

Antibodies and vaccination

Question Paper 7

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Immunity
Sub Topic	Antibodies and vaccination
Booklet	Theory
Paper Type	Question Paper 7

Time Allowed : 63 minutes

Score : / 52

Percentage : /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

- 1 (a) Complete the table to **describe** three differences between DNA replication and DNA transcription.

DNA replication	DNA transcription

[3]

- (b) Errors during replication may lead to gene mutations.

Define the term *gene mutation*.

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..... [2]

(c) Some disease-causing organisms undergo frequent mutation, changing their surface antigens and making the disease much more difficult to control with a vaccination programme.

(i) Explain why existing vaccines may no longer be effective when the surface antigens of a disease-causing organism change.

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..... [2]

(ii) State precisely the type of immunity gained by a person who has been vaccinated.

..... [1]

(d) The virus causing measles is said to be antigenically stable as it rarely mutates. Measles vaccination programmes have been successful in preventing epidemics in many areas.

Outline **two** reasons why measles is still common in many parts of the world, even though the vaccine is available.

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..... [2]

CHEMISTRY ONLINE
— TUITION —

[Total: 10]

2 Malaria and tuberculosis (TB) are two of the most important infectious diseases.

(a) Define the term *infectious disease*.

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.....[1]

(b) Describe how malaria is passed from an infected person to an uninfected person.

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.....[2]

Fig. 4.1 shows the worldwide distribution of malaria.

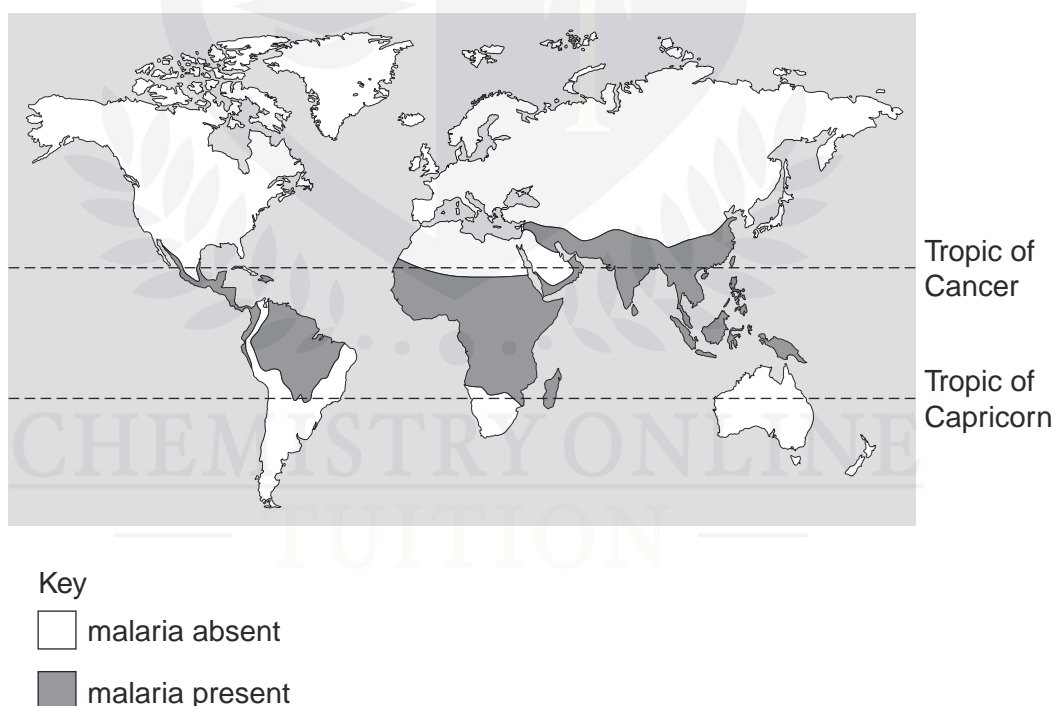



Fig. 4.1

- (c)** Unlike malaria, TB is found across the whole world.

Explain why malaria shows the distribution pattern shown in Fig. 4.1, but TB is found everywhere.




[4]

- (d)** Vaccinations are used to control infectious diseases. They were used as part of the programme to eradicate smallpox and as part of the continuing programmes against diseases such as polio and measles.

