CENTRAL BOARD OF SECONDARY EDUCATION

CBSE 2026-27

Artificial Intelligence

Subject Code: 417 | Class X

Question Bank – Set 1

Questions in this Booklet

Ch.	Chapter	MCQs	A-R	VSA	SA	LA	CS	All
1	Communication Skills – II	9	0	3	5	0	0	**17**
2	Self-Management Skills – II	9	0	3	5	0	0	**17**
3	Information and Communication Technology Skills – II	9	0	3	5	0	0	**17**
4	Entrepreneurial Skills – II	9	0	3	5	0	0	**17**
5	Green Skills – II	9	0	3	5	0	0	**17**
6	Revisiting AI Project Cycle & Ethical Frameworks for AI	12	3	4	5	2	2	**28**
7	Advanced Concepts of Modeling in AI	12	3	4	5	2	2	**28**
8	Evaluating Models	12	3	4	5	2	2	**28**
9	Computer Vision	12	3	4	5	2	2	**28**
10	Natural Language Processing	12	3	4	5	2	2	**28**
	Total	**105**	**15**	**35**	**50**	**10**	**10**	**225**

MCQs = Multiple Choice; A-R = Assertion–Reason; VSA = Very Short Answer; SA = Short Answer; LA = Long Answer; CS = Case Study / Source-based.

About this booklet: Chapters 1–5 = Part A Employability Skills; Chapters 6–10 = Part B Subject Specific Skills (theory-assessed units). Units 4 (Statistical Data) and 7 (Advance Python) are assessed through practicals only and are therefore not included. Marks: MCQ/A-R/VSA = 1, SA = 2, LA = 4, Case Study = 4. Questions tagged in grey come from CBSE Sample Papers / Board papers; the others are CBSE-pattern practice questions.

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1. Communication Skills – II

Part A, Unit 1

Multiple Choice Questions (MCQs)

Q1. Which type of non-verbal communication is shown by actions like raising a hand to greet or pointing a finger at someone? **[1]**

[SQP 2025-26; MS 2025-26]

(a) Facial Expression (b) Posture (c) Gesture (d) Eye Contact

Q2. Using a language that the audience does not understand is an example of a _____ barrier. **[1]**

(a) Physical (b) Linguistic (c) Organisational (d) Cultural

Q3. Which word is a conjunction in 'She was tired but she finished the task.'? **[1]**

(a) She (b) was (c) but (d) task

Q4. A verb is a word that expresses: **[1]**

(a) An action or state of being (b) A name
(c) A quality (d) A place

Q5. The sentences that explain, illustrate or give evidence for the main idea are the: **[1]**

(a) Topic sentences (b) Concluding sentences
(c) Headings (d) Supporting sentences

Q6. Which of these is a principle of effective communication? **[1]**

(a) Ignoring the receiver's response (b) Using long, complicated sentences
(c) Avoiding feedback (d) Clarity of message

Q7. In 'Ravi quickly finished his homework', the word 'quickly' is a/an: **[1]**

(a) Adjective (b) Noun (c) Pronoun (d) Adverb

Q8. Choosing a quiet, well-lit place for a meeting helps overcome: **[1]**

(a) Physical barriers (b) Cultural barriers
(c) Linguistic barriers (d) Interpersonal barriers

Q9. Eye contact and body posture are examples of which type of communication? **[1]**

(a) Verbal communication (b) Non-verbal communication
(c) Written communication (d) Oral communication

Very Short Answer (VSA)

Q10. Feedback that describes a behaviour with specific examples, without judging the person, is called _____ feedback. **[1]**

Q11. The 'C' that means using facts, figures and examples is _____. **[1]**

Q12. A barrier caused by noise, distance or a faulty microphone is a _____ barrier. **[1]**

Short Answer (SA)

Q13. Explain how a linguistic barrier affects communication and suggest one way to overcome it. **[2]**

Q14. Write the 7 C's of communication. **[2]**

[Board 2026]

Q15. Differentiate between a phrase and a sentence with one example each. **[2]**

Q16. What is a topic sentence? Why is it important in a paragraph? **[2]**

Q17. Explain why 'Concrete' is an important principle of communication. Give an example. **[2]**

2. Self-Management Skills – II

Part A, Unit 2

Multiple Choice Questions (MCQs)

Q1. Recognising one's own strengths, weaknesses and emotions is called: **[1]**

(a) Self-motivation (b) Delegation (c) Procrastination (d) Self-awareness

Q2. Emotional intelligence means: **[1]**

(a) Ignoring one's emotions
(b) Relying only on academic knowledge
(c) Avoiding people
(d) Recognising and managing one's own and others' emotions

Q3. Which is an example of responsibility at home? **[1]**

(a) Blaming siblings for broken items (b) Avoiding chores
(c) Doing homework without reminders (d) Ignoring family rules

Q4. Vacations help manage stress because they: **[1]**

(a) Add more work (b) Give the mind a break and time to recharge
(c) Increase deadlines (d) Reduce rest

Q5. Which is a common symptom of stress? **[1]**

(a) Improved focus (b) Restlessness (c) Calm mind (d) Good appetite

Q6. Identifying one's own strengths and areas to improve is an example of: **[1]**

(a) Self-awareness (b) Blaming others (c) Dependence (d) Impulsiveness

Q7. Which activity is a nature-based stress-relief practice? **[1]**

(a) Late-night gaming (b) Sitting in heavy traffic
(c) Skipping rest (d) Nature walk

Q8. The first step to build self-motivation is to: **[1]**

(a) Stay loyal to goals (b) Find out your strengths
(c) Set goals (d) Develop a plan

Q9. Which is a component of emotional intelligence? **[1]**

(a) Empathy (b) Procrastination (c) Hoarding (d) Indifference

Very Short Answer (VSA)

