Nucleic Acids Chemistry Questions with Solutions

Q1: The structural feature that is common to Uracil and Thymine is:

a. Both contain a keto group
b. Both contain 5-membered ring
c. Both contain 1 methyl group
d. Both contains 3 N atoms

Answer: (a.)

Explanation: Both Uracil and Thymine consist of a keto group.

Q2. Comment on the stability of DNA on its stability towards heat denaturation.

Answer:

Q3. Do DNA and RNA have the same constituting units? If not, name the different units.

Answer: Both DNA and RNA are polymeric units made from nucleotides. The nucleotides are monomer units which consist of three constituents namely: 5-carbon sugar, a phosphate group (PO_4^{3-}) and a nitrogenous base.
The DNA and RNA differ in terms of constituting sugar molecules; the RNA contains the ribose sugar and the DNA contains the deoxyribose sugar.

Q4. Which fragment moves most quickly during the gel electrophoresis?

a. Large fragments
b. Small fragments
c. Large genome
d. None of the above

Answer: (b.)

Explanation: All the DNA fragments have equal charge/mass ratio. This is why the smaller fragments move faster during the gel electrophoresis.

Q5. Which pyrimidine base contains an amino acid group at C4?

Answer: Cytosine contains an amino group at C4.

Q6. At what wavelength do the nucleotides absorb light?

Answer: Nucleotides absorb light at 260 nm.

Q7. What is the function of glycosidic bonds in DNA and RNA?

Answer: The glycosidic bonds connect the sugar to the base.

Q8. Which of the following is useful in nucleic acid (NA) analysis?

a. Molecular weight of the nucleic acids
b. Absorption of UV light
c. Absorption of visible light
d. None of the above

Answer: (b.)

Explanation: The double bonds present within the purine and pyrimidine rings in the nucleic acids absorb strongly at a maximum wavelength of 260 nm. Thus, absorption of UV light is useful in NAs analysis.

Q9. What are the helical structures in the DNA and RNA made of?

Answer: The helical structure backbone in the DNA and RNA is made of the alternating sugars and the phosphate groups. Each sugar molecule is connected to a base.

Q10. Which of the 5 canonical nucleobases occurs only in

a. DNA, and
b. RNA

Answer: There are 5 primary nucleobases namely Uracil, Adenine, Thymine, Guanine and Cytosine. Out of these, Thymine is found only in DNA and Uracil is found only in RNA.

Q11. How is the base-pair sequencing significant in DNA and RNA?

Answer: During the protein synthesis, the base-pair sequencing enables the DNA to store and transmit the coded information. This coded information is known as genes. While in RNA, the base-pair sequencing is essential for most of the chemical processes of all life forms.

Q12. Who proposed the double-helix model of DNA?

Answer: Watson and Crick in 1953 proposed the double-helical structure of DNA.

Q13. Where were the nucleic acids discovered first?

Answer: The nucleic acids were first discovered in the nucleus of the Eukaryotic cells.

Q14. The viruses are under a constant debate of whether they are living or non-living things. Give a reason to support this statement.

Answer: The cells in all living beings consist of both- the DNA and the RNA. Only the viruses contain either DNA or RNA. It is very rare to find the DNA and RNA both in a virus. This is why the viruses are always under the debate whether they are living or non-living.

Q15. What is solid-phase chemical synthesis? Give 1 use of this method in terms of nucleic acids.

Answer: The solid-phase synthesis is a method in which a solid-state material is taken in a reaction vessel and the molecules are covalently bonded to it in stepwise manner. This is a highly efficient reaction that takes place in a single vessel.
The solid-phase synthesis is used in the laboratory preparation of Nucleic acids.

Practise Questions on Nucleic Acids

Q1. Is genetic coding universal or specific to some species?

Answer: The genetic coding is universal. However, there may be some rare exceptions owing to the mitochondria and some protozoa.

Q2. How are Peptide Nucleic Acids (PNA) different from other nucleic acids?

Answer: The main points of difference are:

a. Unlike other nucleic acids, PNAs are synthesized in the laboratory and do not occur naturally.
b. They have high binding strength.
c. PNAs are resistant to the enzyme degradation.
d. These are stable over a very wide range of pH.
e. PNA backbone consists of N-(2-aminoethyl)-glycine units linked to each other by peptide bonds.

Q3. What is the half-life of Phosphorus- 32?

Answer: The half-life of P-32 is 14.3 days.

Q4. The smooth endoplasmic reticulum (SER) is the site for:

a. Calcium storage
b. Amino-acids synthesis
c. Protein synthesis
d. Carbohydrate synthesis

Answer:(a.)

Explanation: SER is the storage site for calcium within the cells.

Q5. Where are the promoters of tRNAs located?

Answer: The promoters of tRNAs are located downstream from the start codon.