Cambridge Assessment International Education

Cambridge O Level

AGRICULTURE **5038/12**

Paper 1 Theory **October/November 2022**

MARK SCHEME

Maximum Mark: 100

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

PUBLISHED

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Science-Specific Marking Principles

1	Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
2	The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
3	Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
4	The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.
5	‘List rule’ guidance For questions that require ***n*** responses (e.g. State **two** reasons …): • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked *ignore* in the mark scheme should not count towards ***n***. • Incorrect responses should not be awarded credit but will still count towards ***n***. • Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response. • Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science.

6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Question	Answer	Marks
1(a)(i)	A D B C 1 correct for 1 mark. 2 correct for 2 marks. 3 / 4 correct for 3 marks.	**3**
1(a)(ii)	top soil;	**1**
1(a)(iii)	break down of organic materials; release of nutrients; nitrogen fixation; improved aeration; improved drainage; mixing soil layers; adding organic material;	**2**
1(b)(i)	repeated ploughing to the same depth; this compacts the soil below the ploughing depth; and creates an impermeable / hard layer; ploughing in wet weather; causes polishing; which prevents water passage;	**2**
1(b)(ii)	poor drainage; roots rot; reduced movement of gases; roots cannot permeate the pan; poor nutrient uptake; pan causes increased soil erosion; *Allow development of a point for additional mark.*	**2**

Question	Answer	Marks
2(a)(i)	sulfur;	**1**
2(a)(ii)	iron;	**1**
2(a)(iii)	pH 6.5–8.0;	**1**
2(b)	add lime / add calcium carbonate;	**1**

Question	Answer	Marks
3(a)(i)	*One mark for each correct label in an appropriate position:* cytoplasm; nucleus; cell wall;	**3**
3(a)(ii)	thin cell walls allowing passage of water and nutrients; long allowing root to cover a wide area; small diameter to get between soil particles; high surface area for absorption; semi-permeable membrane allowing passage of nutrients; large vacuole to enable intake of larger volumes of water;	**2**
3(b)	the presence of a semi-permeable membrane (in osmosis not diffusion); osmosis refers to movement of water whereas diffusion can apply to many substances;	**1**
3(c)(i)	high temperature; low humidity; high wind speed; high light intensity;	**3**
3(c)(ii)	shade crops; wind breaks; spray with water / use water to cool the crop;	**1**

Question	Answer	Marks
4(a)	watertight / dry; flame proof / fire resistant; rodent proof; clearly labelled; suitable size; made of steel / metal; shelves to keep chemicals separate;	**3**
4(b)	*advantage:* only needs to be applied once / does not need reapplication; allows crop to be sold as organic; beneficial insects are not killed; fewer workers / labour needed; less environmental pollution caused; *disadvantage:* slower to reduce pest numbers to desirable levels; cost of biological agent; may not completely remove the pest; predators may become pests themselves; can only control certain pests;	**2**
4(c)	30.3;	**1**
4(d)	mouthparts penetrate the crop; aphid feeds on infected plant; aphid takes in virus in sap; aphid moves to healthy plant; when feeding aphid transfers virus;	**3**

Question	Answer	Marks
5(a)	*One mark for each correct label in an appropriate position:* oesophagus; small intestine; caecum; rectum;	**4**
5(b)	small stones mix with the food; gizzard muscles contract; grind food and stones together; breaking food into smaller pieces / crush food;	**2**

Question	Answer	Marks
6(a)(i)	800; 14 700;	**2**
6(a)(ii)	30 880;	**1**
6(b)(i)	50%;	**1**
6(b)(ii)	colostrum gives the young animals the mother's antibodies / immunity to disease / confers passive immunity / less likely to die if they have this immunity; colostrum is a rich source of energy which helps young animals need to survive / energy to get up and feed; colostrum helps young animals digest food; colostrum is a good source of fats / fluids / calcium / vitamins / protein / carbohydrate needed by young animals;	**3**

Question	Answer	Marks
7(a)	head down; ears back / down; eyes sunken; ribs visible / looks thin; tail between legs; hunched up / poor stance; poor skin / skin condition;	**3**
7(b)	check the animal's health record; inspect for signs of parasites; inspect for signs of disease; check animal has no injuries; isolate the animal before introducing to the herd; watch the animal to make sure it is accepted when first put with the herd; vaccinate; dip / dust with insecticide; wash to remove bacteria; tag for easy identification; ensure docile / not aggressive / good temperament; ask vet to check for specific conditions, e.g. TB;	**2**
7(c)	isolate suspected animals; report to the authorities; stop movements off and onto the farm; consult a vet; implement biosecurity measures;	**2**