Q10. The ability to recognise and manage one's emotions and those of others is called _____ intelligence. **[1]**

Q11. Self-motivation means driving yourself to achieve goals without _____ pressure. **[1]**

Q12. Stress arises when demands exceed a person's _____ to cope. **[1]**

Short Answer (SA)

Q13. (a) What is emotional intelligence? (b) Name any two skills included in emotional intelligence. **[2]**

[Board 2026]

Q14. Explain any two causes of stress. **[2]**

Q15. Write two benefits of vacations and nature walks in managing stress. **[2]**

Q16. Explain the effectiveness of physical exercise and fresh air in stress management. **[2]**

[Board 2025 Comptt]

Q17. Differentiate between self-motivation and external motivation. **[2]**

3. Information and Communication Technology Skills – II

Part A, Unit 3

Multiple Choice Questions (MCQs)

Q1. Cleaning the keyboard, cleaning the monitor and dusting the CPU are part of: **[1]**

(a) Daily maintenance (b) Monthly maintenance
(c) Weekly maintenance (d) Yearly maintenance

Q2. What is the action called when you place the mouse pointer over a file in File Explorer and it displays the file's details without clicking? **[1]**

[SQP 2025-26; MS 2025-26]

(a) Click (b) Drag (c) Scroll (d) Hover

Q3. After an anti-virus detects a virus, it usually: **[1]**

(a) Adds it to the desktop (b) Shares it on the internet
(c) Cleans or removes it (d) Prints it

Q4. Which type of virus replicates itself and spreads to all files on a computer? **[1]**

(a) Trojan Horse (b) Firewall (c) Anti-virus (d) Worm

Q5. Which is the stronger protection step for files and e-mails? **[1]**

(a) Leave passwords blank (b) Use strong passwords and a firewall
(c) Share your password (d) Disable anti-virus

Q6. The main purpose of a computer maintenance schedule is to: **[1]**

(a) Increase the number of viruses
(b) Remove the operating system
(c) Keep the computer in good condition for a long time
(d) Stop backups

Q7. A copy of important data kept on another device is called a: **[1]**

(a) Backup (b) Virus (c) Firewall (d) SPAM

Q8. A harmful program that damages data and software or steals information stored on a computer is called a: **[1]**

(a) Font (b) Virus (c) Icon (d) Cursor

Q9. Sharing personal details on unsecure websites can lead to: **[1]**

(a) Information leakage (b) Faster printing
(c) Reduced spam (d) Better performance

Very Short Answer (VSA)

Q10. The _____ is the software that starts working as soon as a computer is switched on. **[1]**

Q11. Temporary files that use too much hard-disk space can be removed with _____ software. **[1]**

Q12. True or False: Moving a file leaves the original file in its original location. **[1]**

Short Answer (SA)

Q13. What does Trojan horse mean in computer terminology? **[2]**

[SQP 2023-24; SQP 2024-25]

Q14. Explain the difference between the copy and move operations on a file. **[2]**

Q15. Mention any two measures that individuals or organisations can take to protect their data from theft and viruses. **[2]**

[Board 2024]

Q16. What are the benefits of cleaning temporary files and unused programs? **[2]**

Q17. Suggest any two points to keep in mind to prevent a new computer from virus infection. **[2]**

[Board 2023]

4. Entrepreneurial Skills – II

Part A, Unit 4

Multiple Choice Questions (MCQs)

Q1. Which of the following correctly lists the entrepreneurial career process in order? **[1]**

(a) Survive, Enter, Retire, Grow
(b) Enter, Survive, Grow, Retire
(c) Grow, Enter, Survive, Retire
(d) Enter, Grow, Retire, Survive

Q2. An entrepreneur spends money to buy materials, pays the rent of the building and pays salaries to people. This is the function of: **[1]**

(a) Dividing income
(b) Creating a new product
(c) Taking risks
(d) Making decisions

Q3. In which stage must an entrepreneur remain in a competitive market where many other businesses sell similar products? **[1]**

(a) Survive (b) Enter (c) Grow (d) Retire

Q4. Which career option involves starting and running a business to meet people's needs by trying new ideas? **[1]**

(a) Entrepreneurship (b) Wage employment (c) Retirement (d) Unemployment

Q5. After losing money in a business, Rahul says he will try again with a better plan. Which quality is he showing? **[1]**

(a) Dependency (b) Laziness (c) Impatience (d) Does not give up

Q6. Ganesh started a car rental business. To be different from other businesses, he added luxury cars to his fleet. This shows that: **[1]**

(a) Every idea must be totally new
(b) Business needs no customers
(c) Only rich people can start a business
(d) A common business can be made different with a new idea

Q7. Which of the following is an example of innovation in business? **[1]**

(a) Copying the same product as competitors
(b) Stopping all new ideas
(c) Using a new method to improve the product
(d) Ignoring customer feedback

Q8. A doctor who runs her own clinic and earns from her patients is: **[1]**

(a) A self-employed person
(b) A wage-employed person
(c) A consumer
(d) A government servant

Q9. The statement 'Entrepreneurs are born, not made' is: **[1]**

(a) A fact proven by research
(b) A myth about entrepreneurship
(c) A law of business
(d) A government rule

Very Short Answer (VSA)

Q10. Entrepreneurs are _____, not _____. **[1]**

[Board 2026]

Q11. Name the function in which an entrepreneur acts against fires, theft and lost items. **[1]**

Q12. _____ is the money used to start a business. **[1]**

Short Answer (SA)

Q13. State any two qualities to become a successful entrepreneur. **[2]**

[Board 2026; SQP 2020-21; SQP 2021-22]

