



CARIBBEAN EXAMINATIONS COUNCIL

Caribbean Advanced Proficiency Examination

Information Technology Syllabus

Correspondence related to the syllabus should be addressed to:

The Pro-Registrar
Caribbean Examinations Council
Caenwood Centre
37 Arnold Road, Kingston 5, Jamaica, W.I.

Telephone Number: (876) 920-6714
Facsimile Number: (876) 967-4972
E-mail address: cxcwzo@cxc.org
Website: www.cxc.org

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The Garrison, St. Michael 11158 Barbados




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Please check the website www.cxc.org for updates on CXC's syllabuses.





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Introduction

T

he Caribbean Advanced Proficiency Examination (CAPE) are designed to provide certification of the academic, vocational and technical achievement of students in the Caribbean who, having completed a minimum of five years of secondary education, wish to further their studies. The examinations address the skills and knowledge acquired by students under a flexible and articulated system where subjects are organised in 1-Unit or 2-Unit courses with each Unit containing three Modules.

Subjects examined under CAPE may be studied concurrently or singly, or may be combined with subjects examined by other examination boards or institutions.

The Caribbean Examinations Council offers three types of certification. The first is the award of a certificate showing each CAPE Unit completed. The second is the CAPE diploma, awarded to candidates who have satisfactorily completed at least six Units, including Caribbean Studies. The third is the CAPE Associate Degree, awarded for the satisfactory completion of a prescribed cluster of seven CAPE Units including Caribbean Studies and Communication Studies. For the CAPE diploma and the CAPE Associate Degree, candidates must complete the cluster of required Units within a maximum period of five years.

Recognized educational institutions presenting candidates for CAPE towards the award of the Council's Associate Degree in nine categories must, on registering these candidates at the start of the qualifying year, have them confirm in the required form, the Associate Degree they wish to be awarded. Candidates will not be awarded any possible alternatives for which they did not apply.



Information Technology

◆ RATIONALE

The Information Technology Syllabus for the Caribbean Advanced Proficiency Examination (CAPE) reflects the belief that Information Technology is essential to the economic and social development of the region.

The widespread use of Information Technology, the tools and techniques for *inputting, processing, storing, outputting, transmitting and receiving* information, which was made possible because of improvements in computer and telecommunications technology, has significantly changed society. A large proportion of business transactions is now performed over computer networks. *The Internet and multimedia computers have had a significant impact on the ways in which people work, learn, communicate, conduct business, and on the ways they seek entertainment. The increased integration of computer and telecommunications technology has led to an increased globalisation of the world economy. It is now possible to use a telephone line to transfer information between computers located anywhere in the world.*

Moreover, as the world becomes familiar with the potential of Information Technology, people are beginning to realise that many problems and situations which were hitherto thought of as primarily involving physical activities, in fact rely for their solution on the ready availability of relevant information.

In order for the Caribbean to participate in and contribute to this new world, it is essential that Caribbean people become familiar with this technology. This not only implies that we must know how to use the technology from a purely technical point of view; but also means that we must be conscious of the impact of Information Technology. In particular, we must be made aware that the appropriate use of Information Technology can help solve the problems that we are facing in their daily lives, whether they be of an economic, social or personal nature, and that Information Technology provides opportunities for economic development, as well as for further integration, of the region.

However, the increased use of Information Technology also raises a number of ethical, legal and political issues, ranging from questions concerning privacy of information about individuals, to intellectual property rights.

The introduction of Information Technology without careful consideration often worsens a problem, rather than solves it. Any decision to turn to Information Technology must, therefore, be preceded by a critical analysis of the strengths and weaknesses of the proposed solution. In addition, Information Technology has made access to information and misinformation far easier. It is, therefore, crucial that anyone, before using any information, first critically evaluate its reliability.

◆ **AIMS**

The syllabus aims to:

1. develop an awareness of the importance of information in the solution of many problems;
2. develop *a critical attitude to gathering, processing and evaluating information;*
3. *develop a broad understanding of hardware, software, networks, databases and information systems and their uses;*
4. *sensitize students to the use of Information Technology in conducting and living their daily lives;*
5. develop an awareness of the power and pitfalls of Information Technology;
6. develop an awareness of the ethical, legal and political considerations associated with information technology;
7. *assist students in solving real-life problems, using the tools and techniques of the computer and computer-related technologies;*
8. *encourage students to use information sources and services to retrieve, interpret and communicate information;*
9. develop a positive attitude to new and emerging technologies in Information Technology.

◆ **SKILLS AND ABILITIES TO BE ASSESSED**

The skills that students are expected to have developed on completion of this syllabus have been grouped under three headings:

1. Knowledge and Comprehension;
2. Application and Analysis;
3. Synthesis and Evaluation.

Knowledge and Comprehension

The ability to:

- recall and grasp the meaning of basic facts, concepts and principles of Information Technology;
- identify real-life problems for which Information Technology solutions are appropriate and beneficial.

Application and Analysis

The ability to:

- use facts, concepts, principles and procedures in unfamiliar situations;
- interpret and present data and draw logical conclusions about Information Technology issues;
- identify and recognize the relationships between the various components of Information Technology and their impact on society;
- recognize the limitations and assumptions of data gathered in an attempt to solve a problem.

Synthesis and Evaluation

The ability to:

- make reasoned judgements and recommendations based on the value

of ideas and information and their implications;

- use the computer and computer-based tools to solve problems;
- justify and apply appropriate techniques to the principles of problem-solving.

◆ **PRE-REQUISITES OF THE SYLLABUS**

Any person with a good grasp of the Caribbean Secondary Education Certificate (CSEC) Information Technology Syllabus, or its equivalent, should be able to pursue the course of study defined by this syllabus. However, successful participation in the course of study will also depend on the possession of good verbal and written communication skills.

◆ **STRUCTURE OF THE SYLLABUS**

This syllabus is arranged into TWO Units, each made up of three Modules. Whilst each Module in each Unit is independent, together they form a coherent course of study which should prepare candidates for the world of work and studies at the tertiary level.

UNIT 1: INFORMATION TECHNOLOGY THEORY

Module 1 - Fundamentals of Information Technology

Module 2 - Information Technology Systems

Module 3 - Information and Problem-Solving

UNIT 2: APPLICATION AND IMPLICATION

Module 1 - Information Management

Module 2 - Use of Information Technology Tools

Module 3 - Social, Organizational and Personal Issues

In order to be successful, students should spend at least 50 hours of the 150 hours per Unit in a computer lab or on a computer at home or in the workplace.

