Immunity – AS 9700 Biology Nov 2022

1. Nov/2022/Paper_11/No.40

A student wrote the following statements about the production of monoclonal antibodies.

Which statement is **not** correct?

A Non-self antigen is injected into a mammal.

B Plasma cells secrete the specific antibody in response to a non-self antigen.

C Selected hybridoma cells divide by mitosis to form a clone.

D T-lymphocytes are fused with cancer cells to form hybridoma cells.

2. Nov/2022/Paper_12/No.35

Which statement about the structure of the heart is correct?

A The semilunar valves close when the pressure in the ventricles falls lower than the pressure in the arteries.

B A muscle called the septum separates the atria from the ventricles.

C There is a small patch of tissue in the right atrium that acts to delay the electrical impulse.

D Closure of valves in the veins prevents backflow of blood into the ventricles.

3. Nov/2022/Paper_12/No.39

Immunity to certain pathogens develops when a person is given a vaccination.

Which effects of vaccination are correct?

1 production of antibodies to protect against future infections

2 results in artificial active immunity

3 stimulation of appropriate lymphocytes

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

4. Nov/2022/Paper_12/No.40

A student wrote three statements about antibodies.

1 Their structure depends on peptide, hydrogen and disulfide bonds.

2 They are protein molecules with both tertiary and quaternary structure.

3 Four polypeptides provide four antigen binding sites.

Which statements are correct?

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

5. Nov/2022/Paper_22/No.2(a)

Human cytomegalovirus (HCMV) is a common virus affecting humans. In people with a fully functioning immune system, infection by HCMV usually causes no, or only mild, symptoms.

Fig. 2.1**A** is a diagram of a section through HCMV. In Fig. 2.1**B**, only the outer part of HCMV is sectioned.

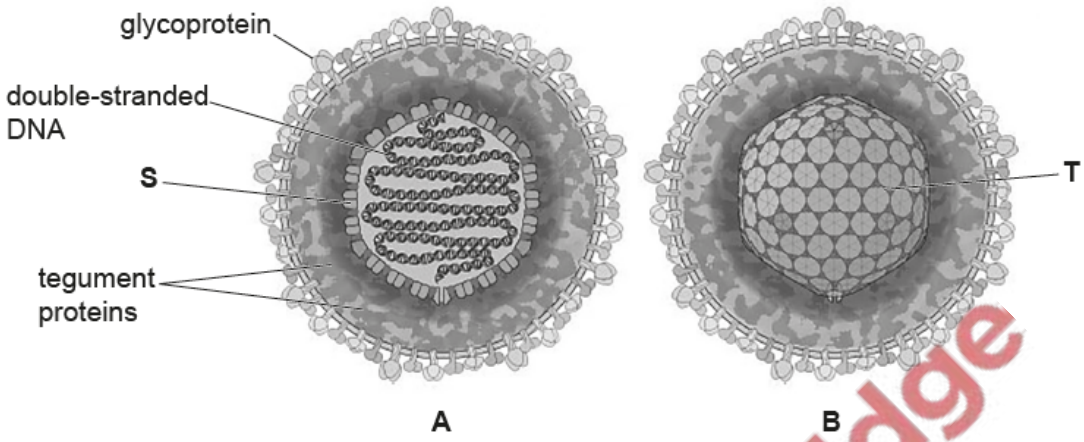

Fig. 2.1

The viral DNA shown in Fig. 2.1 contains genes that code for proteins important in viral replication and viral structure, including viral DNA polymerase and proteins known as tegument proteins.

Viruses can only replicate in host cells as they need to use processes and contents of the host cell. Complete viral particles that are released from the host cell are known as virions.

(a) Structure **S** in Fig. 2.1**A** is a subunit of structure **T** in Fig. 2.1**B**.

Name the chemical compound used to make structure **S and** name structure **T**.

S .....

T .....

[2]

6. Nov/2022/Paper_22/No.3(a_ b)

Plasmodium falciparum is one species of *Plasmodium* that causes the life-threatening disease malaria. With early diagnosis and the correct drug treatment, the pathogen can be eliminated from the body, particularly if the disease is not severe.

