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MARKSCHEME

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INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY

Standard Level

Paper 2

21 pages

Examiners should be aware that in some cases, candidates may take a different approach, which if appropriate should be rewarded. If in doubt check with your Team Leader.

In the case of an "identify" question read all answers and mark positively up to the maximum marks. Disregard incorrect answers. In the case of a "describe" question, which asks for a certain number of facts *e.g.* "describe two kinds", mark the **first two** correct answers. This could include two descriptions, one description and one identification, or two identifications.

Area of Impact: Business and Employment

1.   (a)   Identify *two* collaborative IT tools a worker may use when telecommuting.   *[2 marks]*

Answers may include:
- e-mail
- VoIP
- online chat
- discussion groups
- a collaborative web site such as a Wiki
- video conferencing
- microphone/speakers
- webcam
- teleconferencing
- collaborative document sharing *e.g.* Google docs
- voice networking
- instant messaging
- groupware
- PDA/smart phone/Blackberry with some indication of the collaborative nature (*e.g.* accessing phone calls, documents and Internet).

N.B. If a student lists microphone for one and speakers for another, they can only be awarded *[1 mark]*. If keyboard/mouse or file sharing are mentioned, these are not acceptable answers.

Award [1 mark] for any one of the above points identified up to a maximum of [2 marks].

(b)   Describe how *two* advances in technology have led to an increase in telecommuting.   *[4 marks]*

Answers may include:
- broadband provides fast data transmission – this allows the transfer of large files/access to VoIP/multimedia downloads
- Virtual Private Networks – provide a secure private tunnel into the company network and are easy to set up
- costs have decreased – many workers can afford a broadband connection/ free VoIP/affordability of faster computers
- improved security – encryption of files during transmission/improved authentication systems to verify the identity of the employee logging into the company network
- improvement in communication hardware such as web cams
- new developments in collaborative tools such as chat, IM, collaborative documents, VoIP
- advances in wireless communications – smart phones, Blackberries allow colleagues to stay connected with co-workers/WiFi allows workers to use laptops from hotspots *e.g.* in coffee shops from where they can establish their offices
- software that enables telecommuters to connect remotely to their workplace computers – this allows access to applications, files and other workplace resources.

Award [1 mark] for identifying each advance up to [2 marks].
Award [1 mark] for the relevant description up to [2 marks].

(c)   Distinguish between the use of biometrics and passwords as a means of authenticating an employee who remotely logs on and accesses the company's server.   *[4 marks]*

Biometrics	Passwords
Unique body characteristics. These could include face, fingerprint, hand, retina, iris, voice.	Secret numbers, letters, symbols.
High security cannot be forged.	Less secure, can be guessed/cracked.
An initial cost to install the scanners. This cost can be very expensive.	Cheap to implement.
Can't forget.	Easily forgotten.
No need to change.	Need to change regularly.

[1 mark]
A limited response that indicates very little understanding of the topic.

[2-3 marks]
A reasonable description of biometrics and passwords, although the answer may not contrast the two effectively at the bottom end of the band.

[4 marks]
A clear, detailed and balanced description of both technologies contrasting the benefits and limitations of each.

It is possible to achieve full marks considering one issue in depth.

(d) **To what extent are employees' concerns about telecommuting outweighed by the advantages to *both* the employer *and* the employee?** *[10 marks]*

Employee concerns may include:
- lack of technical support at home if computer/connection malfunctions
- less involvement in meetings/potentially fewer opportunities for promotion
- less social contact with fellow workers
- inability to separate home and work – work encroaches on family life
- difficulty concentrating in home environment/greater need for self motivation
- the company no longer needs to hire employees locally leading to an increase of unemployment in the area
- lack of support for the home office (*e.g.* no photocopies, staplers, secretaries)
- employees may need to setup/set aside a workspace in the home
- expectations of being available longer hours – this may lead to expectations of more work
- lack of IT skills to use all the hardware devices and software tools
- the need to have Internet access and other equipment (*e.g.* fast computers, mobile phones, *etc.*) might involve costs for employees
- if the connection or technology at home fails (reliability of home equipment) then communication with the office is not possible, files may not be available or a meeting might have to be cancelled
- if the employer monitors the employee's home computer there could be a privacy issue as it is also used for personal files and communications.

Employer advantages may include:
- cost saving on office space/parking
- ability to employ global workers/handicapped people/parents with small children
- increased productivity/less absenteeism
- reduced liability risks *e.g.* reduced accidents in the work place.

