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 May/June 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.
1 (i) Two from:

Original source is only available in hardcopy
…may need to use software to edit the digital copy of the source
…may contain text that may be imported into article using OCR

(ii) Two from:

…dictate article for future typing
…record a voice memo/audio log about the article
…use of speech-to-text/speech recognition
…to record interviews for use in the article

2 Four limitations of laptops from:

Difficulties when viewing/creating the article on laptops which generally have smaller screens and keyboards presenting
Image processing can be slower on laptops which usually have lower specification/ slower processors / less memory (RAM)/ smaller hard drive with slower access times for the same cost as e.g. desktop computer
Laptops are inherently more vulnerable to damage and theft so more risk of loss of article
Power management issues  e.g. limited battery life so more difficult to manage when away from office
Connecting to outside networks may require configuration skills/more technical skill to connect when away from office
Repairs are more difficult than when away from office/traveling

3 Four from:

Ensure resources are all electronic
Gather assets/resources into common/shared area
Convert assets/resources into suitable format for inclusion into final document
Create master document/template
Use of copy/paste of resources into master document
Use of hyperlinks embedded in the master document/template
Use of embedded object linking to include remotely stored assets/resources

4 Four from:

Text and images/assets are brought together
Media/plate held in precise position
Plate wrapped around drum rotating on its axis/plate is put in cylinder and head move long axis/ plate on flat bed and laser is deflected by mirrors line by line
Computer data used to control the laser/ultraviolet to produce image on plate/drum
Separate plates are created for different colours
Plate/drum uses to print onto paper

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5 **Four** from:

**Benefits:**
- Reduction in time taken from conception to publication
- Storage space for the product/assets is virtually unlimited
- Fewer overheads e.g. distribution costs means lower cost of production
- Distribution of electronic publications is faster than printed/hardcopy
- Can include links/multimedia to illustrate/enhance the content

**Drawbacks:**
- Different formats exist so magazine has to be made available in several formats
- Content is not secure compared to printed format/content can be copied more easily
- Perceived lack of ‘quality’ in electronic publications

6 **Six** from:

**Benefits:**
- There is no significant time delay between question and answer
- Interviewer can more easily ask extension questions based on answers…that can add to the verbal answer from the interviewee/scientist
- People from all over the globe can be interviewed
- Enables interviewers/reporters to contact people in restricted areas e.g. laboratories for medical research
- No need to travel/no travel costs for reporter
- No time wasted by reporter in travelling to interview
- Interview can easily be recorded for later transcription/reference

**Drawbacks:**
- The reduction of social cues/cannot see interviewee so e.g. body language/eye contact cannot be used as a source of extra information
- The interviewer has no knowledge of the situation in which the interviewee is situated…so less able to create a good interview ambience
- Telephone line quality can affect responses
- Easier for interviewee/scientist to find excuse/make up excuse/find reasons to terminate the interview

**Max 4** for all benefits or all drawbacks
(b) Six from:

**Advantages:**
Can interview scientists that are not easy to access e.g. in restricted areas
Easier to ask lengthy questions that require a detailed response
Can use emoticons
The lack of nonverbal and social cues can reduce miscommunication due to cultural diversity
Reporter/scientist has some degree of anonymity so reporter may get more information from scientist
Reporter has time to formulate questions/scientist has time to construct reply
No need to travel/no travel costs for reporter
No time wasted by reporter in travelling to interview
Interview dialogue/exchange/emails easily kept for reference
Can use translating tools to interview in different/foreign languages

**Disadvantages:**
The reduction of social cues/cannot see interviewee so e.g. body language/eye contact cannot be used as a source of extra information
The interviewer has no knowledge of the situation in which the interviewee is situated …so less able to create a good interview ambience
Reporter has to adapt to email style of scientist
Reporter has to wait for reply which might be a long time
Scientist may never reply/may terminate the contact without notice
Reporter may have to send reminders

**Max 4 for all benefits or all drawbacks.**

7  (a) Two from:

Very large number of processors/multi-core processors running in parallel
Processors close together in a ‘computer cluster’
Processors can be distributed across a network/the ‘cloud’
Can process trillions of operations per second
Can run different operating systems on different nodes/processors in cluster

(b) Four from:

Computer can be used to scan/search through databases of molecules/chemicals/drugs to find chemical compounds that could be used as basis for new drugs
Computer can be used to scan/search through databases of human genome for possible new drug treatments for e.g. cancer
Computer used to cross-match results of previous research with results of new drug under development
Computer can be used to create/run a model of the effects of the drugs/chemicals on subject/human body
Computer can be used to predict the effects/possible side effects of the new drug
Computer can be used to monitor amount of chemicals/ingredients being used
8 (a) (i) One from:  

Needed to take photograph of employee/technician for use on ID card/to store in employee/staff database  

(ii) One from:  

Needed to type/enter characters to input details of new technician into the database  

