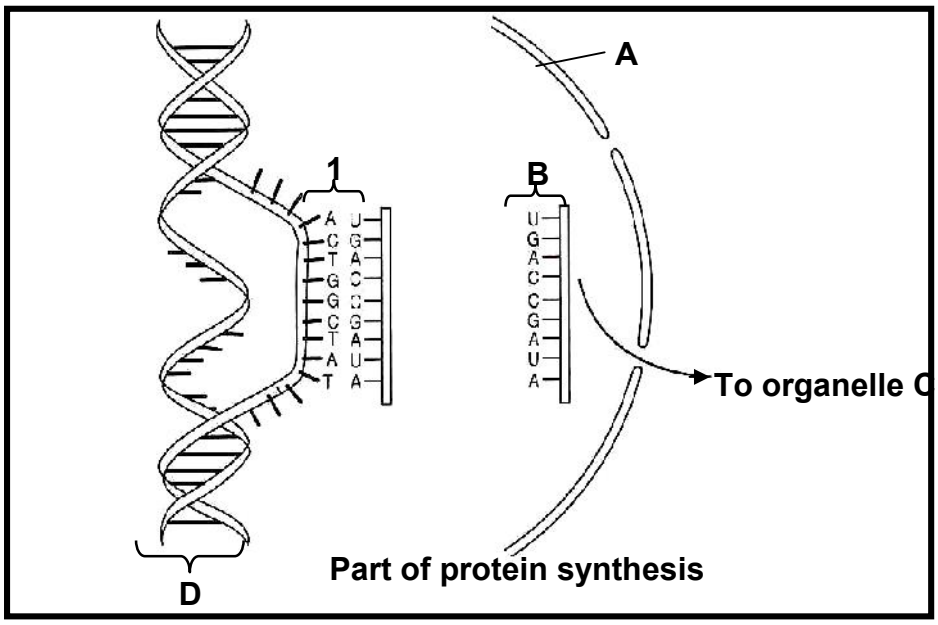
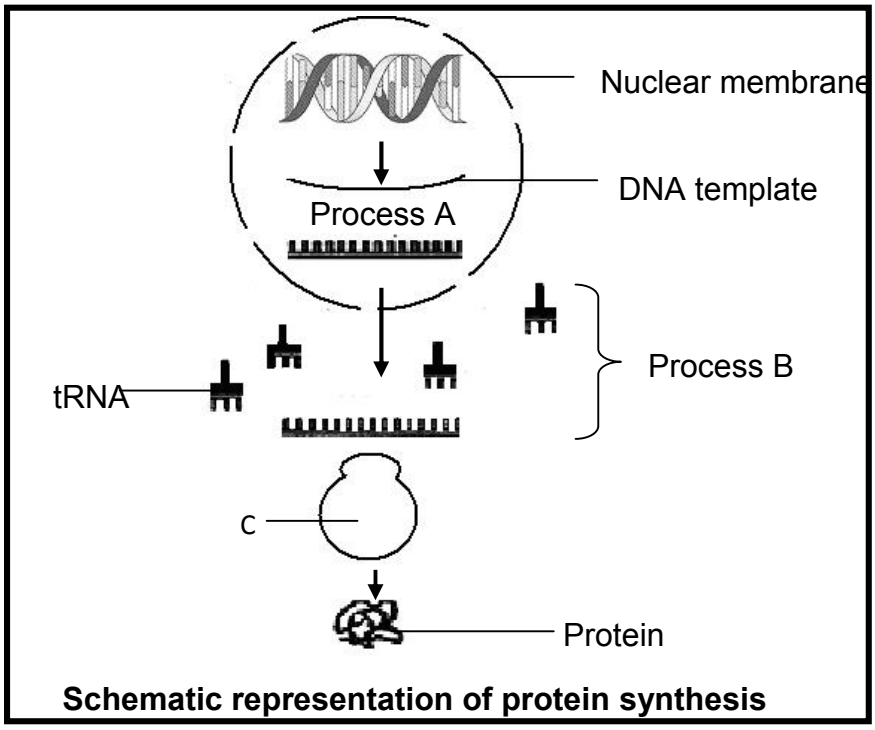
WORKSHEET PRTTEIN SYNTHESIS

