclins.
- 12) Cyclin A levels were high and complexed with CDC.
- 13) Version of the exam.
- 14) The 5' phosphate of the incoming nucleotide attacks the 3' OH of the growing strand (5' to 3' growth).
- 15) The lowest class represents the double recombinants. Comparing the ABC to the parental ABC chromosome we see c changed which means C is in the middle.
- 16) Distance is $12.5 + 10 = 13.5$.
- 17) Note that the total # of mutations is 1×10^9 . This means the number of mutations that previous round was $\frac{1}{2}$ of that, $= 0.5 \times 10^9$. 0.5×10^9 mutations / 1×10^9 mutations = 0.5×10^{18} base pairs. Since there are 1×10^{12} cells the genome size is 0.5×10^6 .
- 18) 3 hour represents 9 divisions. $2^9 = 500$. Thus $500 \times 1,000 = 500,000$.
- 19) Note that $(10^{-3} \times 10^{-3} = 10^{-6})$. $2pq = 2 \times 1 \times 10^{-3} \times \text{almost } 1 (0.999) = 2 \times 10^{-3} \times 5 \times 10^4 = 10 \times 10^1 = 100$.
- 20) All are true of mRNAs.
- 21) NADPH has no role.
- 22) Since lactose and glucose are NOT present you expect high levels of cAMP to be present and CAP to form complexes with cAMP and the promoter should have CAP-cAMP bound which attracts RNA polymerase to each strand. Since I is + the repressor is made and since no lactose is present it should bind to the O+ locus BUT NOT the Oc locus. Thus, transcription of the upper strand will occur and functional B galactosidase will be made. There is no functional permease. There is functional acetylase.
- 23) S phase should proceed normally but you can't separate chromatids and as a result the C value should be 4. All cells should proceed to the S phase but can't progress further in the cell cycle.
- 24) Translation occurs from the 5' end of the mRNA to the 3' end and this corresponds to N terminus to C terminus of the synthesized polypeptide. Exon 1 would be present along with Intron 1 (normally not present) and Exon 2.
- 25) A mutation in Z should only affect beta galactosidase, not permease or acetylase. B – D are true.
- 26) It was mentioned in lecture that the poly A tail helps to increase the half life of the mRNA (makes it more stable).
- 27) The phosphodiesterase cleaves cAMP and there will be no cAMP present. Thus CAP-cAMP can't form and RNA polymerase will not be recruited to the promoter.
- 28) Direction of replication is 5' to 3'. The lower portion of the fork represents the lagging strand synthesis. Thus, D and B are 5' ends and A and C are 3' ends.
- 29) The mRNA made is 5' UUU. Thus, the top strand is the template and RNA polymerase moves 5' to 3' which is anti-parallel to the upper/top strand.
- 30) From the AUG codon to the left of the E site you already have Met incorporated. In addition, the empty E site no longer has Gly. The P site has Met-Gly already attached to the Thr bound to that tRNA. Thus it is N terminus (free end) Met –Gly-Thr- t-RNA.
- 31) Cis regulatory elements are DNA. Note that mRNA would be trans acting.
- 32) Exon 1 could be in or out, exon 2 could be in or out. Exon 3 is always in. 4 possibilities.
- 33) The number of recombinants must be 80 total. The female's genotype was $slo\ bw//slo\ bw$ and the male's genotype was $slo^+\ bw^+//slo^+\ bw^+$. Thus the F1 female would have been $slo\ bw//slo^+\ bw^+$. The parental chromosome would be $slo\ bw$ OR $slo^+\ bw^+$. Thus you expect the largest numbers of those, smaller (80 total) of the recombinants.
- 34) The trait can't be dominant. The trait must be recessive. Males display it far more often than females.
- 35) Individual 7 mated with individual 8 produced a male with the disease (generation V, individual 6). Thus the male had to get the disease allele from mom (individual 7) but she does not have the disease. She is heterozygous. Quite a few students chose haplozygous. This term does not exist and was made up for the exam merging different words.