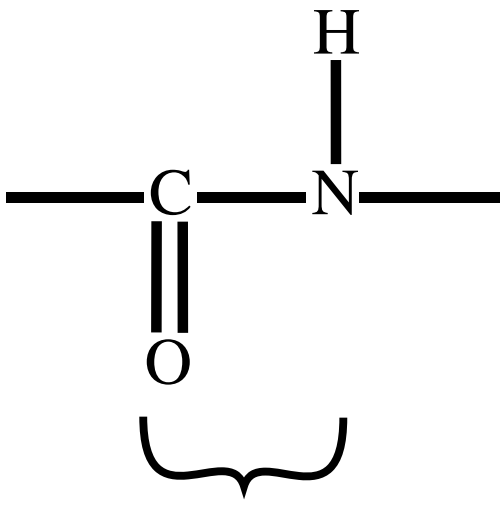
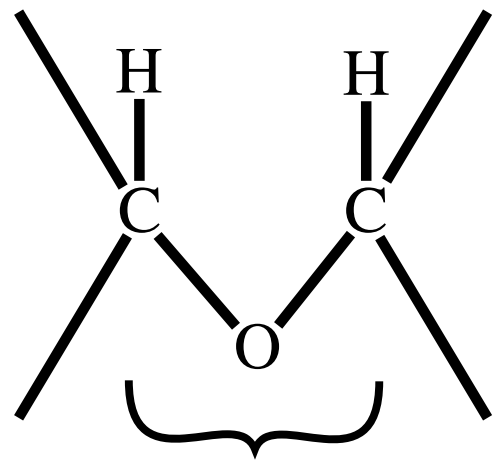
Polymer Bonds

A Level

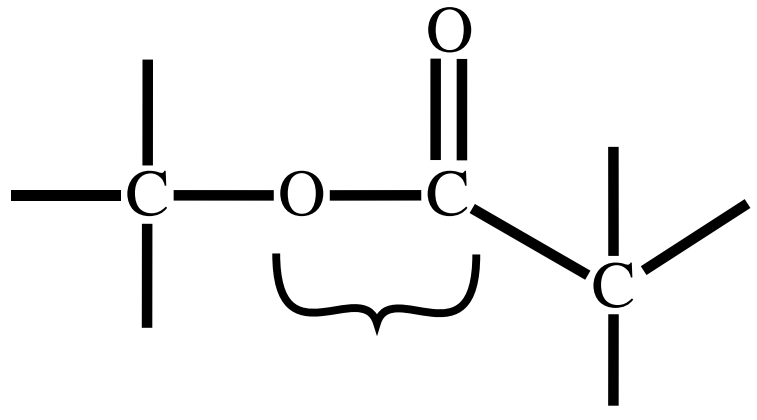
The images below show different types of bonds present in biological polymers.



