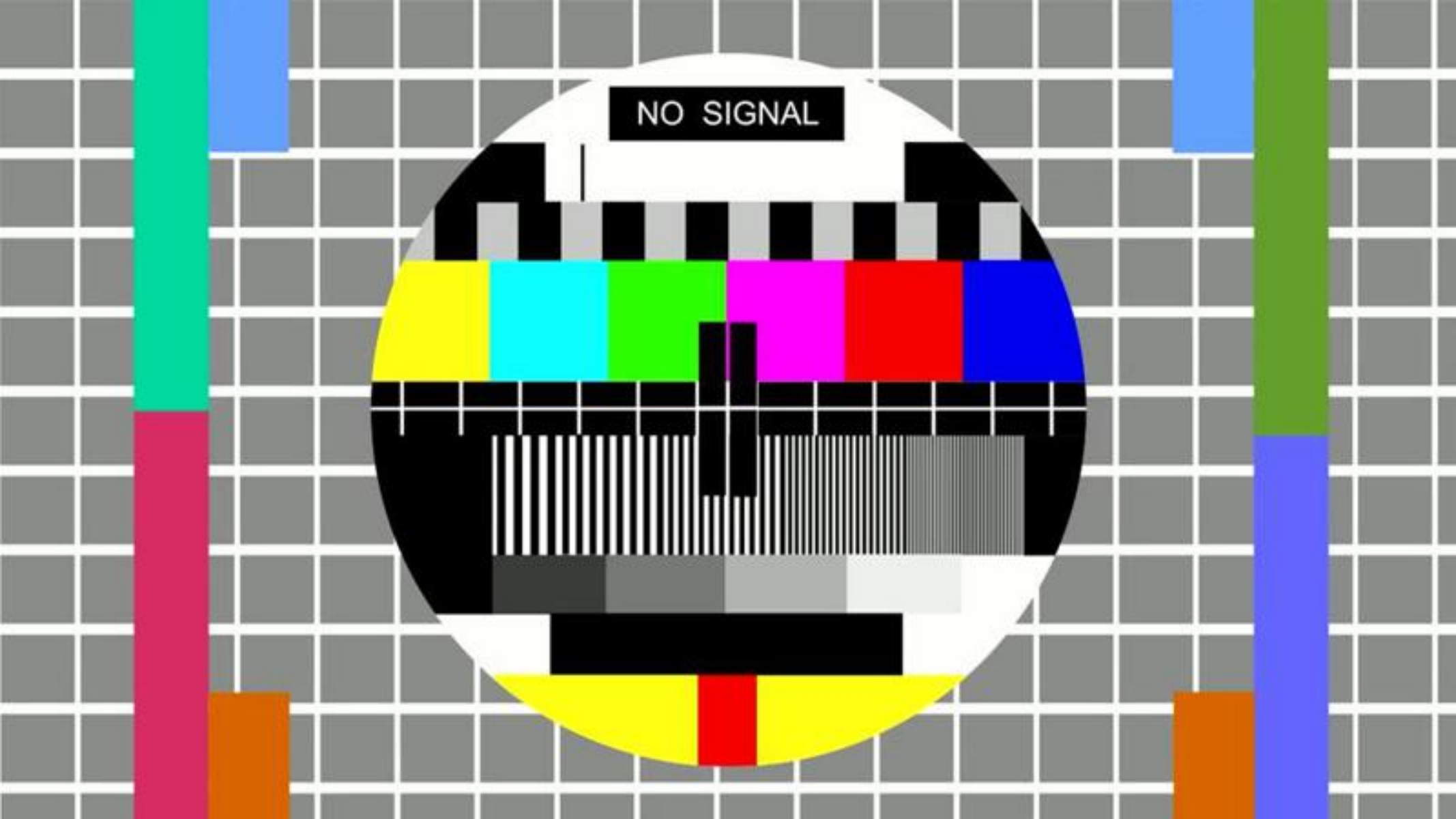
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