**2020 ATAR Paper  
Question 40 (20 marks)**

1. hGH is released from the pituitary gland. State from which lobe of the pituitary this hormone is secreted and explain the relationship between this section of the pituitary gland and the hypothalamus. (6 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| secreted from the anterior lobe | 1 |
| communication between the hypothalamus and the anterior pituitary occurs through chemicals/hormones | 1–5 |
| through the infundibulum/blood vessels |
| hypothalamus stimulates the anterior pituitary to release hormones |
| via releasing factors/hormones |
| the hormones are released into a capillary network and transported through veins |
| also produces inhibiting factors to inhibit activity of the pituitary |
| **Total** | **6** |

1. hGH is a water-soluble hormone. Explain how hGH enters and affects the functioning of its target cell. (6 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Enters target cell | |
| dissolve in water (not fats) so cannot pass through cell membrane | 1–3 |
| hormone molecule attaches to receptor molecule |
| receptor molecule found on surface of target cell |
| receptor molecule must match shape of signalling molecule |
| **Subtotal** | **3** |
| Affects target cell | |
| binding of hormone to receptor triggers a secondary messenger/response inside the cell | 1–3 |
| secondary messenger activates enzymes inside the cytoplasm |
| enzymes adjust chemical activity of the cell |
| speed of reactions will either increase or decrease |
| **Subtotal** | **3** |
| **Total** | **6** |

1. Dwarfism can be treated using synthetically produced hGH. Explain how hGH could be produced using recombinant DNA technology. (8 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| gene for hGH located (on human chromosome) | 1–8 |
| gene cut out using endonuclease/treated with restriction enzyme |
| cuts DNA at specific sites/produces sticky ends |
| plasmid cut with same restriction enzyme |
| gene inserted into plasmid using ligase |
| acts as a vector/produces a transgenic organism |
| recombinant plasmid enters into host bacterial cell |
| which propagates/replicates/clone |
| bacteria express gene to synthesize human protein/hormone |
| produces large scale amounts of hGH |
| **Total** | **8** |