♦ **UNIT 1: INFORMATION TECHNOLOGY THEORY**

MODULE 1: FUNDAMENTALS OF INFORMATION TECHNOLOGY

GENERAL OBJECTIVES

On completion of this Module, students should:

1. *develop an understanding of how Information Technology (IT) relates to other disciplines in Computing;*
2. *develop an understanding and appreciation of data and information, and the distinction between them;*
3. *develop an understanding of the nature and sources of information;*
4. *develop an understanding and appreciation of Information Technology and its history.*

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

- | | |
|--|--|
| 1. <i>explain the concept of Information Technology;</i> | Definition and scope of Information Technology; application of tools for informational purposes. |
| 2. <i>describe the relationship between Information Technology and other disciplines in Computing;</i> | <i>Computing, Computer Science, Software Engineering, Computer Engineering, and Information Systems; commonalities and differences between disciplines.</i> |
| 3. <i>explain the characteristics of data and information;</i> | Definition of terms; examples. <i>Data: include unprocessed, unorganised and discrete (in separate, unrelated chunks), qualitative (opinion-based, subjective) or quantitative (measurement-based, objective), detailed or sampled.</i> |
| | <i>Information: including distortion, disguise, reliability, inconsistency, incomprehensibility, subject to interpretation, value, relevance, confidentiality, timeliness, completeness,</i> |

security, shareability, availability, lifespan, information as a commodity, format and medium; Nature and structure of information: strategic, tactical, operational; structured, semi-structured and unstructured.

UNIT 1
MODULE 1: FUNDAMENTALS OF INFORMATION TECHNOLOGY
(cont'd)

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

4. distinguish among data, information and knowledge;

Differences among data, information and knowledge.

5. explain information processing;

Definition of information processing (input process, output process); manual versus automated information processing; components of manual information processing: collect, collate, analyze, present and disseminate; components of automated information processing: input (data capture or entry), process (for example, analyze, sort, calculate), store, retrieve, output (present and disseminate); transmit data and information. Interrelationship between data and information through information processing.

Types of manual and automated information systems.

6. discuss the importance of data and information;

Use of information in decision making: data quality; appropriateness of data. Nature and structure of information: strategic, tactical, operational; structured, semi-structured and unstructured.

7. identify ways of representing data and

Data: including character, string, numeric, **aural** (for example, Morse Code, musical

information;

*notes), **visual** (for example, the individual frames of a movie, fingerprints); musical symbols.*

Information: including text, graphics, sound, video, special purpose notations (mathematical, scientific and musical notations); graphical representations (graphs and charts); tables.

8. *discuss various types of information sources;*

Types of information sources: including books, journals, catalogs, magazines, newspapers, online libraries, CD-ROMs, DVDs, electronic databases, web sites, people, blogs, wikis; advantages, disadvantages of information sources.

UNIT 1

MODULE 1: FUNDAMENTALS OF INFORMATION TECHNOLOGY (cont'd)

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

- | | | |
|--|----|--|
| 9. identify characteristics of information sources; | of | Include availability, cost, currency of information, amount of detail (depth), breadth of coverage, reliability, format and medium. |
| 10. identify tools used in the entry, retrieval, processing, storage, presentation, transmission and dissemination of information; | | Examples of hardware, software, and communication tools. Tools associated with the Internet including on-line services; search engines; Usenet, Internet Relay Chat (IRC), telnet, ftp, newsgroups, message board, mailing list, Internet telephony. |
| 11. justify the tools used in Information Technology; | | Hardware, software and communication tool used in the entry, retrieval, processing, storage, presentation, transmission and dissemination of information; advantages and disadvantages. |
| 12. outline the history of Information Technology; | | Brief history of computer hardware and software, Internet and telecommunications; categories by size, cost, and processing ability. |
| 13. explain the meaning of terms related to telecommunication. | | Transmission media, channels, receivers, senders, modulation, bandwidth; telecommuting. |

Suggested Teaching and Learning Activities

To facilitate students' attainment of the objectives of this Module, teachers are advised to engage students in the teaching and learning activities listed below.

1. Use the Internet to source relevant material.
2. Compile a glossary of terms using the Internet, computer magazines, textbooks and other information sources. This could form the basis of an in-class discussion.

3. *Develop and use diagrams to represent the concepts and relationships contained in the Specific Objectives.*
4. *Invite resource persons with experience in the innovative use of Information Technology in fields, such as business and entertainment, to speak on relevant issues.*
5. Develop manual filing system and compare functions, such as retrieval and sorting, with automated information system.

UNIT 1

MODULE 1: FUNDAMENTALS OF INFORMATION TECHNOLOGY (cont'd)

RESOURCES

Daley, B. *Computers are your Future, New Jersey: Pearson Prentice Hall, 2007.*

Heathcote, P. *A Level Computing, Letts, London: Letts, 2005.*

Long, L. and Long, N. *Computers: Information Technology in Perspective, New Jersey: Prentice Hall, 2004.*

Parson, J. and Oja, D. *Computer Concepts, New York: International Thompson Publishing Company, 2007.*

Shelly, G., Cashman, T., and Vermaat, M. *Discovering Computers, New York: International Thompson Publishing Company, 2008.*

UNIT 1
MODULE 2: INFORMATION TECHNOLOGY SYSTEMS

GENERAL OBJECTIVES

On completion of this Module, students should:

1. *develop an understanding of the components of Information Technology Systems;*
2. *develop an appreciation for human computer interaction (HCI);*
3. *develop an awareness of security measures associated with information technology systems;*
4. *develop an awareness of the structure of the World Wide Web and its standards and protocols.*

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

- | | |
|---|--|
| <p>1. <i>describe Information Technology Systems;</i></p> | <p><i>Definition; types of Information Technology Systems; examples.</i></p> |
| <p>2. <i>identify the components of an Information Technology System;</i></p> | <p><i>Hardware, software, network, users: end-users and IT professionals; definitions and examples.</i></p> |
| <p>3. <i>describe the purpose and functions of hardware components;</i></p> | <p><i>Purpose, functions and types of hardware including input, output, storage, processor and peripheral devices; definitions and examples; interaction between hardware components.</i></p> |
| <p>4. <i>describe the purpose and functions of software components;</i></p> | <p><i>Purpose, functions and types of software including application, system (operating systems, language translators, and utilities); proprietary versus open source software; information systems including embedded systems: monitoring and control systems; data processing systems; management information systems, decision support systems, executive information systems; expert systems, data warehouses; definitions and examples; major input and output from each type of information system, such as data, information, processed</i></p> |

transactions, reports including detailed, summarised, exception, ad hoc.

5. explain the various stages of the system development life cycle (SDLC), and software engineering;

Including feasibility study, analysis, design, development, implementation, review; deliverables/output of each stage including system proposal, project plan, various diagrams and charts, information system (software) test plans, conversion plans, documentation including user and technical manuals.

