GradeMax

Pearson

Mark Scheme (Results)

Summer 2026

Pearson Edexcel International Advanced Level in Biology

WBI15/01

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Additional guidance	Mark
1(a)(i)	**The only correct answer is B (deoxyribose sugar and thymine)** ***A*** *is not the correct answer as uracil is not a DNA base* ***C*** *is not the correct answer as ribose is not the sugar in DNA and uracil is not a DNA base* ***D*** *is not the correct answer as ribose is not the sugar in DNA*		**(1)**

Question number	Answer	Additional guidance	Mark
1(a)(ii)	**The only correct answer is D (phosphodiester bonds)** ***A*** *is not the correct answer as glycosidic bonds form between saccharides not mononucleotides* ***B*** *is not the correct answer as hydrogen bonds hold the bases together not the mononucleotides* ***C*** *is not the correct answer as peptide bonds form between amino acids in polypeptides not in mononucleotides*		**(1)**

Question number	Answer	Additional guidance	Mark
1(b)(i)	A description that includes two of the following points: • {(restriction) endonucleases / restriction enzymes} are used to {cut (out) / isolate} the {gene / CSP8 / plasmid} (1) • (DNA) ligase to {splice / connect / join} {sticky ends / plasmid and gene(s)} (1) • using (DNA) polymerase to make copies of the gene (1)	Please do not give 2 marks for endonucleases cutting gene and plasmid **IGNORE** RE unqualified **ACCEPT** (DNA) ligase forms phosphodiester bond between (adjacent) {DNA / plasmid and gene} (strands) **ACCEPT** ligase inserts gene into plasmid **IGNORE** bacterial DNA unqualified **ACCEPT** reverse transcriptase transcribes mRNA into cDNA	**(2)**

Question number	Answer	Additional guidance	Mark
1(b)(ii)	An answer that includes four of the following points: **Advantages** • increased {crop yields / farmer profits} / less financial risk / increased food {supplies / security} (1) • land which was previously unsuitable for farming could be used (e.g. arid land) / can be grown in countries with low rainfall (1) **Disadvantages** (max 2) • cross breeding / accumulation of GM material in other species / horizontal gene transfer (1) • unknown long-term effects of GMOs (on food chain) (1) • increased costs of {seeds / food / maize} produced (1)	**ACCEPT** uses water more effectively / grows deeper roots **IGNORE** uses less water **IGNORE** other GM produced qualities – pest resistance flavour/ nutrient levels / they are resistant to drought unqualified **ACCEPT** can be grown in {arid / semi-arid} areas **IGNORE** {maize / crop mutating} / monoculture / decrease in biodiversity / disrupting food chain / out competing / superweeds / superpests **ACCEPT** special care needed to get best results e.g. exact fertilisers, seeds planted right distance apart **IGNORE** the process of genetically modifying the plants being expensive	**(4)**

Total for Question 1 = 8 marks

Question number	Answer	Additional guidance	Mark
2(a)(i)	A calculation showing the following steps: • calculation of volume of sphere (1) • answer given to two significant figures (1)	 2144.66 / 2144.7 (mm^3) 2143.57 / 2143.6 (mm^3) if use 3.14 2145.52/ 2145.5 (mm^3) if use 22/7 2100 (mm^3) or 2.1×10^3 ECF if use diameter instead of radius for 1 mark 17157.25 = 17000 or 1.7×10^4	 **(2)**

Question number	Answer	Additional guidance	Mark
2(a)(ii)	A calculation showing the following steps: • 28.6 (%)	((2 x 2) ÷ 14) x 100 = 28.6 % **ALLOW** 28.57 (%) / 29 (%) **IGNORE** 28 **ACCEPT** correct answer with no working	**(1)**

Question number	Answer	Additional guidance	Mark
2(a)(iii)	An answer that includes the following points: • (large eyes) allow a large {pupil / retina} (1) • credit the consequence of a large {retina / pupil} (1)	**ACCEPT** allows for {greater / more} dilation **ALLOW** more rod cells **IGNORE** pupil dilates unqualified e.g. allows enough light to see predators e.g. allows more light in to {detect / find / see} {food / insects / prey} **IGNORE** allows them to see at night so they can eat	**(2)**