Q14. Explain how the Survive stage is different from the Grow stage. **[2]**

Q15. Raj has a small convenience store in his locality. There are many other convenience stores in the area. Yet, Raj's store survives the competition and does well. Which stage of an entrepreneur's career process can you relate this to? Explain. **[2]**

[SQP 2022-23; MS 2022-23]

Q16. What is capital? Why is it needed to start a business? **[2]**

Q17. Differentiate between wage-employed people and self-employed people. **[2]**

[Board 2025 Comptt]

5. Green Skills – II

Part A, Unit 5

Multiple Choice Questions (MCQs)

Q1. Donating things we do not use, such as clothes, books, furniture, or food, contributes to which Sustainable Development Goal? **[1]**

[SQP 2025-26; MS 2025-26]

(a) SDG 12 - Responsible Consumption and Production
(b) SDG 3 - Good Health and Well-being
(c) SDG 1 - No Poverty
(d) SDG 4 - Quality Education

Q2. Which SDG relates to 'Reduced Inequalities'? **[1]**

(a) SDG 12 (b) SDG 10 (c) SDG 7 (d) SDG 4

Q3. The _____ Sustainable Development Goals (SDGs) were launched at the United Nations Sustainable Development Summit in New York in the year 2015, forming the 2030 Agenda for Sustainable Development. **[1]**

[SQP 2022-23]

(a) 15 (b) 13 (c) 19 (d) 17

Q4. _____ is caused when a natural or man-made disturbance disrupts the natural balance of an ecosystem. **[1]**

[SQP 2020-21; MS 2020-21]

(a) Ecological Imbalance (b) Pollution
(c) Damage (d) Natural disaster

Q5. Which of these best describes 'green skills'? **[1]**

(a) Skills that help protect and conserve the environment
(b) Skills to use more chemicals
(c) Skills to burn waste
(d) Skills to cut trees

Q6. Which SDG is related to 'Life Below Water'? **[1]**

(a) SDG 15 (b) SDG 14 (c) SDG 6 (d) SDG 3

Q7. Which of the 3 Rs means using fewer resources in the first place? **[1]**

(a) Reduce (b) Recycle (c) Reuse (d) Dispose

Q8. Which of these is a non-renewable resource? **[1]**

(a) Solar energy (b) Wind energy (c) Tidal energy (d) Coal

Q9. Which SDG relates to 'Good Health and Well-being'? **[1]**

(a) SDG 6 (b) SDG 13 (c) SDG 3 (d) SDG 14

Very Short Answer (VSA)

Q10. The three Rs of sustainable living are Reduce, Reuse and _____. **[1]**

Q11. Name the SDG for 'Affordable and Clean Energy'. **[1]**

Q12. Fill in: The process of making manure using earthworms is called _____. **[1]**

Short Answer (SA)

Q13. Define green skills. Why are they important? **[2]**

Q14. Mention two ways in which a student can practise environmental citizenship at school. **[2]**

Q15. Mention any two human activities that lead to environmental degradation. **[2]**

[SQP 2023-24; SQP 2024-25]

Q16. Discuss the following problems related to sustainable development: (i) Water (ii) Fuel. **[2]**

[Board 2025]

Q17. What is drip irrigation? How does it help conserve water? **[2]**

6. Revisiting AI Project Cycle & Ethical Frameworks for AI

Part B, Unit 1

Multiple Choice Questions (MCQs)

Q1. Which of the following contributes to the efficiency of an AI project? **[1]**

[Board 2024]

(a) High model complexity
(b) Relevant and authentic training data
(c) Minimal preprocessing
(d) Limited hardware resources

Q2. A team starts an AI project. It first states the problem, then collects data, then gives the data a visual form, then builds a model and finally tests the model on newly fetched data. Which stages of the AI project cycle are shown by these steps? **[1]**

[SQP 2021-22 (T1); MS 2021-22 (T1)]

(a) Problem Scoping, Data Acquisition, Data Exploration, Modelling, Evaluation
(b) Data Acquisition, Problem Scoping, Modelling, Evaluation, Deployment
(c) Modelling, Evaluation, Deployment, Problem Scoping, Data Acquisition
(d) Evaluation, Deployment, Problem Scoping, Data Acquisition, Data Exploration

Q3. In the AI Project Cycle, the stage in which you set the goal of your project by stating the problem you wish to solve is: **[1]**

(a) Deployment (b) Data Exploration (c) Modelling (d) Problem Scoping

Q4. Which of the following is the second stage of an AI Project Cycle? **[1]**

[Board 2025 Comptt]

(a) Problem Scoping (b) Evaluation (c) Data Exploration (d) Data Acquisition

Q5. A city council must choose between two AI traffic systems. It picks the one that gives the greatest benefit to the largest number of residents while minimising harm. Which value-based framework is being applied? **[1]**

(a) Rights-based framework
(b) Virtue-based framework
(c) Utility-based framework
(d) Sector-based framework

Q6. Ethical frameworks are primarily designed to: **[1]**

[Board 2026]

(a) Increase the efficiency of AI algorithms.
(b) Ensure that the choices we make do not cause unintended harm.
(c) Reduce the cost of AI development.
(d) Speed up the AI project cycle.