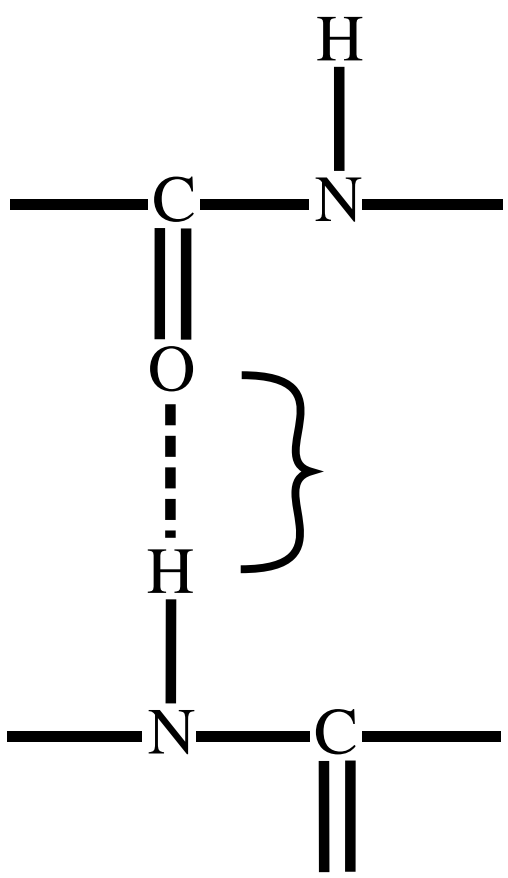
A



B

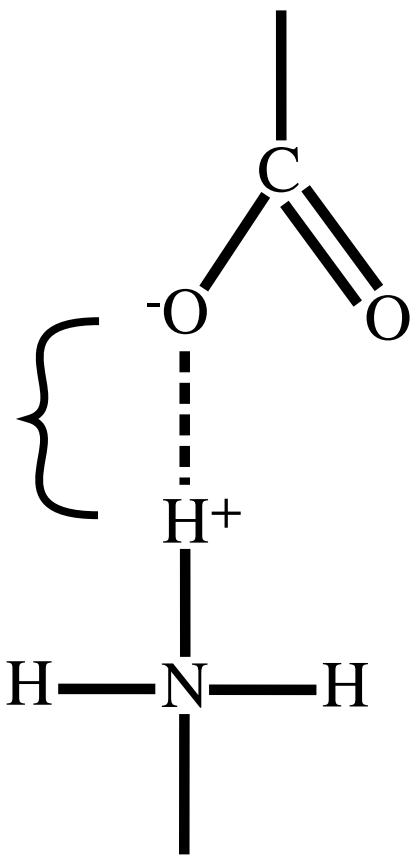


C

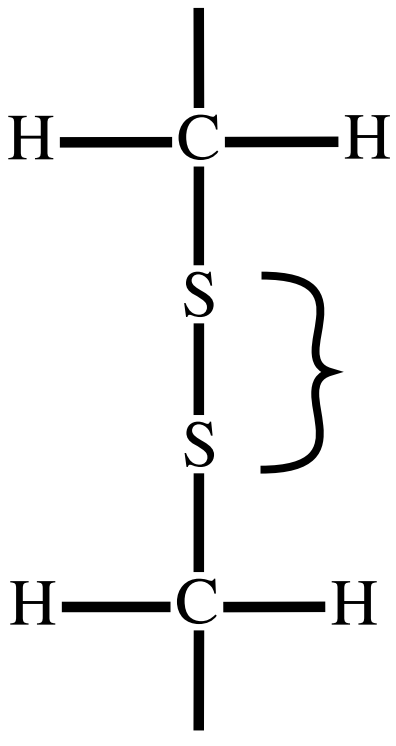


O

D



E



F

Part A Bond types

Match the bond type to the image above.

Image	Bond type
A	
B	
C	
D	
E	
F	

Items:

glycosidic **hydrogen** **peptide** **phosphodiester** **ester** **disulfide** **ionic**

Part B Carbohydrates

Which of the bond types above is part of disaccharides and polysaccharides? Select all that apply.

- [ ] A
- [ ] B
- [ ] C
- [ ] D
- [ ] E
- [ ] F

Part C Lipids

Which of the bond types above is part of triglycerides and phospholipids? Select all that apply.

- [ ] A
- [ ] B
- [ ] C
- [ ] D
- [ ] E
- [ ] F

Part D Proteins - primary structure

Which of the bond types above is part of the primary structure of proteins? Select all that apply.

- [ ] A
- [ ] B
- [ ] C
- [ ] D
- [ ] E
- [ ] F

Part E Proteins - secondary structure

Which of the bond types above is/are responsible for maintaining the secondary structure of proteins? Select all that apply.

- [ ] A
- [ ] B
- [ ] C
- [ ] D
- [ ] E
- [ ] F

Part F Proteins - tertiary structure

Which of the bond types above is/are responsible for maintaining the tertiary structure of proteins? Select all that apply.

- [ ] A
- [ ] B
- [ ] C
- [ ] D
- [ ] E
- [ ] F

Adapted with permission from OCR A Level January 2002, Biology Foundation, Question 1