UNIT 1

MODULE 2: INFORMATION TECHNOLOGY SYSTEMS (cont'd)

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

6. discuss the tools used in the different stages of the (SDLC);

Including questionnaires, interviews, observation, review/investigation of printed material, ER diagrams, data flow diagrams, process models, object models, decision tables and trees, computer-aided software engineering (CASE) tools, GHANT charts, prototypes, flowcharts, pseudocode, programming languages.

7. describe the purpose and functions of network components;

Purpose, functions and types of networks including local area network (LAN), wide area network (WAN), metropolitan area network (MAN); virtual private network (VPN); Internet; Intranet; Extranet; configuration; topologies; transmission media: (wired versus wireless): fibre-optic, Unshielded Twisted Pair (UTP); hotspots, protocols; definitions and examples; network security; firewalls.

8. explain the roles of users;

Inclusion of IT professionals, end users: expert users, novice users; definitions and examples.

9. compare the various features associated with the components of Information Technology Systems;

Features including, speed, efficiency, portability, maintainability, storage, transmission.

10. describe the

Relationship between the components:

interrelationship between the components in an Information Technology System;

hardware, software, network, user.

11. *describe different types of HCI;*

Types of HCI including forms, menu, command line, natural language, graphical user interface (GUI), speech and direct manipulation.

12. *distinguish between different types of HCI;*

Types of HCI including forms, menu, command line, natural language, graphical user interface (GUI), speech and direct manipulation.

13. *describe ways in which a user's characteristics require adaptation of a user interface to increase effectiveness;*

For example, age, education, differently abled and cultural differences, non-visual interfaces, sensors, accessibility features; differences.

UNIT 1

MODULE 2: INFORMATION TECHNOLOGY SYSTEMS (cont'd)

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

14. compare various security mechanisms;

Physical access control versus logical access control measures and devices; including passwords (characteristics of an effective password- not obvious, length, mixed case, alphanumeric); authentication, encryption, swipe or key cards, biometric; data integrity.

15. explain the meaning of terms related to the security of Information Technology Systems;

For example, data security, passwords, authentication, encryption, data corruption.

16. describe the structure of the World Wide Web (WWW) as interconnected hypertext documents;

Hyperlinks, home page, web page versus web site; Hypertext Transfer Protocol (HTTP), universal resource locator (URL), hypertext markup language (HTML), extensible markup language (XML); IP address versus domain name.

17. discuss Internet standards.

Hypertext Transfer Protocol (HTTP); Transfer Control Protocol/Internet Protocol (TCP/IP) in terms of specifications, guidelines, software and tools.

Suggested Teaching and Learning Activities

To facilitate students' attainment of the objectives of this Module, teachers are advised to engage students in the teaching and learning activities listed below.

1. *Identify a user of a microcomputer system in an office environment and conduct an interview to ascertain which software tool is used by the user and why. Discuss specific features of the software that makes it suited to the given task. Determine if a more appropriate software tool could be used for the task, identify the software tool and explain why it is more appropriate.*

2. *Compile a glossary of terms using the Internet, computer magazines, textbooks and other information sources. This could form the basis of an in-class discussion.*
3. *Identify two examples of a HCI and make a presentation comparing and contrasting those interfaces.*
4. *Use the example of a person driving a car and interacting with the instruments on the dashboard as an opportunity to introduce HCI.*

UNIT 1

MODULE 2: INFORMATION TECHNOLOGY SYSTEMS (cont'd)

5. *Identify HCI used in different organizations (for example, restaurants, hospitals, recording studios, security firms, scientific labs) and by the student (for example, ipod, gaming consoles, cell phone, web pages) and evaluate these designs based on a set of identified criteria.*
6. *Develop and use diagrams to represent the concepts and relationships contained in the Specific Objectives.*
7. *Invite resource persons with experience in the innovative use of Information Technology in business to speak on relevant issues.*

RESOURCES

- | | |
|---|---|
| <i>Daley, B.</i> | <i>Computers are your Future, New Jersey: Pearson Prentice Hall, 2007.</i> |
| <i>Heathcote, P.</i> | <i>A Level Computing, Letts, London: Letts, 2005.</i> |
| <i>Long, L. and Long, N.</i> | <i>Computers: Information Technology in Perspective, New Jersey: Prentice Hall, 2004.</i> |
| <i>Parson, J. and Oja, D.</i> | <i>Computer Concepts, New York: International Thompson Publishing Company, 2007.</i> |
| <i>Shelly, G., Cashman, T., and Vermaat, M.</i> | <i>Discovering Computers, New York: International Thompson Publishing Company, 2008.</i> |

UNIT 1

MODULE 3: INFORMATION AND PROBLEM-SOLVING

GENERAL OBJECTIVES

On completion of this Module, students should:

1. *develop the knowledge, skills and understanding of the problem-solving process;*
2. *develop an appreciation for the value and importance of information to solve problems.*

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

- | | |
|---|---|
| 1. <i>explain the concept of problem-solving;</i> | Problem-solving as a process; finding solutions to a problem. |
| 2. <i>describe the stages of the problem-solving process;</i> | <i>Stages: including define the problem, analyze the problem (using tools, such as questionnaires, interviews, observation, reviewing documents), identify and evaluate possible solutions, select and justify the optimal solution, implement, and review.</i> |
| 3. <i>describe the role of information in the solution of real-life problems;</i> | <i>Identification of the information necessary for the solution of personal, commercial, scientific and social problems. Categorization of information as essential, desirable, extraneous or cosmetic in the solution of a problem.</i> |
| 4. <i>explain how information can be used to solve real-life problems;</i> | <i>Criteria for rejecting or accepting a piece of information, including bias, accuracy, cultural context, completeness, currency of information, refereed and unrefereed sources, characteristics of information on the Internet.</i> |
| 5. <i>analyse the role of information in fulfilling the goals of an individual or organization;</i> | Information used in decision-making and problem-solving; capitalising on opportunities. |
| 6. <i>use data flow diagrams (DFD) to document the flow of information within an</i> | <i>Use of symbols for data stores, processing, data flow and external entities; context level DFD and first level detailed DFD.</i> |

organization;

7. explain the concept of an algorithm;

Definition; algorithm as a problem-solving strategy; its role and importance in the problem-solving process; properties of algorithm.

8. identify the necessary properties of 'well designed' algorithms;

Properties including a general solution to the problem in a finite number of steps, clearly defined and unambiguous, flow of control from one process to another.

UNIT 1

MODULE 3: INFORMATION AND PROBLEM-SOLVING (cont'd)

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

9. identify ways of representing algorithms;

Inclusion of narrative, flowcharts and pseudocode.

10. develop algorithms to represent problem solution;

Simple input, output, processing; control structures: sequence, selection, looping and iteration.