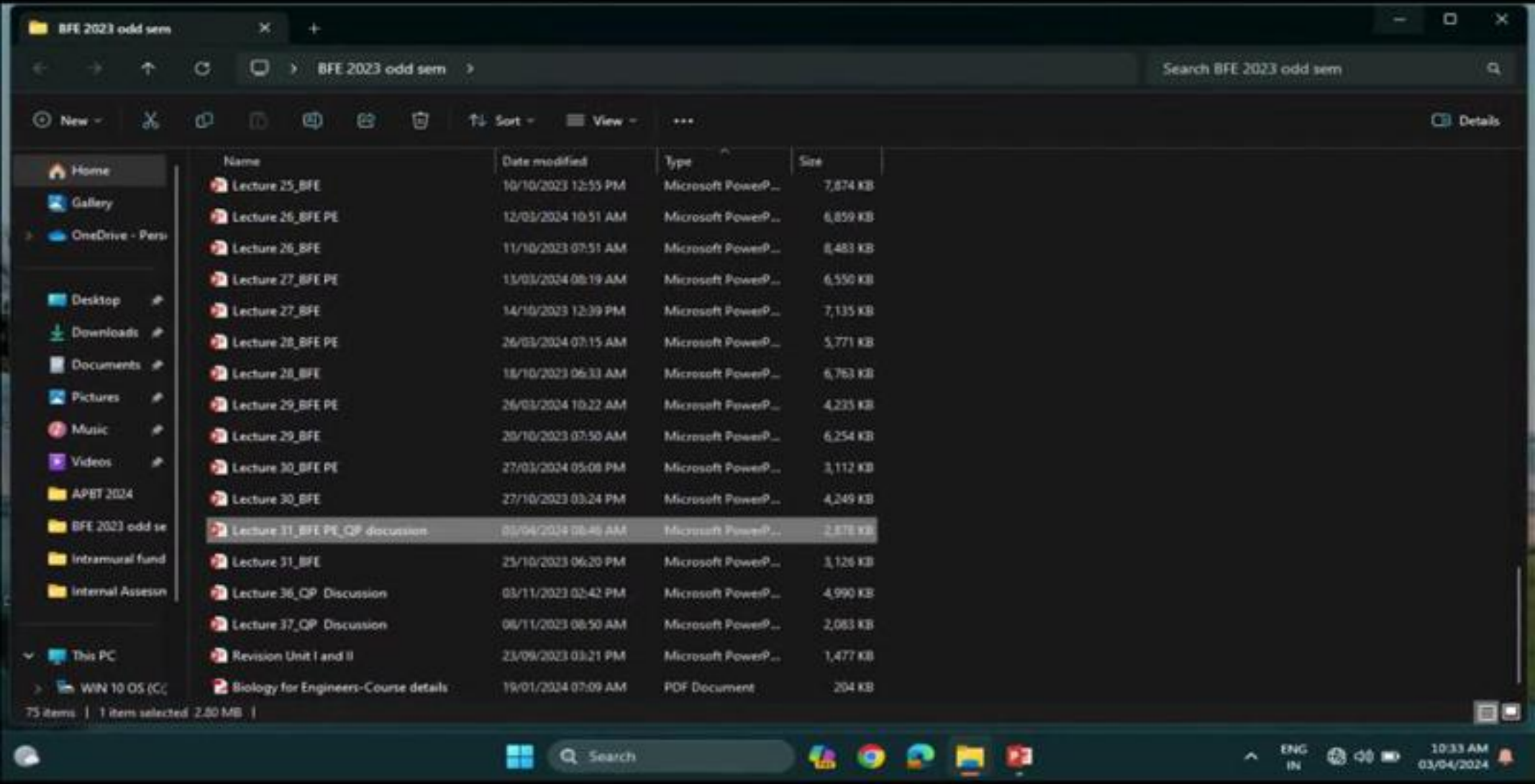
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Question paper discussion