Enzyme Conditions

A Level

C C C

Part A Reaction rate

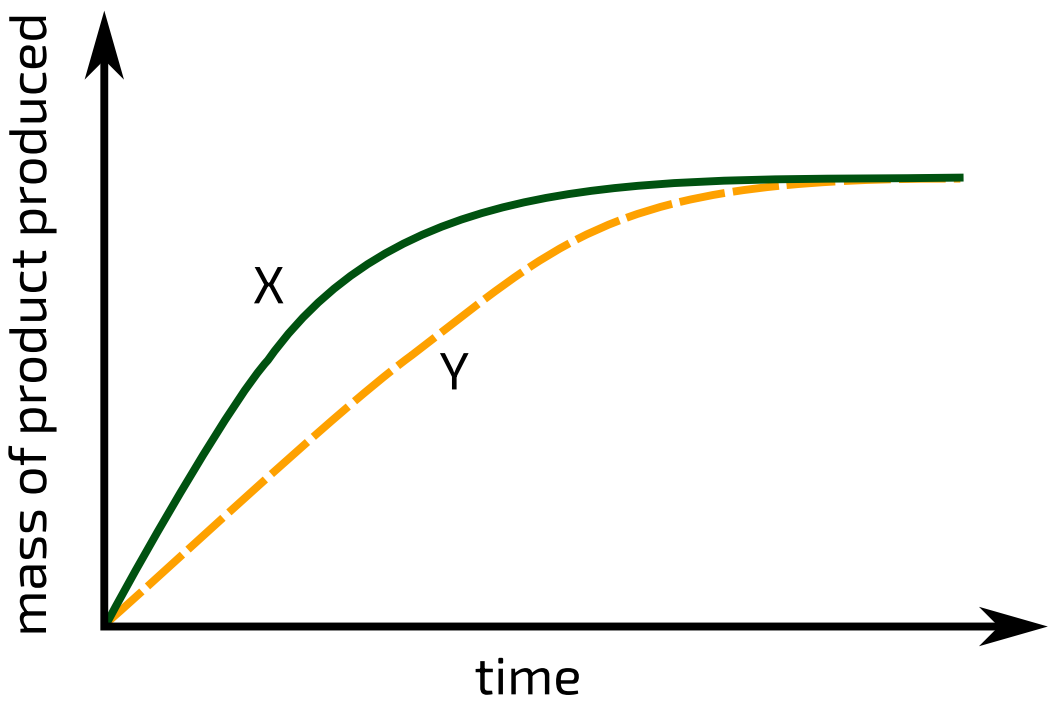


Figure 1: The graph shows the mass of product produced over time for an enzyme-controlled reaction in two different conditions: X and Y. All other variables were kept constant.

Which of the following could explain the differences between X and Y?

- [ ] Condition X is a higher pH than condition Y.
- [ ] Condition X has more substrate supplied than condition Y.
- [ ] Condition X is a lower pH than condition Y.
- [ ] Condition X has less substrate supplied than condition Y.

