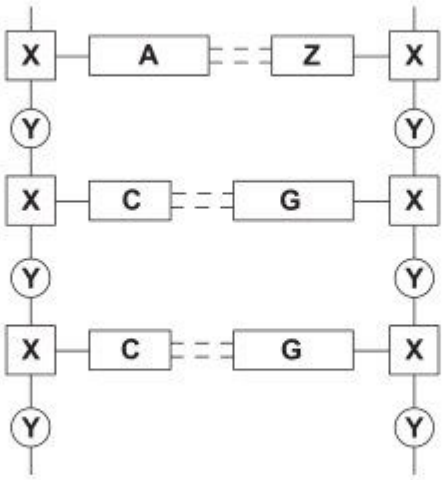
June 2007 P4 – Q7

(b) The diagram below shows a section of DNA.
Identify the blocks labelled **X**, **Y** and **Z**.



X ..... **Y** ..... **Z** .....

[3]

(c) The table below shows the 3-base codes used by RNA.

UUU	phe	UCU	ser	UAU	tyr	UGU	cys
UUC	phe	UCC	ser	UAC	tyr	UGC	cys
UUA	leu	UCA	ser	UAA	stop	UGA	stop
UUG	leu	UCG	ser	UAG	stop	UGG	trp
CUU	leu	CCU	pro	CAU	his	CGU	arg
CUC	leu	CCC	pro	CAC	his	CGC	arg
CUA	leu	CCA	pro	CAA	gln	CGA	arg
CUG	leu	CCG	pro	CAG	gln	CGG	arg
AUU	ile	ACU	thr	AAU	asn	AGU	ser
AUC	ile	ACC	thr	AAC	asn	AGC	ser
AUA	ile	ACA	thr	AAA	lys	AGA	arg
AUG	met/ start	ACG	thr	AAG	lys	AGG	arg
GUU	val	GCU	ala	GAU	asp	GGU	gly
GUC	val	GCC	ala	GAC	asp	GGC	gly
GUA	val	GCA	ala	GAA	glu	GGA	gly
GUG	val	GCG	ala	GAG	glu	GGG	gly

(i) What amino acid sequence would the following base code produce?
(You may use abbreviations in your answer.)

-AUGUCUAGAGACGGGUAA-

.....

.....

(ii) What would be the effect on the amino acid sequence if a mutation caused the base G at position 13 in the sequence to be replaced by U?

.....

.....

(d) (i) Name a disease which results from a genetic defect.

.....

(ii) Explain how the genetic defect can bring about your named disease.

.....

.....

.....

[3]

Nov 2007 P4 Q8

8 **(a)** DNA carries the genetic code in living organisms and consists of a double helix.

(i) Describe what is meant by a *double helix*.

.....

.....

(ii) How are the strands of the double helix held together?

.....

.....

[2]

(b) In replicating the genetic code two RNA molecules, mRNA and tRNA, are used to perform functions called *transcription* and *translation*.
Describe the role of the RNA molecules in these two functions.

transcription .....

.....

.....

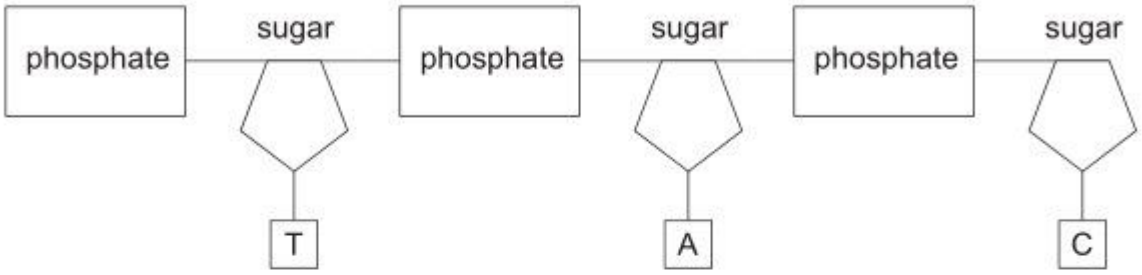
translation .....

.....

.....[4]

Nov 2009 P41 Q6

6 **(a)** The diagram shows part of one strand of DNA. Draw the complementary strand, labelling the bonds formed to the original strand, and labelling the components of the strand you draw.



[3]

(b) Briefly describe the roles of each of the following in protein synthesis.

(i) tRNA .....

.....

.....

(ii) the ribosome .....

.....

.....

[4]

(c) Some diseases, such as sickle cell anaemia, are caused by a single mutation in the DNA for a particular gene. This causes the haemoglobin produced to change the shape of red blood cells, reducing their efficiency in carrying oxygen.

(i) What is meant by a *mutation*?

.....

(ii) Explain why such a mutation could alter the bonding in haemoglobin.

.....

.....

.....

.....