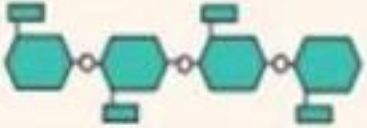
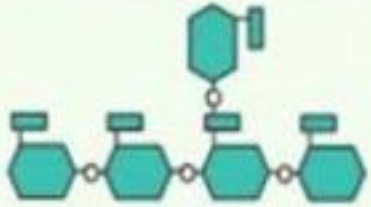
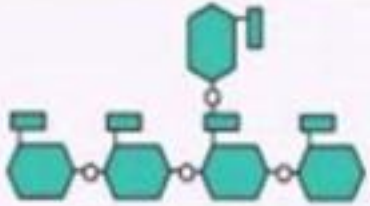
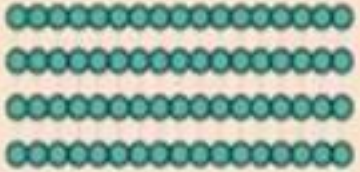
Exam Date & Time: 08-Dec-2023 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIRST SEMESTER B.TECH. DEGREE EXAMINATIONS - NOVEMBER / DECEMBER 2023
SUBJECT: BIO 1071 / BIO_1071 - BIOLOGY FOR ENGINEERS

Marks: 50 **Duration: 180 mins.**

1A) Given below is an illustration of carbohydrates. You will see that they differs in their structure (3)

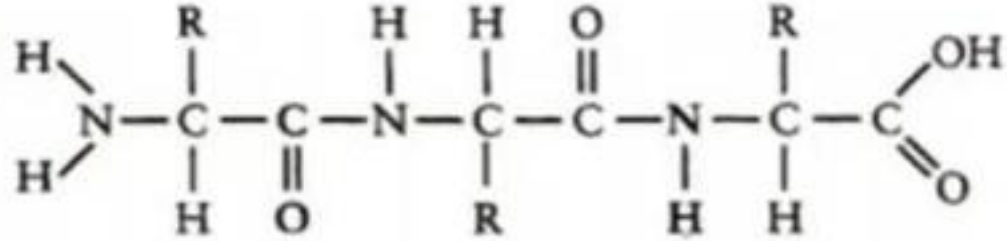
	Cellulose	Starch		Glycogen
		Amylose	Amylopectin	
Diagram				
Shape				

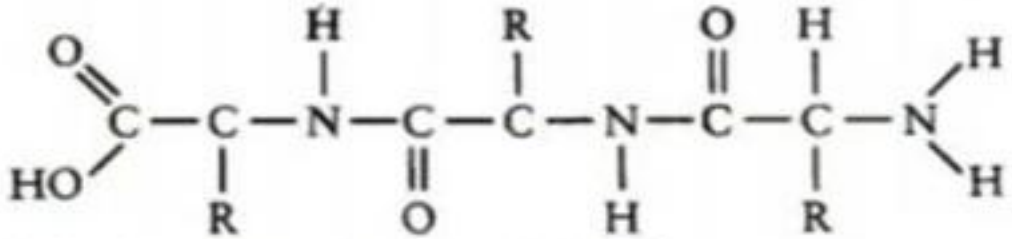
i) Why cellulose and amylose unbranched, while amylopectin and glycogen are branched?

ii) Among these cellulose is more fascinating towards engineer's perception. Why?

iii) Which can't be used as an energy source for human body? Why?

1B) Here you will get two proteins chains. (3)





i) How these two molecules can interact?

ii) Identify the part which is not significant to protein secondary structure is [Copy the figure and highlight]Why?

1C) Life on earth is nothing but carbon polymers (4)

i) Name the three types of polymers that makes our life

ii) Why carbon is the basis of life on earth?

2A) In a typical mendelian cross, a pure breeding tall pea plant bearing round seeds is crossed with a dwarf pea plant bearing wrinkled seeds (3)

i) Construct a Punnett square explaining the F2 generation genotypes

ii) Predict the most probable and least probable genotypes of Tall plant bearing round seeds?