11. explain the concept of programming;

Development of computer programs; stages in programme development; programming paradigms; examples of programming languages.

12. outline the interrelationship(s) between algorithms and programming.

Algorithms as precursor to program development.

Suggested Teaching and Learning Activities

To facilitate students' attainment of the objectives of this Module, teachers are advised to engage students in the teaching and learning activities listed below.

1. Conduct discussion leading to the definition of a problem to ascertain the students' perspectives of the problem. Give feedback on the perspectives by identifying problems in different scenarios. For example, a farmer getting rid of a pest affecting his crop.

2. Emphasis should be placed on the fact that most if not all problems have an information component. For example, the information the farmer would need to get rid of the pest affecting his crop would be the type

of pest, what are its natural enemies, what would be the effect on his crop of using a particular pesticide or a natural enemy of the pest.

3. *Visit business places to observe how Information Technology is used to address problems faced by the organisation.*

4. *Invite professionals, artists, and others to make presentations to students to give additional perspectives on issues relevant to their studies. Encourage students to make presentations to persons outside of the school system, who can evaluate a comment on the presentations as well as answer the students' questions.*

5. *Invite professionals, artists, and others to make presentations to students to give additional perspectives on issues relevant to their studies. Encourage students to make presentations to persons outside of the school system, who can evaluate a comment on the presentations as well as answer the students' questions.*

UNIT 1

MODULE 3: INFORMATION AND PROBLEM-SOLVING (cont'd)

6. Choose a physical activity, such as a sport, to demonstrate how the use of information can be an effective tool or mechanism in ensuring a desired outcome, such as improved performance or success over competitors.

7. Develop a set of scenarios in which there are either opportunities or problems encountered by an organization. Students are required to (a) identify a problem, (b) formulate a problem statement, (c) suggest two possible solutions, and (d) recommend one of the solutions and justify the choice.

8. Adopt a single DFD notation style and have students complete several exercises to become familiar with that style, for example, Gane and Sarson. Present data flow diagramming errors and have students label these with the relevant terms. For example, black hole - process with only input data flow, a process with only output data flow from it; data stores or external entities that are connected directly to each other, in any combination; incorrectly labeling data flow or objects, some examples are:

- (i) labels omitted from data flow or objects;
- (ii) data flow labeled with a verb;
- (iii) processes labeled with a noun.

9. Work in groups to address problem-solving through the development of algorithms and the use of pseudocode to solve those problems. This activity should ensure that all elements are practiced.

RESOURCES

- Daley, B. *Computers are your Future*, New Jersey: Pearson Prentice Hall, 2007.
- Heathcote, P. *A Level Computing*, Letts, London: Letts, 2005.
- Long, L. and Long, N. *Computers: Information Technology in Perspective*, New Jersey: Prentice Hall, 2004.
- Parson, J. and Oja, D. *Computer Concepts*, New York: International Thompson Publishing Company, 2007.

Shelly, G., Cashman, T., and Vermaat, M. *Discovering Computers*, New York: International Thompson Publishing Company, 2008.

◆ UNIT 2: **APPLICATION AND IMPLICATION**

MODULE 1: **INFORMATION MANAGEMENT**

GENERAL OBJECTIVES

On completion of this Module, students should:

- 1. acquire the knowledge needed to organize and manage data, making it meaningful to an organization;*
- 2. demonstrate the skills needed to organize and manage data within a database.*

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

- | | |
|--|--|
| <i>1. differentiate among terms used in Information Management;</i> | <i>For example, fields, records, tables, files, database and database management system.</i> |
| <i>2. explain how files and databases are used in organizations;</i> | <i>Uses: including store, organize, search, retrieve; eliminate redundancies; data mining, data marts and data warehouses.</i> |
| <i>3. explain how data storage and retrieval have changed over time;</i> | <i>Concept of the terms; history of storage devices; formats of data (from text-based to multimedia); volumes to be stored; compression utilities; access method and speed.</i> |
| <i>4. explain the advantages of using a database approach compared to using traditional file processing;</i> | <i>Advantages including speed, efficiency, cost; data quality: completeness, validity, consistency, timeliness and accuracy; data handling, data processing.</i> |
| <i>5. describe the different types and organization of files and databases;</i> | <i>File types including master and transaction files; file organization including serial, sequential, random or direct, indexed sequential database types including personal, workgroup, department and enterprise databases; database organization including hierarchical, relational, network and object-oriented.</i> |

6. describe
data flow diagrams
(DFD);

Define DFD; identify and describe the four symbols (elements): entity, process, data store, data flow; identify and describe the various levels of DFDs including context level DFD and first level detailed DFD.

UNIT 2

MODULE 1: INFORMATION MANAGEMENT (cont'd)

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

- | | |
|---|---|
| 7. <i>explain how the growth of the Internet impact on data handling and data processing;</i> | <i>For example, the demands for information (by customers and suppliers); data mining, data warehousing; interfacing websites to underlying databases.</i> |
| 8. <i>explain how the absence of data quality, accuracy, and timeliness will impact on organizations;</i> | <i>Including loss of revenue, sales, competitive advantage, customers; poor decision-making; missed opportunities; impact on problem solutions.</i> |
| 9. <i>explain the concept of normalization;</i> | <i>Definition of normalisation; attribute redundancy and anomalies; normal forms: including first normal form (1NF), second normal form (2NF), third normal form (3NF); keys: primary, foreign and composite (or compound or concatenated); partial and non-key dependencies; relationships, use of entity-relationship diagrams (ERD).</i> |
| 10. <i>apply normalisation rules to remove normal form violations;</i> | <i>To 1NF, 2NF and 3NF; removal of attribute redundancy and anomalies, such as repeating groups of data (or attributes), partial and non-key dependencies.</i> |
| 11. <i>explain how normal for relations impact databases;</i> | <i>Including improve performance, data consistency, data integrity.</i> |
| 12. <i>construct a database.</i> | <i>Including forms; reports, queries, tables, tuples, relationship links, enforcing referential integrity, updates or deletions, use of foreign keys, use of macros, SQL, data validation and verification strategies; used to analyse data and provide multiple viewing and reporting of data.</i> |

Suggested Teaching and Learning Activities



To facilitate students' attainment of the objectives of this Module, teachers are advised to engage students in the teaching and learning activities listed below.

1. Choose a single scenario to which students can easily relate, such as a library system or student registration system, and use it throughout the Module to develop understanding of the specified concepts and techniques.

UNIT 2

MODULE 1: INFORMATION MANAGEMENT (cont'd)

2. Ask students to complete several exercises on the normalisation process involving the use of standard notations to remove normal form violations.
3. Compile a glossary of terms using the Internet, computer magazines, textbooks and other information sources. This could form the basis of an in-class discussion.
4. Students should design and construct a database.
5. Develop and use diagrams to represent the concepts and relationships contained in the Specific Objectives.

