MODULE J HARDWARE AND EMERGING TECH · J6

What artificial intelligence is: mark scheme

20 marks · Cambridge 0478 syllabus 6.3.1 (what is meant by AI: a branch of computer science dealing with the simulation of intelligent behaviours by computers; limited to expert systems and machine learning) and 6.3.2 (the main characteristics of AI: the collection of data and the rules for using that data, the ability to reason, and it can include the ability to learn and adapt)

How to use. One mark per creditworthy point up to the maximum shown. **/** separates alternative words; **//** separates alternative answers. Words in (brackets) are not needed for the mark. **...** at the start of a point means it builds on the point above. Credit any other valid answer that shows the same understanding.

QUESTION	ANSWER	MARKS	GUIDANCE
1 0478 6.3.1, 6.3.2	One mark for each correct row: AI is a branch of computer science: True AI deals with the simulation of intelligent behaviours by computers: True A computer system must have a mechanical structure before it can use AI: False An AI system needs a collection of data, but it does not need any rules for using that data: False	**4**	A row with both boxes ticked, or no box ticked, scores 0 for that row. Row 3: a mechanical structure is a characteristic of a robot, not of AI.
2 0478 6.3.1	Any two from: Recognising speech // understanding spoken commands Recognising images // faces // objects Making decisions Solving problems Playing games (e.g. a board game against a person) Understanding / responding to (typed or written) language // holding a conversation // translating between languages Reasoning // reaching conclusions from facts Learning (from experience) // adapting behaviour // making predictions (from patterns in data)	**2**	max 2. Credit any other valid intelligent behaviour, including a correct named use (e.g. diagnosing a fault, recommending a product, driving a vehicle). Two answers that make the same point (e.g. "recognising faces" and "recognising objects") score 1. Do not accept "thinking" alone, "storing data" or "doing calculations".
3 0478 6.3.1 (AI limited to expert systems and machine learning)	One mark for each correct row: Adapts its own processes and/or data: machine learning Knowledge base, rule base, inference engine and interface: expert system	**2**	Accept "ML" for machine learning. Do not accept "AI" alone, "robot" or "learning system" for row 1, or "knowledge system" for row 2.

QUESTION	ANSWER	MARKS	GUIDANCE
4 0478 6.3.2	One mark for each correct row: Stores parcel data and the 20 kg rule: (a) collection of data and (the) rules for using that data // (it has) data and rules Applies its rules to decide which van: (the) ability to reason // reasoning // (the) ability to make decisions Changes its own rule for the late town: (the) ability to learn // (the) ability to adapt // learning and adapting Reaches the conclusion about the quicker route: (the) ability to reason // reasoning // (the) ability to make decisions	**4**	Row 1: accept "collection of data" or "rules for using data" on its own. Row 3: accept "machine learning". Do not accept "simulation of intelligent behaviour" for any row.
5(a) 0478 6.3.2	Any two from: It uses the data it has // the current positions of the pieces (on the board) // the moves made so far It applies its rules (for playing the game) to this data It works out / compares the possible moves // the likely result of each possible move It reaches a conclusion / decision about which move is best (and makes that move)	**2**	max 2. Accept a correct example of a rule being applied (e.g. "if a piece can be taken, it moves to protect it") for the rules point. Do not accept "it thinks about the move" with no reference to data, rules or a conclusion. Do not accept "it picks a move at random".
5(b) 0478 6.3.2	Any three from: It records / stores the moves made // the results of games it has played It finds which moves / patterns led to wins and which led to losses It changes / updates its own rules // data (from these results) ... without a person / programmer having to change the program // reprogram it ... so it avoids moves that lost games before // repeats / uses more often moves that won It adapts to how the (adult) player plays // learns the player's usual moves / strategies (and responds to them) ... so its decisions improve // become more accurate / successful the more games it plays	**3**	max 3. Do not accept "it gets smarter / better" alone with no explanation of how. Do not accept "a programmer adds new rules after each game" (that is not the system learning by itself).

QUESTION	ANSWER	MARKS	GUIDANCE
6 0478 6.3.1, 6.3.2	Any three from: The ability to learn / adapt is not needed for a system to be AI // AI can include the ability to learn, but does not have to The system has a collection of data (e.g. opening times, the dishes and their ingredients) ... and (the) rules for using that data (written by staff) It has the ability to reason // it applies its rules to the guest's question (and its data) to reach a conclusion / an answer It simulates intelligent behaviour // it simulates a member of staff answering a question // it understands / responds to language	3	max 3. Award the "data" and "rules" points separately. Do not accept "the manager is wrong because all computers are AI". Do not accept "it will learn later": the scenario says it never changes its rules or data.

Total: 20 marks