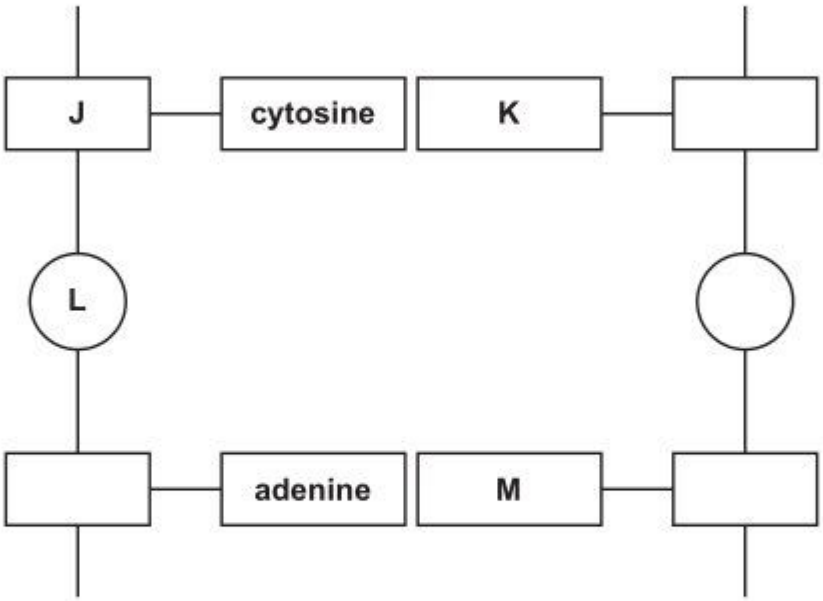
[4]

[Total: 11]

June 2010 P41 Q8

8 The molecule that contains the genetic information for an individual organism is called deoxyribonucleic acid, DNA.

(a) The diagram shows part of a DNA molecule. Study the diagram and identify the blocks labelled **J**, **K**, **L** and **M** as accurately as you can.



block letter	identity
J	
K	
L	
M	

[3]

(b) The DNA molecule is formed from two polymer strands.
What stops these strands from separating from each other?

.....

.....[2]

(c) List **three** differences between the structures of DNA and RNA.

1. .....

.....

.....

2. .....

.....

.....

3. .....

.....

.....

[3]

(d) Outline the different **roles** of mRNA and tRNA in the processes of transcription and translation.

mRNA .....

.....

.....

tRNA .....

.....

.....

[2]

[Total: 10]

Nov 2010 P43 Q9

9 DNA is an extremely important chemical in human cells. It has been described as the 'blueprint of life'.

(a) What **three** types of compound are linked together in DNA?

.....[1]

(b) DNA consists of two strands linked together. Draw a **block diagram** to illustrate this and showing **two** repeat units in the backbones, labelling the components and showing and labelling the bonds between the strands.

[4]

(c) DNA is used to encode for the production of a particular protein. Put the following biochemical structures in the correct sequence from the use of DNA as a template to the formation of the protein by writing their names in the relevant box below.

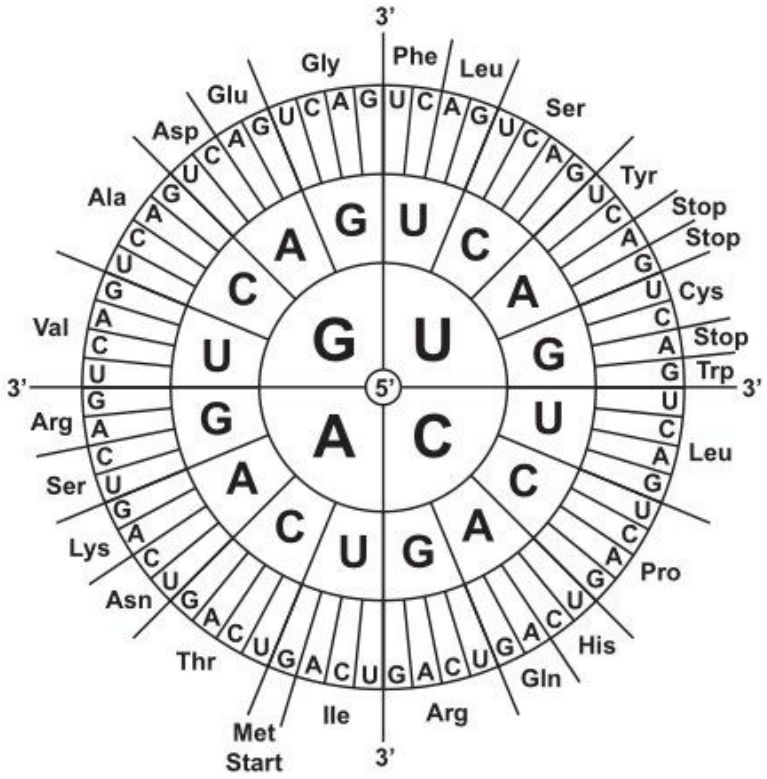
tRNA

mRNA

ribosomes

DNA ➡ [ ] ➡ [ ] ➡ [ ] ➡ protein [2]

(d) In order to produce proteins, the information stored in the DNA molecules has to be translated to produce an mRNA strand. A sequence of three bases, called a triplet, on the mRNA describes a particular amino acid. These amino acids are then combined together to form proteins. The amino acid specified by each triplet is shown below.



The sequence of three bases in a triplet is read from the middle outwards e.g. UGG specifies Trp.

(i) There are four different bases present in mRNA. How many different triplets are possible using these four bases.

.....

(ii) What peptide fragment would the following sequence code for when read from left to right? (Use 3-letter abbreviations for amino acids.)

5' – A U G A G C C G A C U U G A C G U G – 3'

.....

(iii) What would be the effect of changing the 11th base from U to C?

.....

[4]

[Total: 11]