RESOURCES

- | | |
|--|--|
| Daley, B. | <i>Computers are your Future</i> , New Jersey: Pearson Prentice Hall, 2007. |
| Heathcote, P. | <i>A Level Computing</i> , Letts, London: Letts, 2005. |
| Long, L. and Long, N. | <i>Computers: Information Technology in Perspective</i> , New Jersey: Prentice Hall, 2004. |
| Parson, J. and Oja, D. | <i>Computer Concepts</i> , New York: International Thompson Publishing Company, 2007. |
| Shelly, G., Cashman, T., and Vermaat, M. | <i>Discovering Computers</i> , New York: International Thompson Publishing Company, 2008. |

UNIT 2

MODULE 2: USE OF INFORMATION TECHNOLOGY TOOLS

GENERAL OBJECTIVES

On completion of this Module, students should:

1. *develop confidence in selecting and using productivity tools to solve real-life problems;*
2. *use their knowledge and understanding of a variety of software tools and apply their use to various situations;*
3. *develop the competence to present information in the appropriate manner;*
4. *use information critically;*
5. *develop an awareness of emerging technologies.*

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

- | | |
|--|---|
| 1. <i>explain reasons for the use of IT tools;</i> | <i>Enhanced speed, accuracy, reliability, efficiency, flexibility, communication, presentation of information, integration of processes, decision making; storage and retrieval of large volumes of data; manageability of task; pressures from clients, competitors and suppliers.</i> |
| 2. <i>explain the functions and uses of the</i> | <i>Examples of different types of software packages and their function and uses.</i> |

major types of software tools;

Including Financial Packages, Software Development Tools, Statistical Tools, Word Processors, Spreadsheets, Presentation Tools, and Database Management Tools, Desktop publishing, graphics and personal information management.

3. explain where a word processing tool is appropriate;

Main purpose and uses; significant features of the tool.

4. explain where a spreadsheet tool is appropriate;

Main purpose and uses; significant features of the tool.

5. explain where a presentation tool is appropriate;

Main purpose and uses; significant features of the tool.

6. explain where a database management system tool is appropriate;

Main purpose and uses; significant features of the tool.

UNIT 2

MODULE 2: USE OF INFORMATION TECHNOLOGY TOOLS (cont'd)

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

7. use IT tools to solve real-life problems;

Including hardware, application software, and communication tools; main purpose and uses of tool; significant features of the tool.

8. justify the use of IT tools to solve real-life problems;

Criteria for selection including the nature of the solution, type of analysis required (calculations, formatting, graphing), type of data, type of storage, type of access method, type of processing, type of reports (detailed, summary, preformatted, ad hoc).

9. use the most appropriate format to display or present information;

Format including text, graphics, sound, video, graphs, charts and tables.

- | | |
|--|---|
| 10. use appropriate information sources to retrieve and disseminate information for a particular task; | Criteria for selection, appropriateness for task, types of information sources: including books, journals, catalogs, magazines, newspapers, online libraries, CD-ROMs, DVDs, electronic databases, web sites, and people. |
| 11. justify the acceptance or rejection of a piece of information; | Based on critical evaluation of information sources; criteria including authority, publishing body, bias or objectivity, currency, reference to other sources, relevance and coverage (breadth and depth). |
| 12. use information technology tools to access and communicate with remote information sources; | Tools including communication software, browsers, e-mail systems, fax, telephone, pager, computer, word processor, spreadsheet, presentation software, desktop publishing software, Internet: interactive on-line services; telnet, ftp, newsgroups, message board, mailing list, Internet telephony. |
| 13. construct web pages; | Design, code, construct web pages using HTML, authoring tools; hyperlinks. |
| 14. discuss types of web pages; | Including portal, news, blog, wiki, informational, business, marketing. |
| 15. explain how an emerging technology can be used for a particular task. | Including alternative input/output devices; alternative displays; intelligent appliances; mobile computing and wearable computing. |

UNIT 2

MODULE 2: USE OF INFORMATION TECHNOLOGY TOOLS (cont'd)

Suggested Teaching and Learning Activities

To facilitate students' attainment of the objectives of this Module, teachers are advised to engage students in the teaching and learning activities listed below.

1. Compile a glossary of terms using the Internet, computer magazines, textbooks and other information sources. This could form the basis of an in-class discussion.

2. *Identify a software package to research. The student or group may demonstrate one feature of software to the whole class using audio-visual aids. Special attention should be paid to features that make the software uniquely suited to the given task.*
3. *Apprise students of presentation packages like PowerPoint and encourage them to use appropriate packages in their presentation. Invite persons knowledgeable in presentation skills to critique the presentations.*

RESOURCES

- Daley, B. Computers are your Future, New Jersey: Pearson Prentice Hall, 2007.*
- Heathcote, P. A Level Computing, Letts, London: Letts, 2005.*
- Long, L. and Long, N. Computers: Information Technology in Perspective, New Jersey: Prentice Hall, 2004.*
- Parson, J. and Oja, D. Computer Concepts, New York: International Thompson Publishing Company, 2007.*
- Shelly, G., Cashman, T., and Vermaat, M. Discovering Computers, New York: International Thompson Publishing Company, 2008.*

UNIT 2

MODULE 3: SOCIAL, ORGANIZATIONAL AND PERSONAL ISSUES

GENERAL OBJECTIVE

On completion of this Module, students should develop an understanding of the power and potential pitfalls of Information Technology.

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

1. describe ways in which Information Technology impact on the society;

Ways including modes of interaction between people; telecommuting; online shopping; gaming; gender and diversity related issues; impact of automation of existing processes; process innovation; need for information policies and strategies within organizations and the nation; emergence of new organizations (virtual organizations); knowledge management; impact on job skills, job opportunities, retraining, privacy, surveillance, security, commercial transactions, entertainment, culture, economy and economic opportunities, politics; e-commerce and e-business, e-governance, e-learning, e-surgery; copyright, intellectual property rights; proprietary data and software; computer crimes; litigation; technology transfer; cultural biases; trade agreements, legislation; taxation.

2. discuss various computer crimes;

Including propaganda; computer fraud, industrial sabotage; computer viruses; malware, electronic eavesdropping; cyber terrorism, hacking; identity theft, spoofing, phishing, hardware theft and vandalism, piracy, information theft, spam.

3. explain how Information Technology System components can be threats, vulnerabilities, countermeasures, attacks and compromises to organizations;

For example, threats posed by the Internet, such as by providing access to the Internet to employees the organization is exposed to lawsuits, viruses and hacking; encryption as a two-edged sword; difficulties experienced by organisations in the disposal of obsolete equipment.

