OCR
Oxford Cambridge and RSA

Level 3 Cambridge Technical in Applied Science

Scheme number - 05874

Unit 22: Global Scientific Information

Sample Assessment Material

Date – Morning/Afternoon

Time Allowed: 1hour 30 minutes

You must have:
- Pre-release material
- A ruler

You may use:
- A scientific calculator

* 800000001 *

First Name		Last Name	

Centre Number						Candidate Number				

Date of Birth								

INSTRUCTIONS
- Use black ink.
- Complete the boxes above with your name, centre number and candidate number. Please write clearly and in capital letters.
- Answer **all** the questions.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number (s).
- Do **not** write in the bar codes.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question or part question are shown in brackets **[ ]**.
- This document consists of **16** pages.

Answer **all** the questions

Part A

This section relates to the case study on Mid-Cheshire Scientific Research (MCSciR).

1. MCSciR is reviewing its information security and personal data protection measures.

It is essential that the data held are secure.

(a) Scientific information can be classified in many different ways.

This type of information is often classified as confidential.

(i) Suggest what confidentiality means in relation to the scientific data collected and stored at MCSciR.

……

……

……

……

[2]

(ii) Identify **two** other ways of classifying scientific information.

1 ……..

2 ……..

[2]

(b) MCSciR is highly regarded in the scientific community.

The current activities of MCSciR include:

A scientific analysis - of its own research activities and those of the companies for which it provides support

B microbiology – to identify potentially useful or harmful microorganisms

C drug development – involving the trialling of drugs for human use.

The Information Security Officer is carrying out a review of the risks associated with data collection and storage at MCSciR.

(i) One risk associated with poor information security is the unauthorised access to data.

Suggest the impact of unauthorised access to data for MCSciR in relation to the three activities.

A (Scientific analysis) ……..

……

B (Microbiology)..……..……..

……

C (Drug Development) ……...

……

[3]

(ii) Describe **one** impact of accidental loss of data for MCSciR and suggest **two** ways in which this could be avoided.

Impact of accidental loss of data …….

……

……

Suggestions to avoid this loss of data

1 ……

……

2 ……..……..

……

[3]

2. MCSciR is a leading organisation for microbiological research.

This research starts in MCSciR's laboratories when technicians observe the response of different microorganisms to a variety of drugs including antibiotics.

Technicians often take handwritten laboratory notes to record the findings of various experiments.

(a) Suggest **one** advantage and **one** disadvantage of writing such handwritten laboratory notes.

Advantage ……..

……..

……..

Disadvantage ……

……..

……..

[2]

(b) Information can also be recorded and stored using optical media.

Give one example of optical media and explain one benefit of using this system to record and store information.

……

……

……

……

[2]

(c) The company aims to share results of its microbiological research around the globe.

Suggest **one** reason for sharing results and consider **three** different access issues affecting the success of this global target.

Reason for sharing results globally:		
Access issue	**1**	
	2	
	3	

[4]

MCSciR has purchased access to several online libraries including universities in the UK, USA and Europe.

Consider the relevance of online libraries for the future development of MCSciR.

……

……

……

……

[2]

3. A Senior Researcher has identified genetic research as the field for future expansion of MCSciR.

This research is likely to include gene testing, gene therapy and the construction of genetic databanks for pharmacogenomics.

Pharmacogenomics is the branch of genetics concerned with determining the likely response of an individual to therapeutic drugs.

(a) Suggest **three** different stakeholder groups and describe the way in which pharmacogenomics databanks can have an impact on their work or their lives.

Stakeholder group	**Impact of pharmacogenomic databanks**

[6]

(b) Technicians are often involved in collecting, storing and collating information.

A number of MCSciR technicians are responsible for exploring data collection and storage for the new pharmacogenomics project.

The Data Protection Officer gives a presentation to the technicians. He refers to two aspects of legislation;

- Data Protection Act (DPA) 1998
- Copyright, Designs and Patents Act 1988

Describe **one** key feature of each Act and suggest why it is relevant to the introduction of pharmacogenomics at MCSciR.

Data Protection Act (DPA) 1998	Key feature
	Relevance
Copyright, Designs ar Patents Act 1988	Key feature
	Relevance

[4]

Part B

You do not need the case study to answer these questions.