1.1 Name and describe the part of protein synthesis that takes place at organelle C. **(8)**



1.2 The following diagram represents protein synthesis.



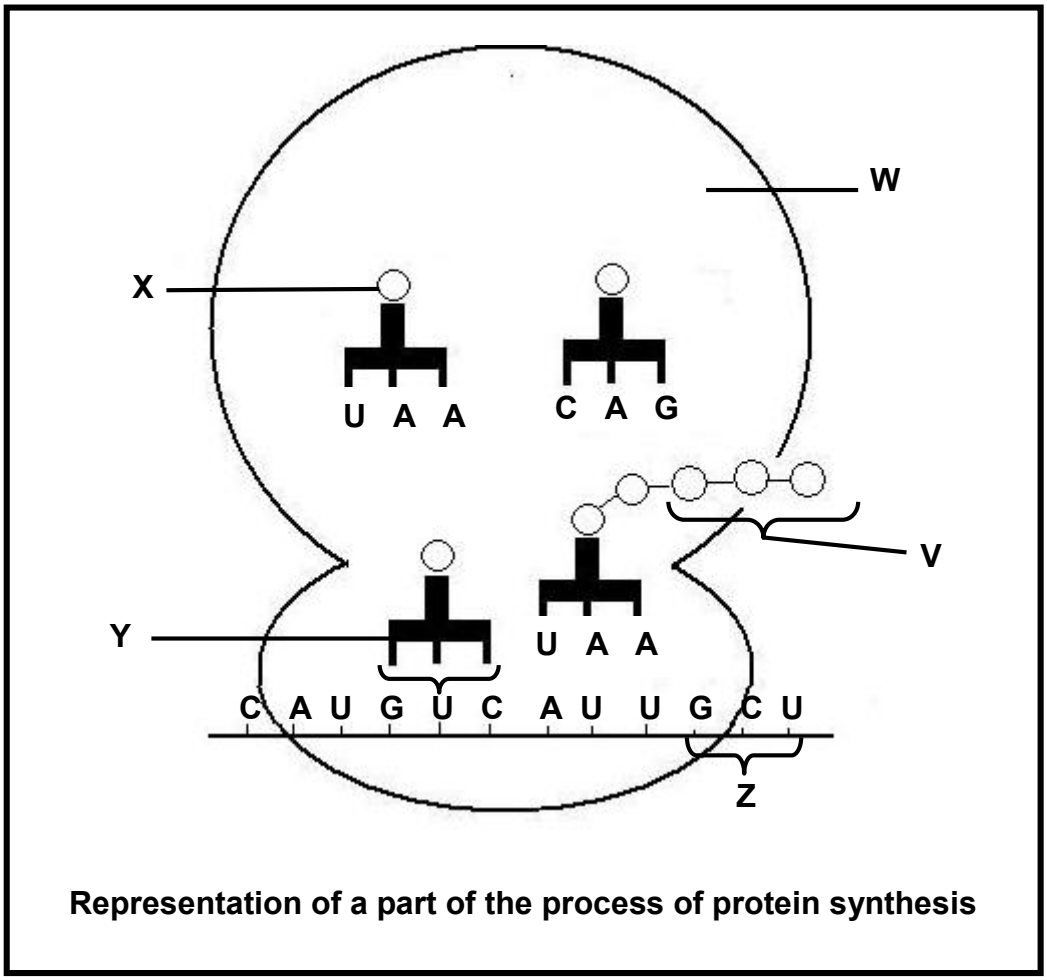
1.2.1. Name the following processes:

(a) A

(b) B (2)

