

# Cambridge IGCSE ICT Theory Workbook Answers

## ● 1 Types and components of a computer system

- 1 a hard disk drive/processor
- b mouse
- c monitor/screen
- d keyboard
- e solid state memory/SSD
- f printer

[6 marks]

2

Definition	Item from list
Software used to manipulate photographs stored on a computer	photo editing software
Software which obtains data from sensors allowing computers to monitor and control external activities	control and measurement software
Software used to manipulate and organise numerical data; data is put into a grid of numbered rows and lettered columns	spreadsheet
Software running in the background of a computer which manages most of the basic functions, such as <i>user interface</i> and <i>memory management</i>	operating system
Software that translates a program written in a high level language into machine code so that it can be directly run on the computer	compiler
Software that takes one or more object files produced by a language translator and combines them into a single program that can be run on a computer	linker
Software that enables one or more hardware devices to communicate with the computer's operating system	device driver

[7 marks]

3

Statement	True	False
Streaming videos to mobile phones using 4G networks has faster data transfer rates than using WiFi		✓
Mainframe computers have smaller internal memories than desktop computers		✓
Spreadsheets and word processors are examples of <i>applications software</i>	✓	
Video cards and sound cards are typical examples of computer software		✓
Examples of <i>utilities</i> include <i>anti-virus software</i> , <i>anti-spyware software</i> and <i>screen savers</i>	✓	

[5 marks]

4 a	Advantages	Disadvantages
<b>CLI</b>	<ul style="list-style-type: none"> <li>• user is in direct communication with the computer</li> <li>• user not restricted to a number of pre-determined options</li> <li>• it is possible to alter computer configuration settings directly</li> </ul>	<ul style="list-style-type: none"> <li>• user needs to learn a number of commands</li> <li>• all commands need to be keyed in which takes time and can be error-prone</li> </ul>
<b>GUI</b>	<ul style="list-style-type: none"> <li>• user doesn't need to learn any commands</li> <li>• more user-friendly; icons used to represent applications</li> <li>• pointing devices used to select icons and launch applications – easier than typing in commands</li> </ul>	<ul style="list-style-type: none"> <li>• uses up considerably more computer memory than CLI interface</li> <li>• user is limited to the icons provided on screen</li> <li>• need an OS (e.g. <i>Windows</i>) to operate GUI which uses up much memory</li> </ul>

[8 marks]

b **CLI:** programmer, analyst or technician – somebody who needs to have direct communication with the computer

**GUI:** end-user; somebody who uses the computer to run Apps, play games or store/manipulate photos, for example

[2 marks]

5 a i tablet

ii very fast start up

fully portable

touch screen technology makes them simple to use

have built-in cameras, MP3/4 players and so on

don't generate any heat – use solid state technology

battery life of tablets greater than laptop

even when switched off they go into stand-by and can still receive 'events'

iii often have limited memory compared to laptops

can be expensive to run if use 3G/4G/5G mobile phone networks

typing on touch screens can be slow and error-prone

transferring of files often needs to be done through an Apps Store

don't support as many types of file format as laptops, for example

iv high definition, anti-glare screens

front- and back-facing cameras

very low weight

uses Bluetooth connection to other devices

use cloud storage facilities to back-up and synchronise other devices/data sources

sensors which can carry out the following functions:

proximity sensors to detect if device is close to the ear

accelerometer which detects orientation of device

use of speech recognition systems allowing users to ask verbal questions

security devices such as fingerprint recognition

[6 marks]

- b i laptop
- ii portable compared to desktop computers  
because unit is fully integrated, no trailing wires or need to carry devices such as screens  
they can make full advantage of WiFi facilities  
since they are portable, they can link into any multi-media system
- iii since they are portable, they are easier to steal  
they have limited battery life compared to tablets  
keyboards and pointing devices can be more awkward to use than desktop computers
- iv lightweight ... often make use of solid state technology  
lower power consumption than desktop computer, therefore generate less heat/consume less power
- [6 marks]
- c i smartphone
- ii very small in size and lightweight – therefore easier to always have on your person  
can use them to make phone calls, surf the net while on the move  
can be used almost anywhere since they can use WiFi or mobile phone networks  
have hundreds of Apps including cameras, mp3 players, etc.  
even better battery life than tablets
- iii small screens make pages more difficult to read and small keyboards can be difficult/slower to enter text than laptops, for example  
web browsing and photography can drain the battery quickly  
memory size is poor compared to laptops and desktops  
not all website features are compatible with mobile phones  
data transfer rate can be very slow if mobile phone networks are used
- iv send/receive emails  
surf the net (e.g. order goods on the move)  
global positioning system (use of maps to navigate to a location)  
calendar functions  
telephone banking (send and receive money using the banking Apps)  
Voice over Internet Protocol (VoIP) – telephone network using the Internet which also allows video calling  
streaming of videos  
streaming of music (from radio stations for example)  
instant access to social networks (social contact with friends no matter where you are in the World)  
instant messaging
- [6 marks]

- 6 a computer-assisted translation (CAT)  
b 3D/holographic imaging  
c quantum cryptography  
d virtual reality  
e vision enhancement  
f artificial intelligence biometrics

[6 marks]

7 a **RAM**

random access memory

internal chip where data is stored temporarily

memory can be written to and read from

holds data/files/part of OS *currently* in use

contents lost on turning off power i.e. temporary/volatile memory

b **ROM**

read only memory

stores information/data that needs to be permanent

contents remain even when power turned off i.e. permanent/non-volatile memory

data on ROM cannot be altered by user/can only be read from

used to store BIOS etc.

c **BIOS**

basic input/output system

when computer turned on, BIOS carries out hardware check ...

... then loads up operating system into RAM

d **CMOS**

complementary metal oxide semi-conductor

stores the date, time and system configuration for BIOS

chip is battery-powered

e **Mother board**

printed circuit board

allows processor and other hardware to function and communicate with each other

acts as a kind of 'hub' that other devices connect to

contains several sockets and slots to connect to the other components

[10 marks]

**8 Banded response question**

[8 marks]

**Level 3 (7–8 marks)**

Candidate will address all three aspects of the question and consider a number of different uses of each technology. Information will be relevant, clear, organised and presented in a structured and coherent format.

**Level 2 (4–6 marks)**

Candidate will address all three aspects of the question and consider one different use of each technology. Most of the information will be relevant and presented in a reasonably structured and coherent format. Some part of the description of the operation of the technology will be missing.

**Level 1 (0–3 marks)**

Some of the description of how the technology works or applications will be missing. Description will not always be relevant or coherent.

**Marking points:****Artificial intelligence (AI) biometrics**

- many fingerprint identification systems falsely reject a person's fingerprints
- when the scanned fingerprints are checked against the database no matches are found; this is a known problem with this biometric technology
- artificial intelligence (AI) biometrics overcomes this problem by using dynamic profiling
- the system learns by using AI about a person's fingerprints on every scan
- this means a person doesn't have to worry about getting their finger in exactly the right place every time on the scanner
- the system learns from the different alignments and is therefore still able to match the fingerprints to those stored on a database
- facial recognition systems suffer from the same problem
- a human being is still able to recognise a face even if the person has grown facial hair, now wears glasses or has aged
- existing facial recognition systems are confused by such soft biometric changes
- new systems use artificial intelligence to learn from scanning a number of faces and they can pick out these soft biometric features
- this means the system can still recognise faces and cross-reference these attributes with corresponding images stored on the database

**Quantum cryptography**

- quantum cryptography is the science of making a message unintelligible to any unauthorised user (e.g. a hacker)
- this technique is often referred to as encryption
- there are many methods of cryptography in existence, but all of them have a limited life as computers become faster and faster at number crunching
- a consequence of this is that a hacker is increasingly likely over the next few years to decipher encrypted messages unless computer designers can further strengthen security systems
- quantum cryptography is based on the use of photons (light) and their physical quantum properties to produce a virtually unbreakable cryptography system

- this helps protect the security of data which is being transmitted over fibre optic cables
- the technology relies on the fact that photons oscillate in various directions and produce a sequence of random bits (0s and 1s) across the optical network
- it is all based on the laws of physics rather than mathematics (which is how current cryptography methods work)

### Virtual reality

- virtual reality is an artificial environment created by software
- the user makes use of data goggles, sensor suits, data gloves or helmets to get a feeling of reality (i.e. the feeling of 'being there')
- the technology is used in training (e.g. in a nuclear reactor where the user can see all the walls, pipes, vessels and valves as if they were inside the reactors) and ...
- ... can thus be trained safely to deal with certain events, education (e.g. explore the inside of a building such as a castle in a history lesson) or in games (where the user can interact as if they were there)
- virtual reality is used in all of the following areas:
  - military applications (e.g. training to use a new tank)
  - education (e.g. looking inside an ancient building as part of a history lesson)
- healthcare (e.g. as a diagnostic tool)
- entertainment (e.g. games where gloves, goggles or helmets are worn to give realism to the scenario and even to give visuals or sound to make it seem very real)
- fashion (e.g. to do fashion shows before doing the real thing – see the clothes on people, check out the venue and so on)
- heritage (e.g. showing monuments like Stonehenge)
- business (e.g. training courses and role-playing scenarios for staff)
- engineering (e.g. seeing how new designs like bridges will look etc.)
- sport (e.g. a golfer trying to improve his swing can use this technology and get feedback to improve his game)
- media (e.g. special effects in films; for example, *The Matrix* movie)
- scientific visualisation (e.g. looking at molecular structures in chemistry)

## ● 2 Input and output devices

1

Application	MICR	Touchscreen	Sensor
Reading the numbers found on a cheque	✓		
Inputting the temperature directly in an industrial process			✓
Selecting a choice on an ATM		✓	
Inputting moisture levels in a greenhouse directly			✓

[4 marks]

2 a i OCR

optical character recognition/reader

software that takes text and converts it into a computer-readable form

ii OMR

optical mark recognition/reader

device/method that can read marks written in pencil or pen

position of the mark is stored in computer memory after being scanned by OMR device

[2 marks]