Q7. Sector-based ethical frameworks for AI: **[1]**

(a) Apply only to healthcare
(b) Maximise utility for the greatest number
(c) Focus on the character of decision-makers
(d) Are tailored to specific sectors or industries

Q8. Value-based ethical frameworks: **[1]**

(a) Are tailored to one industry only
(b) Are written only for robots
(c) Focus on fundamental ethical principles and values guiding decision-making
(d) Replace the need for data

Q9. A hospital AI explains to patients how its risk scores are computed and lets them question the results. Which principle of bioethics is being followed? **[1]**

(a) Respect for autonomy
(b) Justice
(c) Non-maleficence
(d) Beneficence

Q10. Which of the following correctly matches an AI domain with the data it works on? **[1]**

(a) Computer Vision – text and speech
(b) Natural Language Processing – images and videos
(c) Statistical Data – numeric and alphanumeric data
(d) Modelling – graphical data

Q11. An application uses a camera to unlock a phone, another translates Hindi speech to English text, and a third compares flight prices across websites. The AI domains used, in the same order, are: **[1]**

(a) CV, NLP, Statistical Data (b) NLP, CV, Statistical Data
(c) Statistical Data, NLP, CV (d) CV, Statistical Data, NLP

Q12. Which of the following is not a stage of the AI Project Cycle? **[1]**

[SQP 2020-21; MS 2020-21]

(a) Data Exploration (b) Modelling (c) Testing (d) Problem Scoping

Assertion–Reason

Q13. **Assertion (A):** Virtue-based framework focuses on the character and intentions of individuals involved in decision-making.
Reason (R): Virtue-based framework evaluates whether actions align with principles such as honesty, compassion, and integrity. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

[SQP 2025-26; MS 2025-26]

Q14. **Assertion (A):** AI systems used for decision-making must make morally acceptable recommendations.
Reason (R): AI is essentially being used as a decision-making / influencing tool in society. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Q15. **Assertion (A):** Machine translation systems such as Google Translate are applications of Natural Language Processing.
Reason (R): They analyse the structure and semantics of sentences to generate equivalent translations in the target language. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Very Short Answer (VSA)

Q16. The sector-based ethical framework used in healthcare and life sciences is called _____. **[1]**

Q17. With respect to the type of data fed into the AI model, AI models can be broadly classified into _____ domains. **[1]**

[SQP 2025-26; MS 2025-26]

Q18. Name the bioethics principle that requires enabling users to be fully aware of the decision-making of an AI algorithm. **[1]**

Q19. The AI domain in which input to machines can be photographs, videos and pictures from thermal or infrared sensors is _____. **[1]**

Short Answer (SA)

Q20. What do you do in the second and third stages of an AI Project cycle? **[2]**

[SQP 2025-26; MS 2025-26]

Q21. What is Natural Language Processing? Name its two real-life applications. **[2]**

Q22. How does Data Exploration help a team working on an AI project? **[2]**

Q23. Why is Problem Scoping important in an AI project? Explain in 20–30 words. **[2]**

Q24. Name the three domains of AI and state the type of data each one works with. **[2]**

Long Answer (LA)

Q25. Define Artificial Intelligence. List the three domains of AI and the type of data that is used in these domains. **[4]**

[SQP 2022-23; MS 2022-23 (adapted)]

Q26. Read the case: A hospital's AI tool identifies patients at high risk so that extra care can be given to those who need it most. The tool was trained on healthcare expense data as a measure of illness. Because less money had historically been spent on patients of one community, the tool marked genuinely sicker patients of that community as low risk, so they received less care. Explain how the four principles of bioethics could have been used to avoid this outcome. **[4]**

Case Study

Case Study: A company aimed to support hospitals in optimizing patient care by creating an AI algorithm designed to identify individuals at high risk, so that healthcare providers could allocate resources effectively and ensure those most in need receive appropriate attention. However, patients from the western region of a particular area, who were categorized at the same risk level by the algorithm, generally exhibited more severe health conditions compared to patients from other regions.

Q27. Answer the following questions based on the case above. **[4]**

(i) State the two reasons why the problem happened. [2]

(ii) Name the ethical framework whose principles can ensure an ethical AI solution here, and state the principle which requires that the training data be unbiased. [2]

Case Study: Ravi's team is developing an AI project. First, they state the problem they wish to solve and look at the parameters affecting it. Next, they collect data from various reliable and authentic sources. Since the data is large in quantity, they give it visual representations using graphs and flow charts, and interpret the patterns it follows. They then research and select a model, after which they test it on newly fetched data. Finally, they put the model into operation in the real world.

Q28. Answer the following questions based on the case above. **[4]**

(i) Name the stages Ravi's team went through, in order. [2]

(ii) Why does the team test the model on newly fetched data? What happens after this testing? [2]

7. Advanced Concepts of Modeling in AI

Part B, Unit 2

Multiple Choice Questions (MCQs)

Q1. Supervised learning uses a dataset that is: **[1]**

(a) Labelled (b) Unlabelled (c) Random noise (d) Only images

Q2. Clustering is a type of: **[1]**

(a) Supervised learning (b) Unsupervised learning
(c) Reinforcement learning (d) Rule-based learning

Q3. The training dataset is used to: **[1]**

(a) Test the final accuracy of a model (b) Store the deployed model
(c) Teach the model patterns from examples (d) Count the number of instances

Q4. Which scenario is a classification problem? **[1]**

(a) Predicting the price of a house in Rs. lakh
(b) Predicting the rainfall amount in mm
(c) Identifying whether a loan applicant will default (Yes/No)
(d) Predicting the marks a student will score

Q5. A model predicts whether a student will pass, using Attendance and Study hours as inputs. Attendance and Study hours are called: **[1]**

(a) Features (b) Labels (c) Instances (d) Models

Q6. What does labelled data mean? **[1]**

(a) Data with the correct output (tag) attached to each example
(b) Data printed on paper
(c) Data stored in a cloud folder
(d) Data with no attributes

Q7. A neural network with many hidden layers is called: **[1]**

(a) A deep neural network (b) A rule-based system
(c) A reinforcement agent (d) A clustering model

Q8. Predicting the marks a student will score in an exam is an example of: **[1]**

(a) Classification (b) Clustering (c) Association (d) Regression

Q9. Which of the following is the best example of AI in daily life? **[1]**

(a) A calculator performing addition
(b) A printed book
(c) A USB drive
(d) A voice assistant that understands spoken questions and responds

Q10. A spam filter that gets better as it sees more emails is an example of a: **[1]**

(a) Rule-based approach (b) Hardware-based approach
(c) Learning-based approach (d) Fixed-logic approach

Q11. Which statement about the rule-based approach is correct? **[1]**

[SQP 2021-22 (reworded)]

(a) It learns and changes its rules automatically from new data.
(b) It improves itself with every new example.
(c) It needs no rules to be written by a programmer.
(d) Its learning is static; it cannot adapt beyond the rules given to it.