4. describe

Including laws, policies, procedures,

legal and ethical considerations related to the handling and management of enterprise information assets;

guidelines; the misuse of information, such as manipulation of information to give false representations, identity theft; invasion of privacy; phishing, pharming.

UNIT 2
MODULE 3: SOCIAL, ORGANIZATIONAL AND PERSONAL ISSUES
(cont'd)

SPECIFIC OBJECTIVES

CONTENT

Students should be able to:

5. *explain the risks or threats associated with disasters or disruptions;*

Risks associated with natural disasters and other hazards, such as hurricanes, flooding, earthquakes, volcanic eruptions, fires, riots, strikes, acts of terrorism. Risks associated with disruptions including power outages, spikes or surges.

6. *examine various other computer security, health and safety, and environmental risks and threats;*

Computer security risks including Internet and network attacks, unauthorized access and use; hardware theft and vandalism; software and information theft, system failure: defective devices (electromechanical problems), software glitches or bugs.

Health and safety risks including repetitive strain injury, carpal tunnel syndrome, computer vision syndrome, computer addiction.

Environmental risks including energy consumption, environmental pollution, such as disposal of obsolete computer equipment and storage media.

7. *specify key mitigation strategies (mechanisms and measures) to counter risks;*

Including disaster recovery plan, backup; uninterruptible power supply (UPS); surge protectors, firewalls; authentication: usernames, passwords, possessed objects, biometric devices, encryption; audit trails; transaction logs; intrusion detection software; antivirus software; legislation; company policies; software licensing including agreements, shareware, freeware, site licenses, enterprise licenses and single user licenses; product activation; ergonomics and workplace design; therapy and support groups; green computing.

8. *distinguish*

Explanation of terms copyright, patent and

among copyright, patent, and trademark laws;

trademark; differences.

9. *explain the implications of plagiarism;*

Negative implications of plagiarism.

10. *examine the consequences of software piracy;*

Including enacting legislations, establishing policies, loss of revenue for developers, software agreements and licenses, product activation.

UNIT 2

MODULE 3: SOCIAL, ORGANIZATIONAL AND PERSONAL ISSUES (cont'd)

SPECIFIC OBJECTIVES

CONTENT

11. *distinguish among the different types of malware;*

Malware including viruses, Trojan horses and worms.

12. *evaluate policies and practices that are relevant to safeguarding an organisation's information assets.*

Policies including Internet policies, email policies and practices; security measures.

Suggested Teaching and Learning Activities

To facilitate students' attainment of the objectives of this Module, teachers are advised to engage students in the teaching and learning activities listed below.

1. *Make extensive use of the Internet to source material relevant to this Module.*
2. *Invite resource persons with the relevant expertise to discuss issues relevant to this Module. This is particularly useful for Specific Objectives 3, 4, 6, 9 and 10.*
3. *Use case studies to demonstrate techniques and concepts.*

4. *Use concept maps and concept frames to organise and illustrate the interrelationships between various pieces of information.*
5. *Conduct teacher-guided classroom discussion. Students should be encouraged to discuss and debate the ethical, social, economic, legal and political implications of the use of Information Technology.*
6. *Obtain brochures from vendors and service providers.*

RESOURCES

- Daley, B. Computers are your Future, New Jersey: Pearson Prentice Hall, 2007.*
- Parson, J. and Oja, D. Computer Concepts, New York: International Thompson Publishing Company, 2007.*
- Shelly, G., Cashman, T., and Vermaat, M. Discovering Computers, New York: International Thompson Publishing Company, 2008.*

◆ **OUTLINE OF ASSESSMENT**

Candidates' performance will be reported as an overall grade and a grade on each Module. The scheme of assessment will comprise two components, one external and one internal.

EXTERNAL ASSESSMENT **(80%)**

| | | |
|---|--|-------|
| Paper 01 (1 hour 30 minutes) | Forty-five multiple-choice items, fifteen (15) from each Module. Each item is worth 1 mark. | (30%) |
| Paper 02 (2 hours 30 minutes) | The paper will consist of nine questions, three on each Module. Candidates will be expected to answer all questions. | (50%) |

INTERNAL ASSESSMENT **(20%)**

Paper 03A/03B

This paper is compulsory and consists of a project.

Unit 1: Information Technology Theory

The aim of the project is to develop the candidate's appreciation for and use of the problem-solving process.

Requirements

Each candidate is required to identify and examine a problem in their own environment which requires an Information Technology based solution. The candidate should define the problem, collect data relevant to that problem, identify and examine options and present the selected solution with justification. The candidates should ensure that the selected solution is an Information Technology based solution. The student should produce a report of approximately 1500-2000 words.

Unit 2: Application and Implications

The aim of the project is to provide opportunity for the candidate to demonstrate proficiency in the use of Information Technology tools to solve real-life problems and have an appreciation for the factors that mitigate against and manage risk associated with Information Technology.

Requirements

Each candidate is expected to implement an Information Technology based solution to an identified problem in their environment and present that solution using appropriate productivity tools and/or web pages. The project should also include a report of approximately 500-700 words which outlines the problem and addresses any implications which may arise from the implementation of the solution.

MODERATION OF INTERNAL ASSESSMENT

An Internal Assessment Record Sheet will be sent each year to schools submitting students for the examinations.

All Internal Assessment Record Sheets must be submitted to CXC by May 31 of each year of the examination. A sample of assignments will be requested by CXC for moderation purposes. These samples will be re-assessed by CXC Examiners who moderate the Internal Assessment. Teachers' marks may be adjusted as a result of moderation. The Examiners' comments will be sent to teachers.

Copies of the students' submissions must be retained by the school until three months after publication by CXC of the examination results.

ASSESSMENT DETAILS

External Assessment

Paper 01 and Paper 02

The external assessment consists of two written papers. They are externally set and externally assessed. Together they contribute 80% of the final mark.

Paper 01 (1 hour 30 minutes)

1. Composition of the Paper

The paper will consist of forty-five (45) multiple-choice items, fifteen (15) from each Module. All questions are compulsory and knowledge of the entire Syllabus is expected. The paper will assess the candidate's knowledge across the breadth of the Syllabus.

2. Mark Allocation

The paper is worth 45 marks, with each question being allocated 1 mark.

3. Question Type

Questions may be presented using diagrams, data, graphs, prose or other stimulus material.

Paper 02 (2 hours 30 minutes)

1. Composition of the Paper

This paper has three sections and consists of nine questions, three on each Module. Candidates are required to answer all questions.



2. Mark Allocation

The paper is worth 150 marks, each module being allocated 50 marks, comprising of two questions being allocated 15 marks each, and one question being allocated 20 marks.