1.2.2. Explain how the mRNA is made from the DNA template during process A (8)

1.3 The diagram below represents a part of the process of protein synthesis.



Representation of a part of the process of protein synthesis

1.3.1 Name the part/stage of protein synthesis that is illustrated in the diagram above.

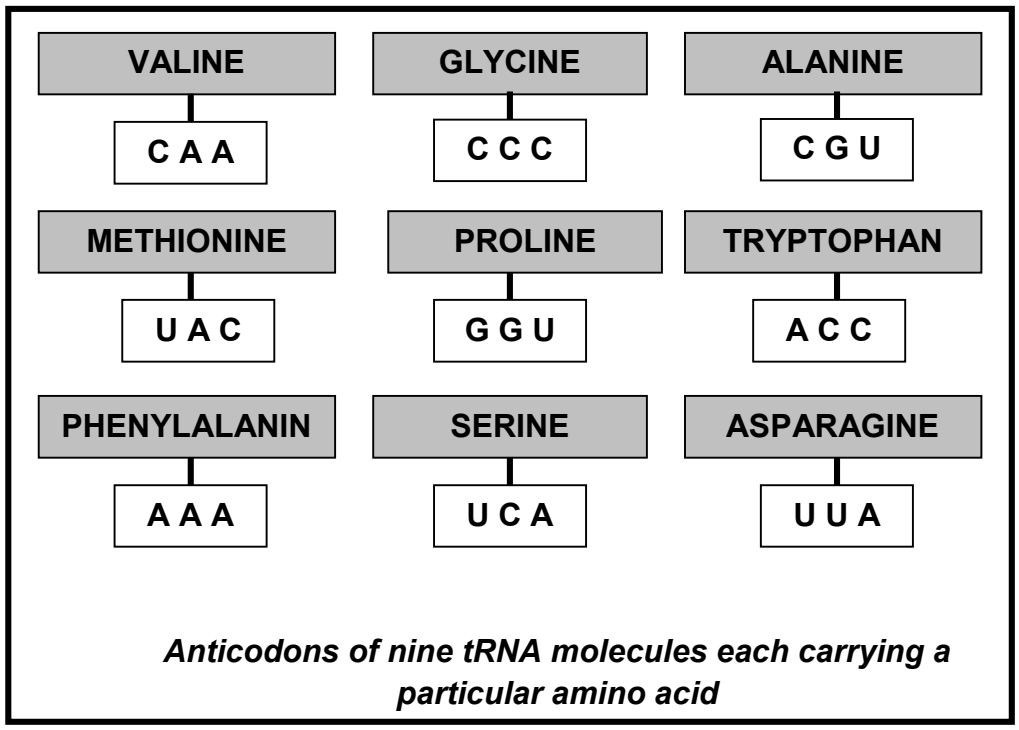
1.3.2 Name the organelle labelled **W**.

1.4 The following diagram shows the sequence of nitrogenous bases of a strand of DNA which codes for part of a protein molecule.

GTT ATG TGG

1.4.1 Write down the mRNA codon sequence that reads from left to right from the DNA sequence above.

1.5 The following diagram shows the anticodons of nine different tRNA molecules each carrying a particular amino acid

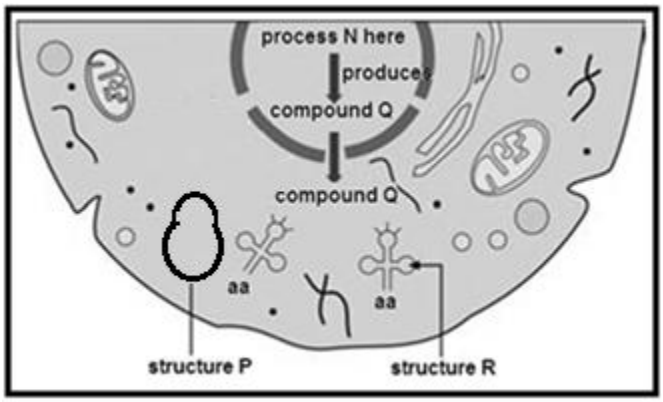


Anticodons of nine tRNA molecules each carrying a particular amino acid

1.5.1 Select and write down from the diagram above the amino acids (in the correct sequence) that would be required for the base sequence of mRNA shown below. (3)

