

Nucleotides and Nucleic Acids

1. An anticodon sequence of five successive tRNA molecules involved in protein synthesis was analysed and found to have the following percentage base composition.

Adenine 40; Cytosine 27; Guanine 13; Thymine 0; Uracil 20 %

Which row shows the percentage base composition of the template strand of the original DNA molecule?

	Adenine	Cytosine	Guanine	Thymine	Uracil
A	40	27	13	20	0
B	20	13	27	40	0
C	20	13	27	0	40
D	40	27	13	0	20

Your answer

[1]

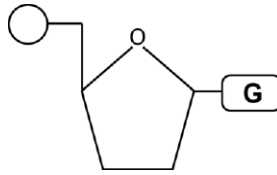
2. Which of the stains, **A** to **D**, would be chosen to bind to the phosphate group of DNA to make chromosomes more visible when using a light microscope?

- A** carbolfuchsin – a non-polar dye
- B** nigrosin – a negatively charged dye
- C** methylene blue – a positively charged dye
- D** Sudan 111 – a lipid-soluble dye

Your answer

[1]

3. The diagram below shows an organic molecule.



What bond is formed when the molecule is polymerised?

- A ester
- B glycosidic
- C peptide
- D phosphodiester

Your answer

[1]

4. Which of the following statements describes an organelle which is **not** membrane bound?

- A. contains cristae
- B. modifies and packages proteins
- C. contains digestive enzymes
- D. is made of rRNA and protein

Your answer

[1]

5. The following statements are about the structure of DNA.
Which of the following statement(s) is / are true?

- Statement 1:** Purine bases pair with pyrimidine bases.
Statement 2: Phosphodiester bonds link adjacent nucleotides.
Statement 3: There are always equal amounts of adenine and guanine.

- A. 1, 2 and 3
- B. Only 1 and 2
- C. Only 2 and 3
- D. Only 1

Your answer

[1]

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6. Which of the statements, **A** to **D**, shows that the genetic code is degenerate?

- A** CCA and CCT code for proline
- B** rRNA is manufactured in the nucleolus
- C** tRNA is not complementary to DNA
- D** uracil is not found in DNA

Your answer

[1]

7. Which of the following processes occur during DNA replication?

- 1 breakage and (re)formation of phosphodiester bonds
- 2 breakage and (re)formation of hydrogen bonds
- 3 alignment of free nucleotides with their complementary bases

- A** 1, 2 and 3
- B** Only 1 and 2
- C** Only 2 and 3
- D** Only 1

Your answer

[1]

8. The following are a series of organic molecules and the chemical processes that occur to convert them into different molecules.

Which of the rows, **A** to **D**, is correct?

- A** nucleic acid $\xrightarrow{\text{hydrolysis}}$ nucleotide $\xrightarrow{\text{hydrolysis}}$ polynucleotide
- B** α -glucose $\xrightarrow{\text{condensation}}$ amylopectin $\xrightarrow{\text{hydrolysis}}$ α -glucose
- C** amino acid $\xrightarrow{\text{condensation}}$ dipeptide $\xrightarrow{\text{hydrolysis}}$ polypeptide
- D** β -glucose $\xrightarrow{\text{condensation}}$ cellulose $\xrightarrow{\text{condensation}}$ maltose

Your answer

[1]

9. Which of the following statements, **A** to **D**, about DNA replication is correct?

- A** RNA will bind to DNA through complementary base-pairing.
- B** The distance between the strands in the double helix will always be the same.
- C** The proportion of adenine in a nucleic acid will always equal the proportion of guanine.
- D** The formation of phosphodiester bonds will occur in the same direction on each strand during DNA replication.

Your answer

[1]

10. DNA is made up of two polynucleotide chains.

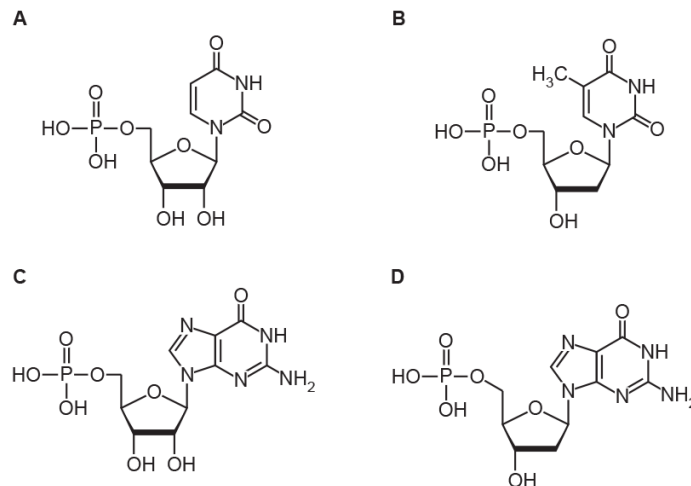
Which of the bonds, **A** to **D**, forms between two nitrogenous bases holding the two polynucleotide chains together?