OCR	OMR
<ul style="list-style-type: none"> <li>• because the method uses handwriting, it is possible for customers to extend their replies/answers</li> <li>• the method can read handwriting but poor handwriting can cause errors</li> <li>• used for converting printed documents to an editable electronic format</li> <li>• it is a very complex method</li> <li>• needs fewer user instructions</li> <li>• more accurate than entering data via a keyboard but some handwriting can cause problems</li> </ul>	<ul style="list-style-type: none"> <li>• since this involves filling in lozenges information obtained is limited to the choices offered in each question</li> <li>• position of marks is compared to a template stored in memory ... it is a totally automatic data entry method</li> <li>• it is ideal for multiple choice questions since only a limited number of choices are given</li> <li>• it is a simpler method than OCR</li> <li>• needs more instructions to allow user to complete the form</li> <li>• it is a more accurate method of reading data</li> </ul>

[4 marks]

3 a **Input devices**

barcode reader

scans in barcodes from products

touch screen

allows choices to be entered (e.g. loose fruit or vegetables)

keyboard/keypad

enter barcode number if barcode fails to scan, enter number of items

electronic scales

automatically enter weight of loose items

chip and PIN reader

allows customers card to be used to pay for goods

**Output devices**

printer

produces itemised bill/receipt for the customer

screen/monitor

shows running totals, item description

speaker/beeper

confirms barcode read successfully/gives error if barcode failed to scan correctly

[8 marks]

**b Manager**

- no need to price each item individually
- allows automatic stock control to take place
- better trending of products/system can easily produce sales reports
- much easier to alter prices
- can have unmanned check-outs, saving staff costs

**Customer**

- itemised billing/proof of purchase
- shorter queues at check-out
- cost savings can be passed on to customer
- less chance of errors in final bill
- allows automatic check-outs for customers [4 marks]

4 a quick response code [1 mark]

b no need for user to actually key in a website address – done automatically by scanning QR code with a camera

- codes can store website addresses that appear in magazines etc. providing an effective means of advertising
- can store more information than 2-D barcodes [2 marks]

c tourist can scan QR code using smartphone/tablet

- websites will be automatically downloaded
- information such as phone numbers for taxis and restaurants can be found quickly/easily
- information about tourist spots can be found in their own language
- no need to queue at information kiosks to find tourist information [3 marks]

5 a **Additive**

object is built up layer by layer

**Direct 3-D printing**

- uses inkjet technology
- print head moves left to right and up and down to build up layers

**Binder 3-D printing**

- this method uses two passes for each layer being built up
- first pass sprays fine powder and second pass sprays a binder to form a solid layer [3 marks]

b car enthusiast finds blue prints of part(s) on line or has drawing produced (using CAD)

if it is difficult to produce drawing, can use laser or other 3-D scanning techniques to produce a 3-D image

the drawing is then prepared using software so that it is in a form which can be understood by a 3-D printer

the drawing is sent to a 3-D printer where it is built up layer by layer

part is removed from printer and unwanted bits are removed from final part [3 marks]

c prosthetic limbs

allows precision reconstructive surgery

aerospace to make lightweight parts

fashion and art to make one-off objects

manufacture of old artefacts which are exact in their copy but cause no damage to original [3 marks]

6

Input device	Application
Trackerball	<p>can replace mouse as pointing device</p> <p>used in control rooms where space is limited</p> <p>can help people who have limited hand/arm movement to communicate with a computer</p> <p>used in some luxury cars as a device for navigating options on a screen</p>
Joystick	<p>computer/video games</p> <p>simulations such as driving or flight</p>
Concept keyboard	<p>airport/railway station information kiosks</p> <p>in restaurant/café where limited number of items</p> <p>any application which needs to be tamper-proof</p>
Remote control	<p>televisions and satellite receivers</p> <p>DVD players/hifi systems</p> <p>control of multi-media devices</p> <p>in industry to have remote control e.g. to stop/start machinery</p> <p>in conference rooms to control lighting levels, close/open blinds etc. automatically</p>
Microphone	<p>input speech/sound in presentations/voice-overs</p> <p>used with voice recognition software (input data into a computer using voice, input commands verbally in a car, etc.)</p> <p>used as a sensor to pick up sounds (e.g. burglar alarm)</p> <p>used in communication applications such as VoIP</p>

[5 marks]

7 **Motors**

automatic washing machines

cooker fans

water pumps in central heating

open windows/doors automatically

**Buzzers**

used in cookers/microwave ovens to indicate end of cooking cycle

used in burglar alarm systems to give intruder alert

**Lights**

security lights

in glasshouses/greenhouses to control lighting environment

**Heaters**

automatic washing machines to heat up water

control temperature of a hot plate

central heating/air-con systems

temperature control in chemical processes

[6 marks]

8 a **USB port**

connect camera directly to USB port on a computer and transfer files

**direct reading of SD/XD card**

memory card is slotted directly into computer and files uploaded

**wifi or Bluetooth**

files can be transferred by synchronising camera with computer and upload files wirelessly

**emailing/sms**

some cameras allow the files to be emailed or sent as SMS messages (particularly useful if camera is part of a smartphone)

[3 marks]

b better lenses in cameras

larger memories in cameras

stand-alone cameras still have greater number of features

more software options for manipulating images

stand-alone cameras often have greater number of pixels in images

[2 marks]

9 a LEDs reach their maximum brightness almost immediately (there is no need to 'warm up' before reaching full efficiency)

LEDs give a whiter light which sharpens the image and makes the colours appear more vivid; CCFL had a slightly yellowish tint

LEDs produce a brighter light which improves the colour definition

monitors using LED technology are much thinner than monitors using CCFL technology

LEDs last almost indefinitely; this makes the technology more reliable and makes for a more consistent product

LEDs consume very little power which means they produce less heat as well as using less energy

[3 marks]

## b i organic light emitting diode

these use organic materials (made up of carbon compounds) to create semi-conductors which are very flexible

organic films are sandwiched between two charged electrodes

[1 mark]

## ii the plastic, organic layers of an OLED are thinner, lighter and more flexible than the crystal structures used in LEDs or LCDs

the light-emitting layers of an OLED are lighter; OLED layers can be made from plastic rather than the glass as used in LED and LCD screens

OLEDs give a brighter light than LEDs

OLEDs do not require backlighting like LCD screens - OLEDs generate their own light

since OLEDs require no backlighting, they use much less power than LCD screens (most of the LCD power is used to do the backlighting); this is very important in battery-operated devices such as mobile phones.

since OLEDs are essentially plastics, they can be made into large, thin sheets (this means they can be used on large advertising boards in airports, subways, and so on)

OLEDs have a very large field of view, about 170 degrees, which makes them ideal for use in television sets and for advertising screens

[2 marks]

10

Sensor	Application
Temperature	<ul style="list-style-type: none"> <li>washing machines</li> <li>ovens</li> <li>central heating systems</li> <li>greenhouses</li> </ul>
Pressure	<ul style="list-style-type: none"> <li>burglar alarm systems</li> <li>washing machines</li> <li>environmental monitoring</li> </ul>
Acoustic/sound	<ul style="list-style-type: none"> <li>burglar alarm systems</li> <li>liquid/powder flow in pipes</li> <li>environmental monitoring</li> </ul>
pH	<ul style="list-style-type: none"> <li>maintain acidity of soil</li> <li>maintain pH of a chemical process</li> <li>pollution measurements in rivers/sea</li> </ul>
Humidity/moisture	<ul style="list-style-type: none"> <li>greenhouse moisture levels</li> <li>monitoring air quality</li> <li>atmospheric monitoring in factories where humidity levels need to be controlled (e.g. in the manufacture of microchips)</li> </ul>

[5 marks]

- 11 a MICR  
 b barcode reader/scanner  
 c OMR  
 d magnetic stripe reader/chip and PIN reader

[4 marks]

12 Statement	True	False
Webcams record images before being transmitted		✓
Light pens only work with CRT monitors	✓	
Graphics tablets allow drawings to be modified prior to input	✓	
Data from microphones can be directly processed by a computer		✓
Optical mice use light to transmit data directly to the computer		✓
Ergonomic keyboards are much smaller than standard QWERTY keyboards		✓
Driving (steering) wheels use sensors to detect left/right movement to give the sensation of steering	✓	

[7 marks]

13 a **RFID**

i **Use**

live-stock tracking (so that whereabouts of each animal on a farm is known; it also identifies which farm owns the animal)

in retail (this is similar to barcodes but doesn't require any scanning; the details such as price can be stored on the tag and then automatically read at a check-out – a big advantage is that several tags can be read at the same time thus speeding up the check-out process)

in passes (for example, in Theme Parks; RFID cards eliminate the need to scan or swipe people before 'rides', reducing the waiting time; it also allows the tracking of people in the Theme Park and certain information, such as height or age, can be stored to prevent entry to certain rides on safety grounds)

in libraries (books can be tracked in and out automatically by readers at the library entrance; no need to scan barcodes or magnetic stripe cards, making the process quicker and more accurate)

contactless credit/debit cards

ii **Operation**

radio frequency identification readers (RFID) use radio waves to read and capture information stored on a tag

the tag can be read from several metres distance which is one of its advantages over the barcode system

the RFID tag is made up of two components

- a microchip that stores and processes information
- an antenna which is used to receive and transmit data/information

the tags can be passive or battery-powered

passive tags use the reader's radio wave energy to relay back the information; battery-powered tags use a small embedded battery to power the RFID

## b Contactless card reader

## i Use

contactless debit or credit cards allow customers to pay for items worth up to \$25 without entering their PIN.

all contactless cards have a small chip embedded in them;

this chip emits radio waves (RFID).

to pay for an item the card is held within a few centimetres of the payment terminal

the terminal picks up the signal from the chip and allows the transaction to be processed

## ii Operation

customers look out for the



symbol on the payment terminal

the shop assistant enters the amount for payment

the card reader informs the customer to present their contactless card

the customer holds their card in front of the card reader

the terminal display will indicate that the card has been read

[6 marks]

14	Description of stage	Order of stage
	3-D printer is now set up to allow the solid object to be 'printed'	3
	Finalised drawing is imported into 3-D printing software that prepares data in a format understood by the printer	2
	Object removed from the 3-D printer and any unwanted material is cut or washed away to produce a final solid object	5
	Design is made using CAD software or blueprint downloaded from the internet	1
	Solid object is now built up layer by layer; each layer is 0.1 mm thick and printing can take several hours	4

[5 marks]

15	Description of use	Name of device
	Produce high quality 'one-off' printing, such as a photograph	inkjet printer
	Produces continuous stationery and multi-part printouts	dot matrix printer
	Produces high quality printing where high volume is also required	laser (jet) printer
	Produces very large printouts, such as an A0 drawing	(graph) plotter

[4 marks]

16 1 = temperature/pH sensor

2 = pH/temperature sensor

3 = ADC

4 = microprocessor/computer

5 = DAC

6 = valve

[6 marks]

**17 Banded response question**

[7 marks]

**Level 3 (6–7 marks)**

Candidate will discuss at least one advantage and one disadvantage of each item. Information will be relevant, clear, organised and well presented in a structured and coherent format. Some form of conclusion/reasoned argument for choosing one of the printers for maximum marks.