Employee advantages may include:
- time saved in travelling to and from work
- may work at home if ill/injured
- reduced costs *e.g.* petrol
- less interruptions
- more control over organisation of work
- more control over factors outside work *e.g.* flexibility with child care/ family time.

N.B. Negatives for the company are not relevant and will not be rewarded with any marks.

Please see generic markband information sheet on page 21.

Area of Impact: Education

2.   (a)   **Describe how a password-protected web site operates.**   *[2 marks]*

Answers may include:
- provides a restricted area of the web for authorised users
- only users with a login **and** the correct password may have access to the screen that shows the school material
- web site uses a database to check valid passwords against a password file
- different logons could have different privileges/permissions *e.g.* a teacher logon may enable read/write access but a student may only be able to read information on the site
- users have to register providing used name and password, then every time they need to enter they need to give their user name and password to be allowed access.

Award [1 mark] for any one of the above up to a maximum of [2 marks].

(b)   **Describe *two* IT features that a computer user would require to access or use this site.**   *[4 marks]*

Answers may include:
- web browser – software needed to open and navigate the web site, that interprets the markup of files in HTML, formats them into web pages, and displays them to the user
- Internet connection – needed to have access to the Internet and through it to the school web site, it is the connection which allows you to get on the Internet through an Internet Service Provider (ISP)
- web site address of the school – users need to have the school URL to be able to access the web site to be able to identify the page to be loaded
- login and password – user has to be provided with these to be identified as an authorized user and gain access to the site
- modem/cable modem/any sort of physical or wireless connection to the Internet
- appropriate software for viewing/running applications included in the web page – in some situations specific software may be needed to access material in the web page (a reader for portable documents/flash player).

N.B. Do not accept a computer.

Award [1 mark] for each feature identified up to [2 marks].
Award [1 mark] each for the relevant description up to [2 marks].

(c)   Explain how the new web site could improve student learning.   *[4 marks]*

Answers may include:
- in the web site work can be interactive, use animations and/or have links to other sites
- tasks in the website may be done several times by students until the topic is understood
- when using application in the web site feedback may be provided instantly by the program in use
- motivation: some students may prefer to work using the computer than working with pencil and paper
- access: students and parents will always have access to the materials as long as they have a computer with an Internet connection (papers may get lost)
- web site may provide different types of tools for different learning abilities: students with different learning abilities may have new possibilities to study if different types of tools are uploaded in the web site
- organization: this may be more organized than a student's file/will help students who lose papers, and may help some students find past exercises to revise
- by using the web site parents may follow students' needs and help them at home
- the web site will allow students to have access to the materials from home or from any other location (even when sick or on holidays)
- resources in the web site (applications, links and others) are selected by the teacher – they are reliable and directly related to the topic being studied.

[1 mark]
A limited response that indicates very little understanding of the topic.

[2-3 marks]
A reasonable description of how the web site enhances learning, although the answer may lack appropriate reasoning at the bottom end of the band.

[4 marks]
A clear, detailed explanation (with reasons) of the way the web site enhances learning.

(d) **This system may be a great advantage for students, but it may place teachers with limited IT skills under great pressure.**

Discuss the concerns of some teachers when they are asked to make this new resource available for the students. *[10 marks]*

Answers may include:
- teachers may not feel competent in the use of technology
- teachers may need to spend extra time learning the tools/creating the new resources
- teachers may be expected to pay for their own training to learn these new tools
- teachers may be worried that not all students have the facilities at home to access the site
- teachers may be worried that the school IT systems will not be always available because of system failures and that students may use that as an excuse to not do their work on time
- teachers may not like parents interfering with students work as they would like students to be independent
- teachers may be worried about copyrights when placing their materials on the web
- teachers who are used to traditional methods of teaching may have reservations about this system
- teachers may be concerned that students may not know how to use the system – training for students will be required
- teachers may be concerned about privacy of photos placed on the web site – images of students can be copied, shared and even manipulated
- teachers may be concerned that information on the site could be changed – integrity of the data would be at risk if a hacker could gain access and change information making it unreliable for students.

Please see generic markband information sheet on page 21.

Area of Impact: Health

3. **(a)** **Identify *two* features of a sensor.** *[2 marks]*

- A device that detects changes in a physical stimulus.
- A device that captures information from the person/environment and turns it into a signal that can be measured or recorded.

Award [1 mark] for each feature identified up to [2 marks].