Question number	Answer	Additional guidance	Mark
2(b)(i)	**The only correct answer is B** ***A*** *is not the correct answer as it is the constriction* ***C*** *is not the correct answer as it is the nucleus* ***D*** *is not the correct answer as it is the synaptic region*		**(1)**

Question number	Answer	Additional guidance	Mark
2(b)(ii)	An explanation that includes two of the following points: • rod cells are sensitive to {dim light / low light (intensity)} (1) • several rod cells synapse with the same **bipolar** {cell / neurone} (1) • producing (lots of small) generator potential(s) (1) • (therefore) triggering action potentials (in **bipolar** neurone) (1)	**ACCEPT** rod cells contain high amounts of rhodopsin / rhodopsin is sensitive to low light intensities **ACCEPT** many rod cells {link / synapse} to a single neurone **ACCEPT** retinal convergence **ACCEPT** summation of generator potentials trigger an action potential in **bipolar** neurone gains mp3 and mp4 **PLEASE NOTE** to get mp4 they need to refer to bipolar neurone somewhere in their answer	**(2)**

Question number	Answer	Additional guidance	Mark
3(a)(i)	**The only correct answer is C (T)** ***A*** *is not the correct answer as Q is responsible for osmoregulation* ***B*** *is not the correct answer as S is responsible for bring blood into the nephron* ***D*** *is not the correct answer as V is responsible for osmoregulation*		**(1)**

Question number	Answer	Additional guidance	Mark
3(a)(ii)	• 1. (letter) S 2. (letter) R	Both answers needed **Do not accept** 1. (letter) R 2. (letter) S	**(1)**

Question number	Answer	Additional guidance	Mark
3(a)(iii)	A description that includes three of the following points: • (glucose reabsorbed) in {proximal convoluted tubule / PCT} (1) • sodium ions are {actively pumped / moved by active transport} into the {blood / capillaries} (from the epithelial cells lining the proximal tubule) (1) • sodium ions move (down their concentration gradient) by facilitated diffusion (1) • glucose moves into the {blood / capillaries} by (facilitated) diffusion (1) • (sodium ions / glucose move) through a sodium-glucose cotransporter protein (1)	**ACCEPT** proximal tubule / first convoluted tubule **ACCEPT** sodium ions are {actively pumped / moved by active transport} out of epithelial cell **ACCEPT** glucose moves through {GLUT / (co-)transport protein / carrier protein}	**(3)**

Question number	Answer	Additional guidance	Mark
3(b)(i)	• Any value between 4.7 : 1 and 7.0 : 1 (1)	**ACCEPT** whole numbers in the ratio e.g. 7 : 1	**(1)**

Question number	Answer	Additional guidance	Mark
3(b)(ii)	An answer that includes three of the following points: • long(er) loop of Henle (1) • more {Na+ / K+ / Cl-} move through {carrier proteins / channels / pumps} (1) • (more) sodium ions move {out of ascending limb / into medullary fluid} (1) • greater countercurrent effect (1) • {more / greater} reabsorption of water by osmosis (1)	**ACCEPT** more aquaporins (in DCT / collecting duct) **ACCEPT** collecting duct cells become more sensitive to ADH **ACCEPT** ADH causes walls of collecting duct to become (more) permeable (to water) **ACCEPT** {water potential gradient steeper / decrease in water potential / solute concentration higher} {in interstitial fluid / medulla} **IGNORE** salt	**(3)**

Question number	Answer	Additional guidance	Mark
4(a)(i)	• 14.69 : 1 (1)	If answer given to one decimal place e.g. 14.7 = 0 marks	**(1)**

Question number	Answer	Additional guidance	Mark
4(a)(ii)	• Correct answer (1)	E.g. covered in feathers huddling together (accept description) insulating layer of fat (beneath skin) dense feathers small {beak / tails / flippers} Blubber (beneath skin) {small / hidden} ears dark {colour / feathers} IGNORE fur / furry / low SA volume ratio / thick skin	**(1)**

