Practice Question Set For A-Level
Subject : Biology
Paper-1 Topic:1 Biological Molecules

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Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Q1.

(a) Describe how **one** amino acid is added to a polypeptide that is being formed at a ribosome during translation.

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(3)

Table 1 shows:

- mRNA codons and the amino acid coded for by each codon
- the type of bond formed by the R group of some of the amino acids.

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Table 1

First base	Second base				Third base
	U	C	A	G	
U	Phe	Ser	Tyr	Cys	U
					C
	Leu		Stop	Stop	A
				Trp	G
C	Leu	Pro	His	Arg	U
					C
			Gln		A
					G
A	Ile	Thr	Asn	Ser	U
					C
	Met		Lys	Arg	A
					G
G	Val	Ala	Asp	Gly	U
					C
			Glu		A
					G

Key to the type of bond formed by the R group of each amino acid

Hydrogen bonds Ionic bonds Disulfide bridges

(b) Crystallin is a structural protein found in the human eye. An inherited disease that leads to blindness is caused by changes in properties of crystallin. The replacement of the amino acid Arg with the amino acid Gly causes these changes.

Use information in **Table 1** to suggest why this amino acid replacement changes the properties of crystallin.

_____

_____

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_____

_____

_____

(2)

(c) The amino acid replacement of Arg with Gly is caused by a single base substitution mutation in the DNA. The non-mutant DNA triplet is TCC.

Complete **Table 2**.

Give:

- the mRNA codon complementary to the non-mutant DNA triplet
- the mutated mRNA codon that could cause the change from Arg to Gly in the crystallin protein
- the DNA triplet complementary to this mutated mRNA codon.

Table 2

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mRNA codon for the non-mutant triplet	
Mutated mRNA codon	
Mutated DNA triplet	

(2)
(Total 7 marks)

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Q2.

(a) Complete the table below with ticks (✓) to show which elements are found in the following biological molecules.

Biological molecules	Element			
	Carbon	Nitrogen	Oxygen	Phosphorus
Galactose				
Phospholipid				
RNA				
Sucrose				

(2)

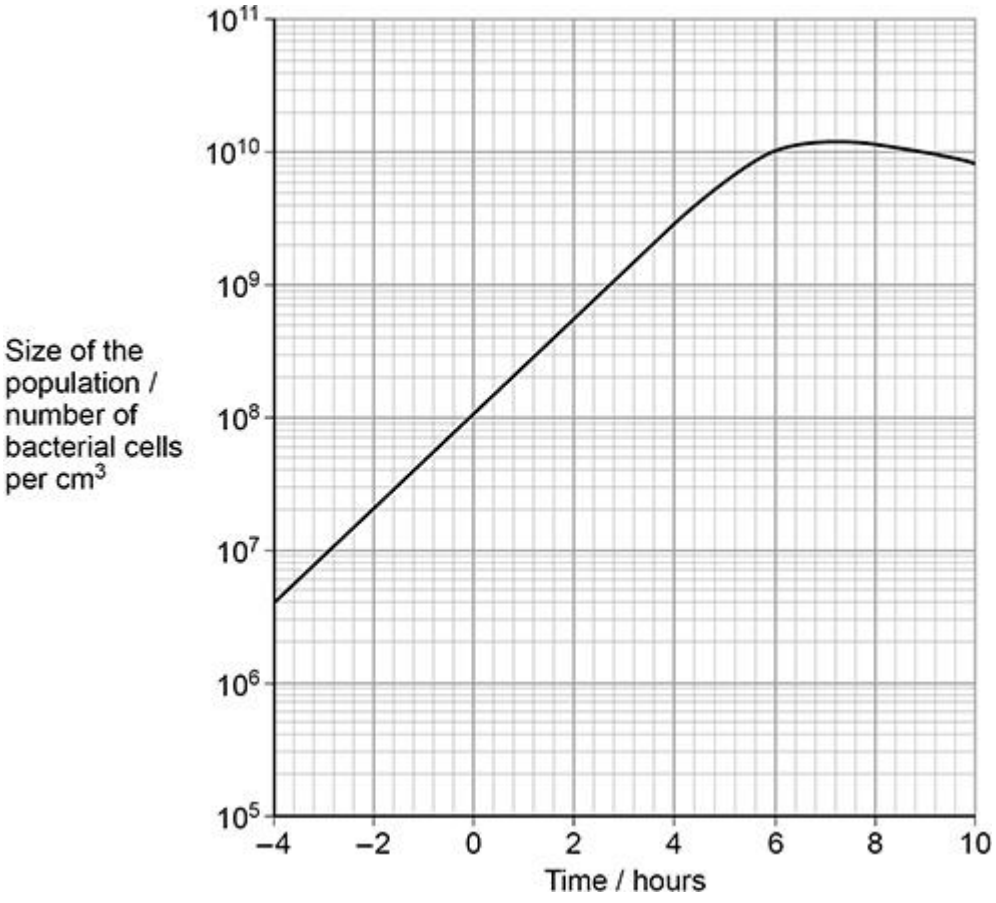
After Watson and Crick proposed the model of DNA structure, scientists investigated the possible mechanisms for DNA replication.