Q12. Machine learning enables machines to: **[1]**

(a) Improve at tasks with experience
(b) Follow only programmed instructions
(c) Replace all human workers
(d) Store large files

Assertion–Reason

Q13. **Assertion (A):** An artificial neural network can extract data features automatically.
Reason (R): Its nodes adjust weights and biases during training to learn from data, so the programmer does not need to specify the features. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Q14. **Assertion (A):** The input layer of a neural network performs most of the calculations.
Reason (R): The input layer only receives raw data and passes it to the hidden layers. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Q15. **Assertion (A):** Clustering is used to group similar data points without predefined labels.
Reason (R): Clustering uses labelled data to assign each point to a class. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Very Short Answer (VSA)

Q16. _____ learning learns by trial and error using rewards and penalties. **[1]**

Q17. The data used to check the accuracy of a trained model on unseen examples is called _____ data. **[1]**

Q18. Name the learning model that assigns data to predefined categories, such as spam or not spam. **[1]**

Q19. _____ is the process of grouping similar data points together without predefined labels. **[1]**

Short Answer (SA)

Q20. What is a neural network? How is it inspired by the human brain? **[2]**

Q21. What is the role of hidden layers in a neural network? **[2]**

Q22. Differentiate between training data and testing data. **[2]**

Q23. Give one example each of a rule-based system and a learning-based system. **[2]**

Q24. Describe how the Human Neural Network game represents a neural network. **[2]**

Long Answer (LA)

Q25. Differentiate between rule-based and learning-based approaches with one example of each. Which approach is more suitable for an email spam filter, and why? **[4]**

Q26. Explain supervised, unsupervised and reinforcement learning, with one example of each. **[4]**

Case Study

Case Study: Read each scenario and name the application of Machine Learning (ML) or Deep Learning (DL) being used.

Q27. Answer the following questions based on the case above. **[4]**

[SQP 2025-26]

(i) A fitness tracker learns your normal heart rate. While you watch a horror movie, it flags a sudden spike as an anomaly. Name the application. [1]

(ii) A wildlife camera identifies animals and classifies them into categories such as bird, mammal and insect. Name the application. [1]

(iii) A smart refrigerator places an AI-generated label such as 'Milk Carton' on each food item in its live image. Name the application. [1]

(iv) A bike-unlock app recognises a numerical code such as '5281' scribbled with a finger, even when the handwriting is messy. Name the application. [1]

Case Study: A health app stores records of 200 patients with the attributes Age, Blood pressure, Sugar level and Diabetes (Yes/No). The app is used to predict whether a patient has diabetes.

Q28. Answer the following questions based on the case above. **[4]**

(i) Name the label. [1]

(ii) Name the features. [1]

(iii) How many instances are there in the dataset? [1]

(iv) Which data is used to check the model on unseen patients? [1]

8. Evaluating Models

Part B, Unit 3

Multiple Choice Questions (MCQs)

Q1. TP = 40, FP = 20, FN = 10 and TN = 30. What is the recall? **[1]**

(a) 0.67 (b) 0.57 (c) 0.80 (d) 0.75

Q2. Accuracy can be misleading when: **[1]**

(a) the dataset is balanced
(b) the model is trained on labelled data
(c) the dataset is highly imbalanced
(d) the testing data is used for evaluation

Q3. Precision = 1 and recall = 0.5. The F1 score is: **[1]**

(a) 0.50 (b) 0.75 (c) 1.50 (d) 0.67

Q4. Which expression represents precision? **[1]**

(a) TP / (TP + FN)
(b) TN / (TN + FP)
(c) (TP + TN) / total observations
(d) TP / (TP + FP)

Q5. Which expression gives the accuracy of a classification model? **[1]**

(a) TP / (TP + FP)
(b) TP / (TP + FN)
(c) (TP + TN) / (TP + TN + FP + FN)
(d) 2 × Precision × Recall / (Precision + Recall)

Q6. A spam filter flags 20 emails as spam, and 15 of them are actually spam. What is its precision? **[1]**

(a) 0.15 (b) 0.20 (c) 0.75 (d) 0.85

Q7. In a train-test split, which dataset is used to make the model learn patterns? **[1]**

(a) Testing dataset (b) Training dataset (c) Prediction output (d) Confusion matrix

Q8. In spam email detection, which of the following will be considered a 'False Negative'? **[1]**

[Board 2024]

(a) When a spam email is mistakenly identified as legitimate.
(b) When a legitimate email is accurately identified as not spam.
(c) When an email is accurately recognised as spam.
(d) When an email is inaccurately labelled as important.

Q9. In a medical screening test for a specific disease, which scenario represents a True Negative? **[1]**

[Board 2025 Comptt]

(a) A person without the disease tests negative for the disease.
(b) A person without the disease tests positive for the disease.
(c) A person with the disease tests positive for the disease.
(d) A person with the disease tests negative for the disease.

Q10. Statement 1: Overfitting is not recommended for evaluation of a model. Statement 2: This is because the model will simply remember the whole training set, and will therefore always predict the correct label for any point in the training set. **[1]**

[Board 2025]

(a) Both Statement 1 and Statement 2 are incorrect.
(b) Statement 1 is correct but Statement 2 is incorrect.
(c) Both Statement 1 and Statement 2 are correct.
(d) Statement 2 is correct but Statement 1 is incorrect.