Smallpox was eradicated from the world in the 1970s. Polio is likely to be the next infectious disease to be eradicated. TB and malaria continue to be important diseases.

Explain how vaccination provides immunity as an important part of programmes to control and eradicate infectious diseases.


CHEMISTRY ONLINE
— TUTOR —
[5]

[Total: 12]

- 3 (a) Complete the table by indicating with a tick (✓) or a cross (✗) whether the statements apply to proteins, DNA, messenger RNA and cellulose.

You should put a tick or a cross in each box of the table.

statement	protein	DNA	messenger RNA	cellulose
hydrogen bonds stabilise the molecule				
glucose is the subunit molecule				
subunits are joined by peptide bonds				
may be hydrolysed to amino acids				
contains uracil				

[5]

CHEMISTRY ONLINE
— TUITION —

During an immune response, B-lymphocytes become plasma cells and begin to make polypeptides that are assembled into antibodies.

Fig. 3.1 is a diagram showing the formation of a polypeptide at a ribosome in a plasma cell.

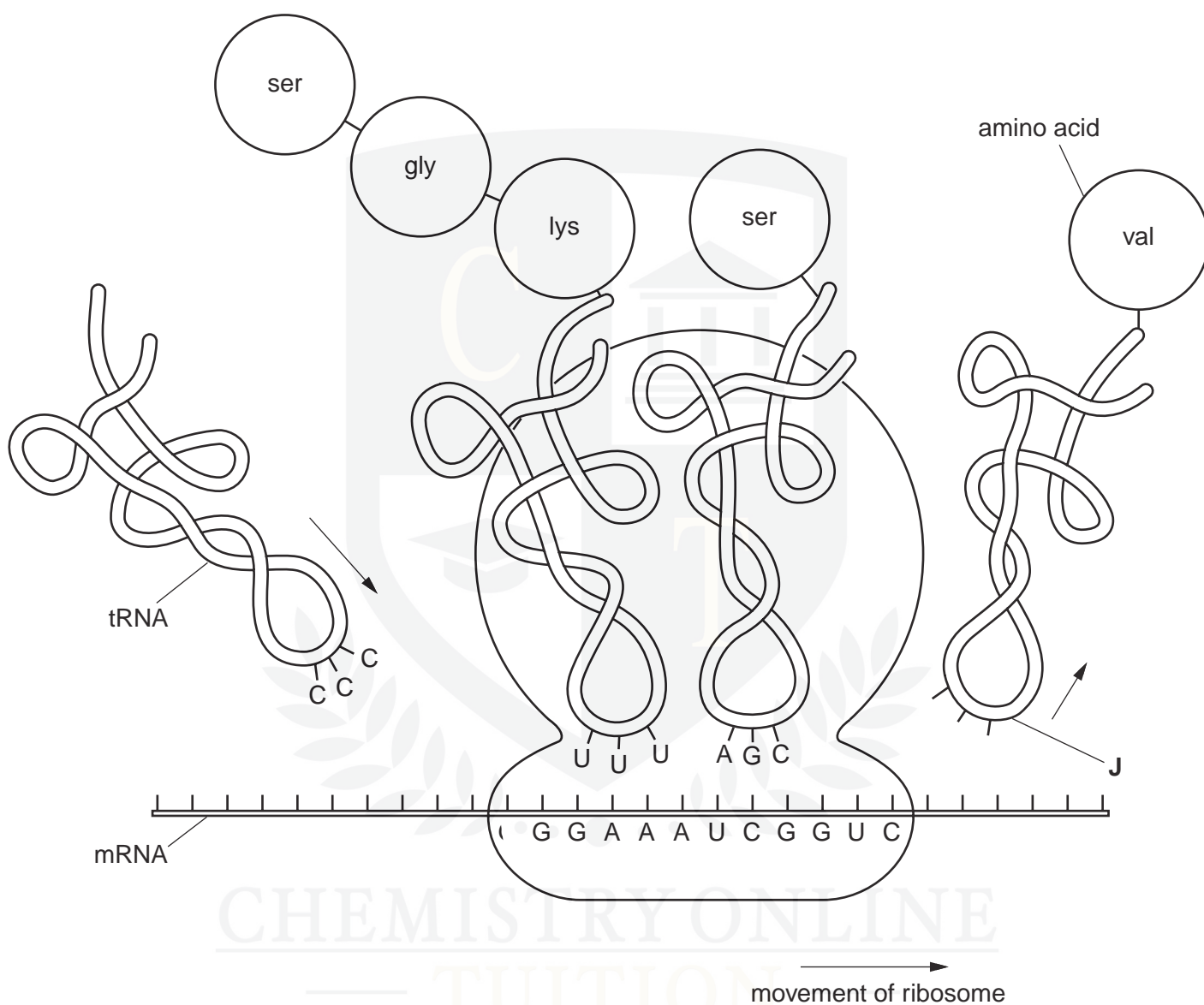


Fig. 3.1

(b) State the sequence of bases at J.


.....[1]

(c) Use the information in Fig. 3.1 to describe the role of transfer RNA molecules in translation.

[5]

The bacterium that causes cholera, *Vibrio cholerae*, releases a toxin known as cholera toxin. During an immune response to cholera some B-lymphocytes produce antibodies that combine with cholera toxin so inactivating it. Antibodies that inactivate toxins are called antitoxins.