Question	Answer	Marks
8(a)(i)	animals kept in a small paddock / indoors; food cut / conserved; feed is brought to them; no actual grazing;	**2**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>8(a)(ii)</td><td>animals are not moving around to find food;
less energy is wasted in moving;
OR
less grass is wasted by animals trampling defecating on;
animals get more / better-quality feed;
OR
may have less exposure to poor weather;
use less energy to keep warm;
OR
less exposure to predators;
lower livestock losses;</td><td>2</td></tr>
<tr><td>8(a)(iii)</td><td>diseases / parasites spread more rapidly;
animals have a poorer quality of life / become stressed;
increased labour / fencing / maintenance costs;
manure needs to be removed;
farmer may have to buy in extra feed;</td><td>1</td></tr>
<tr><td>8(b)</td><td>
<table>
<tr><th>intensive</th><th>extensive</th></tr>
<tr><td>animals usually have little space</td><td>animals usually have a lot of space;</td></tr>
<tr><td>high equipment costs / high level of mechanisation</td><td>low equipment costs / low level of mechanisation;</td></tr>
<tr><td>high energy costs</td><td>low energy costs;</td></tr>
<tr><td>low labour input</td><td>high labour input;</td></tr>
<tr><td>farmer has high level of control, e.g. over animal’s diet / location;</td><td>farmer has low level of control, e.g. over animal’s diet / location;</td></tr>
</table>
</td><td>3</td></tr>
</table>

Question	Answer	Marks
9(a)	1 plough 2 cultivator 3 harrow 4 planter 5 ridger 1 correct for 1 mark. 2 correct for 2 marks. 3 correct for 3 marks. 4 / 5 correct for 4 marks.	**4**
9(b)	clean / remove soil; dry; check for damage; repair damage / replace missing parts; oil / grease; paint;	**2**
9(c)	*One mark for each appropriate task, in correct context order, for example:* *(turn water supply off)* remove tap cover; use a spanner to remove valve mechanism; remove old washer from valve; clean site for new washer; *(attach new washer)* put tap back together; *(turn water supply back on)*	**2**

Question	Answer	Marks
10(a)	*Explanation required for second mark.* to choose desirable characteristics; so these are increased on the farm; yield / size; so there is more product to sell to make more money; disease resistance; so losses are less; hardiness / drought tolerance; so produce can survive in difficult environmental conditions; appearance / conformation / consistency; so that the customer is more likely to buy the product;	**4**
10(b)	*Max. 4 marks if AI use alone with no AI health and safety.* *AI use:* choose the characteristics you are looking for; select male likely to pass on those characteristics; buy in / collect semen / straws; decide when the animal is on heat; methods of detection; semen inserted into the female on heat; detail of method, e.g. inseminating gun; *AI health and safety:* adult male animals can be dangerous; AI means adult males do not have to be kept on the farm; less transmission of disease from male animal to female e.g., STIs / semen can be screened; females less likely to be hurt by the male (during mating); AI speeds up breeding for healthier animals; can speed up breeding of animals without dangerous features, e.g. horns; prevents unplanned mating, e.g. of immature females;	**6**

Question	Answer	Marks
10(c)	avoid working on your own; wear appropriate PPE; check route is safe; approach the animal from the front so that they can see you; talk to the animal quietly to calm them; do not crowd / rush the animal; agitated animals could be tranquilised; use control method appropriate to the animal to hold them, e.g. nose ring for bull, halter for sheep, pig board for pig; use of race / gates; use vehicle / trailer; secure animal once moved;	**5**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>11(a)</td><td>No mark for the material. Credit any relevant advantages and disadvantages for each material. Must cover at least two materials for full marks.