(b) **Describe *two* advantages of using a USB memory device for the storage of medical information.** *[4 marks]*

Answers may include:
- portable – small and easy to carry around; patients will be able to take it with them without inconvenience
- inexpensive storage device *e.g.* different prices available, accessible to patients who need it to store their medical information
- standard format (can be used in many devices) will allow patients/doctors use it in any computer and access the medical information
- robust – will not get damaged easily so patients can comfortably take it around without worrying it can be easily damaged
- plug and play – doctors/patients will not need to install any additional software to be able to access the medical information when required
- can store a large amount of data – medical files can be large if monitoring is done constantly and information is saved updating the files
- more versatile method of transferring data than a CD patients/doctors can choose to use this device to save medical information even if they do not have a CD drive
- they are read/write whereas CDs may be read only and medical information may be updated.

Award [1 mark] for each advantage identified up to [2 marks].
Award [1 mark] each for the description relevant to the storage of medical information up to [2 marks].

(c) **Explain *two* advantages for the hospital of having a patient at home using these monitoring devices**. *[4 marks]*

- Cost: cheaper to have a patient monitored at home than have a patient in the hospital permanently.
- Space: hospitals may use beds for critical patients.
- Continuous monitoring without needing an appointment – gives hospital better control with less specialist time.
- Monitoring from home can give the hospital more reliable results as patients are more relaxed – in a hospital situation patients can feel stressed and results like blood pressure can be abnormally high.
- Patients using this device frees up some doctors' time – doctors may spend more time with emergency cases.

[1 mark]
A limited response that indicates very little understanding of the topic.

[2-3 marks]
A reasonable description of the advantages for the hospital of having a patient at home, although the answer may lack appropriate reasoning at the bottom end of the band. *[2 marks]* *for two advantages identified or one advantage described.* *[3 marks]* *for two advantages described.*

[4 marks]
A clear, detailed explanation (with reasons) of the advantages for the hospital of having patients at home.

(d) **Evaluate possible solutions to overcome the issues of reliability *and* privacy of data when patients use this technology.**   *[10 marks]*

Reliability:
- regularly checking the operation of the devices
- purchasing watch/USB from reliable manufacturer
- confirmation of data sent *e.g.* return e-mail that results have arrived safely
- backing up data from USB to hard disc
- provide a temporary additional device to compare results
- problems with the Internet connection putting in danger the transfer of data to patient's doctor over the Internet
- the patient's results from the remote monitoring device could be double checked by a doctor before any action is taken
- when the device is first set up results from the device could be checked against results from monitoring on site in the hospital – to check they correspond and the device is fully fuctional
- Devices are regularly upgraded/replaced *e.g.* there is a planned roll over
- Use of antivirus software to check for viruses on the USB.

Privacy:
- password protection on USB
- encryption of data during transmission
- limit access of data stored at the hospital – only for authorized personnel
- provide a secure method to send data
- password levels for staff who have access to the data according to their needs
- biometrics security to access/send files.

Please see generic markband information sheet on page 21.

Area of Impact: Arts, Entertainment and Leisure

4.   (a)   **Define the terms *pixel* and *mega byte*.**   *[2 marks]*

Pixel: Picture element – the smallest element/unit on the screen/in a graphic image.

Mega byte: 2^{20} bytes, 1024 KB, 1048576 bytes.

N.B. Accept 10^6 bytes or "a million bytes" or "a thousand Kbytes".

Award [1 mark] for each term defined up to [2 marks].

(b)   **Describe *two* ways that tourists on holiday can share digital photos with their family at home.**   *[4 marks]*

- photos could be uploaded from the camera to a public web site (*e.g. Yahoo* photos) – the family would need to be sent the URL/have access to the site – to access the relevant web page
- photos could be e-mailed – photos could be transferred from the camera to the computer, and then sent as an attachment (they may need to be compressed to a suitable size)
- photos could be burnt onto a CD at a photographic kiosk – the CD would have to be sent by regular post
- photos could be uploaded to the tourist's own web site – this would require access to a computer and network with ftp access
- photos can be shared using IM – using IM a message can be sent to family members asking them to accept an invitation to share photos
- photos taken with a mobile phone can be sent to mobile or e-mail of family members at home
- users can upload photos to a web site using ftp shared by other family members and they can download them.

Award [1 mark] for each way identified up to [2 marks].
Award [1 mark] for each description relevant to tourists on holiday up to [2 marks].