- A** phosphodiester
- B** ionic
- C** covalent
- D** hydrogen

Your answer

[1]

11. Which of the following nucleotides contains uracil?



Your answer

[1]

12. Which statement, **A** to **D**, describes the function of DNA polymerase?

- A** break the hydrogen bonds between complementary bases
- B** make phosphodiester bonds between adjacent nucleotides
- C** make phosphodiester bonds between polynucleotides
- D** make the hydrogen bonds between complementary bases

Your answer

[1]

13. Which of the following statements is/are evidence that DNA replication is semiconservative?

- 1 After one replication, the number of adenine nucleotides is equal to the number of guanine nucleotides.
- 2 After two replications, two DNA molecules have one original and one new strand, and two DNA molecules have two new strands.
- 3 After three replications, there are eight DNA molecules, only two of which have strands from the original DNA.

- A** 1, 2 and 3
- B** only 1 and 2
- C** only 2 and 3
- D** only 1

Your answer

[1]

14. During DNA replication, DNA polymerase can only work in one direction – from the 3' end to the 5' end. This means that the lagging strand has small gaps left in the backbone. DNA ligase works to seal these gaps.

Which of the options, **A** to **D**, identifies the bond formed?

- A** hydrogen bond
- B** phosphodiester bond
- C** glycosidic bond
- D** peptide bond

Your answer

[1]

15. DNA carries the genetic code which is non-overlapping and degenerate.

Which of the options, **A to D**, contains the correct definitions for non-overlapping and degenerate code?

- A** Each nucleotide is only part of one triplet of bases and the molecule breaks down easily.
- B** The genes follow straight after each other and the molecule breaks down easily.
- C** Each nucleotide is only part of one triplet of bases and more than one triplet codes for a specific amino acid.
- D** The genes follow straight after each other and more than one triplet codes for a specific amino acid.

Your answer

[1]

16. A standard method can be used to extract DNA from the nuclei of cells in kiwi fruit.

The statements below list some of the steps involved in this method.

Which statement is **not** correct?

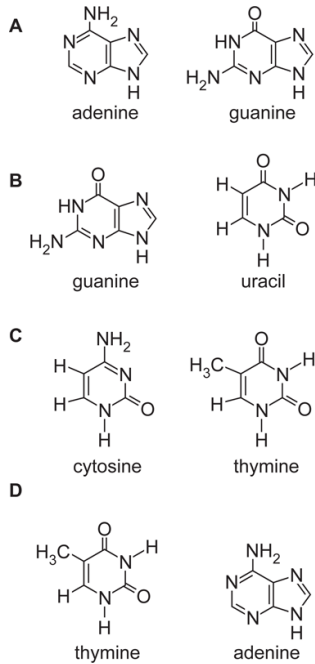
- A** chop the kiwi fruit to break open cell membranes
- B** add detergent to dissolve nuclear membranes
- C** add protease to digest histone proteins
- D** pour ice cold ethanol onto filtrate to precipitate DNA

Your answer

[1]

17. DNA is formed from three main groups of molecules: pentose sugars, phosphate groups and nitrogenous bases. The bases can be divided into purines and pyrimidines.

Identify the two purines below.



Your answer

[1]

18. A length of DNA has the base sequence AATCGCGGTCGCTCA.

Select the row that shows the correct complementary DNA strand and the sequence of mRNA made during transcription of the DNA sequence above.

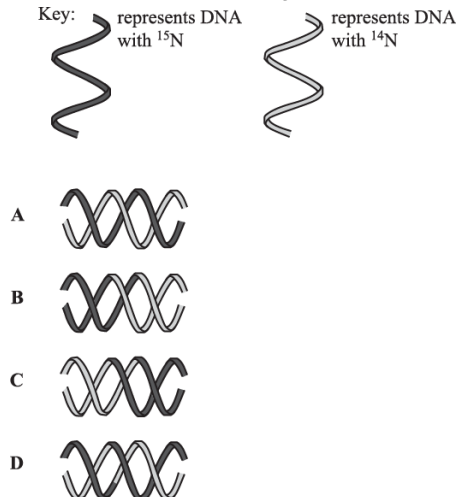
	Complementary DNA sequence	mRNA sequence
A	AATCGCGGTCGCTCA	UUAGCGCCAGCGAGU
B	TTAGCGCCAGCGAGT	UUAGCGCCAGCGAGU
C	TTAGCGCCAGCGAGT	TTAGCGCCAGCGAGT
D	TTAGCGCCAGCGAGT	AAUCGCGGUCGCUCA

Your answer

[1]

19. A sample of DNA containing only one isotope of nitrogen, ¹⁵N, was incubated with nucleotides containing only the ¹⁴N isotope along with the enzymes needed for replication.

Which of the following diagrams would represent the resulting DNA after one round of replication?



Your answer

[1]