3. Question Type

Each question presents a situation related to a specific topic in the syllabus and consists of three or four sub-questions. The required responses to a sub-question may range in length from one sentence to two paragraphs.

4. Award of marks

Marks will be awarded for knowledge and comprehension, application and analysis and synthesis and evaluation.

Internal Assessment (20% of Total Assessment)

Internal Assessment is an integral part of student assessment in the course covered by this syllabus. It is intended to assist students in acquiring certain knowledge, skills and attitudes that are associated with the subject. The activities for the Internal Assessment are linked to the syllabus and should form part of the learning activities to enable the student to achieve the objectives of the syllabus.

During the course of study for the subject, students obtain marks for the competence they develop and demonstrate in undertaking their Internal Assessment assignments. These marks contribute to the final marks and grades that are awarded to students for their performance in the examination.

The guidelines provided in this syllabus for selecting appropriate tasks are intended to assist teachers and students in selecting assignments that are valid for the purpose of Internal Assessment. The guidelines provided for the assessment of these assignments are intended to assist teachers in awarding marks that are reliable estimates of the achievement of students in the Internal Assessment component of the course. In order to ensure that the scores awarded by the teachers are not out of line with the CXC standards, the Council undertakes the moderation of a sample of the Internal Assessment assignments marked by each teacher.

Internal Assessment provides an opportunity to individualise a part of the curriculum to meet the needs of students. It facilitates feedback to the student at various stages of the experience. This helps to build the self-confidence of students as they proceed with their studies. Internal Assessment also facilitates the development of critical skills and abilities emphasised by this CAPE subject and enhance the validity of the examination on which candidate performance is reported. Internal Assessment, therefore, makes a significant and unique contribution to both the development of relevant skills and the testing and rewarding of students for the development of those skills.

The Caribbean Examinations Council seeks to ensure that the Internal Assessment scores are valid and reliable estimates of accomplishment. The guidelines provided in this syllabus are intended to assist in doing so.

Each candidate's total Internal Assessment mark for any Unit should be divided in three and allocated to each Module equally.

Fractional marks should not be awarded. Wherever the Unit mark is not divisible by three, then

- (a) when the remainder is 1 mark, it should be allocated to Module 1
- (b) when the remainder is 2, one of the marks should be allocated to Module 2 and the other mark to Module 3.

1. **Integration of Project into the course**

- (i) The activities related to Project work should be integrated into the course so as to enable candidates to learn and practice the skills of undertaking a successful project.
- (ii) Some time in class should be allocated for general discussion of project work. For example, discussion of how data should be collected, how data should be analysed and how data should be presented.
- (iii) Class time should also be allocated for discussion between teacher and student, and student and student.

2. **Management of Project**

i. **Planning**

An early start to planning project work is highly recommended and the schedule of the dates for submission should be developed by teachers and candidates.

ii. **Length**

The length of the report of the project should be *between 1500 - 2000 words for Unit 1 and 600 – 700 words for Unit 2* excluding diagrams, graphs, tables and bibliographies.

iii. **Guidance**

Each candidate should know the requirements of the project and its assessment process.

Although candidates may consult with resource persons besides the teacher the candidates submission should be his or her own work.

Candidates are not expected to work on their own. The teacher is expected to give appropriate guidance at all stages of project work, for example, chapters to read, alternative procedures to follow and other sources of information.

iv. **Authenticity**

Teachers are required to ensure that all projects are the candidates' work.

A recommended procedure is to:

- (a) engage candidates in discussion;
- (b) ask candidates to describe procedures used and summarize findings either orally or written;
- (c) ask candidates to explain specific aspects of the analysis.

MARK SCHEME FOR INTERNAL ASSESSMENT

UNIT 1

| | |
|--|------------------|
| Problem definition | (2 marks) |
| • Complete accurate description of the problem | 2 marks |
| • Partial accurate description for the problem | 1 mark |
| Ghant chart | (2 marks) |
| • Complete - <i>showing all stages from analysis of the problem to justification of solution with realistic times and appropriate use of chart</i> | 2 marks |
| • Partially complete – <i>showing some stages, timelines incomplete or unrealistic with inappropriate use of chart</i> | 1 mark |
| Analysis of the problem | (3 marks) |
| • Thorough analysis <i>applying at least three appropriate fact finding techniques to establish the major cause or causes of the problem</i> | 3 marks |
| • Thorough analysis <i>applying two appropriate fact finding techniques that identify a cause of the problem</i> | 2 marks |
| • Thorough analysis <i>using one fact finding technique that identifies a cause of the problem</i> | 1 mark |
| Identification of possible solutions | (2 marks) |
| • Identification of <i>TWO or MORE</i> possible | 2 marks |

solutions

- Identification of *ONE* possible solution 1 mark

Evaluation of possible solutions (3 marks)

- Complete evaluation of *TWO* or *MORE* solutions identified with appropriate treatment of elements such as hardware tools, software tools, other equipment, personnel, cost, and other relevant entities. 3 marks

- Partial evaluation of *TWO* or *MORE* solutions identified as it pertains to the treatment of the elements identified above. 2 marks

- Evaluation of *ONE* solution identified 1 mark

Solution (2 marks)

- Selection of the MOST feasible solution 2 marks

- Selection of a solution 1 mark

Justification of solution (4 marks)

- Thorough analysis of the issues and appropriate justification of ALL strategies recommended 4 marks

- Thorough analysis of the issues and appropriate justification of MOST strategies recommended 3 marks

- Some analysis of a few of the issues and appropriate justification of some strategies 2 marks

- Appropriate justification of few or partial analysis 1 mark

Presentation and communication of information (2 marks)

- Paper is organised and well structured
- Cover, content page and abstract present and complete
- Layout of References (MLA or APA)

ALL THREE 2 marks

ANY TWO 1 mark

(20 marks)

UNIT 2

REPORT:

Problem definition (1 mark)

- Complete description of the problem 1 mark

Analysis of the problem (2 marks)

- Thorough analysis of *facts to identify the* causes of the problem 2 marks

- Partial analysis of *facts to identify* a cause of the 1 mark



problem

Identification and justification of tools

(2 marks)

- Identification and justification of all appropriate tools
- Identification and justification of some of the appropriate tools

2 marks

1 mark

Assessment of the implication of the solution

(3 marks)

- Discussion of issues *that may impact the organisation*
- Discussion of strategies to address the issues
 - Discussion of ALL strategies to address issues
 - Discussion of SOME strategies to address issues

1 mark

2 marks

1 mark

SOLUTION:

Implementation of the solution

(12 marks)

- *Appropriate* use of tools
- *Appropriate* use of ALL tools

(1 mark)

1 mark

- *Human Computer Interface*
 - *Logical and user friendly navigation with appropriate labelling*
 - *Limited navigation available with appropriate labelling*

