Cambridge Technicals

Applied Science

Unit 22: Global scientific information

Level 3 Cambridge Technical in Applied Science
05874

Mark Scheme for January 2025

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

MARKING INSTRUCTIONS

PREPARATION FOR MARKING

RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training: OCR Essential Guide to Marking*.

2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor

3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the RM Assessor messaging system.

5. **Crossed-Out Responses**

    Where a candidate has crossed out a response and provided a clear alternative then the crossed-out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed-out response where legible.

    Rubric Error Responses – Optional Questions

    Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM Assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

    Multiple-Choice Question Responses

    When a multiple-choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).
    When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

    Contradictory Responses

    When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

    Short Answer Questions (requiring only a list by way of a response, usually worth only one mark per response)

    Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

    Short Answer Questions (requiring a more developed response, worth two or more marks)

    If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space).

Longer Answer Questions (requiring a developed response)
Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6.   Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add the annotation 'SEEN' to confirm that the work has been seen and mark any responses using the annotations in section 11.

7.   There is a NR (**No Response**) option. Award NR (No Response):

-      if there is nothing written at all in the answer space

-      OR if there is a comment which does not in any way relate to the question (e.g., 'can't do', 'don't know')

-      OR if there is a mark (e.g., a dash, a question mark) which is not an attempt at the question.

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8.   The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

9.   Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10.   For answers marked by levels of response:
        To determine the level – start at the highest level and work down until you reach the level that matches the answer

        To determine the mark within the level, consider the following

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

11.   Annotations available in RM Assessor

Annotation	Meaning
✔	Correct response
✘	Incorrect response
∧	Omission mark
BOD	Benefit of doubt given
CON	Contradiction
RE	Rounding error
SF	Error in number of significant figures
ECF	Error carried forward
L1	Level 1
L2	Level 2
L3	Level 3
NBOD	Benefit of doubt not given
SEEN	Noted but no credit given
I	Ignore

12.   Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

Question			Answer	Marks	Guidance
1	(a)	(i)	**A** / public ✓	1 2.1	**ALLOW** the correct classification term instead of the correct letter
		(ii)	**C** / private OR **D** / confidential ✓	1 2.1	
		(iii)	**B** / sensitive ✓	1 2.1	
		(iv)	**A** / public ✓	1 2.1	
	(b)	(i)	**damage to plants** (waters, materials, ecosystems, health) by ozone/air pollutants is known / quantified / measured ✓ **protocols** provide targets/limits for emissions OR protocols are monitored (for effectiveness) / revised ✓ **reduced emissions** (of pollutants is achieved) by specific target years ✓	3 2.2	**OWTTE** **IGNORE** damage to plants unqualified **IGNORE** protocols unqualified / I 'development' **NOT** protocols monitor **IGNORE** reduced emissions unqualified
		(ii)	**programmes / experiments / strategies** (for crop management / crop breeding / field based) ✓ **policies** (integration / to reduce air pollution with climate change policies) ✓ **quantification / measurement** (ozone's effect on crop yield/quality / meat and milk quality / along with climate change) ✓	3 2.2	**ALLOW** crop breeding as AW for experiments **ALLOW** regulations as AW for policies **IGNORE** tests / testing **ALLOW** e.g. experiments for measurement of … (2 marks)
		(iii)	**Any two from:** ✓✓ air sensors Sensing-as-a-service / sensing solutions air quality monitoring networks	2 2.2	**OWTTE** **IGNORE** air quality monitoring unqualified (i.e. the network is the product whereas monitoring is the process)

Question			Answer	Marks	Guidance
	(c)		**Any four from:** ✓✓✓✓	4	
				2.3.2d	Box 1
			An air quality monitoring network that is validated for accuracy and precision		
					Box 3
			Current crop varieties tend to be more sensitive to ozone than older varieties		
					Box 5
			Ozone concentrations are rising in developing areas of the world		
					Box 7
			Results from ICPs and task forces are used in the development of Protocols		
					Box 8
			Scientists can explain how ozone damages crops		
			Total	**16**	

Question			Answer	Marks	Guidance
2	(a)		**Any one from:** ✓ - it is not a new/original technology/invention - it is existing technology - difficult to prove that the application is novel - the technology is rapidly changing **AND** **Any three from:** ✓✓ ✓ - it uses mathematical processes / makes calculations / processes data - it records measurements - it stores/displays data/tables/graphs - it is written in computer code	**4** 3.1.1f	**IGNORE** references to open source / third party etc. **ALLOW** idea as AW for invention
	(b)		username ✓ password ✓	**2** 4.1	**ALLOW** biometrics unqualified but ignore e.g. fingerprint **ALLOW** pass code as AW for password **IGNORE** email address
	(c)		access ✓ protection ✓ controller / manager ✓ compliance ✓	**4** 3.1.1	
	(d)		data is encrypted before transmission ✓ data is protected from unauthorised modification ✓ the sensors are solar powered and fitted with global cellular communications ✓	**3** 4.1	BOX 1 BOX 2 BOX 6
	(e)		Freedom of Information Act (2000) ✓	**1** 3.1	**IGNORE** e.g. 1998 etc.
			Total	**14**	

