

| Question | answers | Mark | Additional Guidance |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1 (e) 1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> | <p>mutation / change in DNA ;</p> <p>in the gene, for blood clotting protein / on X chromosome ;</p> <p>in the mother / mother is a carrier / mother is heterozygous ; R parent(s) is / are heterozygous</p> <p>haemophilia is <u>sex linked</u> / shows <u>sex linkage</u> ;</p> <p><i>idea that</i> the mother's egg with the mutant allele fuses with a Y bearing sperm ;</p> <p>e.g. cause of mutation ; ionising radiation / chemical(s)</p> | <p>[max 2]</p> | <p>MP2 can only be awarded if MP1 is awarded</p> <p>MP3 A in context of allele passing down the female line for several / many generations (without being expressed in a male)</p> <p>ignore carried on the X chromosome as this is in the question</p> |

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| 2 | (a) | <p><i>substance that</i></p> <p>speeds up a chemical reaction ; not changed during the reaction ;</p> | [2] | |
| | | | | |
| | (b) | <p>(i) <i>ideas that</i></p> <p>temperature is not a variable being investigated ; temperature is a factor that affects enzyme action ; 30 °C, optimum temperature / enzymes work best ;</p> | [max 2] | A temperature is a control variable |
| | | | | |
| | | <p>(ii) as control(s) ; <i>tube 5</i> to show that urea does not breakdown without enzymes ;</p> <p><i>tube 6</i> to show that beans are not source of pH change ;</p> | [max 2] | |
| | | | | |
| | | <p>(iii) soya and jack beans have urease ; mung and broad beans have no urease ; mung and broad beans may have low concentration of urease ; jack beans have more urease than soya beans ;</p> | [max 3] | A more active |
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| 2 | (c) | converted to, nitrite (ions) / nitrate (ions) ; by nitrifying bacteria ; absorbed by plants ; vapourises ; donates hydrogen ions ; (hydrogen ions from ammonium ions) reacts with lime in neutralised (in this context only) ; | [max 2] | |
| | | | | |
| | (d) | (i) (gastric juice contains) hydrochloric acid ; low pH ; kills bacteria / stops them dividing ; AVP ; | [max 2] | |
| | | | | |
| | | (ii) urease produces ammonia ; neutralises, stomach acid / hydrochloric acid ; | [2] | |
| | | | | |
| | | (iii) <i>lymphocytes secrete</i> antibodies ; phagocytes engulf bacteria ; | [2] | |
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| | | | [Total: 17] | |

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| 3 (a) | <p>1 enter, blood / plasma / lymph ;</p> <p>2 infect / enter, white blood cell / lymphocyte / phagocyte / AW ;</p> <p>3 infect, brain / liver / lungs / skin / reproductive system / kidney / gut ;</p> <p>4 cannot reproduce ;</p> <p>5 may be transmitted to another person ;</p> <p>6 e.g. of method of transmission ; R excreted, die</p> | [max 2] | <p>A ref. to antibodies combining with virus</p> <p>A 'attack' / 'invade' white blood cells</p> <p>A 'attack' / 'invade' / enter</p> <p>MP6 A sexual intercourse / in blood / in breast milk / across placenta / needle stab</p> |
| (b) | <p>1 infects / destroys / kills, phagocytes ;</p> <p>2 destroys / kills / disables, <u>lymphocytes</u> ;</p> <p>3 fewer antibodies produced ;</p> <p>4 ref. to, T lymphocytes / T cells ;</p> <p>5 slow / no / weaker, immune response / response by immune system ;</p> <p>6 <i>idea of increased susceptibility to disease / infection / (named) pathogens ;</i> A viruses / bacteria cancers ;</p> <p>7 fungal infections / TB / pneumonia / named disease linked with HIV ; R common cold</p> <p>9 develop AIDS ;</p> <p>10 AVP ;</p> | [max 3] | <p>A no phagocytosis</p> <p>A fewer lymphocytes R 'attacks' / 'damages'</p> <p>A 'immune system not working'</p> <p>A suppresses / damages, immune system</p> <p>A 'can't fight disease'</p> <p>MP3–8 A <i>answers that give role(s) of immune system followed by 'this doesn't happen'</i></p> |
| (c) (i) | (substance) changes / modifies / affects, (chemical) reactions in the body / how the body works ; | [1] | I category of drug, medicine, specific effects of named drug, etc. |
| (ii) | <p><i>antibiotics</i> if 'antibodies' written rather than antibiotic – mark to max 1</p> <p>are not effective against viruses / only effective against bacteria ;</p> <p><i>idea that</i> nothing for them to act on ; e.g. cell wall / protein synthesis / cellular structure / capsule</p> | [2] | <p>I viruses inside cells</p> <p>A do not work against viruses</p> <p>A ORA</p> <p>R 'life processes'</p> |
| [Total: 8] | | | |