4. George is a senior IT technician working in a National Health Service (NHS) hospital clinic.

He is responsible for recording and analysing data as part of an investigation carried out by the NHS across the country.

The investigation focuses on the link between diet and diabetes.

Each patient participating in the investigation keeps a diary of their weekly diet and hands this in for transcribing and analysis.

George records:

- the body weight of each patient
- results of blood samples taken at weekly visits to their local clinic
- patients' food diary entries.

(a) George uses solid state media for this investigation.

(i) Explain **two** advantages and **two** disadvantages of using solid state media for this investigation.

Advantage1 ……...

……

Advantage2 ……..

……..

Disadvantage 1 ……

……..

Disadvantage 2 ……

……..

[4]

(ii) The investigation is based on data collected from many patients.

George is aware that the patients involved in this NHS investigation have **rights** as outlined in UK legislation and regulation.

State **two** relevant examples of current UK legislation and outline the rights of the patients that are protected by these Acts.

……

……

……

……

……

……

[4]

(iii) Suggest **three** ways the rights of the patients are protected in this investigation.

1	
2	
3	

[3]

(b) Discuss the possible impact that poor quality information may have for the patients **and** the clinical research teams involved in this investigation.

……

……

……

……

……

……

……

……

……

……

……

……

[6]

5. A new plant culture company is under development.

The company name is Miniphyte.

The owners of Miniphyte are planning to research the most effective ways of growing tiny vegetables for human consumption.

The company logo is shown in (Fig 1)

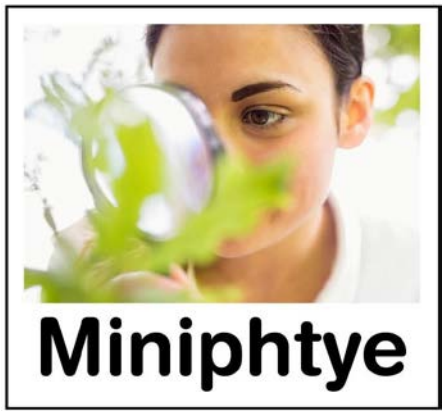

Fig 1

- The research will generate vast amounts of data over the next five years.
- The owners are exploring the most effective options for storing their data.
- They are considering data storage using servers in the USA.
- The data will therefore be stored in the 'cloud'.

(a) Describe **two** key features of the regulations affecting data protection when data are stored outside of the UK, in the 'cloud'.

1……..

……..

2……..

……..

[2]

The owners are already planning to launch a website to promote their company.

They are keen to make sure that people who are disabled will be able to fully access the information available on the website.

They are aware that there is a UN Convention on the Rights of Persons with Disabilities (UNCRPD).

(b) Suggest **three** ways in which the Miniphyte website could be designed to give access to disabled people.

Suggestion	Website design feature
1	
2	
3	

[3]

6. Sam is the Information Security Officer at a nuclear research facility.

The research facility is involved in the production of radioisotopes for medicine and industry.

An example of this type of research facility is shown in (Fig 2)

Image of research facility to be included – pending copyright

Fig 2

The research is highly sensitive and Sam is responsible for information security.

The principles of information security include the integrity and availability of data.

(a) Describe the integrity and availability of data in relation to this research facility.

1. Integrity of data

……

……

……

……

2. Availability of data

……

……

……

……

[4]

(b) Sam is informed that there has been a breach of security of the research data held on the computer network.

She is confident that the security breach was intentional but is not sure if data were destroyed or tampered with.

(i) Outline **one** way in which the data could be destroyed and **one** way in which it could be tampered with.

……

……

……

……

[2]

(ii) Evaluate **two** ways in which this security breach may have an impact on the research facility.