Part B **Preferred pH**

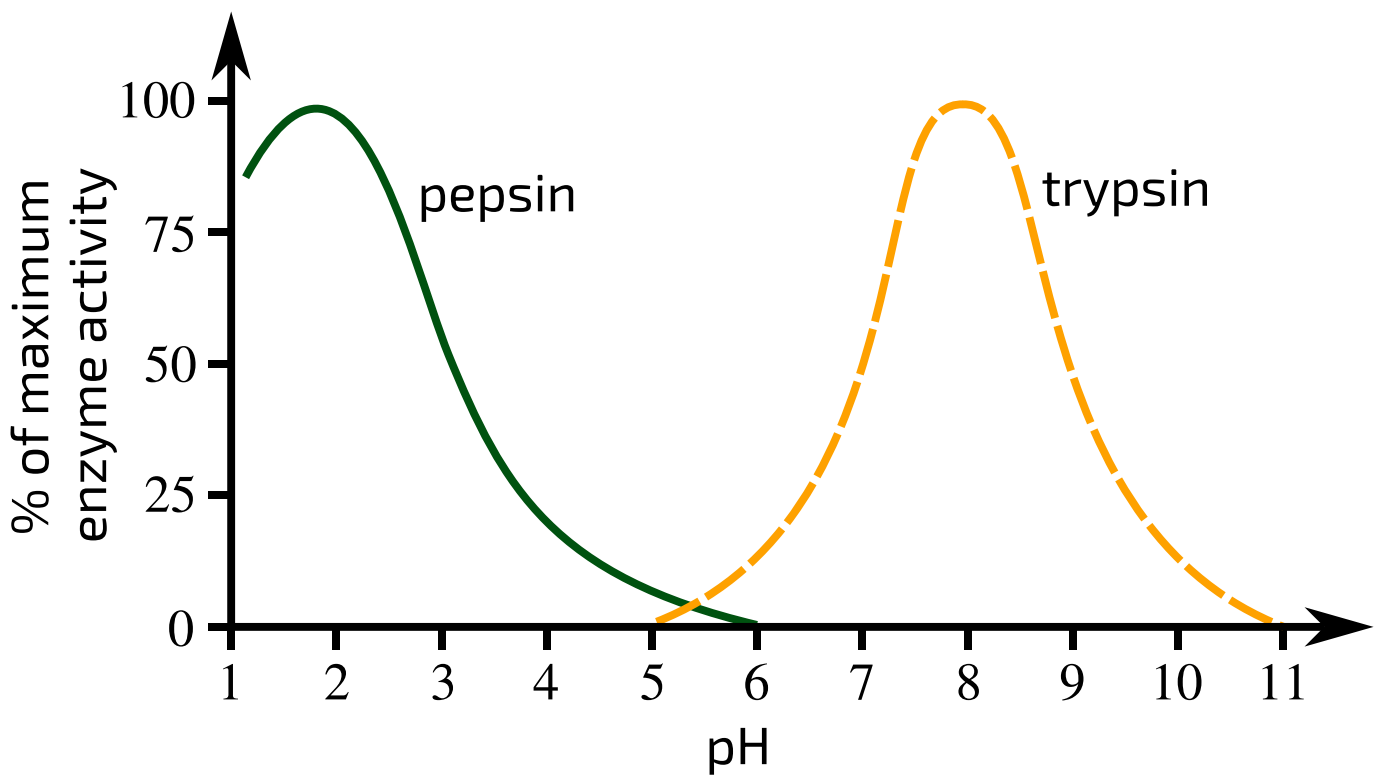


Figure 2: Pepsin and trypsin are both protease enzymes found in the human digestive system. The graph shows how the activity of both enzymes varies with pH.

Which of the following statements are correct, for the human digestive system?

- [ ] Trypsin would be inactive in the stomach.
- [ ] Pepsin is most active in the stomach.
- [ ] Pepsin could be a substrate for trypsin.
- [ ] Pepsin is most active at low acidity and trypsin most active at high acidity.

Question elements adapted with permission from NSAA 2020 Section 1 Q72 and NSAA 2020 Section 1 Q66

Gameboard:

