

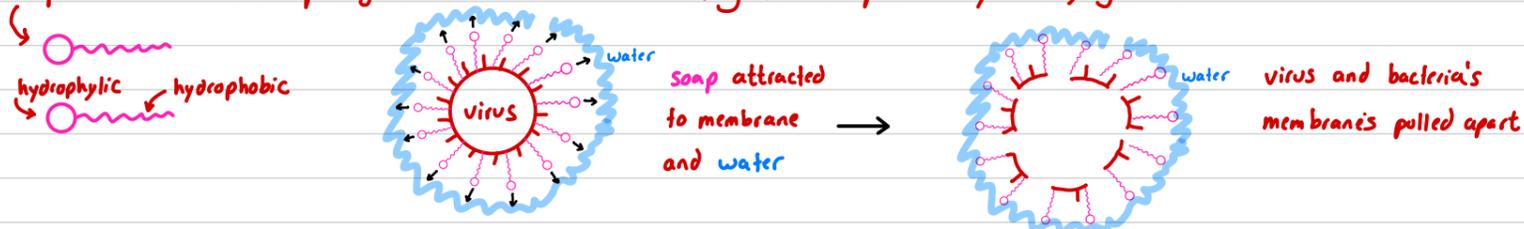
Markscheme

- ① While individual SARS-COV-2 viruses may be small enough to enter, they typically do not travel alone but in aerosol droplets making their size much larger and allowing masks to block their entry. Note, some may still enter but the vast majority will be filtered, reducing transmissibility.

review study: <https://www.sciencedirect.com/science/article/pii/S0140673620311429>

- ② alcohol disinfectants: alcohol disrupts/denatures proteins. In viruses, this destroys/disrupts protein shell (capsid) holding genetic material and in bacteria this destroys the plasma membrane. The best formulation found is 60-70% alcohol as having water aids in effect.

washing with soap: soap itself does not kill pathogens but the act of scrubbing with soap does by destroying the membrane.



* note scrubbing for at least 30sec kills 99.9% of pathogens

- ③ The flu is caused by the influenza virus, whereas antibiotics target and kill bacteria so it will be not only ineffective but harmful as it can kill beneficial bacteria in gut.

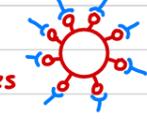
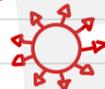
Why - antibiotics target metabolic processes (like replication and protein synthesis) or structures like cell walls which viruses do not have so they are unaffected.

- ④ While its true that they may recover and suffer minimal symptoms or long-term effects,

- they still may develop serious symptoms and even die - plenty of healthy young adults were impacted severely and died
 - by not being vaccinated, it allows the virus longer time to incubate, multiply and spread to others. This will increase transmissibility to more potential vulnerable members of society (infants, elderly, immunocompromised)
 - by not being vaccinated, it allows the virus longer time to survive and mutate, leading to new variants.
- * getting vaccinated is not just for you, but the good of the population.

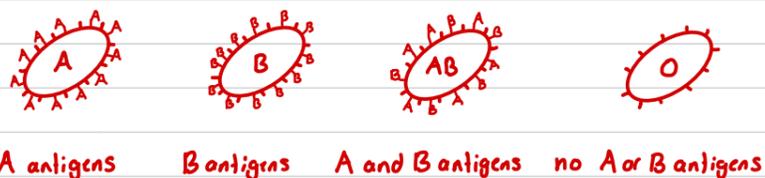
- ⑤ many possible answers.

- ⑥ a) by receiving antibodies, your white blood cells will more easily be able to destroy a particular pathogens. This will allow a much more rapid immune response as your body does not need to produce antibodies but simply deal with destroying the invader.
- b) while very beneficial for a quick response to an infection, this will not result in immunity as your body did not produce any memory cells capable of creating these antibodies. This means if the recipient were to encounter this pathogen again, they would need to undergo the entire antibody production process as if it was a brand new pathogen. Only the presence of memory cells confers immunity.

- ⑦ The first time you encountered SARS-COV-2, the antigens (spike proteins) were a specific shape.  You developed complementary antibodies  to help destroy them and retained memory cells capable of producing these.
- However, a new variant is a mutated form of the pathogen with different antigens (spike proteins)  So your antibodies don't match  so your body will need to develop new antibodies and memory cells for this variant.

- ⑧ Autoimmune disorder is when your body cannot properly distinguish foreign cells from your own cells so your immune system attacks your own body. Many examples such as: Type 1 diabetes, celiac disease, MS, lupus, Chrohn's disease, etc.

- ⑨ Different blood groups have different surface antigens:



- Type AB has both A and B surface antigens. So, if O, A or B type was given, AB person would not recognize any antigens as foreign however, if AB gave to A, type A person would recognize B as foreign, make B antibodies and destroy the cells. Same for B or O.
- Type A can donate to A and AB as A antigens will not be recognized as foreign.
Type A cannot donate to B or O as A antigens will be recognized as foreign and destroyed.
- Type O has neither A or B surface antigens. So, if O gave to A, B, AB, nothing would be identified as foreign and accepted.
However, if O received A, B, or AB it would recognize all as foreign and produce both A and B antibodies to destroy them.

- ⑩ Cutting the skin provides direct contact between outside body and inside, allowing easy access for pathogens. This is a breach of the first line of defence.

Treatment should be as follows:

- 1) Stop the bleeding: press on wound with cloth/gauze and elevate
- 2) Clean wound with running water. This will reduce risk of pathogens remaining
- 3) Apply antiseptic cream and cover with bandage - Prevent further entry + promote healing