Question number	Answer	Additional guidance	Mark
4(a)(iii)	An answer that includes the following points: • thermoreceptors in (skin / spinal cord / brain) detect {fall / change in / low(er)/ cold(er)} (blood / core) temperature (1) • impulses sent to {hypothalamus/ thermoregulatory centre} / {hypothalamus/ thermoregulatory centre} sends impulses {via motor neurones / to (named) effectors} (1) • description of how effectors reduce heat loss (1)	**IGNORE** references to increase in temperature **ACCEPT** hypothalamus instead of thermoreceptors **REJECT** signals / messages **ACCEPT** CNS sends impulses to (named) effector e.g. {blood vessels to constrict / less blood flows to skin / vasoconstriction} e.g. sweat glands to stop secreting sweat (so less evaporative heat loss) e.g. increased shaking / involuntary contraction of muscles /shivering e.g. initiates penguins to shift weight onto their heels and tails e.g. initiates huddling behaviour **ACCEPT** nervous system stimulates release of hormones involved in changing metabolic rate **IGNORE** comments relating to fur / hair	**(3)**

Question number	Answer	Additional guidance	Mark
4(b)(i)	**The only correct answer is D (secondary structure)** ***A*** *is not the correct answer as it is not globular* ***B*** *is not the correct answer as it is not a carbohydrate* ***C*** *is not the correct answer as it is folded*		**(1)**

Question number	Answer	Additional guidance	Mark
4(b)(ii)	A description that includes four of the following points: • AVT is {transported in / released into} the blood (1) • AVT cannot {cross the cell membrane / cannot diffuse into the cells} (1) • (therefore), AVT will bind to a {protein / receptor} (on the cell membrane) (1) • (resulting in) {formation / activation} of a {secondary messenger / cAMP} (1) • (secondary messenger) acts as a transcription factor (1) • so increased gene expression causing production of {water channels / aquaporins / proteins} (1)	**IGNORE** {stimulation / activation} of transcription factor **ACCEPT** more aquaporin genes {switched on / transcribed} **ACCEPT** more translation (of aquaporins)	**(4)**

Question number	Answer	Additional guidance	Mark
5(a)(i)	**The only correct answer is A (J)** ***B*** *is not the correct answer as it is not the extensor muscle* ***C*** *is not the correct answer as it is not the extensor muscle* ***D*** *is not the correct answer as it is not the extensor muscle*		**(1)**

Question number	Answer	Additional guidance	Mark
5(a)(ii)	**The only correct answer is B is the correct answer** ***A*** *is not the correct answer as statement two is incorrect* ***C*** *is not the correct answer as statement two is incorrect* ***D*** *is not the correct answer as statement two is incorrect*		**(1)**

Question number	Answer	Additional guidance	Mark
5(b)	A calculation showing the following steps: • calculation of stroke volume (1) • (any) conversion from dm^3 into cm^3 (1)	37 / 128 = 0.289 (dm^3) X1000 = 289 (cm^3) **ACCEPT** 289.1(cm^3) / 289.06 (cm^3) **ACCEPT** 1000 x 37 = 37000 (cm^3) for 1 mark **IGNORE** 3 decimal places or more Correct answer with no working = 2 marks	**(2)**

Question number	Answer	Additional guidance	Mark
5(c)	An answer that includes the following points: • higher {proportion / concentration} of fast twitch (muscle fibres) (1) • fast twitch muscles respire {anaerobically / without using (much) oxygen} (1) • to provide short burst of {speed / power / rapid movement / high intensity activity} (1)	**ACCEPT** more fast twitch (muscle fibres) **ACCEPT** correct refs to {glycogen / ATP/PC system / creatine phosphate / phosphocreatine} **IGNORE** myoglobin / capillaries **ACCEPT** {explosive / rapid / fast} contraction (of muscle fibres) **ACCEPT** run very fast (for short period of time) **IGNORE** comments on amount of energy required	**(3)**

Question number	Answer	Additional guidance	Mark
5(d)(i)	• the ratio of the (volume of) carbon dioxide produced to oxygen consumed (1)	**ACCEPT** as an equation **ACCEPT** (volume) CO_2 produced divided by (volume) of O_2 consumed **IGNORE** {number / amount / value} not an acceptable alternative to ratio **IGNORE** CO_2 respired	**(1)**

