

2023

M.Sc.

4th Semester Examination

HUMAN PHYSIOLOGY

PAPER : PHY-402.1 & 402.2

Full Marks : 20

Time : 1 hour

The figures in the right-hand margin indicate marks.

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

Illustrate the answers wherever necessary.

Answer from *any one* Section.

SECTION--I

(402.1)

Answer from **all** the Groups as directed.

GROUP—A

Answer *any two* questions from the following :

2×2=4

1. Differentiate between pluripotent and adult stem cells.

(2)

2. What is differentiation?
3. Mention two functions of microfilaments.
4. How does paracrine signaling differ from endocrine signaling? Give an example.

GROUP—B

Answer *any two* questions from the following :

4×2=8

5. Describe the structure of microtubules. Mention its importance in cell division. 3+1=4
6. What are muscle satellite cells? How are they important in muscle development? 2+2=4
7. What are cell surface receptors? Differentiate them according to their functions. 1+3=4
8. What is meant by epigenetic control? Mention two such mechanisms of it. 2+2=4

GROUP—C

Answer *any one* question from the following :

8×1=8

9. What are motor proteins? Give a brief description of one microtubule based motor protein. 4+4=8

(3)

10. Write down the properties of stem cells. Give a brief description of Haematopoietic stem cells with its different lineages. 3+5=8

SECTION—II

(402.2)

Answer from **all** the Groups as directed.

GROUP--A

Answer *any two* questions from the following :

$2 \times 2 = 4$

1. State the significance of using cosmid in cloning. 2
2. Genes *A*, *B*, *G* and *H* are located on the same chromosome. The distances between the genes are as below : 2

Relationship	Map Unit distance
<i>A - H</i>	18
<i>A - B</i>	10
<i>B - H</i>	8
<i>A - G</i>	2
<i>H - G</i>	20

Determine the most likely order of the genes on the chromosome.

3. What are the two important differences between the cDNA library and the genomic library? 2
4. What is transfection? 2

GROUP—B

Answer *any two* questions from the following :

4×2=8

5. Mention the important features of a cloning vector. What are Bacterial Artificial Chromosomes (BACs)? 2+2=4
6. Discuss the mechanism of action of restriction enzymes with diagram. 4
7. (a) You, as a scientist are studying two traits in a type of Honey Bee : body texture and color. Smooth body (*B*) is dominant to bumpy body (*b*), and Yellow-Black stripe (*D*) is dominant to yellow (*d*). A *BbDd* and a *bbdd* Honey Bee mate and produce the following offsprings :

Phenotype	Number of Offspring
Smooth, yellow-black stripe	345
Bumpy, yellow	355
Smooth, yellow	148
Bumpy, yellow-black stripe	152

(5)

What is the percent recombination frequency for this cross you can find?

(b) Briefly mention how the crossing over is related with the linkage of gene? $2+2=4$

8. Write the principle of Western blotting. What is q-PCR? What is the basic difference between Class I and Class II transposons? $2+1+1=4$

GROUP—C

Answer *any one* question from the following :

$8 \times 1 = 8$

9. Write down the type and sources of stem cells. Mention the advantages of stem cell therapy. Give a brief account on different stem cell therapies used in heart diseases. $2+2+4=8$

10. In your opinion, what might be the applications of CRISPR/Cas9 as a gene editing tool? What is RFLP? Draw a typical thermal cycle for RT-PCR and mention the significance of each step. What is recombination frequency?

$3+1+3+1=8$

★ ★ ★