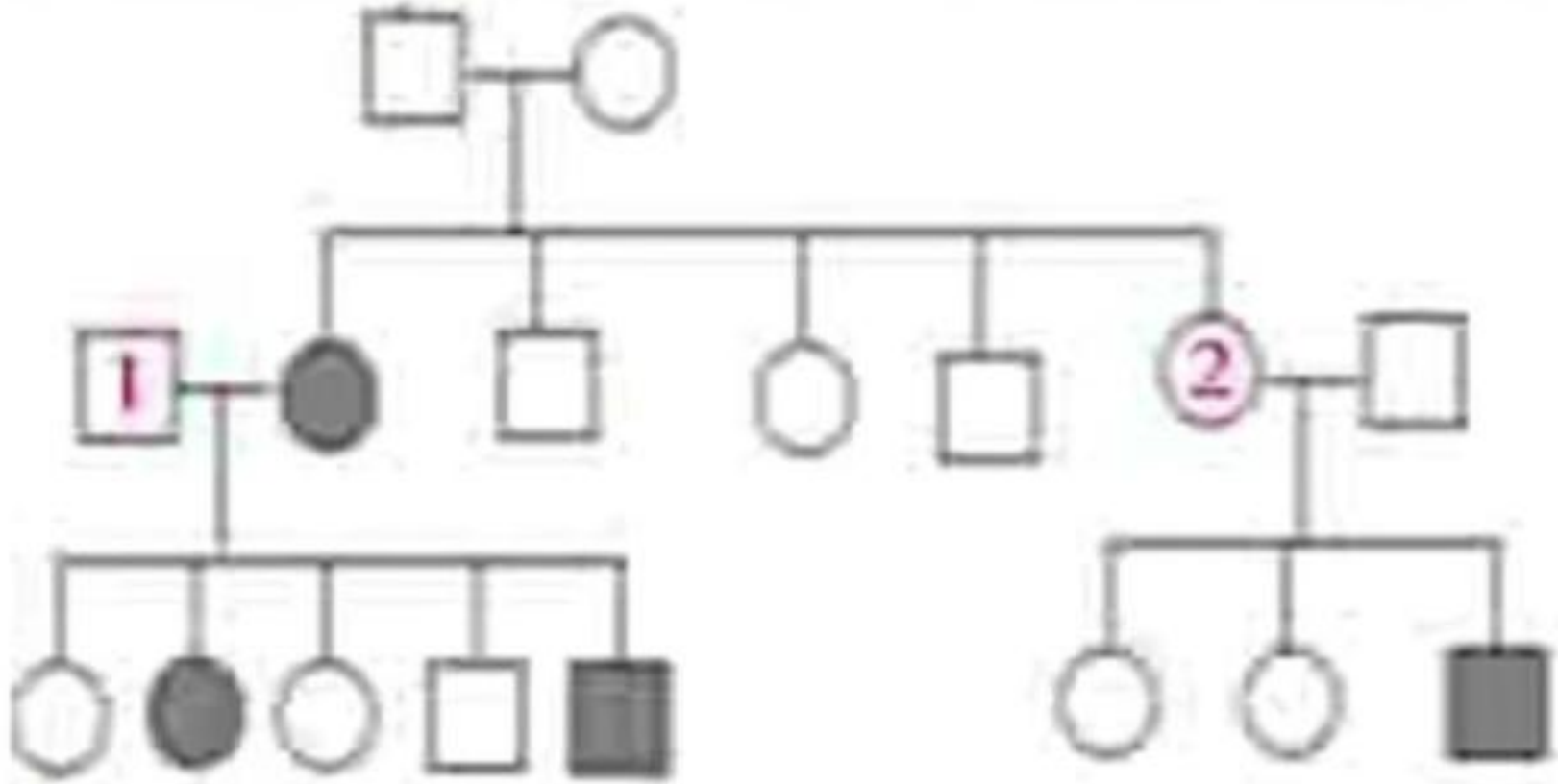
iii) Calculate the probability of a double homozygous genotype in F2?

2B) Given below is the outcome of a test cross. Long and thin : Dominant, Short and thick: Recessive (3)
(Homozygous dominant genotype: LLTT
Homozygous recessive genotype: lltt)

Long wheat, thick seeds = 186
Long wheat, thin seeds = 564
Short wheat, thick seeds = 63
Short wheat, thin seeds = 187

i) Construct a Punnett square explaining the test cross
ii) Calculate the recombination frequency
iii) What is your conclusion from the results of test cross?