Question number	Answer	Additional guidance	Mark
5(d)(ii)	• 0.07 (1)		**(1)**

Question number	Answer	Additional guidance	Mark
5(d)(iii)	An answer that includes the following points: • {at time 0 / initially} athlete have an RQ of {0.68/ 0.7} which indicates they are using (mostly) lipids for respiration (1) • (RQ changes) during first {90/100} seconds (as) they are using increasingly {fewer lipids / more carbohydrates} (1) • (RQ changes) from (90 / 100 –) {280 / 300} seconds {no lipids / only carbohydrates} being used (1)	**IGNORE** description of changes of RQ **ACCEPT** initially lipid is main respiratory substrate **ACCEPT** aerobic respiration occurs {during first part of race / before {90/100} seconds / when RQ is ≤1} **ACCEPT** after {90 /100} seconds athlete switches to anaerobic respiration (as RQ >1) **ACCEPT** anaerobic respiration occurs when RQ>1 **ACCEPT** 280 seconds onwards the athlete (mainly) uses anaerobic respiration (for their final sprint) **ACCEPT** because oxygen levels in the muscles have {become very low / developed an oxygen debt}	**(3)**

Question number	Answer	Additional guidance	Mark
6(a)	A description that includes the following points: • conduction velocity is faster in myelinated (than nonmyelinated) (1) • for nonmyelinated neurones increased axon diameter increases conduction velocity (1) • for myelinated neurones there is no correlation between (decrease in) diameter and conduction velocity (1)	**ACCEPT** converse for all marking points	**(3)**

Question number	Answer	Additional guidance	Mark
6(b)(i)	A description that includes three of the following points: • {acetylcholine / neurotransmitter} is released from the vesicle into the synapse (1) • (acetylcholine) diffuses across the {synapse /synaptic cleft} (1) • binds to an (acetylcholine) receptor on the post-synaptic membrane (1) • (causing) {sodium channels open / influx of sodium ions} (resulting in depolarisation of the post-synaptic membrane) (1)	**ACCEPT** vesicles (containing acetylcholine) {fuse / bind} with presynaptic membrane **ACCEPT** acetylcholine released by exocytosis **ACCEPT** through for across If they say acetylcholine diffuses and binds to receptors on post synaptic membrane they get mps 2 and 3 **IGNORE** action potential	**(3)**

Question number	Answer	Additional guidance	Mark
6(b)(ii)	An explanation that includes two of the following points: • (fewer acetylcholine receptors) so reduced chance of generating a threshold potential (in post synaptic membrane) (1) • fewer impulses transmitted to muscle (fibres) (1) • less (forceful) contraction of muscle (fibres) (1)	**REJECT** 'no' in mps 1,2 and 3	**(2)**

Question number	Answer	Additional guidance	Mark
6(b)(iii)	An answer that includes two of the following points: • prevents breakdown of {acetylcholine / ACH} / increases concentration of acetylcholine in the synaptic cleft (1) • (therefore) continuing the stimulation of the receptors (of post-synaptic neurone) (1) • sodium ions channels (continue to) open (1) • (therefore) threshold is reached / generating {action potentials / impulses} (in motor neurone) (1)	**ACCEPT** acetylcholine remains in the synaptic cleft **ACCEPT** acetylcholine continues to bind to post-synaptic neurone receptors	**(2)**

Question number	Answer	Additional guidance	Mark
7(a)(i)	**The only correct answer is A** ***B*** *is not the correct answer as Pfr does not absorb red light* ***C*** *is not the correct answer as Pr does not break down in the dark and Pfr does not absorb red light* ***D*** *is not the correct answer as Pr does not break down in the dark*		**(1)**

Question number	Answer	Additional guidance	Mark
7(a)(ii)	**The only correct answer is A** ***B*** *is not the correct answer as statement 3 is incorrect* ***C*** *is not the correct answer as statement 1 is incorrect* ***D*** *is not the correct answer as statements 1 and 3 are incorrect*		**(1)**