Q11. A model is tested on 200 emails. It has TP = 60, FP = 20 and FN = 10. The number of True Negatives is: **[1]**

(a) 100 (b) 130 (c) 90 (d) 110

Q12. The actual value is 80 and the predicted value is 92. The error rate is: **[1]**

(a) 0.15 (b) 0.12 (c) 0.13 (d) 0.85

Assertion–Reason

Q13. **Assertion (A):** In machine learning, a model with lower error is considered to perform better on a given dataset.
Reason (R): Error helps us evaluate how accurately a model can predict both training and unseen data, which is why it is used to select the best-performing model. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.
[SQP 2025-26]

Q14. **Assertion (A):** Accuracy is not a reliable metric for an imbalanced dataset.
Reason (R): Accuracy measures the proportion of correct predictions among all predictions. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Q15. **Assertion (A):** Ethical evaluation requires that test data represent all user groups fairly.
Reason (R): Test data never has to represent real users in any deployed system. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Very Short Answer (VSA)

Q16. _____ is an integral part of the model development process that helps to find the best model that represents our data and how well the chosen model will work in the future. **[1]**
[SQP 2025-26; Board 2023]

Q17. State True or False: In machine learning, the error is used to see how accurately the model can predict data. **[1]**
[Board 2026]

Q18. _____ is the outcome of the model wrongly predicting the negative class as the positive class. **[1]**
[SQP 2025-26]

Q19. State True or False: A model that scores 100% on its training data is guaranteed to perform well on unseen data. **[1]**

Short Answer (SA)

Q20. Differentiate between precision and recall. **[2]**

Q21. Define Confusion Matrix. **[2]**
[Board 2023]

Q22. With reference to the evaluation stage of the AI project cycle, explain the term Accuracy. Also give the formula to calculate it. **[2]**
[Board 2022]

Q23. Distinguish between 'error' and 'error rate' of a model. **[2]**

Q24. Give one example each where recall is preferred and where precision is preferred. **[2]**

Long Answer (LA)

Q25. A fraud detection model is tested on 10,000 transactions in which only 1% are fraudulent. A model that labels every transaction as legitimate gets a high accuracy. Explain why accuracy is misleading here and which metrics should be used instead. **[4]**

Q26. Explain accuracy, precision and recall with their formulas. Name one situation in which precision is more important than recall. **[4]**

Case Study

Case Study: A clinic tested an AI model that screens 500 patients for a disease. The model correctly flagged 80 patients who have the disease (TP), missed 20 patients who have the disease (FN), wrongly flagged 40 healthy patients (FP), and correctly cleared 360 healthy patients (TN).

	Reality: Disease	**Reality: Healthy**
Prediction: Disease	80 (TP)	40 (FP)
Prediction: Healthy	20 (FN)	360 (TN)

Q27. Answer the following questions based on the case above. **[4]**

(i) How many patients actually have the disease? [1]

(ii) Calculate the accuracy of the model. [1]

(iii) Calculate the precision of the model. [1]

(iv) Calculate the recall of the model. [1]

Case Study: PQR Security Solutions designed an AI model to detect cyber attacks on an e-commerce website. The model was tested on 1500 network activities. It correctly predicted 1000 activities as cyber attacks and correctly identified 250 as not cyber attacks. It predicted 200 activities as cyber attacks when they were not, and predicted 50 activities as not cyber attacks when they were.

Q28. Answer the following questions based on the case above. **[4]**

[Board 2026]

(a) Draw the confusion matrix for the given scenario. [2]

(b) How many total cases are True Negative? [1]

(c) Calculate the precision. [1]

9. Computer Vision

Part B, Unit 5

Multiple Choice Questions (MCQs)

Q1. What is the range of possible pixel values in a byte image format? **[1]**

[Board 2026; SQP 2025-26]

(a) 0 to 100 (b) 0 to 255 (c) 1 to 256 (d) –128 to 127

Q2. Which set correctly lists the channels of an RGB image? **[1]**

(a) Red, Yellow, Blue
(b) Red, Green, Blue
(c) Cyan, Magenta, Black
(d) Hue, Saturation, Brightness

Q3. Which CNN layer is the first to receive the pixel values of the input image? **[1]**

(a) Output layer
(b) Input layer
(c) Pooling layer
(d) Fully connected layer

Q4. Image segmentation is best described as: **[1]**

(a) Adding a single label to the entire image
(b) Dividing an image into regions by labelling pixels
(c) Drawing a box only around one person
(d) Changing an RGB image to grayscale

Q5. The purpose of convolution in Computer Vision is to: **[1]**

(a) store images as bytes
(b) count words in a document
(c) translate speech
(d) extract features such as edges

Q6. Which statement correctly describes image processing? **[1]**

(a) It enhances or transforms an image, such as changing brightness or rescaling
(b) It only classifies objects into categories
(c) It converts speech into text
(d) It draws labelled boxes around people only

Q7. Which of these is NOT an application of Computer Vision? **[1]**

(a) Self-driving cars
(b) Spam filtering in e-mails
(c) Medical imaging
(d) Facial recognition

Q8. Which task is most suitable for counting the number of cars in an image of a parking lot? **[1]**

(a) Image classification
(b) Grayscale conversion
(c) Image enhancement
(d) Object detection

Q9. _____ is mainly focused on enhancing raw input images or preparing them for other tasks, such as rescaling, correcting brightness, or changing tones. It is a subset of _____. **[1]**

[SQP 2025-26; MS 2025-26]

(a) Computer Vision; Image Processing
(b) Machine Learning; Artificial Intelligence
(c) Image Processing; Computer Vision
(d) Object Detection; Image Processing