2C) Given below is a pedigree chart. Analyse and answer the following questions

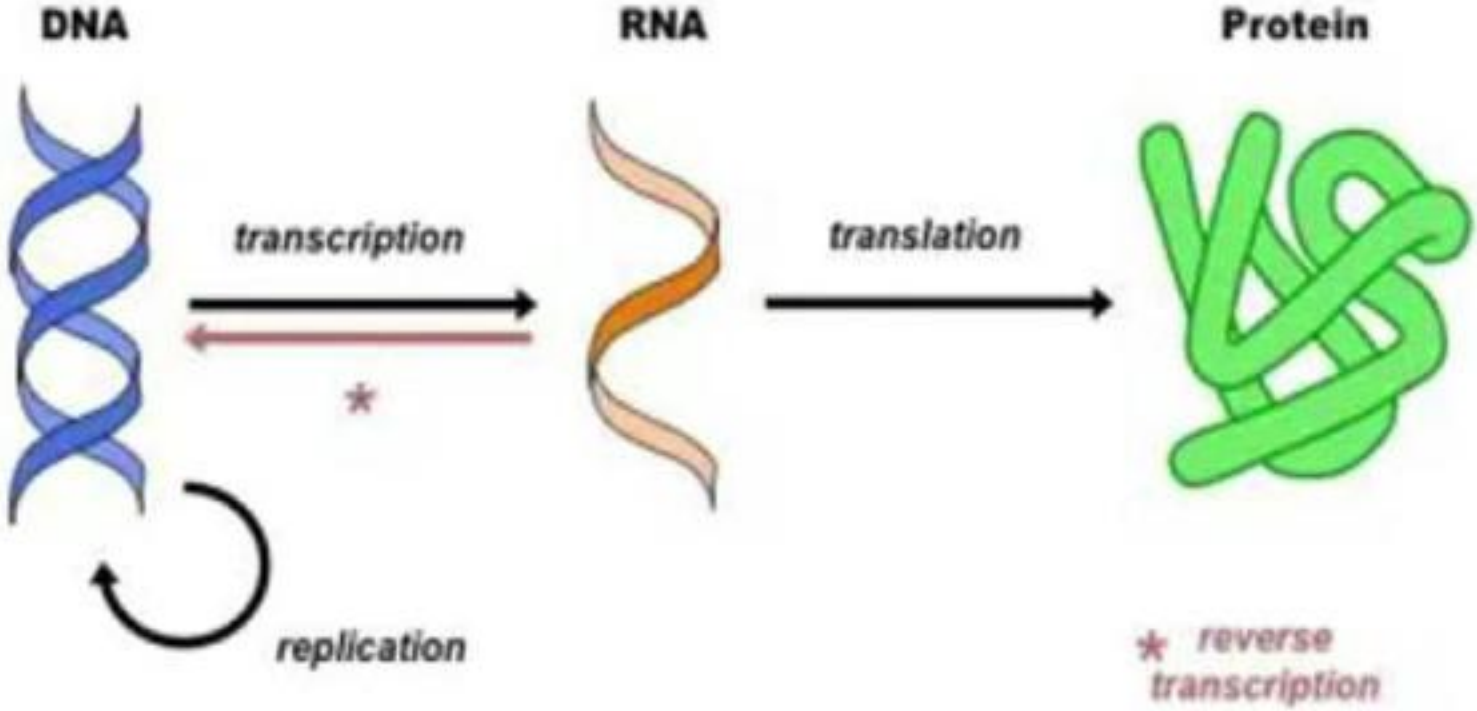


i) Predict the genotype of the individual 1

ii) How you can 100% rule out X linked recessive in this example?

iii) Can this pedigree be X linked dominant? Justify

iv) Find the genotype of the affected male from individual 2



Analyze the above diagram and answer the following questions

i) Why transcription and translation occurs at different locations? Justify

ii) An error in the form of a mutation occurred in DNA, but not reflected in protein. Justify