STEM SMART Biology Week 15

Changing Substrate Concentrations

A Level

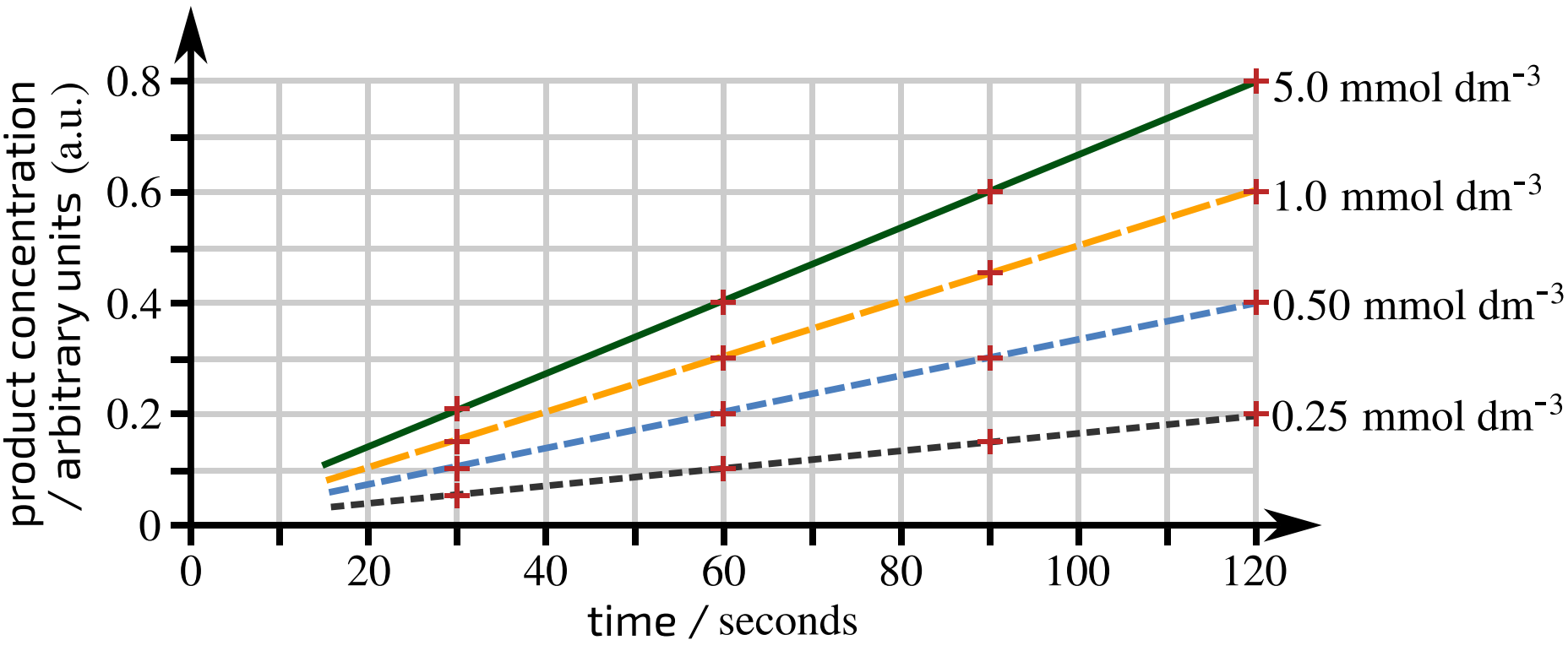


Figure 1: An investigation was carried out on the effect of substrate concentration on an enzyme-controlled reaction. Four different concentrations of substrate were tested. In each case, the concentration of product was measured at regular intervals following the introduction of the substrate. All other variables were kept constant.

Part A Reaction rate

What is the average rate of reaction for a substrate concentration of $1.0\,\mathrm{mmol\,dm^{-3}}$?

Part B Substrate statements

Which of the following statements are correct? Select all that apply.

- [ ] Doubling the substrate concentration always doubles the rate of reaction.
- [ ] Doubling the substrate concentration always doubles the amount of product produced over $120\,\mathrm{s}$.
- [ ] At substrate concentrations above $1.0\,\mathrm{mmol\,dm^{-3}}$, the relationship between substrate concentration and average reaction rate is non-linear.
- [ ] As substrate concentration increases, the time taken to produce 0.2 arbitrary units of product decreases.
- [ ] As substrate concentration increases, the time taken to produce 0.2 arbitrary units of product increases.

Adapted with permission from NSAA 2019 Section 1 Q71

Gameboard:

STEM SMART Biology Week 15

Base Proportions

A Level

One strand of a section of DNA has the following sequence of bases:

AATCGGTCTTGCGGCCAAGGCCCTT

The complementary strand is not shown.

Part A Adenine

For this section of DNA, what percentage of bases are adenine?

Part B Thymine

For this section of DNA, what percentage of bases are thymine?

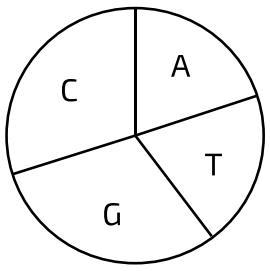
Part C Cytosine

For this section of DNA, what percentage of bases are cytosine?

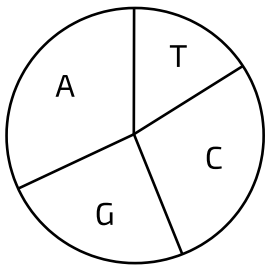
Part D Guanine

For this section of DNA, what percentage of bases are guanine?

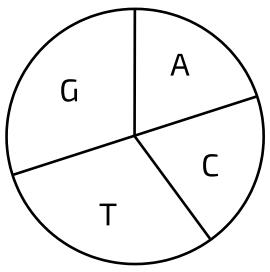
Part E Pie chart proportions



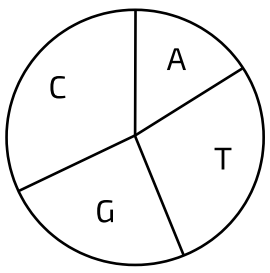
A



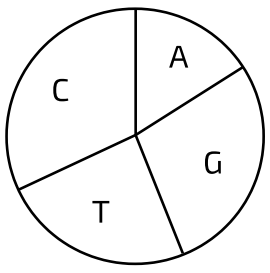
B



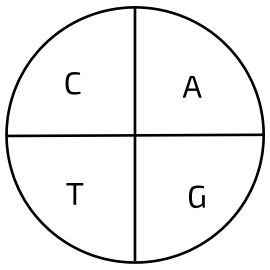
C



D



E



F

Match the pie chart to the proportion.

