

M.Sc. 2nd Semester Examination, 2010

ZOOLOGY

PAPER—Z-203

Full Marks : 40

Time : 2 hours

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Write the answers to questions of each Group in separate books

GROUP—A

(Molecular Biology)

1. Answer any *two* questions : 2 × 2

- (a) Which processes in protein synthesis require hydrolysis of GTP ?

(Turn Over)

(b) What features are present at the terminus of all bacterial transcripts ?

(c) RNA polymerase lacks the nuclease activities of DNA polymerase. Name two activities possessed by RNA-P and not by DNA-P.

(d) Suppose E.coli is growing in a growth medium containing lactose as the sole source of carbon. The genotype is $i^-o^+z^+y^+$. Glucose is then added. Which one of the following will happen ?

(i) Nothing

(ii) Lactose will no longer be utilized by the cell.

(iii) Lac mRNA will no longer be made

(iv) The repressor will bind to the operator.

2. Answer any *two* questions :

4 × 2

(a) Suppose that a mutation in the *trp R* gene prevented the *trp* repressor from binding to the DNA. Would transcription of the *trp* operon be reduced when tryptophan levels are high ? Explain how you arrived at your answer.

(b) Mention stepwise with appropriate diagram the catalytic function of aminoacyl-tRNA synthetase.

(c) If the non-template strand of a gene in *E.coli* had the sequence :

5'-TTGACA-(18 bases)-TATAAT-(8 bases)-GCCTTCCAGTG-3'

(i) What nucleotide sequence would be present in the RNA transcript of the gene ?

(ii) If the non-template strand shown above were part of a gene in *Drosophila* rather than *E.coli*, would the same transcript be produced ?

(d) Match one of the following terms with each of the description given below :

(i) poly A tail (ii) hnRNA (iii) RNA polymerase I
(iv) snRNA (v) CAAT box
(vi) exon (vii) RNA Pol III (viii) TTGACA.

(A) An E.coli promoter sequence located 35 nucleotide upstream from initiation site.

(B) A polyadenosine tract 20-200 nucleotide long that is added to the 3' end of most eukaryotic mRNA..

(C) The population of primary transcript in the nucleus of a eukaryotic cell.

(D) The RNA polymerase in the nucleus that catalyzes the synthesis of all rRNAs...

(E) The RNA polymerase in the nucleus that catalyzes the synthesis of transfer RNA.

(F) A conserved sequence in the non-template strand of eukaryotic promoters that is located about 80 nucleotides upstream.

(G) Small RNA molecules that are located in the nuclei of eukaryotic cell, most as components of spliceosome.

(H) Segments of a eukaryotic gene that correspond to the final processed RNA transcript of gene.

3. Answer any *one* of the following : 8 × 1

(a) (i) What is polymerase switching and why it is necessary in eukaryotic replication fork ?

(ii) How does sliding DNA clamp works in a fork (mention briefly in stepwise manner with appropriate diagram) ?

(iii) Mention briefly the function of Dna A and Dna B protein at oriC.

3 + 3 + 2

(b) In order to study the regulation of the lac operon in E.coli you perform a diploid analysis with various regulatory and structural gene mutants which you have isolated. The results of your experiments are shown in table. The numbers represent relative activity of the enzyme β -galactosidase. Your results are somewhat different from what you had expected.

(i) Complete the table for experiments 5 through 10, write in the expected missing numbers.

(ii) Compare experiments 1 and 4 why do the values for induced β -galactosidase differ ?

Exp.	genotype	Observed β -galactosidase activity		Expected β -galactosidase activity	
		Induced	Uninduced	Induced	Uninduced
1.	$i^+o^+z^+$	100	0.1	100	0.1
2.	$i^-o^+z^+$	100	100	100	100
3.	$i^-o^+z_1^-$	0.1	0.1	0.1	0.1
4.	$i^+o^+z^+/i^+o^+z^+$	200	0.1	200	0.1

Exp.	genotype	Observed β -galactosidase activity		Expected β -galactosidase activity	
		Induced	Uninduced	Induced	Uninduced
5.	$i^- o^c z_1^- / i^+ o^+ z^+$	10	0.1	—	—
6.	$i^+ o^c z_1^- / i^- o^+ z^+$	10	0.1	—	—
7.	$i^- o^+ z_1^- / i^+ o^c z^+$	10	100	—	—
8.	$i^+ o^c z^- / i^- o^+ z_1^-$	10	100	—	—
9.	$i^- o^+ z_2^- / i^+ o^c z_3^-$	40	0.1	—	—
10.	$i^- o^- z_3^- / i^+ o^c z_2^-$	40	0.1	—	—

z_1^- , z_2^- and z_3^- are three different mutant alleles in the z gene. All three are missense mutations. 5+3

GROUP-B

(Parasitology)

4. Answer any *two* questions from the following : 2 × 2

(a) Define parasitoid with example.

(b) What are rosette stage and hypnozoites ?

(c) Distinguish between trophozoite and cyst of *Balantidium*.

(d) How is VSG gene expressed ? .

5. Answer any *two* questions from the following : 4×2

(a) Describe with an example of cellular interaction that takes place between a parasite and host epithelium. 4

(b) What type of cercariae found in *Schistosoma* ?
Add a note on it with suitable diagram. $\frac{1}{2} + 3\frac{1}{2}$

(c) Describe the structure of typical cestode tegument. 4

(d) (i) What is epicuticle ?

(ii) Distinguish between Hard ticks and Soft ticks. 1+3

6. Answer any *one* question from the following : 8×1

(a) Describe briefly about the life cycle of *Paragonimus westermani*. Mention its pathogenesis and prophylaxis. 5+2+1

(b) (i) Describe the lymphokine production in malaria.

(ii) Discuss the socio-economic factor and disease prevalence in filariasis. 6+2