**Level 2 (4–6 marks)**

Candidate will mention disadvantages and advantages of all three devices but some evidence of repeated information (e.g. dot matrix printers have lower quality output than inkjet printers; inkjet printers produce better quality output than dot matrix printers). Most of the information will be relevant and presented in a reasonably structured and coherent format. No evidence of any reasoned conclusions.

**Level 1 (0–3 marks)**

No real comparison made with some general features of each type of printer only. Descriptions are not very coherent or even conflicting.

**Marking points:**

**Benefits of laser printers**

- printing is fast (unless only a few pages are to be printed in which case they are little faster than inkjet printers)
- they can handle very large print jobs
- the quality is consistently high
- toner cartridges last for a long time (and the printers can sometimes be a cost-effective option particularly if colour outputs are not required)

**Drawbacks of laser printers**

- only really fast if several copies are being made
- colour laser printers tend to be expensive to run (4 colour/black cartridges are needed plus diffuser kits etc. which are expensive to purchase)
- they produce ozone and volatile organic compounds because of their method of printing and type of toner/ink used (these have been linked to health hazards in the office)

**Benefits of inkjet printers**

- high quality output
- cheaper to buy than laser printers
- very lightweight and have a small footprint
- don't produce ozone and volatile organic compounds unlike laser printers

**Drawbacks of inkjet printers**

- slow output if several copies needed (little buffer capacity to store the pages)
- can't do large print jobs (ink cartridges run out too quickly)
- printing can 'smudge' if user is not careful
- can be expensive if used a lot (original ink cartridges are expensive to buy)

**Benefits of dot matrix printers**

- they can be used in environments which would be a problem to laser or inkjet printers (e.g. dusty/ dirty or moist atmospheres)
- carbon copies or multi-part outputs can be produced
- very cheap to run and maintain
- easy to use if continuous stationery is required (e.g. long print jobs such as wages slips)

**Drawbacks of dot matrix printers**

- very noisy – not good in an office environment
- actually cost more than an inkjet printer to buy initially
- very slow poor quality printing

## ● 3 Storage devices and media

1 a NMF:

[4 marks]

1	2	3	4	5	6	7	8	9	10	11	12	13	14	
---	---	---	---	---	---	---	---	---	----	----	----	----	----	--

TF or MF?

T	T	M	T	T	M	T	T	M	T	M	M	T	T	
---	---	---	---	---	---	---	---	---	---	---	---	---	---	--

b

1 GB	
1 KB	
1 TB	✓
1 MB	

[1 mark]

c 1000

[2 marks]

2

Storage device	Magnetic	Optical	Solid state
Hard disk	✓		
Flash memory card			✓
Blu-ray disk		✓	
CD-ROM		✓	
Memory stick			✓
DVD-RAM		✓	

[6 marks]

- 3 Blu-ray disks use blue laser light  
 DVDs use red laser light  
 Blu-ray uses a single 1.1 mm thick polycarbonate disk  
 DVDs use a sandwich of two 0.6 mm disks  
 DVDs suffer from birefringence/light refraction due to dual layer format  
 Blu-ray disks have built-in encryption systems  
 DVD track pitch is 2.5 times that of Blu-ray [4 marks]

- 4 a more reliable/no moving parts  
 considerably lighter  
 don't have to 'get up to speed'  
 have low power consumption  
 run much cooler than HDD  
 very thin because no moving parts  
 much faster data access than HDD [4 marks]

- b tablet – very thin/light/less battery drain/run cooler [4 marks]  
 smartphones – very light/don't use much power/run cooler

5

Primary	Secondary	Off-line
RAM	HDD	Blu-ray
ROM	SSD	DVD-RAM
		Removable HDD
		flash memory

[6 marks]

6

Media	Serial	Direct
Magnetic tape	✓	
Magnetic disk		✓
CD-RW		✓

[3 marks]

7 **Banded response question** [6 marks]

**Level 3 (5–6 marks)**

Candidate will discuss at least three reasons why optical media is becoming obsolescent. The discussion will include at least two different types of storage which are competing. Some form of conclusion/reasoned argument why optical media is becoming obsolescent.

**Level 2 (3–4 marks)**

Candidate will discuss at least three reasons why optical media is becoming obsolescent. The alternatives will be rather sketchy with little reason why they could 'take over'. Most of the information will be relevant and be presented in a reasonably structured and coherent format. No evidence of any reasoned conclusions.

**Level 1 (0–2 marks)**

No real comparison made with alternatives to optical media. Descriptions are not very coherent or even conflicting.

**Marking points:**

- in recent times both the CD and DVD are showing signs of becoming obsolete
- many computer systems now come with USB connectors only and no DVD or CD drive
- the main method of transferring files between devices has become the flash memory
- many people now store all their music in the following ways:
  - on hard disk drive systems
  - in MP3 format on:
    - a computer/tablet
    - their mobile/smart phone
    - a portable music player (such as ipod)
  - using the 'cloud' to store all their files so they can access their music from anywhere in the world
  - by 'streaming' their music from the internet; provided the user has an internet connection, they can access music through a laptop computer, mobile phone, tablet or any other receiving device
- it is also a similar story for movies where streaming is becoming increasingly more common.
- many television sets are now set up as 'smart' televisions – this means it is possible to simply stream movies or television programmes on demand without the need for any DVD or Blu-ray players.
- in effect, the television set has become the central computer with a link to the internet using wireless connection.
- floppy disks met the same fate in the early 21st century.
- how often do you see floppy disks any more?
- it is very likely that CDs and DVDs will meet the same fate and will be replaced by one of the systems described above or something entirely new

## ● 4 Networks and the effects of using them

- 1 a NIC (network interface card)  
 modem/router  
 hub/switch  
 network cables  
 external telephone line

[3 marks]

- b social networking  
 booking theatre/cinema tickets/train tickets  
 computer games  
 ebooks  
 streaming music/videos  
 send/receive emails  
 blogs  
 carrying out research  
 reading latest news/current affairs [3 marks]

- c copy data onto removable storage medium  
 save at regular intervals  
 store medium away from main computer in shop  
 make incremental back-ups  
 make use of cloud storage [3 marks]

d

Password	Weak (✓)	Strong (✓)
Pas5word	✓	
Ken123	✓	
Ab!*56@@		✓
15April2000	✓	
TXwm50.		✓

[5 marks]

- 2 a i LAN  
 local area network  
 close geographically e.g. in one building  
 uses hubs and switches
- ii WAN  
 wide area network  
 covers large geographical area e.g. continents  
 examples include the internet
- iii WLAN  
 wireless local area network  
 provides wireless network communications  
 uses access points (APs) or hot spots which are connected to the network [6 marks]

- b 1 = hub/switch  
 2 = server  
 3 = bridge  
 4 = router  
 5 = internet [5 marks]

c **Advantages**

no cabling therefore increased flexibility

easier to add new devices

reduced costs since less cabling

**Disadvantages**

less secure than wired networks since signal can be 'piggy-backed'

possible objects blocking signal

possible interference from other radio sources

slower data transfer rates

[2 marks]

3 a

Item of information	Present
Size of the packet (in MB)	
Header to identify data packet	✓
Sender's IP address	✓
Identity of each node covering whole route	
Identity number of each packet	✓

[3 marks]

b packets reassembled in the correct order

according to identity number on packet

[2 marks]

4 a **Advantages**

very portable; can be used almost anywhere provided a mobile phone network signal can be accessed

a person is more likely to have a mobile phone with them at all times

it is easier to use a mobile phone while on the move than the other devices

**Disadvantages**

expensive to use if WiFi 'hot spot' not available

the displays on mobile phones are smaller than the other devices – this makes it more difficult to read web pages

keyboards are very small – it is therefore more difficult to type messages or navigate web pages

not all websites are mobile-friendly; therefore not all websites may be accessible

signal less likely to be stable or reliable as a wired system (used by PCs and laptops)

b **Advantages**

laptops are more mobile than desktops but heavier and less portable than tablets or mobile phones

touch pads on laptops are not as easy to use as a mouse when navigating web pages; but much easier than mobile phones

the keyboards on laptops are not as easy to use as a desktop but are much better than those on a mobile phone

**Disadvantages**

although the screen size is usually bigger than a mobile (and some tablets) they are not usually as large as those on desktops

to allow laptops to use phone networks requires expensive 'dongles'

processors used in laptops are not usually as powerful as those used in desktops – so access speed is not as quick

**c Advantages**

tend to have more powerful/faster processors than other devices

usually have more stable and more reliable internet connection since they use a wired system rather than WiFi

all web pages are accessible due to larger screen size than other devices

use of full-sized keyboard and pointing devices, such as a mouse, make web page navigation much easier

**Disadvantages**

to allow a desktop to access the phone network requires an expensive 'dongle'

because the parts are all separate and because of the large size, desktop computers are not very portable

[9 marks]