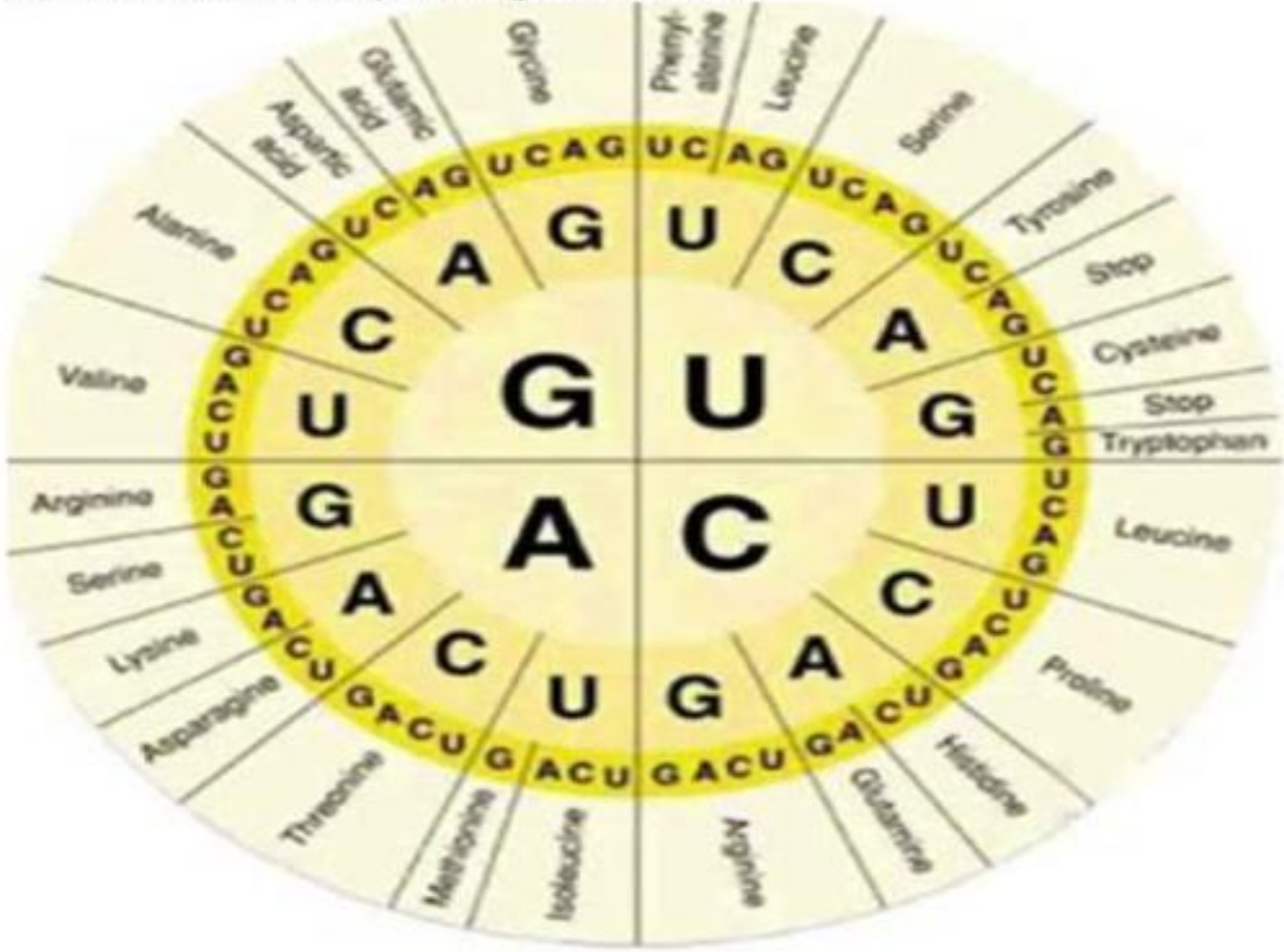
iii) Which is more stable among this? Justify?

3B) A non-template DNA code 5'TAC3'.