Question			Answer	Marks	Guidance
3	(a)		UNCRPD / UN Convention on the Rights of Persons with Disabilities ✓	1 3.2	**ALLOW** persons = people, individuals **ALLOW** UNCPRD but IGNORE 'UN convention on persons with disabilities' i.e. rights must be stated or implied by 'R'
	(b)	(i)	moving e.g. a mouse / pointer / keyboard arrow keys around a screen and to open/click/access icons/apps/menus ✓	1 3.2	**NOTE** award one mark for reference to a device and use of the device to open a tab etc. **IGNORE** unqualified definitions of navigation e.g. finding a way to a location
		(ii)	**Any two from:** ✓✓ eyeball tracking voice recognition adapted keyboard / adapted mouse touch screen text to speech / speech to text	2 3.2	**OWTTE** **IGNORE** vague references to adaptation e.g. 'specialised' **IGNORE** text for images / describe images **IGNORE** refs to font size / font type / high contrast / colour blind settings / vague references e.g. buttons instead of keyboard symbols
	(c)	(i)	perception / understanding ✓	1 3.2	**IGNORE** references to cost **ALLOW** examples of perception barriers e.g.: visual / auditory / design e.g. poor colour contrast **ALLOW** examples of understanding barriers e.g.: complex language / lack of plain language / untranslated language / instructions difficult to follow
		(ii)	**Any one from:** ✓ alternative text to describe images / audio-described images/diagrams high contrast between text and background webpage with headings drop-down menus help chatbots AVP	1 3.2	**IGNORE** refs to font size / font type / text to speech **ALLOW** valid responses relating to the design of computer systems
			Total	6	

Question			Answer	Marks	Guidance
4	**(a)**		academic journals ✓	**1** **1.1&1.2**	
	(b)		electronic devices ✓	**1** **1.1&1.2**	
	(c)		libraries ✓	**1** **1.1&1.2**	
	(d)		databases ✓	**1** **1.1&1.2**	
	(e)		cloud services ✓	**1** **1.1&1.2**	
	(f)		individuals ✓	**1** **1.1&1.2**	
	(g)		government agencies ✓	**1** **1.1&1.2**	
	(h)		organisations ✓	**1** **1.1&1.2**	
	(i)		international bodies ✓	**1** **1.1&1.2**	
	(j)		archives ✓	**1** **1.1&1.2**	
			Total	**10**	

Question			Answer	Marks	Guidance

5			**[Level 3]** Candidate provides a good description of how data is stored **AND** gives specific advantages **AND** limitations of each
			(5 – 6 marks)
			
			[Level 2] Candidate provides a description of how data is stored **AND** gives advantages **AND/OR** limitations of each.
			(3 – 4 marks)
			
			[Level 1] Candidate provides a limited description of how data is stored **OR** gives advantages **AND/OR** limitations of each.
			(1 – 2 marks)
			
			[Level 0] Candidate includes **fewer than two** valid points.
				6
				
				6x1.3
					Indicative valid points:
					
					Magnetic tape
					Description: data stored on a magnetised strip of plastic
					    ALLOW VHS / cassette / floppy disk
					Advantages/disadvantages
					• advantage: low cost / high capacity / durability / long-term storage
					• limitations: slow access speed / susceptibility to magnetic fields (unreadability / contamination) / needs specialised equipment to read and write data / degradation over long storage time / obsolescence of technology used to read them
					
					Solid state drives
					Description: data stored using flash memory
					    ALLOW USB 'stick'
					Advantages/disadvantages
					• advantage: fast access speed / low power consumption / durability / portability / re-writability
					• limitations: high cost per GB of storage / limited write cycles (unreliability) / limited capacity c.f. HDDs (hard disc drives)
					
					Optical discs
					Description: data stored on a metallized glass/plastic disc read by laser
					    ALLOW DVD / CD
					Advantages/disadvantages
					• advantage: low cost / high capacity / **portability** / long-term storage
					• limitations: slow access speed / susceptibility to scratches/other physical damage (contamination) / limited capacity c.f. other storage media / degradation over long storage time / obsolescence of technology used to read them
					
					IGNORE corruption / loss of medium/data throughout

			Total	**6**	

Question			Answer	Marks	Guidance
6	(a)		**Any two from:** ✓✓ loss of contracts loss of reputation media/competitors accessing data	**2** 4.2	
	(b)		**Any four from:** ✓✓✓✓ use encryption file closure systems personnel training (in security protocols) two-factor authentication / username and password restrictions / permissions	**4** 4.2	**IGNORE** methods of deterrence e.g. cctv **IGNORE** vague descriptions of encryption e.g. use numbers instead of names / anonymising **IGNORE** inform personnel **IGNORE** vague descriptions e.g. 'authorisation methods' / authentication unqualified **ALLOW** email address and one-time pass token/pass code **ALLOW** biometric and e.g. face/fingerprint
	(c)		idea of secret/private information ✓ only accessed by authorised persons / requires permission to be accessed ✓	**2** 4.1	**SSU** to determine acceptable, alternative explanations **IGNORE** vague descriptions e.g. 'certain persons'
			Total	**8**	

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