5

Traditional faxes	Emails
<ul style="list-style-type: none"> <li>• more likely to be intercepted or read by 'the wrong people'</li> <li>• signatures on received documents can be accepted as legal documents</li> <li>• can be a delay in sending documents if telephone line is busy</li> </ul>	<ul style="list-style-type: none"> <li>• more secure system since documents are password-protected</li> <li>• documents are usually of a higher quality</li> <li>• received documents can be more easily modified or used in other documents</li> <li>• easier and quicker to send to multiple recipients</li> </ul>

[7 marks]

6 information on the internet more likely to be up to date

easier to find information using a search engine

vast amounts of information which is easier to locate than using several textbooks

however, information can be inaccurate or biased

risk of information overload when using search engines

security issues (viruses etc.)

risk of plagiarism

risk of undesirable websites

[5 marks]

**7 a Webcams**

very large monitors/TVs

microphones

speakers

CODEC software

echo cancellation software

hardware drivers

[3 marks]

**b Potential issues**

lag in responses

expensive to set up/buy equipment

time zones can give problems when setting up meetings

need to train users, which is both costly and time consuming

relies on good internet connections

**Advantages**

easier to access key documents or 'bring in' experts as required at each video conference venue

can hold a meeting at short notice

reduced travelling costs and accommodation costs

doesn't take people away from their work for several days (due to travelling) which can be expensive in terms of salary

reduced risk – flying, terrorist attacks and so on

[4 marks]

**8 a Webinars**

web conferencing (often referred to as a webinar) uses the internet to permit conferencing to take place

with webinars multiple computers are used all connected over the internet

as with video conferencing, it is carried out in real time, and allows the following to take place:

- business meetings to discuss new ideas
- making presentations
- carrying out online education or training

the only requirement is a computer and a high speed, stable internet connection

to carry out web conferencing, each user either downloads an application or logs on to a website from a link supplied in an email from the conference organiser

delegates can leave or join the conference as they wish

the organiser can decide who can speak at any time using the control panel on their computer

if a delegate wishes to speak, they raise a flag next to their name

at any time, a delegate can post a comment using instant messaging for all delegates to see

some of the main features include:

- slide presentations using presentation software which can be posted on the conference website in advance of the meeting
- it is possible for any delegate to draw or write on a 'whiteboard' using the keyboard or mouse on their own computer
- it is possible to transmit images or videos using the webcam throughout the conference
- documents can be shared by first uploading them onto the website before the conference begins

**b Phone conferencing**

audio conferencing refers to meetings held between two people using audio (sound) equipment the equipment used can be the telephone, a computer (with built-in microphones and speakers) or an internet phone.

audio conferencing can be done over the telephone network (often referred to as a phone conference).

the following procedure needs to be carried out when doing a phone conference:

- the organiser of the phone conference is given two PINs by the phone company. One PIN is the personal PIN given to the organiser and the second PIN is the participant's PIN
- the organiser contacts all of the participants and informs them of their PIN and the data and time of the phone conference
- when the phone conference is about to start, the organiser dials the conference phone number and once they are connected, they key in their personal PIN

the participants then call the same conference number to join in – once they get through they each input the PIN given to them by the organiser; without this PIN, it will be impossible to join the phone conference

it is possible to hold an audio conference using a computer provided a microphone and speakers are connected

this makes use of Voice over internet Protocol (VoIP)

it is also possible to hook up an internet telephone which usually plugs into the router or other internet device

using VoIP allows an organiser to create a group of people to take part in the conference call the group is created by dragging and dropping user names and telephone numbers into the group when the conference is to take place, the organiser clicks on the required group and the conference is initiated

using VoIP allows communication using voice, instant messaging and video (by using an attached webcam)

if some of the users don't have an internet connection or don't have access to a computer, it is possible to add actual telephone numbers (landline or mobile) to the created group

[8 marks]

- 9 a Data Protection Act  
b anti-virus software  
c holographic image (hologram)

- d authentication
- e Bluetooth
- f WAP or hot spot
- g spread-spectrum frequency hopping

[7 marks]

**10 Banded response question**

[7 marks]

**Level 3 (6–7 marks)**

Candidate will discuss at least four or five reasons why the internet should be policed. The discussion will include both sides of the argument. Some form of conclusion/reasoned argument regarding policing of the internet will be evident.

**Level 2 (3–5 marks)**

Candidate will discuss only two or three reasons why the internet should be policed. The discussion will tend to be rather imbalanced with perhaps only one side of the argument being made. A conclusion may be made but is unlikely to be supported by the facts given.

**Level 1 (0–2 marks)**

Very few arguments in favour of or against the statement likely to be made. Many of the points given will conflict. No attempt at making a conclusion.

**Marking points:****Arguments in favour of some form of control**

- it would prevent illegal material being posted on websites (e.g. racist/prejudice, pornographic, terrorist activities, etc.)
- people find it much easier to discover information which can have serious consequences (e.g. how to be a hacker, how to make bombs, etc.); although most of this can be found in books, it is much easier to find the information using a search engine
- some form of control would prevent children and other vulnerable groups being subjected to undesirable websites
- some form of control would stop incorrect information being published on websites

**Arguments against some form of control**

- material published on websites is already available from other sources
- it would be very expensive to 'police' all websites and users would have to pick up the bill
- it would be difficult to enforce rules and regulations on a global scale
- it can be argued that policing would go against freedom of information
- many topics/comments posted on websites are already illegal and laws currently exist to deal with the perpetrators

## ● 5 The effects of using ICT

- 1 a i =IF(B2>69,"A",IF(B2<40,"C","B"))  
 =IF(B3>69,"A",IF(B3<40,"C","B"))  
 =IF(B4>69,"A",IF(B4<40,"C","B"))

[3 marks]

ii =IF((B2+D2+F2)>179,"Class 1",IF((B2+D2+F2)<130,"Class 3","Class 2"))  
 =IF((B3+D3+F3)>179,"Class 1",IF((B3+D3+F3)<130,"Class 3","Class 2"))  
 =IF((B4+D4+F4)>179,"Class 1",IF((B4+D4+F4)<130,"Class 3","Class 2")) [3 marks]

b add two additional columns for each subject ....  
 for example, Maths, columns B and C would be term 1, D and E would be term 2 and F and G would be term 3  
 formulae to work out which class a student goes into would need modifying to take into account marks from all three terms  
 class formulae may need average mark for each subject over three terms  
 or formula altered as follows: Class 1 over 540 marks etc. [3 marks]

c produce graphs/charts to compare progress in each subject  
 graphs/charts can be used to show student progress e.g. 'rolling averages' or trend lines  
 use of conditional formatting (e.g. worsening performance shown in red and improved performance shown in green)  
 use functions such as sorting or averages to allow students to see how well they are doing  
 spreadsheet data can be used to help teachers produce reports for parents [4 marks]

2 a

Statement	(✓)
Redundancy payments to dismissed workers can be expensive	✓
Items produced are not made to a consistent standard	
Robots are unable to think for themselves and can repeat errors	✓
Robots don't take any strike action (removal of labour)	
Robots are expensive to buy and to maintain	✓
Robots don't make any errors	
Remaining workers will need to be paid higher wages	

[3 marks]

b creation of network manager/technician jobs  
 creation of website designer jobs  
 creation of systems analysis/programmer jobs  
 leads to a better environment/safer workplace  
 need for engineers to build and maintain robots  
 training jobs in use of the new system  
 removal of physical, hard work [3 marks]

3 a A = part time  
 B = flexi-time  
 C and D = job sharing  
 E = compressed hours [4 marks]

- b contented work force more likely to stay in job  
 reduced recruitment and training costs since reduced staff turnover  
 company can stay open longer if they adopt flexi-time  
 job sharing allows more than one person to have required skills set  
 compressed hours allow staff to be more focused on their work  
 varied work patterns give more flexibility during busy times and during staff sickness [3 marks]
- 4 a microwave ovens  
 ovens  
 smart fridges/freezers  
 automatic washing machines  
 automatic dishwashers  
 robotic vacuum cleaners  
 bread-making machines [3 marks]
- b **Advantages**  
 no longer a need to stay home whilst cooking food/washing clothes  
 more time for leisure activities, shopping and socialising  
 can control ovens (etc.) using an App on mobile phones away from home  
 smart fridges and freezers can lead to healthier life styles (can automatically order fresh food)  
 and also prevent food wastage
- Disadvantages**  
 can lead to an unhealthy life style (e.g. reliance on ready-made meals)  
 tend to make people lazy as they rely on labour-saving devices  
 people can become less fit as they lie around the house letting devices do all the work  
 loss of certain skills as devices do the tasks [3 marks]
- 5 a alarm clocks  
 televisions  
 air con/central heating  
 games consoles/toys [3 marks]
- b **Advantages**  
 save energy since devices are more efficient and can even switch themselves off when inactive for a while  
 easy to program devices to do tasks (e.g. QR codes to automatically set correct cooking times etc.)
- Disadvantages**  
 more wasteful society – no longer cost effective to repair goods and easier to just throw them away  
 many people are not comfortable with such devices and find them complex to operate  
 leaving devices on stand-by is wasteful of energy [4 marks]

## ● 6 ICT applications

### 1 a paper-based advertising

easy to print out and distribute using their own computers and printers

easier to target required group of people

recipient can read flyer/brochure wherever they want

hard copies are permanent copies

no need to rely on computer skills

### computer-based advertising

can add multimedia to advertising

can use hotspots/hyperlinks

easier to use 'hit counters' to see how many people visited website

audience can be global

not possible to deface adverts

much easier/quicker to amend or update adverts

### multi-media advertising in local shopping mall

use of sound, animation, video and music

can be interactive

use of transition effects in presentations

more flexible – links to websites, cloud storage, etc. can be used

[9 marks]

b

Term	(✓)
Tweening	✓
Morphing	✓
Tags	
Rendering	✓
Vector graphics	
Formatting	

[3 marks]

### c i Voice over Internet Protocol

allows people to talk to each other using the internet

uses discrete digital packages sent to the destination address over the internet

### ii microphone

speakers

headset/headphones

### iii Advantages

usually free/low cost

can allow a webcam to be used so visual as well as sound

no need for special equipment (can use built-in microphone and speakers)

**Disadvantages**

poor quality of sound/drop-out

needs good internet connection

poor video quality from most webcams used

[6 marks]

