

[This question paper contains 6 printed pages.]

(10)

Your Roll No. 2022-23

Sr. No. of Question Paper : 1038

C

Unique Paper Code : 32491502

Name of the Paper : Gene Expression and Regulation

Name of the Course : B.Sc. (Hons.) Biochemistry

Semester : V

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

Deshbandhu College Library
Kalkaji, New Delhi-19

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. There are 8 questions.

3. Attempt any 5 questions.

4. All questions carry equal marks.

5. Question no. 1 is compulsory.

(a) Explain the following :

(i) Oligonucleotides containing the Shine-Dalgarno sequence inhibit translations in prokaryotes but not in eukaryotes.

P.T.O.

- (ii) Cells carrying suppressor tRNA genes are less viable than wild-type cells.
- (iii) The RNA polymerase core enzyme is catalytically active but non-specific
- (iv) The ribosome is a ribozyme
- (v) Role of the C terminal domain of RNA polymerase is crucial for transcription in eukaryotes

(b) What do you understand by the following terms?

- (i) Enhancers
- (ii) Insulators
- (iii) Inducer
- (iv) Promoter escape
- (v) Guide RNA

(10.5)

2. (a) Differentiate between the following: (any three)

- (i) Group I and Group II introns

(i) Rho dependent and independent transcription termination

(iii) RNA Pol I and RNA Pol II

(iv) Class I and Class II Aminoacyl tRNA synthetase

(v) Negative and Positive Regulation

(b) The following mRNA nucleotide sequence is provided to you :

5'AGUUCUAACGCUACAGUCUACCAGCUCGGA3'

Write the sequence of the coding and non-coding strand of the corresponding DNA. Also indicate the sense, antisense, plus and minus DNA strand.

(9,6)

(a) What are the core promoter elements in prokaryotes and eukaryotes? What do you understand by a consensus sequence?

(b) Discuss the importance of GTP in the translation process. Explain how and why tRNA synthetases play the most crucial roles in determining the fidelity of translation?

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- (c) Why is Sigma factor called the specificity factor?
Describe the structure and function of Sigma factor. (5,4,6)
4. (a) Diagrammatically explain how one eukaryotic gene can give rise to two functional proteins.
- (b) Discuss the biochemical and genetic experiments to prove that the genetic code is triplicate.
- (c) Describe a technique that can be used to demonstrate the promoter binding activity of any transcription factor. (4,6,5)
5. (a) Discuss the experiment that showed that the direction of protein synthesis is from N to C terminal.
- (b) Describe the regulation of Lac operon in bacteria. Contrast it with the regulation of the galactose operon in yeast cells.
- (c) Explain the significance of Cap and Poly-A tail in eukaryotic mRNA. (3.5,7.5,4)

6. (a) In Eukaryotes, a transcript can be broken explicitly into pieces for reducing its expression. Describe the mechanism by which this phenomenon takes place and write the possible applications associated with it.
- (b) Explain how cooperative binding facilitates regulation?
- (c) With the help of a diagram, explain how pre-rRNA transcripts are processed in bacteria? (7,4,4)
7. (a) Explain the regulation of gene expression by Chromatin remodelling.
- (b) Write the mechanism of action of the following :
- (i) Chloramphenicol
 - (ii) Tetracycline
 - (iii) Rifampicin
 - (iv) Fusidic acid
 - (v) Actinomycin D
- (7.5,7.5)

8. Write short notes on **(any three)**

(a) Riboswitches

(b) RNA Editing

(c) DNA binding domains

(d) Attenuation

(e) Salient features of genetic code (15)

(11)

Your Roll No. 2022-23

Sr. No. of Question Paper : 1083

C

Unique Paper Code : 32497901

Name of the Paper : NUTRITIONAL
BIOCHEMISTRY

Name of the Course : B.Sc. (Hons.) Biochemistry

Semester : V (LOCF)

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

Deshbandhu College Library
Nalkaji, New Delhi-110028

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all, including Question No. 1 which is compulsory.
3. **All** questions carry equal marks.

1. (a) Discuss the following terms from a nutritional point of view :

(i) RDA

(ii) Nitrogen balance

P.T.O.

(iii) Lipotropic factors

(iv) BMI

(v) Prebiotics

(b) Comment on the following (**any five**) :

(i) Patients with liver cirrhosis often present with night blindness

(ii) Thiamine deficiency results in lactic acidosis.

(iii) Plant products aren't good quality protein

(iv) Alcohol is not a nutrient

(v) Selenium has antioxidant function.

(vi) Deficiency of manganese leads to impaired skeletal growth

(vii) Ascorbic acid is required for Iron absorption. (5,10)

2. (a) 38-year-old vegetarian female presented to her doctor with fatigue and tingling/numbness in her extremities. Her blood smear showed large immature red blood cells. Suggest biochemical tests to accurately diagnose her condition.

- (b) In a study on experimental diets a group of rats was given only maize, which was found to hamper their growth. What amino acids should be supplemented in their diet to increase the body weight and why?
- (c) Why does Vitamin B6 requirement increases with protein intake? Compare BV and NPU as an index of protein quality. (5,4,6)
3. Give the biochemical basis, symptoms and nutritional management if any, for the following disorders:
- (i) Hemochromatosis
 - (ii) Keshan Disease
 - (iii) Wilson's disease
 - (iv) Familial Hypercholesterolemia
 - (v) Fluorosis (15)
4. (a) Why is consumption of hydrogenated and reheated oils considered harmful? What are the recommended proportions of different fatty acids in the diet?