Question number	Answer	Additional guidance	Mark
7(a)(iii)	A description that includes three of the following points: • (phytochrome / Pfr) enters the nucleus (1) • {binds to / activates} transcription factor (1) • (initiates) transcription of gene(s) (involved in germination) (1) • consequence of altered gene expression on germination (1)	**ACCEPT** binds to with {PIF (3) / phytochrome-interacting factor (3)} **IGNORE** Pfr **acts** as a transcription factor **ACCEPT** allowing RNA polymerase to bind to gene(s) (involved in germination) **IGNORE** activation of gene e.g. stimulating cell division / lowers level of abscisic acid / turns on genes for {gibberellic acid / GA} / increases GA concentration / gibberellin produced / amylase produced / activates enzymes / amylase breaks down starch **IGNORE** enzymes produced unqualified	**(3)**

Question number	Answer	Additional guidance	Mark
7(b)(i)	A calculation showing the following steps: • calculation of **both** numerator and denominator (1) • 43 % (1)	47.5 - 30.7 = 16.8 AND (47.5 + 30.7) ÷ 2= 39.1 (16.8 ÷ 39.1) x 100 = 42.9668 Correct answer with no working gains both marks ECF correct answer given with decimal places gains 1 mark	**(2)**

Question number	Answer	Mark
7(b)(ii) 1 2 3 4 5 6	**Indicative content** **Graph 1** • IAA content in the roots has decreased at low light intensity / IAA content in the roots is higher in normal light intensity • IAA content in the roots has 7.5 ng more in normal light intensity **Graph 2** • at low light intensity the volume of IAA flowing down the phloem has decreased / difference being 0.6au mean flow rate / correct use of data • in normal light intensity mean flow of IAA in phloem is higher • less IAA in the phloem results in a lower concentration of IAA in the roots **Table** • (mean) root mass is greater in normal light intensity / root mass is lower in low light intensity • (mean) root {length / growth} is greater in normal light intensity / root {length / growth} is lower in low light intensity • the number of side roots is the same in normal and low light intensity **General Information on IAA** • IAA is produced in the growing tips of plants / meristems • details of cell elongation • IAA diffuses downward moving to the shaded side of the stem • too {low / high} concentrations IAA inhibits the growth of roots (through cell elongation) • other concentrations of IAA in the roots promotes growth of roots (through cell elongation) Comment linked to photosynthesis • low light intensity will reduce the rate of photosynthesis / accept converse • plant has less glucose available for respiration so cannot use this for as much growth • plant priorities its limited glucose / energy to grow stem taller (for photosynthesis) / roots do not have sufficient resources to support cell division • a lower photosynthetic rate reduces the synthesis of IAA Comment on methodology • with mean mass error bars do not overlap so **difference** is significant • with mean flow rate of IAA in the phloem error bars do not overlap so **difference** is significant • no data on measurements of light intensities. • no mention of species of plant / age of plant / number of plants / growing conditions/environmental conditions	**(6)**

Question number	Answer	Additional guidance	Mark
8(a)	An explanation that includes three of the following points: • ATP binds to the myosin head and {cross bridge is broken / myosin head detaches} (1) • ATP is hydrolysed (1) • (providing energy) to change the myosin (head) {shape / position} (1) • (after new crossbridge formed) ADP and Pi released and then {myosin head bends forward / moves actin filament / allow the powerstroke to occur} (1)	**ACCEPT** ATP broken down into ADP and Pi **ACCEPT** myosin (head) returns to its original position **IGNORE** 'the power stroke' for mp3	**(3)**

Question number	Answer	Additional guidance	Mark
8(b)	A description that includes two of the following points: • receptors detect a {change (away from the normal) / mismatch} (1) • impulse sent to {hypothalamus / CVC / medulla / pituitary gland} (1) • {effectors / muscles / glands} respond to bring the condition back to normal (1) • receptors detect the condition is normal so prevent the effector being stimulated any more (1)	**IGNORE** specific examples of negative feedback **ACCEPT** named receptors e.g. thermoreceptors **ACCEPT** other correct parts of the brain involved in negative feedback **IGNORE** signals / messages	**(2)**

