Ant's Extended Answer Section

Question 40

a)

	Transcription	Translation
Where the process occurs	In the nucleus (1)	In the cytoplasm / attached to ribosome (1)
The processes involved	• Section of DNA unwrapped/unzipped. (1) • RNA polymerase (1) • adds complementary bases to DNA (1) • to form messenger RNA (mRNA) (1) • Uracil replaces thymine (1) • Introns removed / mRNA modified (1)	• mRNA attaches to ribosome (1) • transfer RNA (tRNA) brings specific amino acid to mRNA (1) • Codon on mRNA (1) • matches to anticodon on tRNA (1) • Chain of amino acids forms. • Process repeated to make many protein molecules (dependent of the gene that is transcribed) (1)
Main molecules involved	DNA, RNA polymerase, mRNA (Marks given above)	mRNA, tRNA, (rRNA), amino acids, ribosomes (Marks given above)

Max. of 5 marks for transcription and translation addressing the criteria.

b)

Genetic probe

Technologies

- Identify gene.
- Fragment of DNA (or RNA) labelled with radioactive isotope / fluorescent marker.
- Binds to specific sequence of bases in another DNA (or RNA) molecule / Produces complementary strand.

Influence

- Used to detect presence of heritable diseases.
- Target specific genes suspected of being involved in genetic diseases.

PCR

Technologies

- Denaturing: heat DNA to high temperature to separate strands.
- Annealing: attach primers to DNA (to initiate duplication).
- Elongation: Use of Taq/DNA polymerase to synthesise DNA.

Influence

- Produce large amounts of DNA.
- For DNA profiling (or other suitable).

Question 41

a)

Transmission

- Nerve at rest. (0.5)
- Depolarisation causes sodium (ion) gates to open. (0.5)
- Sodium floods into the neurone. (0.5)
- Causing membrane to go from negative (-70 mV) to positive (+35 mV) (1)
- Potassium (ion) gates open as sodium (ion) gates close. (0.5)
- Potassium leave neurone. (0.5)
- Repolarising membrane. (1)
- Na^+/K^+ pump restores resting potential (across membrane) (0.5)
- Refractory period follows (so no further stimulation can occur immediately) (0.5)
- Diagram of action potential. (1)

Max. = 6 marks

Propagation

- Nerve impulse disrupts next part of the membrane / Depolarisation of next part of membrane. (1)
- Saltatory conduction (1)
- (due to ionic / charge difference) so impulse jumps / travels from node to node. (1)

Max. = 2 marks

At muscle

- At the motor end plate (1)
- Neurotransmitters released (1)
- Such as noradrenalin and ACh (1)
- These are released from vesicles (0.5) into the synaptic cleft (0.5)
- They diffuse/move across this cleft (1)
- and bind to receptors on muscle (1)

Max. = 5 marks

b)

Effects

- Loss in total number of cerebral neurons / Loss of neurons in the brain (1)
- Loss in number of dendritic connections between cerebral neurons (1)
- Patients experience memory loss/confusion/mood swings/aggression/general withdrawal (1)
- Patients experience difficulty with processing information and making decisions / Dopamine regulation disturbed (1)

  4 points for 4 marks

Stem cell effectiveness

- Obtain stem cells from embryo or adult bone marrow (1)
- These are multi/pluripotent (1)
- Treat stem cells with chemicals to establish them as neurons (1)
- Introduce these cells into patient brains (1)

Any three points = 3 marks

Question 42

a)

- Short, wide pelvis/sacrum (1) to support abdominal organs and support a carrying angle at the knees/muscle attachment for gluteals (1)
- Pelvis tilts forward (1) to help create lumbar curve (1)
- Impact of acetabulum effecting carrying angle /Carrying angle of knees (1) so they sit directly under midline of the body (1)
- Long femurs (1) allow an energy efficient long stride length/lower centre of gravity (1)
- Large medial condyles at knee / joint on outside of knee (1) account for carrying angle/ load bearing (1)
- Two arches present in foot (longitudinal and transverse) (1) to allow smooth transfer of weight from heel to toe and spring when pushing off (1)
- Non-opposable and large first digit (big toe) (1) to push off and increase stability (1)
- Robust tarsals (1) for load bearing (1)

Any four pairs = 8 marks

- Bipedalism allowed for free hands (to develop tools) / mobility of digits increased as did ability to manipulate (1)
- As upright, formed a greater deterrent to predators (1)
- Higher reach to pick things up from low branches (1)
- Reduced surface area (as less of body exposed to sun) (1)
- Could see further in developing grassland areas (1)

Any 2 = 2 marks

b)

- A population of australopithecine multiplied and spread over large territory (1)
- A geographic barrier developed (mountain range, water body) (1)
- Separated one population into two populations (1) and
- Prevented gene flow (1)
- Different populations experienced different selective pressures (1)
- And different mutations (1)
- Different features were selected (1)
- Populations accumulated differences and became reproductively isolated to become two distinct species (1)

Any six points = 6 marks

c)

- Development of tool culture / Acheulian or Hand Axe Industry (1)
- Greater variety in diet, including meat (1)
- Use of fire (1)
- Use of constructed shelter (1)
- Greater development of speech communication (1)
- Cooperative hunting (1)
- Greater group numbers (1)

Any four points = 4 marks