- (b) Discuss the factors affecting the bio-availability and absorption of calcium in the gastrointestinal tract. What would be the effects of having excess calcium in the diet?
- (c) Intravenous administration of glucose does not cause the same insulin release as oral glucose administration. Explain. (6,5,4)
5. (a) How is resting metabolic rate different from basal metabolic rate? Discuss the various factors which affect the resting energy expenditure.
- (b) How do nonessential amino acids become conditionally essential? Explain with example.
- (c) Watermelon has a glycemic index of 78 and it contains about 7gm carbohydrate in a serving whereas pasta has a glycemic index of 45 and the carbohydrate content in a helping is 54gm. Calculate and compare the glycemic loads of the two food items. Also discuss the utility of GI and GL in dietary management of diabetics. (5,4,6)
6. (a) Discuss the role of liver in regulation of iron metabolism.

(b) A drug can prevent nutrient absorption by changing the gastrointestinal environment; Explain, giving two examples.

(c) What is the role of dietary fiber in :

(i) Lipid metabolism

(ii) Colon function

(iii) Gastric emptying

(iv) Gut Microbiota

(6,5,4)

7. (a) What is PEM? Differentiate between the 2 types of PEM.

(b) 56-year-old male following a sedentary lifestyle (weight 94 Kilos, height 170 cm) had the following lab findings: fasting blood sugar-114mg/dl, total cholesterol- 240mg/dl, Triacylglycerol 165 mg/dl, VLDL 31 mg/dl, LDL 122mg/dl and HDL 39mg/dl. Dietary analysis indicated that the total caloric intake was 2300 Kcal/day where carbohydrate, fat and protein provided 78%, 12% and 9% of the calories respectively. Fibre intake was 5gm/day. What is your assessment of his risk of lifestyle disorders? What dietary changes could be recommended to reduce his risk?

- (c) What do you mean by thermogenic effect of food?
Can a meal composition influence the TEF, if yes
how? (5,6,4)

8. (a) What is a nutraceutical? Mention the health
benefits of the following foods :

(i) Fenugreek

(ii) Turmeric

(iii) Cloves

- (b) Discuss the salient features of Vitamin-D toxicity.
Can overexposure to sun cause vitamin-D toxicity?
Give reason for your answer.

- (c) Discuss the parameters to assess the oxidative
stress. (6,5,4) 1st

This question paper contains 8 printed pages.]

(12) Your Roll No. 2022-23

No. of Question Paper : 1093

Unique Paper Code : 32177902

Name of the Paper : DSE- Inorganic Materials of
Industrial Importance

Name of the Course : B.Sc. (Hons)

Semester : V

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates Deshbandhu College Library
Kalkaji, New Delhi-19

1. Write your Roll No. on the top immediately on receipt
of this question paper.

2. Attempt **SIX** questions in all.

3. Question **1** is compulsory.

4. Attempt any **five** other questions.

1. (a) Give one word for the following / Fill in the blanks
as required :

P.T.O.

- (i) A device which converts fuel directly into electricity without combustion.
- (ii) The process of applying a protective zinc coating to iron.
- (iii) Notation on a bag of fertilizer signifying that it contains 12% N, 10% P (P_2O_5), and 10% K (K_2O).
- (iv) Presence of the compound in urea fertilizer that can result in toxicity to plants.
- (v) Low refractive index materials, generally white in color, which are added to a paint formulation to increase its volume.

(vi) The protecting power of a surface coating increases with _____ in porosity.

(vii) Borosilicate glasses are known for having _____ coefficient of thermal expansion.

(b) Distinguish between the following :

(i) Silicate and non-silicate glass

(ii) Oil based and Water based paints

(c) Write short notes on :

(i) Potassium fertilizers

(ii) Heat resistant paints

(7,4,4)

2. (a) Explain the working of lithium-ion battery. Describe the intercalation and deintercalation process taking place in this battery.
- (b) How does a hydrogen fuel cell work? Give the reactions involved.
- (c) What do you mean by a solid-state battery? What are the advantages of a solid-state electrolyte battery over the liquid electrolyte battery? (4,4,4)
3. (a) What is a fertilizer? What are the requisites for a compound to be a good fertilizer?
- (b) Explain the manufacture, properties, and applications of Urea as a fertilizer.
- (c) Discuss the importance of super alloys giving at least two examples. (4,4,4)

4. (a) What are ceramics? Why is glazing done for ceramic articles?

(b) What is Portland cement? What makes the cement, a quick setting cement?

(c) Discuss the characteristics and applications of the following :

(i) Photochromic glass

(ii) Safety glass (4,4,4)

5. (a) Describe the formation, and applications of the following forms of carbon :

(i) Fullerenes

(ii) Carbon fibers

(b) What are semiconducting oxides? Explain giving examples.

(c) How are nanomaterials different from their bulk counterparts? Explain with reference to the changes in properties shown by the naomaterials? (4,4,4)

6. (a) Define Pigment Volume Concentration (PVC) and Critical Pigment Volume Concentration (CPVC). Mention the functions of the following additives in a paint formulation (**Any Two**) :

(i) Thinner

(ii) Plasticizer

(iii) Fillers

(b) What is the principle of electroplating? Discuss the process and utility of electroplating for metallic coatings.

- (c) Discuss the technique by which coatings employing metal spraying are applied on a surface.

(4,4,4)

7. (a) What are emulsion paints? What is their drying mechanism?

- (b) Why is it necessary to add a retardant to cement? Give an example of a retardant and explain with chemical reactions how it functions in retarding the setting of cement.

- (c) What are alloys? Discuss the alloys of aluminium and copper.

(4,4,4)

8. (a) What are thermosets and thermoplastics? Explain giving example in each case.

- (b) What are optical fibres? How do signals travel through them?

(c) What are primary and secondary batteries? What are the characteristics of an ideal battery?

(4,4,4)