(b) (i) Two from:  

…not practical to have the computer spend time processing the data to determine how best to store it  

Allows validation rules to be easily applied to the data  

…determines/places constraints on the values that are possible in a field  

…to ensure the integrity of the data  

Makes it easier to determine other properties of the field  

…e.g. format of data within the field/maximum size of a field value/use of the field data in expressions/ whether or not the field can be indexed/size of the database  

Allows use of storage space to be optimised  

(ii) Two from (one mark for a matching data type and a valid reason):  

<table>
<thead>
<tr>
<th>Details stored in the field in the database</th>
<th>Most appropriate data type used for that field</th>
<th>Reason for using the chosen type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technician’s last name</td>
<td>Text/character/ alphanumeric/ string</td>
<td>Name can contain almost any printable character</td>
</tr>
<tr>
<td>Technician’s gender</td>
<td>Boolean</td>
<td>Only two choices</td>
</tr>
</tbody>
</table>

(iii) One explanation from (max 2 marks per explanation):  

Telephone numbers may contain spaces; spaces are not numbers so could not be entered  

Telephone numbers may contain letters, letters are not numbers so could not be entered  

There is no need/requirement for mathematical calculations on telephone numbers  

Some telephone numbers have a leading zero which makes it text  

Some telephone numbers have a leading plus/+ which makes it text
9 (a) **Four from:** [4]

- Data is stored only once/one record per technician/avoids data duplication so less storage space is needed
- Data is stored only once/one record per technician no need to update multiple records/deletion or modification of data is simpler/quicker
- Changes are cascaded to other tables
- Complex queries can be carried out by extracting data from multiple tables
- Enhanced security access to tables can be restricted on individual table basis
- Database can be expanded easier than a flat file database by adding new tables and creating new links
- Ensures referential data integrity

(b) **One-to-many because each technician has more than job role** [1]

c) **one-to-one each job role has only one title** [1]

d) **Six from:** [6]

- Data may be invalid although it has been copied correctly e.g. wrong number of characters in post_code
- Data may not have been copied correctly but may be valid e.g. telephone number/area code copied incorrectly
- The stored data on the technician has to be accurate so that decisions based on the data are appropriate/use of the data is appropriate.

**Verification (max 4):**
- To try and ensure that the data has been copied correctly
- ...appropriate example: e.g. contact telephone number has been copied correctly
- Ensures that data being entered matches/is the same as that obtained from technician
- Ensures that the data stored about the technician is more reliable

**Validation (max 4):**
- Carried out by computer so
- ...only checks that the data is sensible/reasonable/meets pre-set rules
- ...appropriate example: e.g. gender is either male or female
- Does not check that the data is actually correct

10 **Six from:** [6]

- Determine/decide the data to be input into model
- ...input selected data into model
- Decide the parameters that will be used
- ...input selected parameters into model
- Production costs/staffing costs output from model
- Prediction of profits output from model
- Adjust/amend values for ‘what if’
- Use of goal seek/break-even point
- Calculate the total costs
- Use results to help make decision based on his knowledge of the market
- Produce graphical representation of results/data/profits/growth
11 Eight from:

Sensors collect analogue data about the temperature and pH in the vessel/vat.
Data from sensors is converted from analogue to digital using ADC.
Microprocessor continuously monitors data from sensors/process is repeated/continues until fertiliser is made.
Microprocessor compares data from temperature sensor with pre-set value.
…if temperature in vessel/vat is lower than pre-set value microprocessor sends signal to turn on heater.
…if temperature in vessel/vat is higher than pre-set value microprocessor sends signal to turn off heater.
Microprocessor uses actuators to turn heater on/off.
Microprocessor uses actuators to open/close valve.
Data from sensors is converted to analogue from digital using DAC.
Microprocessor compares data from pH sensor with pre-set value.
…if pH in vessel/vat is lower than pre-set value microprocessor sends signal to motor to open valve to allow in more alkali.
…if pH in vat is higher than pre-set value microprocessor sends signal to motor to close valve to stop flow of alkali.

12 (a) Two from:

Primary research is gathering new data that has not been collected before.
Secondary research is the use of existing data that has already been produced.

(b) Six from:

Computer-assisted web-based interviewing (CAWI)
…use on online questionnaires
…automated analysis

Computer-assisted personal interviewing (CAPI)
Either the interviewee or an interviewer sits at a computer terminal
…answers a questionnaire using the keyboard/mouse

Computer-assisted telephone interviewing (CATI)
…telephone survey technique
…the interviewer follows a script provided by software application
…software can choose next question based on previous answer

Automated Computer Telephone Interviewing (ACTI)
…a computer with voice recognition capabilities asks interviewees a series of questions
…recognises and stores the answers
…software follows scripted logic and can branch
…the flow of the questionnaire based on the answers from interviewee
…as well as information known about the interviewee

[Total: 80]