Question number	Answer	Additional guidance	Mark
8(c)	A description that includes the following points: either • use of fMRI (scanning) (1) • (by looking at) the increased absorption of oxygen indicating increased (brain) activity (1) or • use of PET (scanning) (1) • using radioactive tracer like glucose to detect increased (brain) activity (1)	**IGNORE** CT scan **ACCEPT** converse for less active areas if clearly stated less active **ACCEPT** detects increased blood flow indicating brain activity **ACCEPT** active areas of brain light up **ACCEPT** active areas have more {oxygenated blood / oxyhaemoglobin} **ACCEPT** active area have more radiation / more {glucose / radiotracer} absorbed **ACCEPT** active areas of brain light up **ACCEPT** responses giving EEG (1) which identifies {neural activity / impulses in brain} (1)	**(2)**

Question number	Answer	Additional guidance	Mark
8(d)	An explanation that includes three of the following points: • oxygen acts as the final electron acceptor (1) • (by accepting the electrons oxygen allows the) electrons pass {along / down / through} the {electron transport chain / ETC / carriers} releasing energy (1) • (this energy) is used to pump {protons / H^+} to the intermembrane space (1) • {creating /against} an {electrochemical / proton / concentration} gradient (1) • (protons diffuse through) ATP synthase that (uses this gradient) to {produce ATP / phosphorylation of ADP} (1)	**IGNORE** protons **IGNORE** electrons pass to electron transport {chain / carriers} **REJECT** produce energy **ACCEPT** actively transport protons for pump protons **IGNORE** inner membrane **ACCEPT** detailed reference to chemiosmosis **REJECT** ATPase **ACCEPT** (protons diffuse through) ATP synthase causing ADP to be phosphorylated (to ATP) **IGNORE** reference to ADP + Pi →ATP without reference to ATP synthase	**(3)**

Question number	Answer	Additional guidance	Mark
8(e)	An explanation that includes four of the following points: • chemoreceptors send impulse(s) to {cardiac control centre / medulla (oblongata) / ventilation centre} (1) • (increased) impulses through the sympathetic {nervous system / (accelerator) neurones} (1) • (impulses travel) to the {SAN / diaphragm / intercostal muscles} (1) • {SAN depolarises more frequently / (cardiac muscles) contract more frequently / increase heart rate / increase breathing rate} (1) • increased ventilation rate and heart rate increases the {concentration gradient (between alveolus and blood) / rate of oxygen diffusion into the blood} (1)	**REJECT** {signals / messages} once for mp1-3 **ACCEPT** {adrenaline / noradrenaline / epinephrine / norepinephrine} travel in the blood **ACCEPT** {adrenaline / noradrenaline / epinephrine / norepinephrine} binds to SAN which depolarises more frequently **ACCEPT** increase {cardiac output / stroke volume / volume of air inhaled / tidal volume}	**(4)**

Question number	Answer	Additional guidance	Mark
8(f)	An explanation that includes four of the following points: • {histamine / cytokines} released (1) • which causes {vasodilation / increased blood flow} (1) • capillary walls become {leaky / more permeable} (1) • (enabling) more {white blood cells / leucocytes / phagocytes / antibodies} to reach the {area of infection / pathogen} (1) • {fever / increased (core) temperature} which reduces reproductive rate of pathogens (1)	**ACCEPT** descriptions of vasodilation **IGNORE** blood vessels / arterioles / membrane **ACCEPT** named benefits to the infected person of having the {fever / increased (core) temp} e.g. increased temperature increased rate of enzyme activity (in infected person) **ACCEPT** correct statements relating to what happens in specific immune response e.g. activation of {B lymphocytes / T-killer cells / clonal expansion / antibody production / effect of T-killer cells} **ACCEPT** interferons linked to preventing infection of cells **ACCEPT** phagocytosis / descriptions of phagocytosis	**(4)**

Question number	Answer	Additional guidance	Mark
8(g)	An answer that includes two of the following points: • L-DOPA is {a precursor / converted to} to dopamine (1) • dopamine improves {motor control / movement / energy levels / motivation} (1) • reducing the requirement for muscle contraction (1)	 **ACCEPT** L-DOPA increases dopamine levels (in the brain) **ACCEPT** more {brain / striatum} activity **ACCEPT** less tremors / stiffness of muscle	 **(2)**