(2 marks)

2 marks

1 mark

- *Appropriate use of features of tools*
 - *Selection and appropriateness of ALL relevant features*
 - *Selection and appropriateness of SOME relevant features*

(2 marks)

2 marks

1 mark

(7 marks)

7 marks

3 marks

1 mark

- *Working solution based on a minimum of THREE entities from which a minimum of SIX tables directly related to the entity is to be developed.*
 - *Fully working solution with necessary security and integrity features*
 - *MOST features work with some security and integrity checks*
 - *FEW features work with minimal security and integrity checks*

(20 marks)

◆ REGULATIONS FOR PRIVATE CANDIDATES



Candidates who are registered privately will be required to sit Paper 01, Paper 02 and Paper 03B. Paper 03B will test the student's acquisition of the skills in the same areas of the syllabus identified for the internal assessment. Consequently, candidates are advised to undertake a project similar to the project that the school candidates would normally complete and submit for internal assessment. It should be noted that private candidates would not be required to submit a project document.

◆ **REGULATIONS FOR RESIT CANDIDATES**

Resit candidates must rewrite Papers 01 and 02 of the examination for the year in which they re-register. Resit candidates may elect not to repeat the Internal Assessment component provided they rewrite the examination no later than two years following their first attempt.

Resit candidates must be entered through a school, approved educational institution or the Local Registrar Office.

◆ ASSESSMENT GRID

The Assessment Grid contains marks assigned to papers and to Modules and percentage contributions of each paper to total scores.

| Papers | Module 1 | Module 2 | Module 3 | Total | (%) |
|--|----------|----------|----------|-------|-------|
| External Assessment | | | | | |
| Paper 01 Multiple Choice (1 hour 30 minutes) | (15) | (15) | (15) | (45) | (30) |
| Weighting | 30 | 30 | 30 | 90 | |
| Paper 02 Essay (2 hours 30 minutes) | 50 | 50 | 50 | 150 | (50) |
| Internal Assessment | | | | | |
| Paper 03A Paper 03B (1 hour 30 minutes) | 20 | 20 | 20 | 60 | (20) |
| Total | 100 | 100 | 100 | 300 | (100) |



GLOSSARY

| <u>WORD</u> | <u>DEFINITION/MEANING</u> | <u>NOTES</u> |
|----------------|--|--|
| analyse | examine in detail | |
| annotate | add a brief note to a label | Simple phrase or a few words only. |
| apply | use knowledge/principles to | Make inferences/conclusions. |
| solve problems | | |
| assess | present reasons for the importance of particular structures, relationships or processes | Compare the advantages and disadvantages or the merits and demerits of a particular structure, relationship or process. |
| calculate | arrive at the solution to a numerical problem | Steps should be shown; units must be included. |
| classify | divide into groups according to observable characteristics | |
| comment | state opinion or view with supporting reasons | |
| compare | state similarities and differences | An explanation of the significance of each similarity and difference stated may be required for comparisons which are other than structural. |
| construct | use a specific format to make and/or draw a graph, histogram, pie chart or other representation using data or material provided or drawn from practical investigations, build (for example, a model), draw scale diagram | Such representations should normally bear a title, appropriate headings and legend. |
| deduce | make a logical connection between two or more pieces of information; use data to arrive at a conclusion | |
| define | state concisely the meaning of a word or term | This should include the defining equation/formula |

| <u>WORD</u> | <u>DEFINITION/MEANING</u> | <u>NOTES</u> |
|---|---|--|
| | demonstrate show; direct attention to... | where relevant. |
| derive | to deduce, determine or extract from data by a set of logical steps some relationship, formula or result | This relationship etc., may be general or specific. |
| describe | provide detailed factual information of the appearance or arrangement of a specific structure or a sequence of a specific process | Description may be in words, drawings or diagrams or any appropriate combination. Drawings or diagrams should be annotated to show appropriate detail where necessary. |
| determine | find the value of a physical quantity | |
| design | plan and present with appropriate practical detail | Where hypotheses are stated or when tests are to be conducted, possible outcomes should be clearly stated and/or the way in which data will be analyzed and presented. |
| develop | expand or elaborate an idea or argument with supporting reasons | |
| diagram | simplified representation showing the relationship between components. | |
| differentiate/distinguish (between/among) | state or explain briefly those differences between or among items which can be used to define the items or place them into separate categories. | |
| discuss | present reasoned argument; consider points both for and against; explain the relative merits of a case | |
| draw | make a line representation from specimens or apparatus which shows an accurate relation between the parts | In the case of drawings from specimens, the magnification must always be stated. |
| estimate | make an approximate quantitative judgement | |

| <u>WORD</u> | <u>DEFINITION/MEANING</u> | <u>NOTES</u> |
|--------------------|---|--|
| evaluate | weigh evidence and make judgements based on given criteria | The use of logical supporting reasons for a particular point of view is more important than the view held; usually both sides of an argument should be considered. |
| explain | give reasons based on recall; account for | |
| find | locate a feature or obtain as from a graph | |
| formulate | devise a hypothesis | |
| identify | name or point out specific components or features | |
| illustrate | show clearly by using appropriate examples or diagrams, sketches | |
| interpret | explain the meaning of | |
| justify | explain the correctness of | |
| investigate | use simple systematic procedures to observe, record data and draw logical conclusions | |
| label | add names to identify structures or parts indicated by pointers | |
| list | itemize without detail | |
| measure | take accurate quantitative readings using appropriate instruments | |
| name | give only the name of | No additional information is required. |
| note | write down observations | |
| observe | pay attention to details which characterize a specimen, reaction or change taking place; to examine and note scientifically | Observations may involve all the senses and/or extensions of them but would normally exclude the sense of taste. |

| <u>WORD</u> | <u>DEFINITION/MEANING</u> | <u>NOTES</u> |
|--------------------|---|---|
| outline | give basic steps only | |
| plan | prepare to conduct an investigation | |
| predict | use information provided to arrive at a likely conclusion or suggest a possible outcome | |
| record | write an accurate description of the full range of observations made during a given procedure | This includes the values for any variable being investigated; where appropriate, recorded data may be depicted in graphs, histograms or tables. |
| relate | show connections between; explain how one set of facts or data depend on others or are determined by them | |
| sketch | make a simple freehand diagram showing relevant proportions and any important details | |
| state | provide factual information in concise terms outlining explanations | |
| suggest | offer an explanation deduced from information provided or previous knowledge. (... a hypothesis; provide a generalization which offers a likely explanation for a set of data or observations.) | No correct or incorrect solution is presumed but suggestions must be acceptable within the limits of scientific knowledge. |
| test | to find out, following set procedures | |

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