2 a

Application	Measurement	Control
Monitoring the pollution levels in a river	✓	
Burglar alarm system (detection of intruders)	✓	
Maintaining the correct temperature and light conditions in a greenhouse		✓
Automatic oven cooking food at correct temperature		✓
Monitoring patient's vital signs in a hospital	✓	

[5 marks]

b rainfall

temperature

wind speed

wind direction

air pressure

humidity

[3 marks]

c i ADC (analogue to digital converter)

ii DAC (digital to analogue converter)

[2 marks]

d

Sensor	Application
Oxygen/carbon dioxide	<ul style="list-style-type: none"> <li>environmental monitoring/pollution</li> <li>safety applications e.g. in a spacecraft</li> </ul>
Light	<ul style="list-style-type: none"> <li>greenhouse/glasshouse environment</li> <li>automatic doors</li> <li>control switch on/off of street lighting</li> </ul>
Infra-red	<ul style="list-style-type: none"> <li>burglar/intruder alarm system</li> <li>counting people entering/leaving a building</li> <li>traffic control systems</li> </ul>
Pressure	<ul style="list-style-type: none"> <li>burglar/intruder alarm system</li> <li>detection of objects in a production line</li> </ul>
Acoustic/sound	<ul style="list-style-type: none"> <li>burglar/intruder alarm system</li> <li>detecting liquids leaking from pipes</li> <li>any application where sound can be used (e.g. monitoring sound levels at airport perimeter)</li> </ul>
pH	<ul style="list-style-type: none"> <li>pollution monitoring (rivers, air, etc.)</li> <li>acid levels in soil in a greenhouse/glasshouse</li> <li>chemical reaction monitoring/control</li> </ul>

[6 marks]

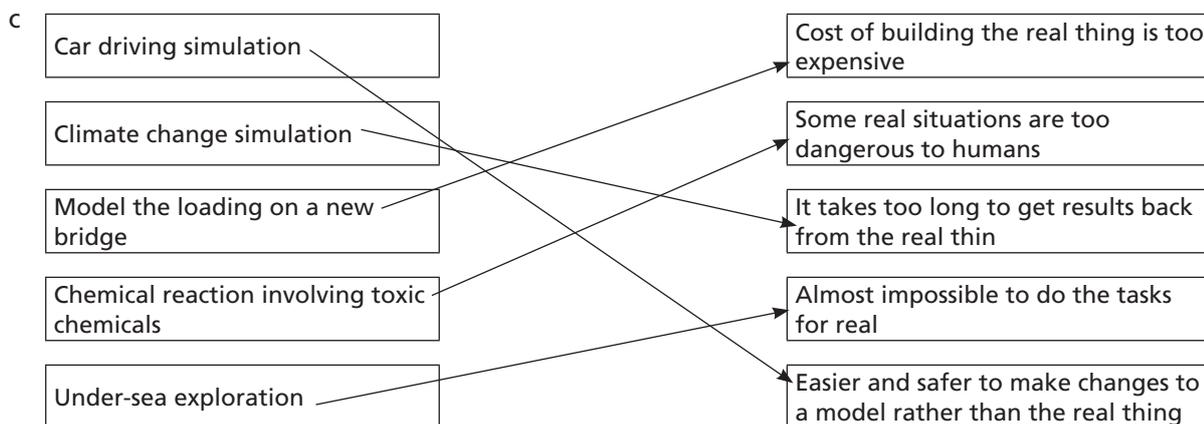
- 3 a infra-red sensor  
 temperature sensor [2 marks]
- b infrared sensor sends data to computer  
 when AI panel detected, computer compares sensor data with pre-stored data  
 if panel detected, signal sent to robot ...  
 ... to begin assembly/gluing process  
 temperature sensor sends data to computer  
 computer compares readings from sensor with pre-stored data  
 if sensor reading < pre-stored value, signal sent to heater ....  
 .... to switch on heater  
 if sensor reading > pre-set value, signal sent to switch off heater  
 if sensor reading = pre-set value, no action is taken  
 process continues until system re-set [6 marks]

- 4 PENDOWN LEFT 90  
 FORWARD 10 REPEAT 3  
 LEFT 90 FORWARD 40  
 REPEAT 3 RIGHT 90  
 FORWARD 30 ENDREPEAT  
 RIGHT 90 FORWARD 30  
 ENDREPEAT LEFT 90  
 FORWARD 10 FORWARD 30  
 LEFT 90 PENUP  
 PENUP  
 FORWARD 10  
 PENDOWN [6 marks]

- 5 a count number of vehicles passing junction in all directions  
 need to collect data at different times of the day  
 also need to collect on different days of the week  
 consider effects on timing of slow/er vehicles  
 consider if any pedestrian crossings near by  
 other factors such as filtering, left turns and so on [3 marks]

- b less expensive than having to build the real thing  
 often safer to run a computer model  
 much easier to try out various scenarios  
 often impossible to try out some tasks in real life (e.g. outer space, under the sea, nuclear reactors, crash testing cars, etc.)  
 time scales are reduced (actual application could take years such as climate changes, population growth, ozone layer depletion, etc.)

[3 marks]



[5 marks]

6

Reasons	Disadvantage?
Robots have difficulty in doing 'one off' tasks	✓
Management can move factories anywhere in the world	
Using robots can lead to unemployment	
Robots manufacture more items per hour than humans	
All items produced using robots are identical	
The set up and maintenance of robots is expensive	✓

[2 marks]

- 7 a bank account details are first read from chip on the debit card  
 the ATM then checks the validity of the card (i.e. has it been stolen, has it been blocked, is it within expiration date)  
 the first thing the customer is asked on international accounts is to choose their language option  
 they are then asked to key in their 4-digit PIN  
 the keyed-in PIN is now compared to the PIN stored on the chip  
 .... if they match up, the customer is taken to the next step  
 .... if they don't match up, the customer is asked to re-enter their PIN  
 .... if three failed attempts are made at entering PIN, the transaction is terminated and the card is retained  
 the customer will now be shown a number of options  
 if the customer chooses **balance** they will then be asked ....  
 .... whether they want balance on screen or a print out

computer sends data back to the ATM and the balance is shown on screen/printed out  
customer will be asked if they want another service ....

.... if not, the card will be returned to them [4 marks]

b the bank's computer checks whether the debit card is stolen or blocked

bank's computer then checks if the account number on the card is a valid account number

if it is, a search is made in the database to locate the customer's record using the account number as the key field

when the record has been found, the *balance* field is read

the value of the *balance* is then sent back to the ATM [3 marks]

8 a account number

bank sort code

cheque number [3 marks]

b the shop presents the cheque to their bank

the bank sends the cheque to a central clearing house

at the clearing house, the cheque passes through a reader/sorter which reads:

- amount on cheque
- the account number, sort code and cheque number

using the sort code, the cheque is ready to send to exchange centres

the cheque is also given a digital signature so that the receiving bank can be sure it hasn't been interfered with

the cheque now goes to an exchange centre and is then passed on to *Hodder Bank*

*Hodder Bank* has its own clearing centre

digital signatures are checked and then the cheque is passed through their own reader/sorter

the sort code is used to sort the cheques into branch order

the bank now checks to see if the customer has sufficient funds

it also checks to see if the cheque is signed and dated correctly

if everything checks out OK, then funds are sent to the shop's account

if not enough money, not signed/dated correctly or if cheque appears fraudulent it is returned to the shop's bank unpaid [5 marks]

c i it is easier to forge cheques if they use barcodes/QR codes

magnetic ink characters are also human-readable

if magnetic ink is over-written (e.g. by a signature) it can still be read by the MICR device

ii magnetic ink would use MICR to scan/read the cheque

MICR would read magnetic signal given out by magnetic ink characters on the cheque

every character has a unique signal/signature

barcode would be read by barcode reader or by camera (QR)

- if a normal barcode, the barcode would be looked up in a database to find customer's account details
- if QR codes used, image would bring up all of the customer account details automatically [6 marks]

- 9 a prosthetics  
tissue engineering  
heart/artery grafts  
blood vessels/arteries  
medical tools and equipment [3 marks]
- b 3-D printer can produce a solid object showing exact internal organs etc.  
surgeons can show the patient exactly what is wrong ....  
.... and then show the patient what procedure is required  
they can show an exact model of the final outcome  
helps surgeon plan surgical procedure ....  
.... since they can see exactly what is required in advance of the operation  
allows for patient engagement which would be missing from traditional methods  
reduces the chance of errors when actual procedure carried out [5 marks]
- 10 a components are:  
knowledge base  
rules base  
explanation system  
inference engine [4 marks]
- b interactive user screen appears  
system asks engineer a series of yes/no questions regarding TV fault  
engineer types in answers to questions  
system then asks questions based on previous responses  
inference engine compares answers to questions with facts stored in knowledge base using the rules base  
system suggests probability of possible fault being identified  
explanation system explains how the expert system arrived at its conclusions  
it will then produce possible ways to fix the TV fault(s) [4 marks]
- c diagnosing patient illnesses/medical diagnosing  
diagnosing faults in car/aero engines  
prospecting for oil/minerals  
tax and financial calculations  
strategy games (e.g. chess)  
identification of plants, animals, chemical compounds, etc.  
road scheduling for delivery vehicles/logistics companies [3 marks]
- d obtain real data with known diagnostics/results  
expert enters a series of answers to E/S questions  
.... and checks E/S output against expected output  
changes are made to E/S until it shows 100% correct known predictions [2 marks]

- 11 a automatic number plate recognition [1 mark]  
 b correct order: 4, 1, 6, 9, 2, 8, 3, 5, 7 [9 marks]

- 12 emergency services use GIS to read closest emergency personnel to a location  
 environmentalists use GIS to protect animal and plant life in certain vulnerable areas  
 teachers can use GIS in their geography, science or engineering lessons [3 marks]

13

Statements	True	False
The sat nav in the car sends signals to the GPS satellites giving the car's location		✓
If the maps are not up to date, the driver can be given incorrect instructions	✓	
The satellites move round the Earth keeping track of all the cars		✓
The sat nav system installed in the car has state-of-the-art timing systems		✓
The system can estimate the time of arrival of the car at its destination	✓	
Paper maps have been scanned in so that the route shows up on the sat nav screen in the car		✓

[6 marks]

- 14 a MICR magnetic ink character recognition/reader  
 b OCR optical character recognition/reader  
 c OMR optical mark recognition/reader  
 d RFID radio frequency identification (reader)  
 e EPOS electronic point of sale  
 f MRI magnetic resonance imaging  
 g ATM automatic teller machine  
 h DAC digital to analogue converter  
 i SIM subscriber identity module  
 j VoIP voice over internet protocol [10 marks]

15 Banded response question [8 marks]

**Level 3 (6–8 marks)**

Candidate will discuss at least six or seven points regarding the booking system. The discussion will include both positive and negative sides of the online method. Some form of conclusion/reasoned argument, based on the given facts, regarding the suitability of the online booking system will be given.