(c)   **Explain *two* benefits of saving digital photos in the JPG format.**   *[4 marks]*

- JPG allows photographic images to be compressed – this enables images to be e-mailed or uploaded to a web page
- there is little loss in image quality – it is possible to choose different qualities of JPG depending on the requirements, other formats, like GIF with less colours, will make the photo lose quality
- the file format is compatible with most software – JPG files can be loaded straight into web browsers, image editing software, word processing, PowerPoint.

[1 mark]
A limited response that indicates very little understanding of the topic.

[2-3 marks]
A reasonable description of the benefits of JPG, although the answer may lack appropriate reasoning at the bottom end of the band. [2 marks] for two benefits identified or one benefit described.   [3 marks] for two benefits described.

[4 marks]
A clear, detailed explanation (with reasons) of the advantages of saving photos in JPG format.

(d)   **Unlike traditional photos, digital photos are easily stored and easily distributed.   Evaluate the concerns that may arise from these developments**.   *[10 marks]*

- Photos of individuals could be intercepted whilst being sent and used by others not intended/private information could be exposed.
- Privacy of individuals could be at risk if their photos are stored by the recipient on a server/computer without security measures in place.
- Digital storage allows easy manipulation of photos, resulting in fictitious/unreal situations.
- Digital photos are easily distributed to a wide audience (*e.g.* via web sites/blogs) without the individual's knowledge or consent.
- Easy distribution means that photos may be used for purposes other than those originally intended.
- Easy distribution means that photos uploaded to web pages can be easily copied without concern for copyright.
- Digital photos could be accidentally deleted for space or by mistake/virus and completely lost.
- While before it was necessary to go to a photo shop and pay for copies now many copies may be printer at home with a good printer and shared without the individual's consent.

Please see generic markband information sheet on page 21.

Area of Impact: Science and the Environment

5.   (a)   **Identify *two* processes involved in data logging.**   *[2 marks]*

Answers may include:
- physically collecting the data using hardware
- using a computer to collect data through sensors
- analyzing/processing/verifying the data
- saving/storing results
- outputting results
- converting analogue signals to digital.

Award [1 mark] for any one of the above processes identified up to a maximum of [2 marks].

(b)   **Describe *two* other ways that automatic data logging may be used.**   *[4 marks]*

Answers may include:
- weather stations – to capture information about weather conditions (temperature, wind, pressure, humidity)
- medicine – capturing information from sensors attached to patients at ICU
- greenhouses – capturing information about temperature and humidity to actuate and change the conditions
- engine management – collection of data about driving history
- driving patterns – to automatically detect the speed of a car
- stock control using smart shelves – shelves automatically scan the RFID tags in products and alert the store when supplies are getting low
- RFID tags worn by athletes – used for entry to club/finishing positions in races
- RFID tags worn by travellers boarding a plane – used to check the passenger list
- criminals can be tracked through an electronic device worn as a bracelet or belt – using GPS the location of the criminal is found and data is automatically sent to a police control station
- use of RFID tags on products – used to automatically record the prices as customers walk through checkout counters
- use of sound sensors – to capture sound levels in different areas of a building (school/hospital) – to help provide a better work/study/hospital environment
- use of movement sensors to record seismic activity – data is recorded to study patterns and make predictions
- data logging – to monitor seasonal water levels in a river that tends to flood or to determine the rate of increase of water levels and give predictions about flooding
- reading of car number plates – to identify drivers who are breaking speed limits
- tracking tagged wild animals – to study behavioural patterns.

N.B. Valid examples of automatic data collection by sensors will be accepted but answers cannot be accepted where data has been manually entered or swiped.

Award [1 mark] for each use identified up to [2 marks].
Award [1 mark] each for the relevant description up to [2 marks].

(c) **Explain** *two* **advantages of using automatic data logging to keep records compared with manual data logging.** *[4 marks]*

- Data can be captured 24/7 without the need for people to make measurements.
- Data from automatic logging is exact and no mistakes are made unless equipment is faulty.
- Data is in digital form from the moment it is captured and can be used straight away to produce graphs or statistics.
- Data from data logging can be analysed immediately and results can help prevent disaster.
- Automatic data collection allows for data to be collected faster and more efficiently than manually collecting the information.
- After the initial startup cost, no one has to be paid to collect the data
- Data can be captured in places which are too remote or dangerous for humans *e.g.* in deserts or on top of a volcano.

[1 mark]
A limited response that indicates very little understanding of the topic.