Q10. Which CV task assigns a single label to a whole image, such as 'apple' or 'banana'? **[1]**

(a) Object detection
(b) Instance segmentation
(c) Image classification
(d) Image processing

Q11. The term that refers to the process of identifying and locating real-world objects like faces, bicycles, or buildings in images or videos, and is used in applications such as image retrieval and automated vehicle parking systems is _____. **[1]**

[SQP 2025-26 (figure omitted)]

(a) Image Classification
(b) Image Segmentation
(c) Object Detection
(d) Feature Extraction

Q12. Which Computer Vision application translates text seen through a phone camera into another language? **[1]**

(a) Sentiment analysis
(b) Auto-generated captions
(c) Spam filter
(d) Google Translate app

Assertion–Reason

Q13. Assertion (A): Face filters on social media apps are an application of Computer Vision.
Reason (R): Image processing is a technique used within Computer Vision. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Q14. Assertion (A): The pixel value 255 represents white in a grayscale byte image.
Reason (R): The range 0 to 255 has 256 possible values. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Q15. Assertion (A): The less pixels you have, the better is the image quality.
Reason (R): Resolution refers to the number of pixels per unit of area in an image, determining its clarity and detail. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

[Board 2025 Comptt]

Very Short Answer (VSA)

Q16. How many channels does a colour image have? **[1]**

[SQP 2023-24; SQP 2024-25; MS 2024-25]

Q17. A 1280 × 1024 image has _____ pixels in total. **[1]**

Q18. A 10 × 10 grayscale image needs _____ bytes if each pixel uses one byte. **[1]**

Q19. Drawing a bounding box to show where an object is located in an image is called _____. **[1]**

Short Answer (SA)

Q20. How do computers store RGB images? **[2]**

[Board 2026]

Q21. Differentiate between Computer Vision (CV) and Natural Language Processing (NLP). **[2]**

[Board 2025]

Q22. What is a pooling layer in a CNN? Give one example of pooling. **[2]**

Q23. Describe object detection with an example. **[2]**

Q24. A 200 × 200 image is stored once as grayscale and once as RGB (1 byte per value). How many bytes does each version need? **[2]**

Long Answer (LA)

Q25. Differentiate between image processing and Computer Vision. Support your answer with one example of each. **[4]**

Q26. Explain the terms pixel, resolution and pixel value. A digital image is 1280 × 1024 pixels in size. Calculate its total number of pixels and state the range of pixel values in a byte image. **[4]**

Case Study

Case Study: A 3 × 3 grayscale image has the pixel values 1 2 3 / 4 5 6 / 7 8 9 (row by row). A 2 × 2 kernel with weights 1 0 / 0 1 slides over the image with stride 1 and no padding.

Q27. Answer the following questions based on the case above. **[4]**

(i) What is the size of the output feature map? [1]

(ii) Calculate the output value at the top-left position. [1]

(iii) Write the complete output feature map. [1]

(iv) Name the CNN layer in which this operation takes place. [1]

Case Study: A hospital uses a Computer Vision system on chest X-ray images. The system labels each X-ray as 'normal' or 'abnormal' and draws a box around any suspected nodule. Doctors check the output before deciding on treatment.

Q28. Answer the following questions based on the case above. **[4]**

(i) Name the CV task that gives the whole X-ray the label 'abnormal'. [1]

(ii) Name the CV task that draws a box around one suspected nodule. [1]

(iii) Why must doctors check the system's output before deciding? [1]

(iv) Name one benefit of this system for the hospital. [1]

10. Natural Language Processing

Part B, Unit 6

Multiple Choice Questions (MCQs)

Q1. Why is the Bag of Words model called a 'bag'? **[1]**

(a) Words must appear in the same order
(b) Only the first word is counted
(c) The order of tokens does not matter
(d) Words are stored in a file

Q2. What are the stemmed and lemmatised forms of the word 'flies'? **[1]**

[SQP 2025-26]

(a) Stemmed: fly, Lemmatized: flies
(b) Stemmed: fly, Lemmatized: fly
(c) Stemmed: flies, Lemmatized: flies
(d) Stemmed: fli, Lemmatized: fly

Q3. Which stage of NLP checks whether a sentence is relevant in the real world and identifies its intended meaning, discarding the literal word meaning? **[1]**

(a) Lexical analysis
(b) Syntactic analysis
(c) Pragmatic analysis
(d) Discourse integration

Q4. Which normalisation technique always gives a root that is a meaningful dictionary word? **[1]**

(a) Stemming
(b) Lemmatisation
(c) Tokenisation
(d) Sentence segmentation

Q5. Stemming the word 'playing' removes the affix '-ing' and gives: **[1]**

(a) playing (b) player (c) plays (d) play

Q6. A news website sorts its articles into Sports, Politics and Food groups. Which NLP application does this? **[1]**

(a) Keyword extraction
(b) Sentiment analysis
(c) Language translation
(d) Text classification

Q7. The word 'bank' can mean the edge of a river or a financial institution. Which feature of natural language does this show? **[1]**

(a) Redundancy (b) Fixed grammar (c) Binary coding (d) Context dependence

Q8. Which word represents the lemma resulting from lemmatisation of 'caring' in the context of NLP? **[1]**

[Board 2024]

(a) Care (b) Cared (c) Cares (d) Car

Q9. Document frequency of a word is the number of: **[1]**

(a) times the word occurs in one document
(b) documents in which the word occurs, irrespective of how many times
(c) stop words in the corpus
(d) tokens in the corpus

Q10. Virtual assistants such as Siri and Alexa are examples of which AI domain? **[1]**

[Board 2024; Board 2023]

(a) Machine Learning (ML)
(b) Computer Vision (CV)
(c) Natural Language Processing (NLP)
(d) Technical Vision (TV)