……

……

……

……

[2]

END OF QUESTION PAPER

OCR
Oxford Cambridge and RSA

SPECIMEN

Sample Assessment Material

LEVEL 3 CAMBRIDGE TECHNICAL IN APPLIED SCIENCE

Unit 22: Global scientific information

MARK SCHEME

Duration: 1hour 30 minutes

MAXIMUM MARK 60

Version 1

Version: 1 **Date:** 25/10/2016

This document consists of 17 pages

Question			Answer	Marks	Guidance
Part A: Pre-release material					
1	**(a)**	**(i)**	*Any two from:* Information is not open to the public; Can only be accessed by the MCSciR research team; Other members of MCSciR staff must be authorised to have access to the information; Personal information can be seen by the individual/participant involved; Individuals/participants can be reassured that their personal information is not freely available to others;	2	**Accept** any realistic explanation for confidentiality in the context of the MCSciR scenario.
		(ii)	*Any two from:* Sensitive; Non-sensitive; Private; Public; Classified; Partially anonymised; Completely anonymised; Impacts on different stakeholders;	2	**Accept** phonetic spelling

Question			Answer	Marks	Guidance
	(b)	(i)	**Scientific analysis** *Any one from:* Competitors/others/media could find out about the company research activities; Competitors/others/media could find out about the research activities of other companies; MCSciR's reputation could be damaged/ cause loss of future contracts; MCSciR could lose the contract it already holds with other companies; **Microbiology** *Any one from:* Competitors/others/media could find out about the microbiology research activities at MCSciR; Competitors/others/media could gain access to confidential information about beneficial/harmful microorganisms; MCSciR's reputation could be damaged/ cause loss of future contracts to supply microorganisms; **Drug development** *Any one from:* Competitors/others/media could find out about the drug development activities at MCSciR; Competitors/others/media could gain access to the personal records of individuals involved in the drug trials; Competitors/others/media could release the confidential names of individuals and thereby destroy the status of blind trials; MCSciR's reputation could be damaged/ cause loss of future contracts to carry out drug trials;	3	**Accept** any realistic suggestion for the impact of unauthorised access to the three types of MCSciR research activities. **Accept** answer 'Competitors/others/media could find out about …' once only.

Question			Answer	Marks	Guidance
		(ii)	**Impact of accidental loss of data** *Any one from:* Research activity may be slowed down/have to stop; Experiments may need to be repeated to generate a replacement set of results; Data could be accessed by a competitor /others/media; **Suggestions to avoid loss of data** *Any two from:* Save data to back-up files; Use a system that prevents closure of files unless saved (in the correct manner); Use of encrypted files with login codes to enter and exit the data files; Use a 'cloud provider' with a facility to retrieve lost data; Ensure that all IT technicians/ research staff are fully trained to follow data security protocols;	3	**Accept** a specific example for the impact of data loss in relation to any of the three research activities eg. may need to • contact other organisations to retrieve early data, • start new microorganism cultures; • repeat drug trials and contact new participants; **Accept** any realistic suggestion to avoid loss of data.

Question			Answer	Marks	Guidance
2	(a)		**Advantage** *Any one from:* Easy/quick (to take handwritten notes); Carry the equipment in a pocket/lab coat; Keep on the lab bench alongside the experimental equipment/materials; Use different coloured pens/highlighters to emphasise specific findings/results; **Disadvantage** *Any one from:* Can be easily misplaced/lost; May be difficult for others to read the notes; Need (extra time) to rewrite the data using IT to collate/carry out statistical analysis; May be contaminated with microorganisms;	2	**Accept** any realistic advantage/disadvantage for using handwritten notes in laboratory research.
	(b)		**Example** *Any one from:* CD-ROMs; DVD-ROMs; CD-R / CD-RW; DVD-R / DVD+R; Blu-ray; **Benefit** *Any one from:* Non-volatile; Memory can be stored (as back up) when power is off; Durability/ archiving/ easy to transport/ random access of data;	1 1	**Accept** any correct trade name as an example of optical media. **Only** award the mark if explanation is given.

Question			Answer	Marks	Guidance
	(c)		**Reason** *Any one from:* Share information/microbiological data/antibiotics with others (around the globe); Enable others in different parts of the globe to carry out similar experiments/ to widen the scope of peer review; Achieve international promotion/recognition of the company/MCSciR; Increase sales/turnover of antibiotics produced by MCSciR; Exchange information with others to benefit research at MCSciR; Increase sponsorship from organisations around the globe; **Access issues** *Any three from:* Developed countries are advantaged due to good provision/quality of IT networks/systems; Problems with compatability of IT networks/systems/software packages; Use of different languages/ information may lose important details in translation; Unreliable data storage facilities could corrupt/change the research data; Developing countries may experience power cuts/blackouts (which could interrupt data deliver/exchange);	1 3	**Accept** reverse argument for developing countries. **Accept** reverse argument for developed countries.