**Level 2 (3–5 marks)**

Candidate will discuss only three or four points regarding the booking system. The discussion will include some positive and some negative aspects of the online method. Some form of conclusion/reasoned argument regarding the suitability of the online booking system will likely be present but the discussion leading up to the conclusion will probably not support it.

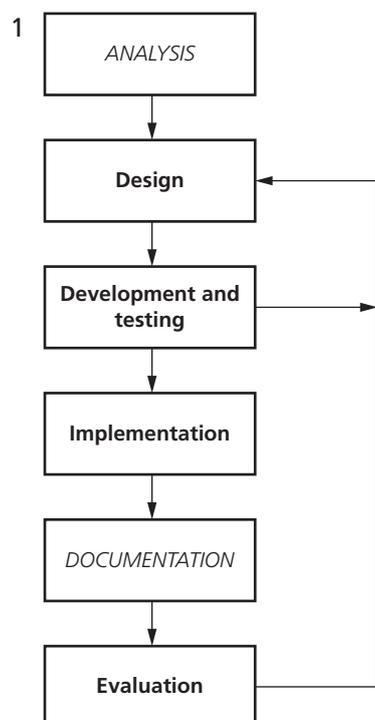
**Level 1 (0–2 marks)**

Very few aspects of the online system are likely to be made. Many of the points given will conflict. No attempt at making a conclusion.

**Marking points:**

- customer clicks on the film they wish to see
- required date and time typed in
- required number of seats chosen
- seating display of cinema is shown on screen
- user selects 4 seats he wants by highlighting them on the seating plan and confirms his choice
- database is searched to check availability of the seats or selected seats shown in red/green on the plan
- once seats chosen, total cost is given OR all seats not available message
- customer confirms his choice
- customer enters personal details
- payment method selected and payment made
- database updated to show seats no longer available on that date/time
- final details on screen and customer confirms all details correct
- email sent to customer as proof of purchase (e tickets) or sent to mobile phone App

## ● 7 Systems life cycle



[4 marks]

Name of fact finding method	Description of fact finding method	Advantages of method	Disadvantages of method
Observation	This method involves watching personnel using the existing system to find out exactly how it works	<ul style="list-style-type: none"> <li>• the analyst obtains reliable data</li> <li>• it is possible to see exactly what is being done</li> <li>• this is a relatively inexpensive method</li> </ul>	<ul style="list-style-type: none"> <li>• people are generally uncomfortable being watched and may work in a different way</li> <li>• if workers perform tasks that violate standard procedures, they may not do this while being watched!!</li> </ul>
Questionnaires	This method involves sending out questionnaires to the work force and/or to customers to find out their views about the existing system and find out how some of the key tasks are carried out	<ul style="list-style-type: none"> <li>• the questions can be answered quite quickly</li> <li>• it is a relatively inexpensive method</li> <li>• individuals can remain anonymous if they want</li> <li>• this method allows quick analysis of the data</li> </ul>	<ul style="list-style-type: none"> <li>• it is often the case that the number of returned questionnaires is low</li> <li>• the questions are rather inflexible since they have to be generic</li> <li>• there is no immediate way to clarify a vague or incomplete answer to a question</li> </ul>
Interviewing	This method involves a one-to-one question and answer session between the analyst and the employee/customer. It is a good method if the analyst wants to probe deeply into one specific aspect of the existing system	<ul style="list-style-type: none"> <li>• it gives the opportunity to motivate the interviewee into giving open and honest answers to the analyst's questions</li> <li>• the method allows the analyst to probe for more feedback from the interviewee (it is easier to extend a question)</li> <li>• it is possible to modify questions as the interview proceeds and ask questions specific to the interviewee</li> </ul>	<ul style="list-style-type: none"> <li>• it can be a rather time-consuming exercise</li> <li>• it is relatively expensive (use of analyst's time)</li> <li>• the interviewee can't remain anonymous with this method</li> </ul>
Looking at existing paperwork	This method allows the analyst to see how the paper files are kept, look at operating instructions and training manuals, check the accounts etc. This allows the analyst to get some idea of the scale of the problem, memory size requirements, type of input/output devices needed, etc.	<ul style="list-style-type: none"> <li>• this method allows information to be obtained which wasn't possible by any of the other methods</li> <li>• the analyst can see for themselves how the paper system operates</li> </ul>	<ul style="list-style-type: none"> <li>• it can be a very time-consuming exercise</li> <li>• because of the analyst's time needed, it is a relatively expensive method to use</li> </ul>

[12 marks]

**3 DFD**

- shows data flows, input/output requirements
- shows processing done and types of data storage needed
- identifies problems with current system
- identifies user and information requirements for new system
- identifies and justifies suitable hardware and software for new system

**System flowchart**

- shows how data flows through a system and how decisions are made
- makes use of special symbols that represent input, output, processing, decisions and data storage
- gives an overall view of the proposed system
- shows how processes are carried out and where various hardware devices are used in the system

[4 marks]

**4 a i heading**

- instructions on how to fill in the form
- use of text boxes to limit amount of information and make form easier to complete
- use of character boxes for data such as names, addresses
- use of tick boxes to make choices easier
- sufficient space to answer question
- clear fonts and clear text colours to make form easier to read

[5 marks]

**ii sample page (many other possibilities exist)**

[3 marks]

**Car ownership form**

**Name:**

**Address:**

**Car Reg No:**

**Make and model:**

**Paint colour:**

**Date bought:**

Car bought new  Or used

b i text boxes

on screen help (buttons)

drop-down/combo boxes where choices are limited

radio buttons and tick boxes where possible

automatic validation of data entries

control buttons (e.g. next page, last page, save, etc.)

double entry boxes to verify data such as passwords

[5 marks]

ii sample page (many other possibilities exist)

[4 marks]

**Online car ownership form**

Name:

Address:  [Look up address](#)

Reg No:  [Look up reg no.](#)

Colour:  New  used

Date of purchase:

Last page 


 Next page

5 a

Activity	Analysis stage	Design stage	Evaluation stage
Interviewing users of the existing system	✓		
Planning the validation and verification routines/ rules		✓	
Deciding on the required file structures		✓	
Interviewing users of the new system			✓
Examining existing documentation used in the booking system	✓		

[5 marks]

b

Changeover method	Description of changeover method
Direct	With this method the old system is stopped overnight and the new system introduced immediately
Parallel	With this method, the old and new systems are run side by side for a time before the new system takes over altogether
Pilot	With this method, the new system is introduced into one part of the company (e.g. into a warehouse of a supermarket) and its performance assessed
Phased	With this method, only part of the new system is introduced and only when it proves to work satisfactorily is the next part introduced, and so on, until the old system is fully replaced

[6 marks]

c

Items	Technical	User	Both types
Program listing/coding	✓		
How to print out data		✓	
Hardware requirements			✓
Software requirements			✓
Sample runs (with results)			✓
Validation routines	✓		
Systems flowcharts	✓		
How to add/delete/amend files		✓	
Meaning of possible error messages			✓
Troubleshooting guide		✓	

[6 marks]

6

Data item	Normal	Abnormal	Extreme
41	✓		
-1		✓	
50			✓
thirty		✓	
1			✓

[5 marks]

7 a

Field name	Validation check	Data type
(cd_title)	none	(alphanumeric)
bar_code	check digit/length check	integer
reorder_level	range check	(integer)
(last_ordered_date)	range check/format check	alphanumeric/integer
ordered	character check	Boolean/logic

[6 marks]

b visual – compare entered data manually with original document

double entry – data typed in twice and computer compares both sets of data

[4 marks]

## 8 (These are examples only – there are several possibilities.)

Field name	Validation check	Example of data item that would PASS validation check	Example of data item that would FAIL validation check
credit card number	length check	1234567891234567	123456
	character check	1234567891234567	123ABCDE4567FGHI
order code	format check	33ABCD44	5DEPT513
colour	look-up check	red	orange
	character check	red	green
size	look-up check	S	XM
	format check	XL	LX
	character check	M	SX

[8 marks]

## 9 Banded response question

[8 marks]

**Level 3 (6–8 marks)**

Candidate will discuss at least six or seven points regarding the evaluation system. The discussion will include what methods are used and what actions come from the results. Some form of conclusion/reasoned argument, based on the given facts, regarding the evaluation methods described.

**Level 2 (3–5 marks)**

Candidate will discuss only three or four points regarding the evaluation system. The discussion will include some of the methods adopted and how they would be acted on. Some form of conclusion/reasoned argument regarding the evaluation methods described but the discussion leading up to the conclusion will probably not support it.

**Level 1 (0–2 marks)**

Very few aspects of the online system are likely to be made. Many of the points given will conflict. No attempt at making a conclusion.