[2-3 marks]
A reasonable description of the differences between data captured automatically or manually although the answer may lack appropriate reasoning at the bottom end of the band. *[2 marks]* *for two advantages identified or one advantage described.* *[3 marks]* *for two advantages described.*

[4 marks]
A clear, detailed explanation giving reasons why automatic data logging is often preferred to manual data logging.

(d) Information obtained at automatic tolls may also be used to map traffic information and help telecommuters travel on the highways. Some cards may also contain customer's information or an identification number to relate the customer to a record in a driver database for later use.

To what extent do the concerns about invasion of drivers' privacy outweigh the advantages of using this system to improve the traffic of cars in a city?   *[10 marks]*

Concerns about driver's privacy invasion:
- information may be saved to track people *e.g.* politicians, criminals
- information saved may be made available to others
- databases may not have appropriate security, hackers may gain access.

Advantages for improvement of traffic control:
- maps may be produced to understand traffic flow at different times, days
- drivers who use the highways may get information about better ways to plan routes and avoid traffic jams
- information about highways with less traffic may be made available to navigation systems in cars and drivers may chose better routes.

Please see generic markband information sheet on page 21.

Area of Impact: Politics and Government

6. **(a)** **Define the term *smart card*.** *[2 marks]*

- Card that contains microprocessor/chip.
- Card that stores data.
- Card that contains data that can be updated.

Award [1 mark] for any two of the above points up to a maximum of [2 marks].

(b) **Some cards store minimal identification details such as patient ID. Describe how any doctor will be able to retrieve the full details of a patient during a medical consultation.** *[4 marks]*

- Card is inserted into a card reader that reads the chip and retrieves the ID.
- Patient details have already been entered into database.
- ID is checked against data in central database.
- ID is matched with data stored in central database and looks through patients' records.
- Matching record is retrieved and information sent back to the doctor's computer.

Award [1 mark] for each step identified up to [4 marks].

(c) **Explain how data matching will help reduce welfare fraud.** *[4 marks]*

- Data matching involves comparing data from different sources – using a unique key code.
- Databases can be linked across government departments for example taxation (shows earnings/incomes) department and welfare department (social security benefits).
- Discrepancies are highlighted *e.g.* find a person that is earning a full time wage who is receiving unemployment benefits.

[1 mark]
A limited response that indicates very little understanding of the topic.

[2-3 marks]
A reasonable description of data matching or mentions an example although the answer may lack appropriate reasoning at the bottom end of the band.

[4 marks]
A clear, detailed explanation of the process of data matching with reasons of how welfare fraud can be reduced.

(d) **Discuss the concerns for citizens of the introduction of this smart card.** *[10 marks]*

Concerns of the citizens include:
- they may have to pay the cost for the initial card and updates/renewals
- data is used for purposes not originally intended so permission may not have been given to all departments to use it
- privacy – this card potentially gives access to all government records on a citizen
- loss of card may result in loss of medical attention or other benefits when needed
- loss of one card would be the equivalent of citizens losing up to 17 cards and services
- ID theft is more likely because it is easier to build up a profile by using the information in all databases
- possible surveillance by the government and consequent feelings of animosity.

Please see generic markband information sheet on page 21.

Markband for all extended response questions

Level 0	0 marks	No knowledge or understanding of IT issues and concepts or use of IT terms.
Level 1	1-2 marks	A brief and generalized response with very little knowledge and understanding of IT issues and concepts with very little use of IT terms.
Level 2 **Description**	3-5 marks	Some knowledge and understanding of IT issues and/or concepts, although a tendency towards fragmentary, common sense points at the bottom of the band with very little use of IT terms. A description that has a basic sense of structure but is not sustained throughout the response with a limited use of IT terms. At the top end of this band the description is sustained.
Level 3 **Examination <u>or</u> Analysis**	6-8 marks	An examination/analysis of the IT issues that may lack depth or be unbalanced e.g. only covering one stakeholder at the lower end of the band. A competent examination/analysis of the IT issues covering a range of stakeholders, using IT terms appropriately. At the top end of the band the examination contains some clear and coherent connections between the IT issues and there may be an attempt to evaluate it in the form of unsubstantiated comments.
Level 4 **Opinion (discuss, evaluate and to what extent)**	9-10 marks	Thorough knowledge and understanding of IT issues and concepts. Appropriate use of IT terms and application to specific situations throughout the response. A detailed and balanced discussion/evaluation that demonstrates a clear understanding of the way IT facts and ideas are related. Opinions, conclusions and/or judgments, albeit tentative, are provided and are well supported at the top end of the band.