(d) Explain how the structure of an antibody, such as the antitoxin for cholera toxin, makes it specific to one substance.


CHEMISTRY ONLINE
— TUITION —

[3]

(e) Explain why cholera remains a significant infectious disease in some parts of the world.

.....[3]

- 4 Bone marrow contains stem cells that divide by mitosis to form blood cells. Each time a stem cell divides it forms a replacement stem cell and a cell that develops into a blood cell.

Fig. 3.1 shows changes in the mass of DNA in a human stem cell from the bone marrow during three cell cycles.

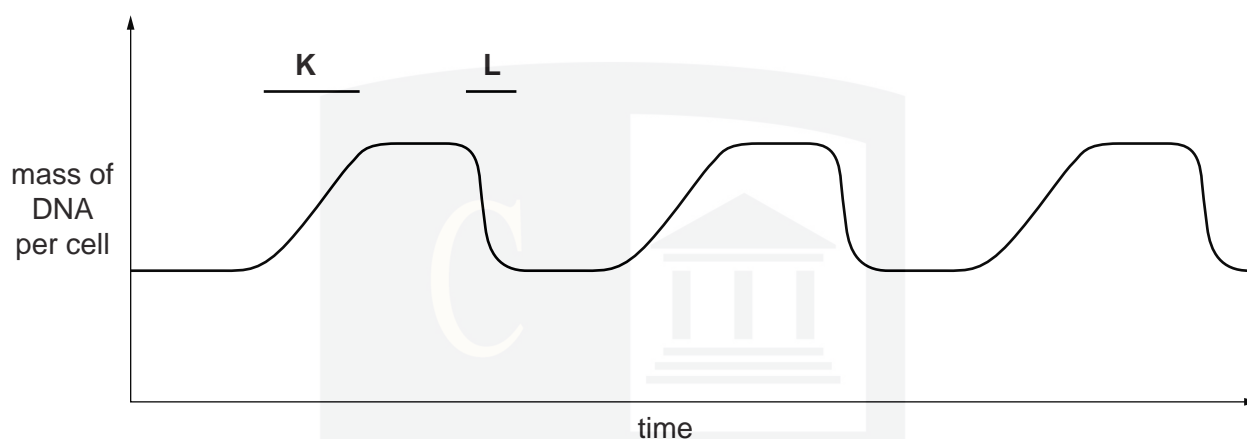


Fig. 3.1

(a) With reference to Fig. 3.1, state:

- (i) what happens to bring about the changes in the mass of DNA per cell at **K** and at **L**

K

.....

L

..... [2]

- (ii) how many blood cells are formed from the stem cell in the time shown

..... [1]

- (iii) what happens to the number of chromosomes in the stem cell.

..... [1]

Stem cells in bone marrow give rise to phagocytes, B-lymphocytes and T-lymphocytes.

(b) Describe how a red blood cell develops from a stem cell.

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..... [3]

(c) During an immune response, cells divide by mitosis.

Describe how mitosis is involved in an immune response.

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..... [3]

(d) Describe the modes of action of T-lymphocytes during an immune response.

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..... [3]

[Total: 13]