Two scientists grew a bacterial population, providing them with a nitrogen source containing only the heavy isotope of nitrogen, ^{15}N. As soon as all the DNA in this population contained ^{15}N, the scientists changed the nitrogen source to one containing only the lighter isotope of nitrogen, ^{14}N. They changed the nitrogen source at 0 hours.

During the investigation, the scientists measured the size of the population of bacterial cells.

Figure 1 shows the scientists' results.

Figure 1



(b) The generation time for a population of bacteria is the time taken for all the bacteria to divide

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once by binary fission.

Use **Figure 1** and the following equation to calculate the generation time for this population of bacteria. Give your answer in hours.

$$\text{Number of generations} = \frac{\log_{10}\left(\frac{\text{size of population at time +4 hours}}{\text{size of population at time} - 4 \text{ hours}}\right)}{\log_{10} 2}$$

Generation time _____ hours

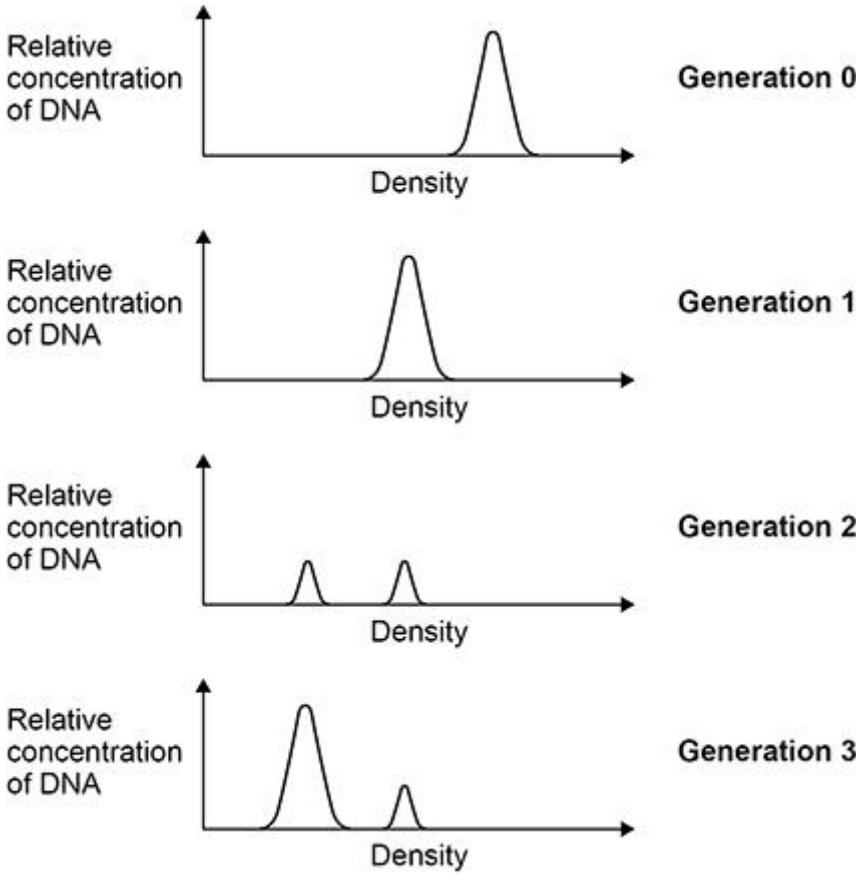
(2)

At intervals during this investigation, the scientists removed samples of the bacterial population, isolated the DNA and measured the density of the DNA.

DNA made using ^{15}N has a higher density than DNA made using ^{14}N.

Figure 2 shows the scientists' results.