- Proportion of bases in the single-strand sequence: ☐
- Proportion of bases in the double-stranded DNA sequence: ☐

Items:

A	B	C	D	E	F

Adapted with permission from NSAA 2021 Section 1 Q70

Gameboard:

STEM SMART Biology Week 15

Comparing Nucleic Acids

A Level

Part A Structures

Complete the table below.

	DNA	RNA
name of sugar present		
no. of carbon atoms in sugar		
no. of polynucleotide chains present in the molecule		
nitrogenous bases present	adenine, cytosine, guanine, and	adenine, cytosine, guanine, and

Items:

5 6 2 1 **deoxyribose** **ribose** **uracil** **thymine**

Part B Functions

Match the nucleic acid to its function in the table below.

Nucleic acid	Function
	brings amino acids together into the correct sequence
	together with proteins, is part of the structure of a ribosome
	carries the protein-coding sequence from the nucleus/nucleoid to a ribosome
	a highly stable template for proteins which is replicated and inherited by daughter cells during cell division

Items:

ribosomal RNA (rRNA) **transfer RNA (tRNA)** **DNA** **messenger RNA (mRNA)**

Adapted with permission from OCR A Level June 1999, Science Modular Central Concepts in Biology, Question 3a

Gameboard:

STEM SMART Biology Week 15

Nucleic Acid Processes

A Level

The figures below show three different processes involving nucleic acids.

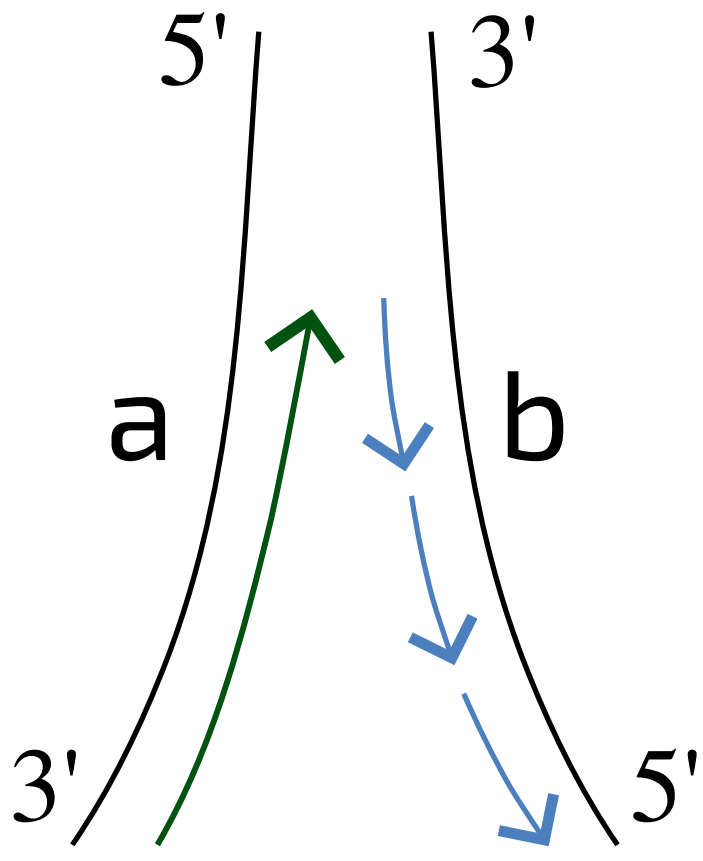


Figure 1: A molecule containing two nucleic acid strands is unzipping, and two new strands are forming.