(a) Name the type of pathogen that causes malaria.

..... [1]

(b) To help prevent the development and spread of drug resistance in *Plasmodium*, the World Health Organization (WHO) recommends using a treatment known as artemisinin-based combination therapy (ACT).

ACT involves two different types of drug:

- a fast-acting drug derived from a compound known as artemisinin, which causes a rapid decrease in the number of *P. falciparum*
- one or more longer-acting, non-artemisinin, drugs that eliminate any remaining pathogens.

(i) Suggest why using ACT with the two different types of drug is more effective in preventing the development of drug resistance in *Plasmodium* than a treatment using only one type of drug.

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..... [2]

(ii) In some areas, partial artemisinin resistance has developed. This means ACT takes a longer time for the pathogen to be eliminated from the body.

Explain why there is an increased risk of transmission of the pathogen to other people if a person is receiving ACT and the pathogen has partial artemisinin resistance.

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..... [2]

7. Nov/2022/Paper_23/No.2(a)

Fig. 2.1 is a scanning electron micrograph showing a macrophage engulfing some bacteria.

Fig. 2.1

(a) (i) Describe how macrophages engulf bacteria.

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..... [3]

(ii) Explain the functions of lysosomes in cells such as macrophages.

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..... [3]

8. Nov/2022/Paper_23/No.5(a_ b)

Cathelicidin LL-37 is a cell signalling compound that stimulates many different cells in humans. One role of cathelicidin LL-37 is stimulating the production of endothelial cells in the formation of capillaries during wound healing.

(a) (i) Explain how it is possible for many different cell types to respond to the same cell signalling compound.

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..... [2]

(ii) Describe the appearance of the endothelial cells of a capillary.

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..... [2]

Cathelicidin LL-37 is a protein composed of 37 amino acids.

Table 5.1 shows:

- the sequence of the first 10 amino acids in the primary structure of cathelicidin LL-37
- DNA triplets in the non-transcribed strand in the gene that codes for the first 10 amino acids in the primary structure of cathelicidin LL-37.

Table 5.1

amino acid position	1	2	3	4	5	6	7	8	9	10
amino acid	leu	leu	gly	asp	phe	phe	arg	lys	ser	lys
DNA triplet	CTG	CTG	GGT	GAT	TTC	TTC	CGG	AAA	TCT	AAA

Table 5.2 shows the triplets of bases in **DNA** and the amino acids for which they code.

Table 5.2

first base	second base: T		C		A		G		third base
T	TTT	phe	TCT	ser	TAT	tyr	TGT	cys	T
	TTC		TCC		TAC		TGC		C
	TTA	leu	TCA		TAA	stop	TGA	stop	A
	TTG		TCG		TAG		TGG	try	G
C	CTT	leu	CCT	pro	CAT	his	CGT	arg	T
	CTC		CCC		CAC		CGC		C
	CTA		CCA		CAA	gln	CGA		A
	CTG		CCG		CAG		CGG		G
A	ATT	ile	ACT	thr	AAT	asp	AGT	ser	T
	ATC		ACC		AAC		AGC		C
	ATA	ile	ACA		AAA	lys	AGA	arg	A
	ATG	met	ACG		AAG		AGG		G
G	GTT	val	GCT	ala	GAT	asp	GGT	gly	T
	GTC		GCC		GAC		GGC		C
	GTA		GCA		GAA	glu	GGA		A
	GTG		GCG		GAG		GGG		G

(b) Mutations of DNA base sequences in a gene can affect the primary structure of proteins.

Use the information in Table 5.1 and Table 5.2 to suggest the effect on the primary structure of cathelicidin LL-37 of:

(i) the substitution of the base T with the base A in the middle of the triplet at position 5

..... [1]

(ii) the deletion of base T in the triplet at position 2

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..... [2]

(iii) the insertion of base G between bases G and T in the triplet at position 3.

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