This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of
the examination. It shows the basis on which Examiners were instructed to award marks. It does not
indicate the details of the discussions that took place at an Examiners’ meeting before marking began,
which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner
Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2015 series for most
Cambridge IGCSE®, Cambridge International A and AS Level components and some
Cambridge O Level components.
1 **Six** from e.g.:

- data logging can be left unattended for periods of time
- ...automatic logging of data
- ...can be continuous or at intervals
- ...can be set up to start sometime in future
- ...to monitor e.g. temperature/relative humidity/solar radiation/soil moisture
- (use of sensors to collect the data) about the conditions in air, soil, water
- recording of amounts/quantity of e.g. oxygen, carbon dioxide, NOx, SO₂

ADC may have to be used to convert data from analogue to digital format

- software in data logging device acquires the data from the sensors
- data logger stores data in digital format/suitable for import to spreadsheet/database
- data logger stores data for a period of time
- ...sends data in batch
- ...sends data on request to a computer for processing
- data logging software analyses data ready for presenting data in appropriate
  format/tables/graphs/charts
- data can be immediately sent from data logger and presented in real time on monitors/as
  hardcopy/generate alert/alarm if readings outside set parameters [6]

2 **Four** descriptions from e.g.:

- MIN to indicate the minimum level of e.g. O₂ recorded
- MAX to indicate the maximum level of e.g. O₂ recorded
- AVERAGE of the collected values
- Nested IF to find where e.g. high O₂ and low CO₂ occur
- COUNTIF to count number of e.g. days when e.g. O₂ is below a safe level
- COUNT the number of days that readings have been taken [4]

3 **Eight** from e.g.:

**Benefits:**

- data is continually monitored by computers
- …if event happens it is not missed
- more accurate collection of data by sensors/computers
- can monitor multiple sensors simultaneously
- logged data is already in electronic form so no transcription errors/does not need to be entered
- personnel are not needed to take the measurements so they can do other useful tasks
- data can be displayed immediately/in real time
- data can be analysed immediately/in real time

**Drawbacks:**

- interruptions to power supply could cause collection of data to be missed/not happen
- damage/failure of equipment could cause collection of data to be missed/not happen/be inaccurate
- maintenance of equipment can be expensive/time consuming/requires expertise/training

Max 6 for all benefits or all drawbacks [8]
4 Six from:

use of FTP client on warehouse computers and FTP server at head office
uses FTP protocol
...can be secured with use of SSL/TLS/SSH
FTP address of server is entered e.g. ftp.cie.org.uk
...or use of IP address of server
user name and password required
...anonymous connections (no user name and password required) may be allowed for downloads
but not for uploads/private FTP servers
use of port 21 to send commands to server from client (communications port)
...port is a 'logical connection point' for transferring data
use of a different port (the data port) for transfer of data
...both communications port and data port must be open/connect for data to be transferred
active mode
...client opens port and server connects to it
...most servers use port 20 as data port
passive mode
...server opens port and clients connects to it
firewalls must be set to allow FTP/ports that FTP uses

5 (a) Proving who you are to the computer system

(b) Two methods from e.g.:

biometrics
...valid example of use
digital certificates
...unique to user
transaction authentication number
...entered and verified against list issued and held by bank
...TAN only recognised/used once
multi-factor authentication
...two or more factors
...knowledge factor (something known only to user)
...possession factor (something only user has)
...inherence factor (something only user is)

6 (a) Four from:

IP packets are interrogated/inspected by firewall
...source/destination address are checked
...data content checked for key words
...port checked to determine application that sent packet
...against a set of criteria/rules determined by user/system (network) administrator
firewall accepts/drops IP packets
...do not usually deny access to packets due to use of bandwidth to send it back
firewall alerts/reports to user
...about activity e.g. attempts to get access
...regular activity in/out network
(b) (i) **Two** from e.g.:

- guards cannot watch every aspect
- guards do not monitor areas continually
- guards can be forgetful
- guards can be dishonest

(ii) **Two** from:

- requires more computer processing power to create file
- file creation can be slow
- if key is lost then data cannot be retrieved
- files are larger than unencrypted files
- criminals can use encryption to hide evidence
- hackers can encrypt files and demand money to unencrypt the file

7 **Anti-virus software:**

**Two** from:
- install/run in background on computer
- regularly update
- scan all files regularly
- scan incoming files
- monitor ports on computer
- remove/quarantine viruses

**Anti-spyware software:**

**Two** from:
- install/run in background on computer
- regularly update
- scan computer regularly
- helps to prevent key-logging

**Anti-popup software:**

**Two** from:
- install/run in background on computer
- regularly update
- use to remove popup code

8 **Six** from:

- use of radio waves
- use of random frequency switching
- …to increase security of data
- random number generators
- …choose random frequencies within band
- …transmission switches frequencies
- receiver and transmitter use same random numbers
- …to stay synchronised
9 Two reasons from e.g.: 

must be in line of sight/unobstructed
...so limited range
will not penetrate walls/obstacles
...so devices have to be in same room
low frequency
...cannot carry large amount of data 

10 Four from:

same traffic key cannot be used twice
...as limited number of keys
small amount of traffic can lead to key being recovered
...so encryption can be broken
single shared key between a number of users
...compromises security 

11 Eight from e.g.: 

Benefits: data/files can be stored on central filesver
can share files/data over a large area/between LANs
can share peripherals/storage between LANs
can send messages/email quickly between users on different LANs
allows employees to work from home on corporate WAN
central backups can be set up

Drawbacks: can be expensive/complex to set up
can be expensive and complex to maintain requiring expertise/skilled technicians
larger networks are easier to compromise/security is of greater importance
use of peripherals e.g. printers can be slow due to queues of jobs
failure of servers can affect all users/workstations
malware can spread more easily between workstations

Max 6 for all benefits/drawbacks
One mark is available for a reasoned conclusion 

12 (a) Six from:

computer-based system
using wide range of human knowledge
to help solve problems
uses knowledge base consists of a database of facts and the rules base
inference engine to find appropriate solutions
rules base consists of IF THEN statements
user interface to input questions/output possible solutions
knowledge base editor to edit rules and facts in in knowledge base
(b) **Two** from:

- **medical diagnosis**
  …to help doctors diagnose patient illness
- **identification systems**
  …to help identify plants
  …stone tools in archaeology
  …structure of chemicals
- **tax/financial planning/advice**
  …calculating e.g. tax liabilities
- **insurance planning**
  …designing insurance packages for individuals/groups
  …investment analysis
- **mineral prospecting**
  …probabilities of finding minerals/oil
- **automatic pilots in aircraft**
  …maintain flight/perform pre-set manoeuvres
  …aid to human pilots

[4]

13 (a) **Four** from:

- number of drop points
- distance between each drop off point
- location of drop off points
- known road works/obstructions
- type/speed of vehicle
- time available
- layout of map

[4]

(b) **One** from e.g.:

- price of fuel
- fuel consumption
- number of hills on the route
- known traffic black spots that might delay/slow journey times

[1]

[Total: 80]