Q11. Which of these is an application of TF-IDF? **[1]**

(a) Information retrieval system
(b) Image pixel scaling
(c) Face unlock
(d) Robot navigation

Q12. Which NLP-based application responds to the request 'Hey Google, set an alarm for 3.30 pm'? **[1]**

(a) Voice assistant
(b) Auto-generated captions
(c) Keyword extraction
(d) Text classification

Assertion–Reason

Q13. **Assertion (A):** Smart bots need coding and can work with bigger databases.
Reason (R): Smart bots use AI and natural language processing to learn from interactions. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Q14. **Assertion (A):** Tokenisation is necessary before Bag of Words can count words.
Reason (R): Bag of Words needs tokens to build the vocabulary and count word frequencies. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Q15. **Assertion (A):** Chatbots are used in customer care to answer frequently asked questions.
Reason (R): Script bots are pre-programmed with rules to answer basic queries. **[1]**
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

Very Short Answer (VSA)

Q16. _____ is a term used for any word or number or special character occurring in a sentence. **[1]**

[Board 2023]

Q17. State True or False: The TF-IDF value of a stop word such as 'the' is always high. **[1]**

Q18. State True or False: Converting all text to lowercase helps the machine treat 'NLP' and 'nlp' as the same word. **[1]**

Q19. Name one NLP application that converts text or speech from one language into another. **[1]**

Short Answer (SA)

Q20. Write down the steps to implement the Bag of Words algorithm. **[2]**

[SQP 2021-22 (T2)]

Q21. Give two differences between a script bot and a smart bot. **[2]**

[SQP 2020-21; Board 2025 Comptt; Board 2022]

Q22. What is pragmatic analysis? Give an example. **[2]**

Q23. A bot in an online shop answers only fixed, pre-written questions and cannot answer a new one. Name this type of bot and state two of its features. **[2]**

Q24. What do we get from the Bag of Words algorithm? **[2]**

[SQP 2022-23]

Long Answer (LA)

Q25. Differentiate between stemming and lemmatisation. Explain with the help of an example. **[4]**

[SQP 2020-21]

Q26. Explain text classification with the example of spam filtering in e-mails. **[4]**

Case Study

Case Study: Read the following three documents and answer the questions that follow. Document 1: 'Students love studying AI'. Document 2: 'AI is transforming education'. Document 3: 'Teachers and students explore AI tools'. After basic text pre-processing (removing punctuation, converting to lowercase and tokenising), the documents become: Document 1: [students, love, studying, ai]; Document 2: [ai, is, transforming, education]; Document 3: [teachers, and, students, explore, ai, tools].

Q27. Answer the following questions based on the case above. **[4]**

[SQP 2025-26]

(a) Create the dictionary (vocabulary) of unique words from all three documents. [1]

(b) Construct the document vector for Document 3 using the dictionary. [1]

(c) Explain how Bag of Words helps in feature extraction. [1]

(d) Why is the order of words not considered important in Bag of Words? [1]

Case Study: Consider the text of the following documents. Document 1: 'Sahil likes to play cricket.' Document 2: 'Sajal likes cricket too.' Document 3: 'Sajal also likes to play basketball.' Apply all four steps of the Bag of Words model on these documents and generate the output.

Q28. Answer the following questions based on the case above. **[4]**

[Board 2022]

(i) Write the normalised tokens of the three documents. [1]

(ii) Create the dictionary of unique words. [1]

(iii) Create the document vectors for all three documents. [2]

Answer Key (MCQs and Assertion–Reason)

Ch. 1: Q1-(c), Q2-(b), Q3-(c), Q4-(a), Q5-(d), Q6-(d), Q7-(d), Q8-(a), Q9-(b)

Ch. 2: Q1-(d), Q2-(d), Q3-(c), Q4-(b), Q5-(b), Q6-(a), Q7-(d), Q8-(b), Q9-(a)

Ch. 3: Q1-(c), Q2-(d), Q3-(c), Q4-(d), Q5-(b), Q6-(c), Q7-(a), Q8-(b), Q9-(a)

Ch. 4: Q1-(b), Q2-(a), Q3-(a), Q4-(a), Q5-(d), Q6-(d), Q7-(c), Q8-(a), Q9-(b)

Ch. 5: Q1-(a), Q2-(b), Q3-(d), Q4-(a), Q5-(a), Q6-(b), Q7-(a), Q8-(d), Q9-(c)

Ch. 6: Q1-(b), Q2-(a), Q3-(d), Q4-(d), Q5-(c), Q6-(b), Q7-(d), Q8-(c), Q9-(a), Q10-(c), Q11-(a), Q12-(c), Q13-(a), Q14-(a), Q15-(a)

Ch. 7: Q1-(a), Q2-(b), Q3-(c), Q4-(c), Q5-(a), Q6-(a), Q7-(a), Q8-(d), Q9-(d), Q10-(c), Q11-(d), Q12-(a), Q13-(a), Q14-(d), Q15-(c)

Ch. 8: Q1-(c), Q2-(c), Q3-(d), Q4-(d), Q5-(c), Q6-(c), Q7-(b), Q8-(a), Q9-(a), Q10-(c), Q11-(d), Q12-(a), Q13-(a), Q14-(b), Q15-(c)

Ch. 9: Q1-(b), Q2-(b), Q3-(b), Q4-(b), Q5-(d), Q6-(a), Q7-(b), Q8-(d), Q9-(c), Q10-(c), Q11-(c), Q12-(d), Q13-(b), Q14-(b), Q15-(d)

Ch. 10: Q1-(c), Q2-(d), Q3-(c), Q4-(b), Q5-(d), Q6-(d), Q7-(d), Q8-(a), Q9-(b), Q10-(c), Q11-(a), Q12-(a), Q13-(b), Q14-(a), Q15-(a)