**Marking points:**

- compare final solution with original task
- identify any limitations of the system
- identify any necessary improvements that need to be made
- evaluate user's responses to using the new system
- compare test results from the new system with results from old system
- compare performance of new system with performance of old system
- observe users performing set tasks (compare old with new)
- measure time taken to complete tasks (compare old with new)
- give out questionnaire to gather responses about the ease of use of new system

- evaluation may lead to:
  - update of hardware due to feedback from users or new hardware comes on the market or changes in company require upgrading
  - update of software due to feedback from users, changes to company structure or changes in legislation

## ● 8 Safety and security

1 a

Health risk	Description	Elimination
back and neck pain/strain	caused by sitting in front of a computer monitor for long periods of time in the same position	<ul style="list-style-type: none"> <li>• adjustable chairs</li> <li>• foot rests to reduce posture problems</li> <li>• take regular breaks</li> <li>• use tiltable screens to ensure head is at the correct height</li> </ul>
repetitive strain injury (RSI)	damage to fingers and wrists caused by continuous use of keyboard or repetitive clicking of a mouse	<ul style="list-style-type: none"> <li>• wrist rests on keyboard</li> <li>• take regular breaks</li> <li>• use ergonomic keyboards</li> <li>• use voice-activated software to reduce amount of typing</li> </ul>
eyestrain	caused by staring at a computer monitor for long periods of time	<ul style="list-style-type: none"> <li>• use LCD screens to reduce flicker</li> <li>• take regular breaks and focus on objects at long distance</li> <li>• use anti-glare screens</li> <li>• have eye tests on a regular basis</li> </ul>
headaches	caused by incorrect lighting, screen reflections and flickering screens	<ul style="list-style-type: none"> <li>• use anti-glare screens and make sure ambient light is OK</li> <li>• take regular breaks</li> <li>• have eyes tested regularly</li> </ul>
ozone irritation	caused by laser printers producing ozone and toner particles in the air	<ul style="list-style-type: none"> <li>• proper ventilation to remove ozone and toner particulates</li> <li>• should house printer in its own room</li> <li>• change to another type of printer wherever possible</li> </ul>

[9 marks]

b

Safety risk	Description	Elimination
electrocution	caused by incorrect maintenance and by allowing drinks next to a computer	<ul style="list-style-type: none"> <li>• use an RCB (residual current breaker)</li> <li>• check and maintain equipment on a regular basis</li> <li>• don't allow drinks to be brought into the computer room</li> </ul>
tripping hazard	caused by having trailing wires on the floor	<ul style="list-style-type: none"> <li>• use cable ducts</li> <li>• cover wires or tuck them away under desks etc.</li> <li>• use wireless connections wherever possible</li> </ul>
heavy equipment falling	caused by having inadequate desks, allowing equipment to fall and injure people	<ul style="list-style-type: none"> <li>• use proper, sturdy computer desks designed for the task</li> <li>• never place equipment near the edge of a desk</li> </ul>
risk of fire	caused by breakdown of insulation, overloading electric sockets and overheating equipment	<ul style="list-style-type: none"> <li>• use of carbon dioxide extinguishers</li> <li>• never cover vents on computer equipment</li> <li>• maintain equipment on a regular basis</li> <li>• have good ventilation in the room</li> <li>• never overload sockets; use more wall sockets</li> <li>• use low voltage hardware wherever possible</li> </ul>

[6 marks]

2 a safety when using the internet i.e. keeping personal data safe

[1 mark]

b don't give out any personal information to people unknown to you

don't send people photos of yourself unless the person is known to you

maintain privacy settings which allow the user to control which cookies are stored or allow you to decide 'who sees what' on social networking sites

when accessing the internet, make sure websites can be trusted (use of https and green padlock)

when using search engines, ensure it is set to 'safe search'

only open emails/attachments from known sources

ensure unknown emails are placed in a 'spam box'

when sending emails or photos never include name of your school or send photos with you wearing your uniform

block/report anybody acting suspiciously online

don't enter private chat rooms – stay public

always respect confidentiality

be careful with language used online

use nicknames and not your real name

use complicated email addresses which are almost impossible to guess

[5 marks]

- 3 a hacking  
 b cracking  
 c spyware/key logging software  
 d virus  
 e spam  
 f moderated forum  
 g cookies

[7 marks]

- 4 a phishing  
 the creator sends out legitimate-looking emails to target users;  
 as soon as the recipient clicks on a link in the email or attachment, they are sent to a fake website or they are fooled into giving personal data in response to the email  
 the email often appears to come from a trusted source such as a bank or well-known service provider  
 the creator of the email can gain personal data such as bank account data or credit card numbers from the user  
 this can lead to fraud or identity theft

- b pharming  
 this is malicious code installed on a user's computer or on a web server;  
 the code will re-direct the user to a fake website without their knowledge (the user doesn't have to take any action, unlike phishing)  
 the creator of the malicious code can gain personal data such as credit/debit card details from users when they visit the fake website  
 usually the website appears to be that of a well-known and trusted company  
 pharming can lead to fraud or identity theft

[4 marks]

5

Task	Carried out by a firewall (✓)
Firewalls can control employee misconduct or carelessness, preventing them divulging passwords	
Firewalls can examine traffic between a user's computer and the public network (e.g. internet)	✓
Firewalls can help to prevent viruses or hackers entering the user's computer or computer network	✓
Firewalls can be used to log all incoming and outgoing traffic to allow later interrogation by a network manager	✓
Firewalls can prevent individuals on internal networks from using their own modems to by-pass the firewall	
Firewalls warn the user if software on their computer is trying to access an external data source (e.g. automatic software update)	✓

[4 marks]

- 6 a i SSL  
 secure sockets layer  
 protocol that allows data to be sent and received securely over the internet  
 SSL encrypts data  
 use of https or padlock
- ii TLS  
 transport layer security  
 form of protocol that ensures security and privacy of data between devices communicating over the internet  
 has two layers:
- record protocol (contains data being transferred over the internet with or without encryption)
  - handshake protocol (permits website and user to authenticate each other and make use of encryption algorithms) [5 marks]
- b it is possible to extend TLS by adding new authentication methods  
 TLS makes use of session caching thus improving overall performance compared to SSL  
 TLS separates handshaking process from the record protocol [2 marks]
- c order: C, E, B, A, D [5 marks]
- 7 a makes data meaningless unless the recipient has a decryption key  
 uses both encryption and decryption keys [2 marks]  
 doesn't prevent hacking, but makes hacked data almost unreadable
- b A = encryption key  
 B = cypher text [2 marks]
- c i COMPUTER SCIENCE IS FUN
- ii 3MU4IN1G34M G2X5M4O4TB J52HG34M [4 marks]
- 8 a pair of files stored on a user's computer  
 includes a public key and a private key  
 it is essentially an electronic 'passport' that enables exchange of information securely over the internet [1 mark]
- b sender's email address  
 name of digital certificate owner  
 public key (to encrypt message)  
 serial number  
 expiry date  
 digital signature of certificate authority (CA) e.g. VeriSign [3 marks]

9	Biometric technique	Comparative accuracy		Input devices required	What can interfere with biometric technique?
		High (✓)	Medium (✓)		
	Fingerprinting	✓		fingerprint scanner	damaged fingers (e.g. cuts)
	Retina scans	✓		digital camera	eye irritation/infection
	Voice recognition		✓	microphone	background noise or something which affects the user's voice
	Face recognition		✓	digital camera	facial hair or wearing of glasses

[6 marks]

**10 Banded response question**

[6 marks]

**Level 3 (5–6 marks)**

Candidate will discuss at least four or five points regarding the security of cloud storage. Some form of conclusion/reasoned argument, based on their two sides of the argument will be given. The conclusion will follow on correctly from the points made.

**Level 2 (2–4 marks)**

Candidate will discuss only two or three points regarding the cloud storage system. Some form of conclusion/reasoned argument based on some of the facts will be evident but the discussion leading up to the conclusion will probably not support it.

**Level 1 (0–1 mark)**

Very few aspects of cloud storage security will be given. Many of the points given will conflict. No attempt at making a conclusion.

**Marking points:****Data security**

- companies who transfer vast amounts of confidential data from their own systems to a cloud service provider are effectively relinquishing control of their own data security
- this raises a number of questions:
  - what physical security exists regarding the building where the data is housed?
  - how good is the cloud service provider's resistance to natural disasters or power cuts?
  - what safeguards exist regarding personnel who work for the cloud service company; can they use their authorisation codes to access confidential data for monetary purposes?

**Data loss**

- there is a risk that important and irreplaceable data could be lost from the cloud storage facilities
- actions from hackers (gaining access to accounts or phishing attacks for example) could lead to loss or corruption of data
- users need to be certain sufficient safeguards exist to overcome these potentially very harmful risks

### Security examples

- In late September 2014, three breaches of security involving two of the largest cloud service providers showed why many of the above fears are making people a little nervous about using this facility to store their important files:
  - the XEN security threat which forced several cloud operators to reboot all their cloud servers; this was caused by a problem in the XEN hypervisor (a hypervisor is a piece of computer software, firmware or hardware that creates and runs virtual machines)
  - a recent case where a large cloud service provider permanently lost data during a routine back-up procedure
  - the celebrity photos cloud hacking scandal where over 100 'interesting' photos of celebrities were leaked; hackers had gained access to a number of cloud accounts which enabled them to publish the photos on social networks and to sell them to publishing companies

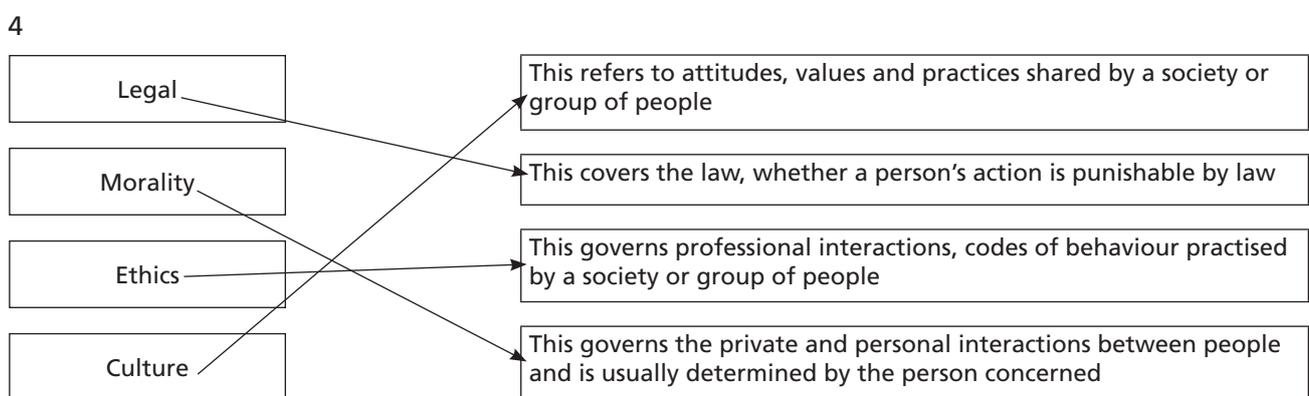
### Conclusion

- all of the above reasons have made individuals and companies a little nervous about using these cloud service providers
- a 'game' between hackers and owners of online service companies continues to rage
- provided users are vigilant in their use of any device connected to the internet then the possibility of being a victim of cybercrime is considerably reduced