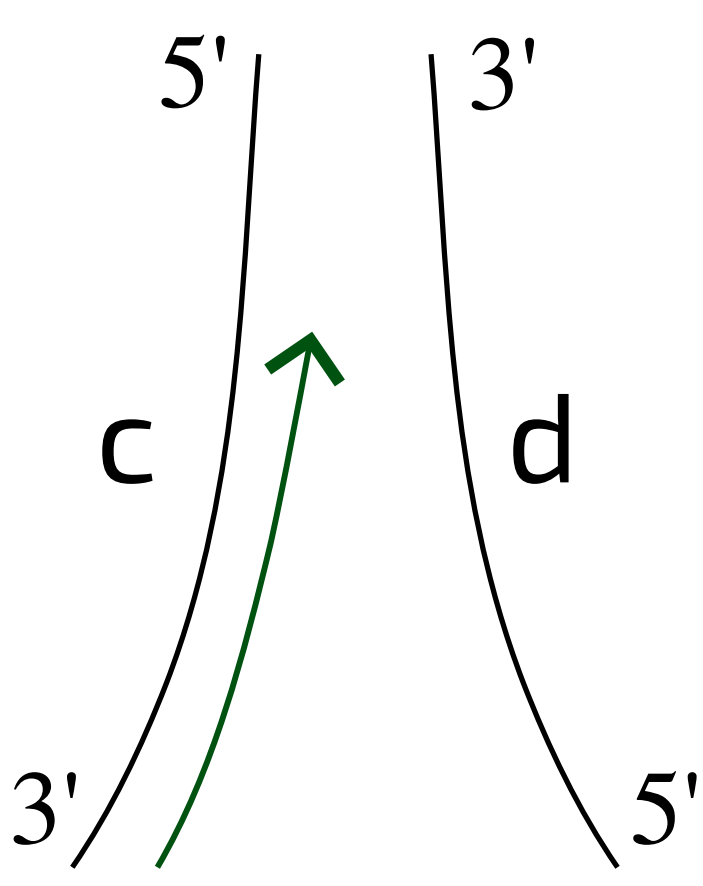


Figure 2: A molecule containing two nucleic acid strands is unzipping, and one new strand is forming.

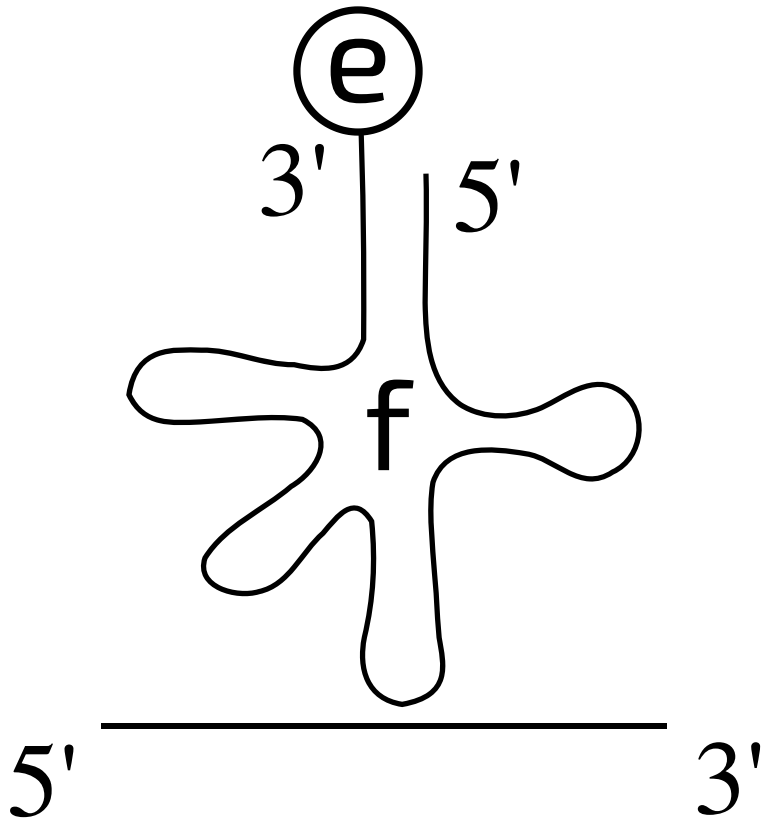


Figure 3: A nucleic acid with a complex two-dimensional structure is bound at one end to a non-nucleic-acid molecule, and bound at the other end to a linear nucleic acid.

Part A Processes

Match the figure above to the process in the table below.

Figure	Process
A	
B	
C	

Items:

transcription **post-transcriptional modification** **mutation** **chromatin condensation**

DNA replication **translation**

Part B Strands (a) & (b)

What is the name given to strand (a) in the process shown in Figure 1?

What is the name given to strand (b) in the process shown in Figure 1?

Part C Strands (c) & (d)

What is the name given to strand (c) in the process shown in Figure 2?

What is the name given to strand (d) in the process shown in Figure 2?

Part D Molecules (e) & (f)

Match the molecule to the label in Figure 3.

- Molecule (e):
- Molecule (f):

Items:

protein | **amino acid** | **messenger RNA (mRNA)** | **transfer RNA (tRNA)** | **ribosomal RNA (rRNA)** | **DNA**

Created for isaacphysics.org by Lewis Thomson