Figure 2

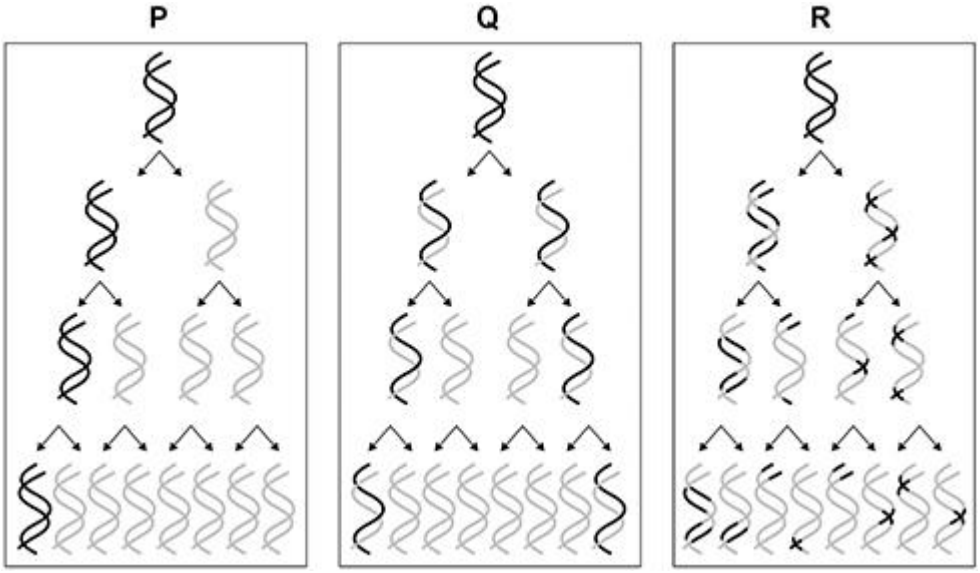


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There are **three** possible models of DNA replication.

These models are shown in **Figure 3**.

Figure 3



(c) Which of these models, **P**, **Q** or **R**, is supported by the results shown in **Figure 2**?

Give the letter and name of the model supported and explain why the results do **not** support the other models.

Model _____

Name _____

Explanation for first **unsupported** model _____

_____

Explanation for second **unsupported** model _____

_____

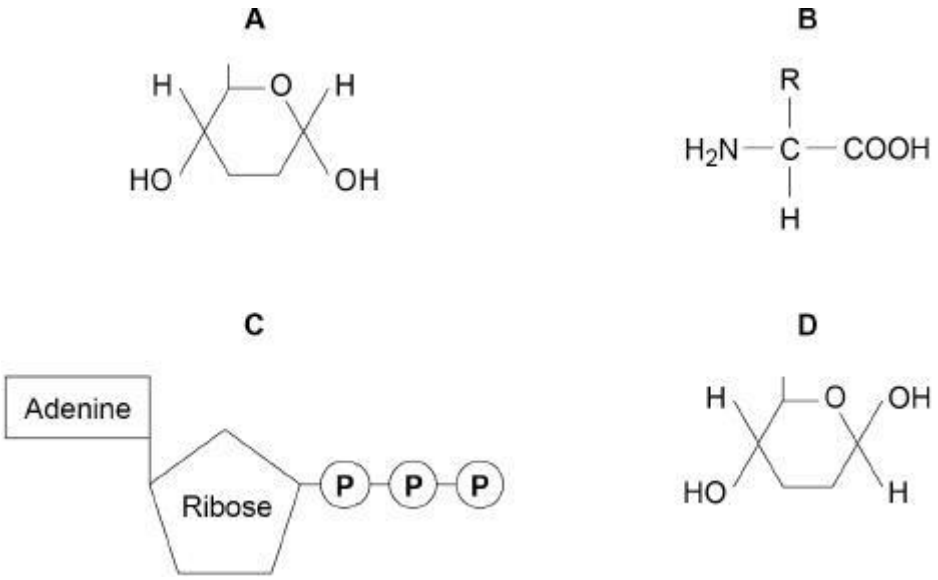
(3)

(Total 7 marks)

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Q3.

The diagram below shows the structure of molecules found in organisms.



(a) Complete the table below by putting the correct letter, **A**, **B**, **C** or **D**, in the box next to each statement. Each letter may be used once, more than once, or not at all.

Letter	**Statement**
	is a monomer in an enzyme's active site
	is a monomer in cellulose
	is produced during photosynthesis and respiration
	forms a polymer that gives a positive result with a biuret test

(4)

(b) Raffinose is a trisaccharide of three monosaccharides: galactose, glucose and fructose. The chemical formulae of these monosaccharides are:

- galactose = $C_6H_{12}O_6$
- glucose = $C_6H_{12}O_6$
- fructose = $C_6H_{12}O_6$

Give the number of carbon atoms, hydrogen atoms and oxygen atoms in a molecule of raffinose.

Number of carbon atoms _____

Number of hydrogen atoms _____

Number of oxygen atoms _____

(1)

(c) A biochemical test for reducing sugar produces a negative result with raffinose solution.

Describe a biochemical test to show that raffinose solution contains a non-reducing sugar.

_____

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(3)
(Total 8 marks)

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