Model Questions

CC-14: Evolutionary Biology

1. The neutral theory states that neutral mutation can't influence the fitness of species

because a) Genetic mutational variations can't alter the structure and function of protein.

b) Neutral alleles are fixed in population by random genetic drift.

c) Two evolutionary forces – mutation and random genetic drift operate together on same allele.

d) Rate molecular evolution equals to rate of mutation of an allele.

2. The evolution rate of Cytochrome c protein is 0.08 amino acid/million year. Speciation takes place at least one amino acid difference. Calculate the expected time for speciation.

- a) 5.0 million years c) 6.25 million years
- b) 5.56 million years d) 12.5 million years
- 3. Correct order of geologic time scale units
- a) Eon>Period>Era>Epoch>Age c) Eon>Era>Period>Epoch>Age
- b) Eon>Era>Epoch>Period>Age d) Eon>Epoch>Era>Period>Age

4. Equation $\mu = m/2t$ — represents molecular clock of α - globin protein, where, μ - mutation rate, m – number of

mutation, t- divergence time and c – constant. Then, which is not correct statement.

a) The rate of molecular evolution is constant among lineages.

- b) The molecular clock is a linear graph that shows rate of mutation.
- c) Mutation rate of α globin depends on generation time of a species.
- d) If amino acid difference of the protein is given over a time, then evolution rate can be predicted.

5. Neutral theory differs from Natural Selection theory in -

- a) Neutral Theory selects harmful alleles.
- b) The prime natural force in Neutral Theory is genetic drift.
- c) Genetic variations in Neutral theory affect fitness of a species.

d) Direction of evolution in Neutral Theory is directional.

- 6. Bird originated in the period of
- a) Permian c) Jurassic b) Triassic d) Cretaceous
- 7. Photosynthesis originates in early earth in -
- a) Sulfur bacteriab) Green Sulfur Bacteriad) Sulfur or Cyanobacteria
- 8. Neo-Lamarckism states that
- a) Acquired characters incorporated in germplasm are heritable.
- b) Germ cells are not formed from somatic cells.

1 x 10 = 10

c) Germ cells are influenced by environmental factors indirectly.

d) Characters affecting germplasm are inherited.

9. Foot prints of dianosaur is a –

a) Body fossilb) Trace fossilc) Subfossild) Pseudofossil

10. The missing link between amphibian and reptilian is

- a) Ichthyostega c) Archaeopteryx
- b) Sphenodon d) Seymouria

B. Answer these questions in very brief -

i) What is coacervate molecule?

ii) State one drawback of Darwinism.

iii) Define molecular clock.

iv) Which is the principal force of heritable variations?

v) The incidence of albinism is 1 in 2500 of a randomly mating human population. What is the frequency of recessive allele ?

vi) Distinguish race from cline.

vii) Give an example of K-T extinction.

viii) Cite the cranial size of Java man.

ix) Differentiate between Phylogram and Chronogram.

x) Complete the selection dynamics –

Genotype	AA	Aa	аа
H-W frequencies	P ²	2pq	q ²
Relative fitness	1	1- bs	?

C. Answer concisely -

a) State the RNA World Hypothesis in origin of life.

b) What do you understand by Neo-Darwinism.

c) Explain the Neutral Theory of molecular evolution.

d) Mention the role of variation in evolution.

e) Signify of bottle neck phenomenon.

f) Adaptive radiation is exemplified by Galapagos finches – explain.

g) Interpret of a Phylogenetic tree.

h) Narrate two causes of mass extinction.

i) Explain geographic isolation with an example in India.

j) How does migration change allele frequencies in a population?

2 x 10 = 20

 $1 \times 10 = 10$

2

Model Questions

CC13: Principles of Genetics

I. Select the correct a	nswer –	1 x	5 = 5
1. Correct match in ge	enetic recombination of bacte	eria is	
a) Transformationb) Transductionc) Conjugationd) Recombination	 Conversion of F⁻ cell into Episome formation DNA translocase Crossing over 	o Hfr cell	
2. Match between Co	lumn I and Column II		
I	II		
A) Molecular clock	i) Lederberg & Tatum		
B) Neutral theory	ii) Zinder & Lederberg		
C) Conjugation	iii) Kimura		
D)Transduction	iv) Zuckerkandl & Pauling		
a) A(iv) B(ii) C(iii) D(i)	c)A(iv) B(iii) C(ii) [D(i)	
b) A(iv) B(i) C(ii) D(iii)	d) A (iv) B(iii) C(i)	D(ii)	
3. In T4 Phage, a companya) <i>Cis</i>-Intragenicb) <i>Trans</i>-Intragenic	plementation test on rII muta c) <i>Cis</i> -Intergenic d) <i>Trans</i> -Intergenic	ation results mutant phenotype only. Then, this mutation occurs a	S
4. Which one is the or	dd event in lysogenic cycle of	λphage	
a) Introduction of pha cytoplasm	age chromosome in <i>E. coli</i>	c) Formation of λ prophage	
b) Site specific recom	bination between bacterial	d) Replication of λ chromosome and lysis of	
and phage chromosor	mes	host cell.	
5. Milk production in	mammal is a -		
a) Sex-linked characte	er c) Sex-limited chara	cter	
b) Sex-influenced cha	racter d) Epistatic characte	r	
			4.0
II. Answer in a senten	ce or in a word –	I X 1U	= 10
a) Make a difference i	between incomplete dominal	nce and co-dominance.	
b) What is worgan un	IIL ? deaminating chamical muta		
d) Montion the coy de	termining factor of gonic bal	sen.	
a) Cite one criterion f	or extra-chromosomal inhorit	tance	
f) Human skin has sig	colors – why?	נמווכד.	
a) Dofino transduction	colors – wrige		
g) Define transduction	1.		

h) Signify of IS element in bacteria.

i) Why is multiple allele is an exception of Mendelian genetics ?

j) Calculate the number of linkage group in *Homo sapiens*.

III. Answer these questions in 2-3 sentences -

i) Homozygotic cystic fibrosis causes death of child – explain.

ii) A test cross of a fully heterozygous grey-bodied (b^+), normal-winged (vg^+) female F₁ fruit fly results in gray, normal – 126; gray, vestigial – 24; black, normal – 26 and red, vestigial – 124 then what is the cross- over % ?

iii) Write down two important features of mouse-human somatic-cell hydrid.

iv) Distinguish between numerical and structural chromosomal aberrations.

v) How do UV-rays damage DNA molecule?

vi) Narrate the Barr body mechanism in sex determination of human.

vii) Draw two conclusions from the reciprocal crosses between streptomycin resistance (Sm^r) and streptomycin sensitive (Sm^s) strains of *ChImydomonas*.

 $\begin{array}{ccc} \operatorname{Sm}^{r}\operatorname{mt}^{+} x \ \operatorname{Sm}^{s}\operatorname{mt}^{-} & \operatorname{Sm}^{s}\operatorname{mt}^{+} x \ \operatorname{Sm}^{r}\operatorname{mt}^{-} \\ \downarrow & \downarrow \\ \operatorname{All}\operatorname{Sm}^{r}(F_{1} \operatorname{hybrids}) & \operatorname{All}\operatorname{Sm}^{s}(F_{1} \operatorname{hybrids}) \end{array}$

viii) Calculate the percentage of offspring with darkest skin color from a heterozygous cross (AaBbCc x AaBbCc) where alleles-A, B and C for melanin pigmentation and alleles-a, b and c are not.

ix) Trans-test is more commonly called the complementation test – explain.

x) State two structural features of P elements in Drosophila.

2 x 10 = 20