CHEMISTRY ONLINE
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BIOLOGY

CELLS

Level & Board	AQA (A-LEVEL)
TOPIC:	THE IMMUNE SYSTEM
PAPER TYPE:	SOLUTION - 1
TOTAL QUESTIONS	6
TOTAL MARKS	47

The Immune System - 1

1.

(a)

A = Attachment protein

B = Capsid

(b)

- The attachment protein attaches to a receptor molecule on the cell membrane of the host helper T-cells.
- The capsid is released into the cell, where it uncoats and releases the genetic material (RNA) into the cell's cytoplasm.
- Inside the cell, reverse transcriptase is used to make a complementary strand of DNA from the viral RNA template.
- From this, double- stranded DNA is made and inserted into the human DNA.
- The enzymes host cell is then used to make viral proteins from the viral DNA found within the human DNA.
- The viral proteins are assembled into new viruses, which bud from the cell and go to infect other cells.

2.

(a)

- The cell engulfs the antibody.
- The lysome fuses with the vesicle containing ADC.
- The lysosomes breakdown the antibody to release the drug.

(b) ADC will bind to healthy cells cause decrease in them.

(c)

1kg / 1000g

Weight of mouse = 23g

$2/1000 = 2x10^{-3}g$

$2x10^{-3} \times 23 = 0.046$

0.046÷500

= 0.000092

=9.2 x10^{-5} dm^3

(d) Because the mice died.

(e)

- Use other animals to check for side-effects for example a rat.
- Use healthy humans check for side-effects.

OR

- Tested on other mammals to check for safety
- Tested on healthy humans to check for safety
- See if repeat doses stop the tumors regrowing in Group J
- Investigate different concentrations of ADC to find suitable/safe
- Dosage

3.

(a)

- RNA converted into DNA using reverse transcriptase
- DNA incorporated/inserted into helper T cell
- DNA transcribed into HIV mRNA
- HIV mRNA translated into new HIV/viral proteins for
- assembly into viral particles

(b)

- There appears to be no virus/ HIV -1, so could be a effective.
- No CCR5/receptor, so not get HIV -1 in the future.
- Only one transplant/BSCT needed shown by patient Q.
- Would not need daily ART 16 months after BSCT.

Against

- Don't know if chemotherapy/radiotherapy is needed.
- Only for HIV-1
- Don't know if it would work in all people.
- Might not be long term.

- HIV-1 may mutate and be able to bind to a different receptor on TH
- cells
- Might be a lack of suitable stem cell/BSCT donors.

4.

(a) Phagocytes degrade pathogens through phagocytosis, which involves engulfing the pathogen, killing and digesting it within a phagolysosome, and then excreting undigested matter.

(b)

- Cells from other organisms
- Tumour cells
- Cells infected by virus

(c) X written at either or both ends of Y shape.

(d) The rest of the heavy and light chains are called the constant region because they're the same between antibodies. These chains are held together by disulfide bridges. These disulfide bridges hold the four polypeptides in place to form this quaternary protein structure.

5.

(a) HIV-1 transmission severely affects the overall B cell response, resulting in an ineffective antibody response. Although potentially protective antibody types are elicited at much later times throughout the course of infection, they are ineffective in controlling viral replication at the time that they develop.

OR

Less/no antibody produced because HIV destroys helper T cells So few/no B cells activated.

(b) Not effective in treating AIDS because

- Number of T cells < 200 at 4 months so drug is not effective
- Does not remove all HIV particles.
- No stats test
- Only shows results over 16 months
- Only one person;
- Unknown side effects of drug

- No control group
  Effective in treating AIDS because
- Number of T cells > 200 after 5 months so drug is effective.

6.

(a)

- Mutation causes altered tertiary structure of viral attachment protein
- Allows attachment protein to bind to receptors of other species.

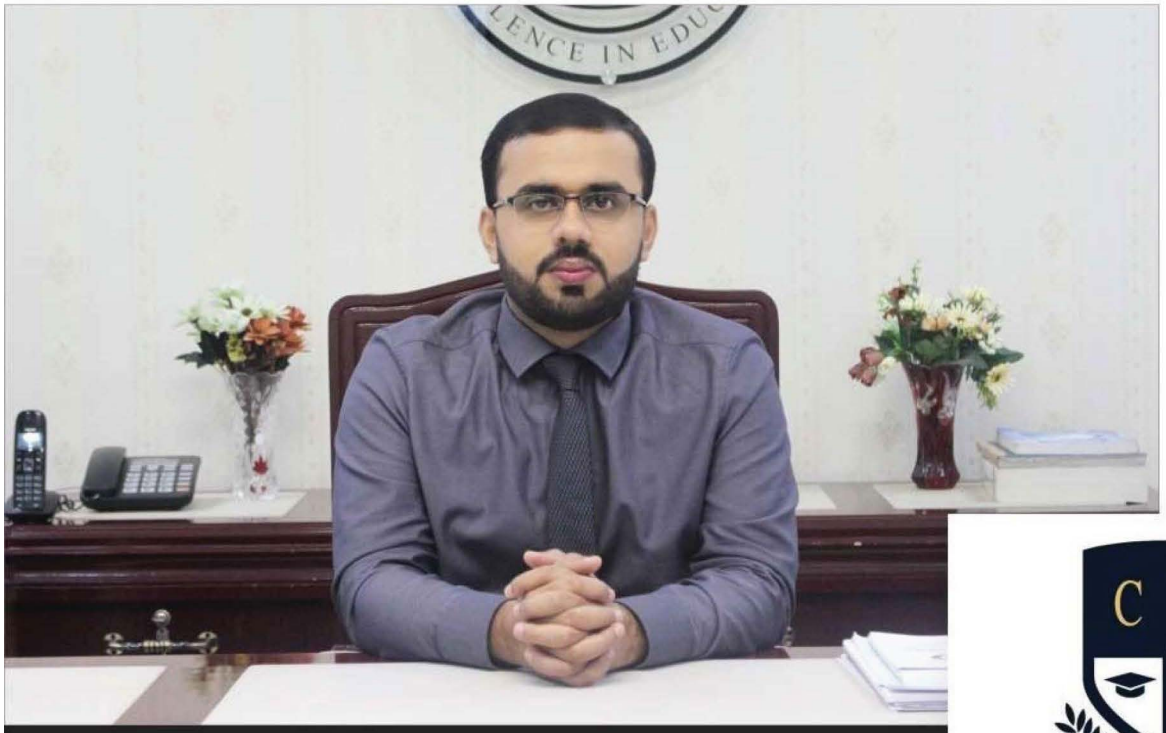
(b)

- Scientists could identify proteins derived from genetic code.
- Scientists could identify potential antigens to use in vaccine.

(c)

- B cell antibody binds to complementary antigen.
- B cells clone
- Plasma cells release monoclonal antibodies against virus
- B cells produce memory cells

I am Sorry !!!!!



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