Question			Answer	Marks	Guidance
	(d)		*Any two from:* Review funding bodies which have supported the company; Access information about new funding opportunities; Obtain copies of policies/documentation for putting a funding bid together; Effective/easy/simple way of obtaining (rich) sources of information about the same/similar research; Can (often) use a search engine to focus on specific research techniques/findings; Rapid way of disseminating research findings/posting data onto the online libraries; Making contact with other researchers/organisations in the same field of research; Do not need to purchase paper copies of research documents/research journals; Can obtain permission/rights to download access to store information on the MCSciR computer network; Rapid access to quality/peer-reviewed journals; Explore (not only journals but) books and articles; Access multinational research findings;	2	

Question			Answer		Marks	Guidance
3	(a)		*Any three from:*		6	
			Stakeholder group	**Impact of databank**		**Only** give mark for impact of databank if correctly linked to an acceptable stakeholder group. **Accept** any other realistic stakeholder groups with a related impact of the pharmacogenomics databank.
			Patients;	Obtain therapeutic drugs/ recover from disease/illness / contribute to future research findings;		
				Access better/safer drugs the first time;		
			MCSciR/ Research company;	Obtain a valuable source of data to develop therapeutic drugs;		
				Target specific drugs to complement the genetics of an individual;		
				More accurate way of determining drug dosages;		
			Wider/international community;	May gain access to research findings to develop other therapeutic drugs;		
				Distribution of more powerful drugs;		

Question			Answers	Marks	Guidance
	(b)		**Data Protection Act (DPA) 1998:** **Key feature** *Any one from:* Data must be ….. Used fairly and lawfully; Used for limited, specifically stated purposes; Used in a way that is adequate, relevant and not excessive; Accurate; Kept for no longer than is absolutely necessary; Handled according to people's data protection rights; Not transferred outside the European Economic Areas without adequate protection (subject to change); **Relevance to MCSciR** *Any one from:* Much of the data is personal/about patients/individuals and so must be held in relation to people's rights; Data must be held for a relatively short period of time; Data must be accurate (a fundamental feature of scientific research);	4	**For each regulation or Act -** **One** mark per key feature, **one** mark for relevance.

Question			Answers	Marks	Guidance
			Copyright, Design and Patents Act 1988: **Key feature** *Any one from:* Description of work and related provisions includes databases; Infringement of copyright by copying; Includes research/data analysis; Transfer of copies/ copying in electronic form; Includes file-sharing networks between organisations; **Relevance to MCSciR** *Any one from:* Research findings/patient records are held on databases; Must obtain a copyright licence to copy other research findings (if needed); Plan to share files with other organisations as part of the global target;		

Question			Answer		Marks	Guidance
Part B: Questions *not* based on pre-release material						
4	**(a)**	**(i)**	Advantages	*Disadvantages*	4	**Accept** any other realistic advantages/disadvantages of solid state media.
			Any two from: Data held on a hard drive; Very large storage capacity; Shared access devices; Data access speeds are very fast; Fixed hard drives are built into the computer; Data transposed to different software packages; Ease of analysis;	*Any two from:* Human error; Loss of equipment; Data corruption; Lack of compatibility;		

Question			Answer	Marks	Guidance
		(ii)	*Any two Acts from:* **Data Protection Act (DPA) 1998;** *Plus one of the following rights:* Data must be handled according to people's data protection rights; Diabetes/body weight data must be held in a confidential manner/ not shared with others outside of the research team; Name of patient must be anonymised (at the stage of data analysis/reporting); Patients must be free to access their own data; **Freedom of Information Act 2012;** *Plus one of the following rights;* Applies to public authorities/NHS; Does not give patients access to their own data/ health records; Patients must be informed about the use of their data (for research findings/applications); **Equality Act (EQA) 2011;** *Plus one of the following rights:* Patients must be treated fairly regardless of race/ gender / disability / any other named protected characteristic; Protects against discrimination;	2 + 2	The rights must be linked to the correct Act.