UUU GUU AUG

1.6.1 **The diagram below shows the overall process of protein synthesis.**



a) Name process N and describe how mRNA (compound Q) was formed during process N. (6)

b) Identify structures P and R. (2)

c) Explain the role of structures P and R in translation. (5)

1.7. **The table below shows the DNA base triplets that code for different amino acids.**

Amino acid	Base triplet in DNA template
Leu (leucine)	GAA
His (histidine)	GTA
Lys (lysine)	TTT
Pro (proline)	GGG
Ala (alanine)	CGA
Trp (tryptophan)	ACC
Phe (phenylalanine)	AAA
Gly (glycine)	CCT

- The following is a part of a sequence of amino acids that form a particular protein molecule:

Ala	**His**	**Trp**	**Leu**	**Lys**

1.7.1 Name the process by which mRNA is formed from a DNA template.

1.7.2 How many mRNA codons would be involved in forming the portion of protein shown above?

1.7.3 Write down the sequence of the first THREE mRNA codons (from left to right) for this portion of the protein.

1.7.4 The following is a sequence of base triplets in DNA:

GAA - GTA - TTT - AAA

a. If guanine, found in the first base triplet, is removed, explain how this would affect the structure of the protein.

b. Name the process that occurs when the sequence of bases in DNA changes.

MEMORANDUM

1.1 Translation✓
-The mRNA strand from the nucleus becomes attached✓ to a ribosome with its codons exposed✓
- each tRNA molecule carrying a specific amino acid✓ according to its anticodon✓matches up with/complements the codon of the mRNA✓
- so that the amino acids are placed in the correct sequence✓
- adjacent amino acids are linked✓ to form a protein✓ (8)

1.2.1 (a) Transcription✓
(b) Translation✓ (2)

1.2.2 - Process is called transcription✓
– Free (RNA) nucleotides✓
– from the nucleoplasm✓
– arrange according to the base sequence✓ of the DNA template
– in a complementary✓ way
– A - U✓
– C - G✓
– Sugar-phosphate bonds form✓ between nucleotides to form required mRNA Process controlled by enzymes✓ (8)

1.3.1 Translation✓
1.3.2 Ribosome✓ (2)

1.4.1 CAA✓ UAC✓ ACC✓ (in sequence) (3)

1.5.1 Phenylalanine✓ Valine✓ Methionine✓ (in sequence) (3)

1.6.1 a) Process N is transcription✓ .
DNA molecule unwinds and hydrogen bonds break, under the control of RNA
polymerase. ✓ As the DNA strands separate, bases of free RNA nucleotides line up opposite exposed complementary bases on the coding strand; ✓ temporary hydrogen bonds form between bases. ✓ Adjacent RNA nucleotides join together to form a strand of mRNA. ✓ Hydrogen bonds between complementary bases break✓ and the mRNA strand is free to leave the nucleus. (6)

1.6.2 b) P – ribosome ✓; R – tRNA✓ (2)

1.6.3 c) P is the organelle at which the mRNA "docks" to have the codons read. ✓ Each tRNA✓ molecule brings its appropriate amino acid from the amino acid pool✓ to the mRNA where the anticodon of a tRNA lines up with the codon on mRNA ✓ to create a string of appropriately ordered amino acids. ✓ (5)

1.7.1 Transcription✓ (1)
1.7.2 5✓ (1)
1.7.3 GCU✓ – CAU✓ – UGG✓ (3)
1.7.4 a) . The sequence of the amino acids will change✓/the actual amino acids could change and a new/different protein could form✓ (2)
b) . Mutation✓ (1)