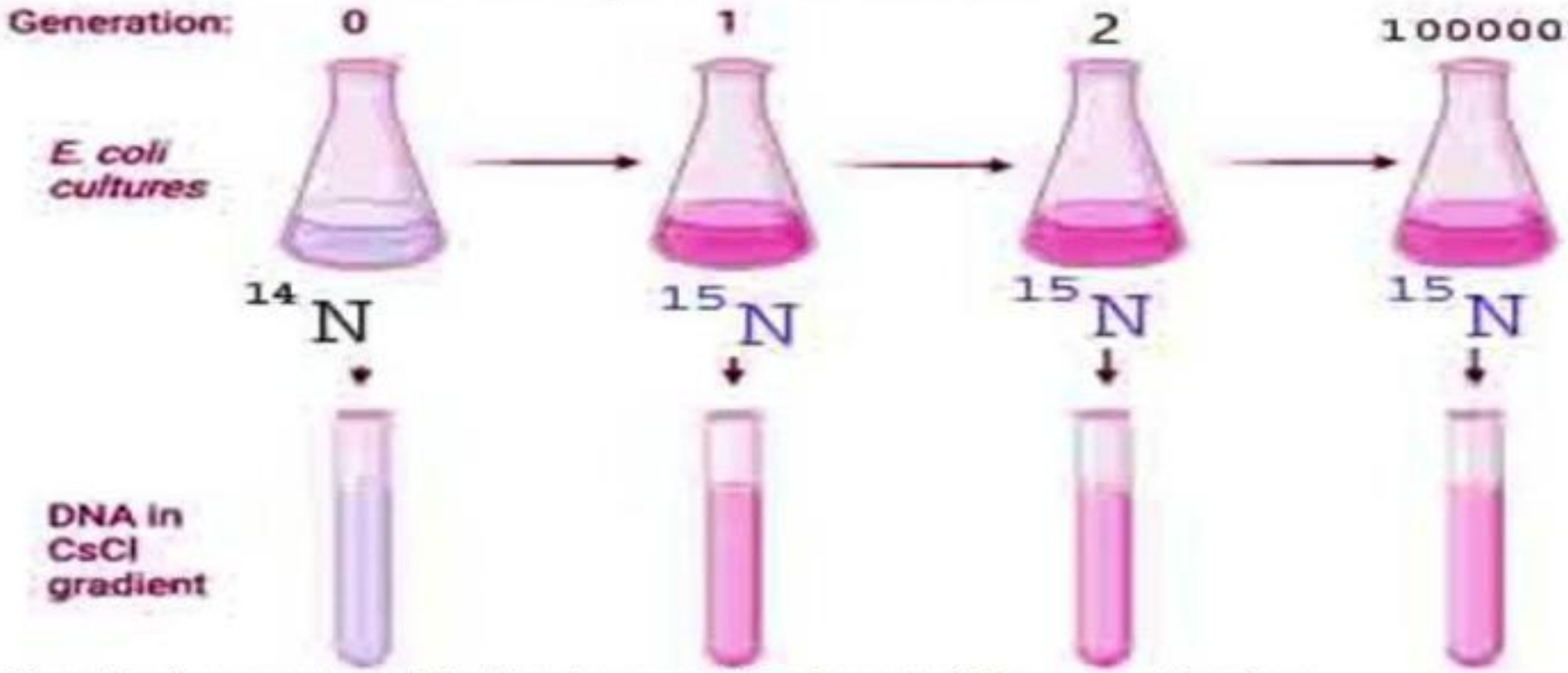
i) Find the RNA code with labelled ends

ii) Construct tRNA anticodon with labelled ends

iii) Find the Corresponding amino acid



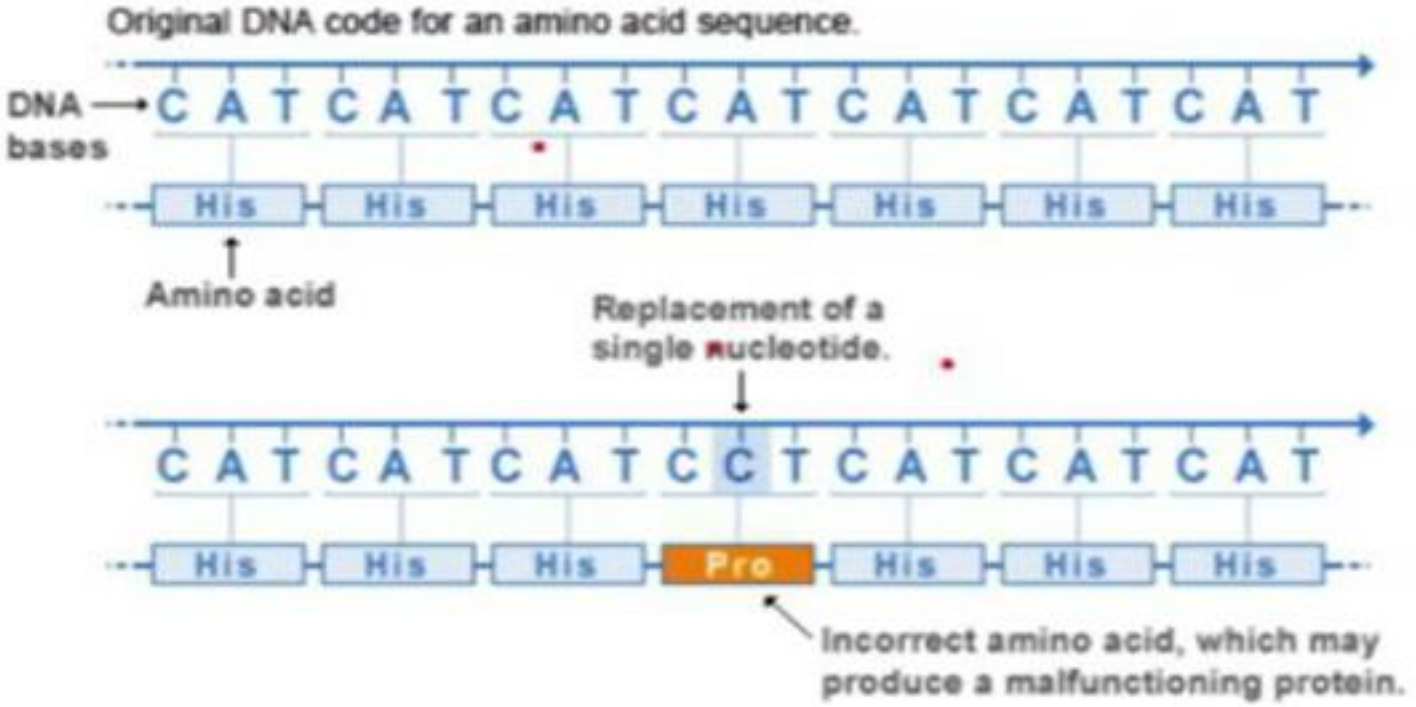
3C) Given below is a illustration of Meselson and Stahl. The student started with ^{14}N cultures and then shifted to ^{15}N. The mode of replication is semiconservative (4)



i) Copy the figure and mark the band accumulation in each of the generation given
ii) Calculate the percentage of DNA at the end of 2nd generation bearing $^{15}N/^{14}N$ strand
iii) Can you rule out dispersive mode and conservative mode of replication using this experiment? Justify

4A) Evolution is acting as a tool for improvising the existing system. Logically explain based on the evolutionary models discussed in the class (3 Marks)

4B) i) A DNA sequence undergoes point mutation which results in subsequent changes in the transcription of mRNA as shown below in mRNA sequence, Identify the type of mutation



(ii) "A small change has resulted in a big difference in function of haemoglobin and chlorophyll". Critically evaluvate (2 marks)

4C) Explain the type of species interaction illustrated in the following diagrams.

	Example	Species interaction
i)		
ii)		
iii)		
iv)		

5A) i) Explain the logic of vaccination

ii)Why some vaccines are effective (eg Polio Vaccine), while others are less effective (Eg Corona vaccine)

(2+1 = 3 marks)

5B) Akshay is working on developing hydrophobic surfaces. He has seen "Lotus effect". How he can logically develop the concept using this phenomenon?

5C) **Give example for Build ideas from bioinspiration with explanation.**

i) Reduced-drag propeller designs

ii) Bionic car

iii) Bullet train

iv) Fog harvesting