Question			Answer	Marks	Guidance
		(iii)	*Any three from:* Ensure that patients are treated equally regardless of race, gender, other protected characteristics; Retain the rights for patient privacy (eg. when weighing patients); Avoid placing the patients under any undue pain/discomfort when taking blood samples; Avoid giving personal opinions with regards to patient food diaries; Only allow patients/ others directly involved with the investigation access to data recorded; Give a full explanation of the use/purpose of data collected;	3	**Accept** any other realistic suggestion to protect the rights of patients in the NHS diabetes/diet investigation.
	(b)		**[Level 3]** Candidate shows a high level of understanding of the impact that poor quality information has on the patients AND the clinical research teams, including **at least six** valid points. The explanation follows a clear logical order. ***(5 – 6 marks)*** **[Level 2]** Candidate shows an understanding of the impact that poor quality information has on the patients AND the clinical research teams, including **at least four** valid points. The explanation follows some logical order. ***(3 – 4 marks)***	6	**Valid points:** **Impact of poor quality information on PATIENTS** • given incorrect data about their body weight • may become anxious because they assume that they have gained weight • may become relaxed with their diet because they assume that they have lost weight • given incorrect data based on their blood samples • may become anxious because they assume that they are developing diabetes (type 2) • may become relaxed about their health because they assume that they are not diabetic • AVP

Question			Answer	Marks	Guidance
			[Level 1] Candidate shows a basic understanding of the impact that poor quality information has on EITHER the patients OR the clinical research teams, including at least **two valid points** but with little or no explanation. With little evidence of a logical order. ***(1 – 2 marks)*** **[Level 0]** Candidate includes **fewer than two** valid points. ***(0 marks)***		**Impact of poor quality information on CLINICAL RESEARCH TEAMS** • collect incorrect data about patient body weight • may make inappropriate conclusions based on this false data • may assume that there is no link between the onset of diabetes and diet • collect incorrect data about the health of patients in relation to diabetes/no diabetes • may embark on a treatment programme involving drugs (such as metformin) • may place the patients on a low sugar-intake diet unnecessarily • may share the incorrect findings with others involved in the research • could damage the reputation of NHS research AVP

Question			Answer	Marks	Guidance
5	(a)		*Any two from:* UK Data Protection legislation applies if stored in Europe; UK Data Protection legislation does not apply if stored outside of Europe/ in USA; The 'cloud provider'/non-European host country can opt to abide by UK Data Protection legislation (or it will be illegal); The 'cloud provider'/ non-European host country must protect the information it handles and stores on behalf of the data controller/ NHS research team; The 'cloud provider'/non-European host country must provide data protection regulations at least as strong as those in the UK;	2	**Accept** any other realistic explanation for data protection outside of the UK.
	(b)		*Any three from:* Large text/facility; Clear/commonly-used fonts; Assistive screen readers for visually-impaired; Braille display for visually-impaired; Non-colour options for colour-blind people; Auditory reader/synthesised speech for the hearing-impaired; Text labels for graphics/images	3	**Accept** any other appropriate modifications of internet design/navigation to support the disabled.

Question			Answer	Marks	Guidance
6	(a)		**1. Integrity of data:** *Any two from:* Information is recorded accurately; Information is maintained securely; Data must be up to date; Information must be complete; Information must be fit for purpose; **2. Availability of data:** *Any two from:* Information must always be available and usable for the individuals/groups/processes that need to use it; Research scientists (at the nuclear research facility) must have free access to the information when needed; Information must **not** be available to individuals/groups/processes that do **not** need to use it;	2 + 2	**Accept** relevant statements about the importance of information security in relation to the nuclear research facility.

Question			Answer	Marks	Guidance
	(b)	**(i)**	**Destroyed:** *Any one from:* Computer virus; Targeted/malicious attack; **Tampered with:** *Any one from:* Fraudulent activity; Hacking;	2	
		(ii)	*Any two from:* Individual/organisation could use the information to generate radioactive materials for commercial reasons/ another purpose; Research into radioisotopes could be stopped/ limited due to loss of protocols/results; Reputation of the research facility may well be damaged; Local people living nearby/working at the research facility may become concerned about contamination/ their health; Medical/industrial organisations may withdraw their contract to purchase radioisotopes; Research facility will have to review its information security measures; Research facility will have to investigate the cause of the information security breach/ write a report about the events; Research facility may have to temporarily close;	2	
			Total	**60**	