## ● 9 Audiences

- 1 a age of the target group  
 experience of the audience  
 audience expectation  
 knowledge of the audience [3 marks]
  - b interview cross-section of the target group to find out how to engage the audience  
 give out questionnaires to people in the target group to find out their background, interests, etc.  
 carry out market research which involves in-depth analysis of the data received [3 marks]
  
- 2 a illegal copying of software [1 mark]
  - b use of product key which is supplied with original copy of the software which indicates its authenticity and can be checked online  
 user is asked to click 'OK? I agree' or put an 'X' in a box to agree to a licence agreement before software continues to install  
 original software package comes with a sticker informing the purchaser it is illegal to make copies; often a hologram label is used to indicate a genuine copy  
 some software needs a dongle (which includes important files) before it will work, stops illegal copies from working [3 marks]

- 3 a no vulgarity or use of inappropriate language which would offend  
only use technical terms with experienced/technical audiences
- b use of sound/animation to keep audience attention  
complicated items better explained using graphics etc.
- c young audience quickly bored!  
long presentations require engagement of the audience to maintain interest
- d asking questions or getting audience to try out things (audience participation)  
always be aware that not everyone likes audience participation
- e remember audience when giving examples (e.g. alcohol is illegal in some countries, vegetarians don't like reference to meat products, etc.)
- [5 marks]



[4 marks]

5

Statement	Unethical	Immoral	Illegal
Sergey uses some of the software routines from his day job when writing his games software	✓		✓
Sergey claims that all the software routines he uses from his day job were written by himself	✓	✓	
Sergey has some of his software written overseas, but only pays the writers a very low wage		✓	
Sergey writes some of his computer games using the powerful computer systems available to him during his day job	✓		
To help advertise his games, Sergey hires a 'hacker' who breaks into websites so that <b>popups</b> appear which advertise his games free of charge			✓
Some of the games software written by Sergey make fun of people who have certain disabilities		✓	
Some of the games Sergey writes collect information from the user's computer, where it is installed. This data is sent back to Sergey for various uses		✓	✓

[7 marks]

## ● 10 Communication

1 a senders of emails are required to obtain 'opt in' permissions before the emails are sent out

emails must not be sent out with false or misleading subject lines

valid postal address must accompany emails from companies/ organisations

most countries don't allow companies/organisations to harvest email addresses

companies must provide subscribers with a very clear way to unsubscribe or opt out from their listings

[3 marks]

b **Passive**

involves release of email material to other users without their consent

**Active**

involves modification of user's messages or even denial of service (i.e. overloading of the system); can include viruses or phishing attacks

[3 marks]

c easier to send out multiple emails if the addresses are all grouped together under a single name; this group name can then be pasted into the 'TO' box

companies/organisations can group people together for marketing purposes e.g. according to age, ethnicity, hobbies, etc.

'spammers' create email groups by buying addresses of users from certain organisations or from software 'raids' on address books; this allows several thousand people to be targeted by a single step

companies use email groups to set up meetings (e.g. for video conferencing) to ensure all the right people are invited to attend; with individual emails it would be easy to miss somebody out

[3 marks]

2 a

Feature	Internet	Intranets
Information available to users is specific to a particular company or organisation only		✓
Requires passwords and user ids to be entered to gain access to the network		✓
Allows public access to information on a global scale	✓	
Sits behind a firewall to give protection from hackers and from viruses		✓
By using an ISP account it is possible to access the network from anywhere in the world	✓	

[5 marks]

b A = external users

B = firewall

C = extranet server

[3 marks]

c safer since less chance of external hacking or viruses

much easier to block certain websites

easier to send out sensitive/private messages in the knowledge they will stay within the company network

better bandwidth therefore number of bits transmitted per second is much higher

[3 marks]

- 3 a i public cloud  
 ii private cloud  
 iii hybrid cloud

[3 marks]

**b Advantages**

data can be accessed at any time from any device anywhere in the world  
 no need for customer/client to carry an external storage device with them  
 provides user with remote backup which helps alleviate data loss/disaster recovery  
 cloud storage automatically recovers data if customer/client system has hard disk failure  
 almost unlimited storage capacity available

**Disadvantages**

security issues of shared data access  
 if internet access is lost or slow data transfer rate, then it will be difficult or impossible to gain access to the data  
 costs can be high for large data storage capacity  
 it is possible for cloud storage provider to go out of business which poses risk of loss of important/sensitive data

[4 marks]

- 4 a https or green padlock

[1 mark]

**b i**

[4 marks]

Meaning	(✓)
hypertext transfer program	
hypertext transfer protocol	✓
hybrid text transaction protocol	
handshaking text transfer protocol	

**ii**

Meaning	(✓)
fixed type protocol	
format testing profile	
faster transfer protocol	
file transfer protocol	✓

**iii**

Meaning	(✓)
protected document format	
portable document format	✓
principal document format	
portable document file	

**iv**

Meaning	(✓)
uploading remote language	
user router locator	
uniform resource locator	✓
uniform remote linker	

- c home page  
 ability to store user's favourite websites/web pages  
 keep a history of websites visited  
 ability to go back and forward through websites opened  
 hyperlinks to allow users to navigate between web pages [3 marks]

- d http:// protocol  
 www.hoddereducation.co.uk/ website address  
 ICT\_books/2017 path/file name [3 marks]

- 5 ftp means file transfer protocol  
 http means hypertext transfer protocol  
 http is used to access websites  
 http transfers contents of a web page to browser for viewing by user  
 http uploading is used for smaller files  
 ftp is used to download files from file servers whereas http downloads data from web servers  
 ftp is used when files are very large [4 marks]

6 a

Feature	Blogs	Wikis
Updated on a regular basis by the author only	✓	
Anyone can edit, delete or modify the content		✓
Organised in reverse chronological order	✓	
Can only be updated and edited by the author	✓	
Can be easily edited using a web browser		✓

[5 marks]

- b each member has free web space  
 each member can build their own private and public profiles  
 possible to write on 'each other's walls'  
 can upload text, images, photos, video to their own area  
 free instant messaging and video chatting  
 can email each other within the community  
 can invite other members to become friends  
 members have control over who can access their private or personal data [4 marks]

- c i **ISP**  
 an internet service provider (ISP) is a company that provides users with access to the internet  
 it is normal to pay a monthly fee for this service  
 when a user registers with an ISP, an account is set up and they are given login details which includes a user id and password  
 an ISP has the equipment and telecommunications line access required to have internet access  
 - usually broadband connections which use copper cables or, more recently, fibre optic cables

**ii netiquette**

netiquette is a shortened form of the phrase interNET etIQUETTE

this refers to the need to respect other user's views and displaying common courtesy when posting views in online discussion groups or when sending out emails

it is always very important to consider what you write since the reader can't see your facial expressions or body language

what may have been intended to be humour, may offend somebody since they misunderstood your message and drew the wrong conclusions

**iii VPN**

VPN is a network that is constructed by using public wires - usually the internet - to connect to a private network, such as a company's internal network/extranet

there are a number of systems that allow the creation of networks using the internet as the medium for the transportation of data

**iv microblog**

microblogs are similar to blogs but are most often used on social networking sites to make short, frequent posts

the posts can be done using instant messaging, emails or use other social networking vehicles (e.g. Twitter)

social networking sites use microblogs to allow members to update, for example, their personal profiles

[6 marks]

**7 Advantages**

tends to be more up to date since it is easier to amend than books

internet has vast, almost limitless, amounts of information

research using search engines is quicker and easier

no need to travel to a library to do research

information is usually free of charge

pages on the internet often have multi-media elements making learning more interesting

**Disadvantages**

the internet is not regulated; anything can be posted on a website and information may be biased or inaccurate

there is always a risk of accessing inappropriate websites when using search engines

it is too easy to be distracted e.g. by computer games and social networking sites

there is a risk of information overload when using search engines

huge risk of plagiarism; since it is easier to cut and paste than copy information from books

some research skills are lost since search engines do all of the work for you

usual risk of viruses etc.

[6 marks]

**8 Banded response question**

[7 marks]

**Level 3 (5–7 marks)**

Candidate will discuss at least five or six points regarding the reliability of information found on the internet storage. Some form of conclusion/reasoned argument, based on their two sides of the argument will be given. The conclusion will follow on correctly from the points made.

**Level 2 (2–4 marks)**

Candidate will discuss only two or three points regarding the use of the internet to find information. Some form of conclusion/reasoned argument based on some of the facts will be evident. But the discussion leading up to the conclusion will probably not support it.

**Level 1 (0–1 mark)**

Very few aspects of using the internet to find information will be given. Candidate will probably spend most of their time discussing viruses and hacking. No attempt at making a valid conclusion.

**Marking points:**

- anybody can set up a website, so all information is not necessarily accurate or true
- many commercial websites are biased (due to advertising for products)
- if website has excessive advertising, it is likely to be unreliable (due to advertising pressures)
- it is possible to use the last part of the URL to identify website's reliability e.g. .ac and .gov tend to be reliable sites
- always compare information from other websites and also cross-check with books
- check if responsible bodies have endorsed the website
- if the website has testimonials this can indicate reliability
- if the website has links to reliable and trusted websites, the information can usually be trusted
- if the last update was a long time ago, information is likely to be out of date or unreliable
- if the author has good credentials then it is more likely for the website contents to be trusted/reliable