For example:
<table>
<tr><th>material</th><th>advantages</th><th>disadvantages</th></tr>
<tr><td>wood</td><td>good insulator;
readily available;
cheap;</td><td>can rot;
insect damage;</td></tr>
<tr><td>concrete</td><td>strong;
durable;
low maintenance;</td><td>cold for animals;
can wear hooves / injure feet;
urine not absorbed;</td></tr>
<tr><td>metal</td><td>strong;
durable;</td><td>expensive;
may require painting;
sharp edges can cut animals;
poor insulator / hot in summer;</td></tr>
<tr><td>stone</td><td>can be locally available;
strong;
durable;
cool in summer;</td><td>expensive to buy;</td></tr>
<tr><td>brick</td><td>strong;
durable;
cool in summer;</td><td>expensive to buy;</td></tr>
<tr><td>earth</td><td>locally available / cheap;</td><td>easily damaged;</td></tr>
<tr><td>thatch</td><td>locally available / cheap;
good ventilation;
may be eco-friendly;
may be easy to install;</td><td>easily damaged;
flammable;
harbour pests;
vulnerable to wind damage;</td></tr>
</table></td><td>6</td></tr>
</table>

Question	Answer	Marks
11(b)	a comfortable temperature; secure / weather resistant; draught free; clean; safe / fresh water supply; troughs for feed; appropriate size for the animal; safe, e.g. no sharp edges; floor non-slip / easy to clean; dry; comfortable; well ventilated; use of CCTV etc. for security; surfaces which avoid harbouring pests; appropriate lighting;	**5**
11(c)	cold: can lead to increased susceptibility to disease; insecure: animal can escape and hurt itself; draughts: can lead to respiratory diseases such as pneumonia; dirty: pests and diseases can build up; no / limited water supply: animals can become dehydrated; no troughs: food on the floor can be contaminated with faeces; too small: animals cannot avoid each other / bullying leading to injury / preventing animals eating / disease spreads more easily between animals; sharp edges: can lead to cuts and infection; slippery floors: animal can fall and be injured; poor ventilation: increased spread of disease / build-up of toxic air;	**4**

Question	Answer	Marks
12(a)	higher yielding / resistant varieties; increased fertiliser use; selective breeding; improved pest control / weed control; removing trees and hedges / bigger fields; more machinery / mechanisation; monoculture; methods to increase available land; aquaculture; GM crops; vertical farms; urban farms; crop rotation; protected cultivation, e.g. polytunnels; rotational / zero-grazing methods; irrigation; mulching;	**7**
12(b)	demand for organic produce; concern for the environment; concern for animal welfare; more sustainable; does less damage to / improves the soil; reduces inputs; personal farming philosophy; may be better for human health; organic fertilisers may be freely available, e.g. on a mixed farm;	**4**
12(c)	if supply is low; organic crops can be lower yielding; … then prices will be higher; if demand is high; people moving to organic crops; … then prices will be higher;	**4**

Question	Answer	Marks
13(a)	For example: *river* advantages: no need for expensive infrastructure; water constantly being replaced; disadvantages: can be polluted; can dry up in dry weather; others upstream could dam / interrupt supply; may be limited by quota / licence; *dam* advantages: large volume of water available; stores water in the rainy season for the dry season; could sell some water; disadvantages: expensive to build; can harbour pests, e.g. mosquito; could fail and destroy crops / buildings / kill people; could lead to conflict with other farmers; *borehole* advantages: water may be naturally cleaned; water safe from evaporation; no loss of valuable agricultural land; disadvantages: difficult / expensive to construct; water table not always accessible; may be limited by quota / licence;	**6**

Question	Answer	Marks
13(a)	*rainwater collection* advantages: very cheap; no need for specialist equipment / can be easily collected; clean water supplied; disadvantages: can be limited supply; unpredictable; may be acidic; *mains water supply* advantages: often potable; often consistent supply; easily piped around the farm; disadvantages: can be expensive; requires piping; not available in remote areas; *desalination* advantages: makes use of otherwise unusable water; large volumes available (in the right location); disadvantages: very expensive; requires large amounts of energy; only available in certain locations (near the sea etc.);	

Question	Answer	Marks
13(b)	*Max. 3 marks if no comparison.* *water for livestock* needs to be clean; free from debris; free from parasites; free from pollution; free from disease; be palatable: *water for irrigation* does not have to be potable; does not have to be free from suspended solids / smells; needs to be free of chemicals / toxins that might harm the plant; *Accept relevant reverse arguments.*	**4**
13(c)	*Max. 4 marks for meaning of hydroponics. Max. 3 marks for how increases availability.* (meaning) growing plants in water; not in soil; enriched with nutrients; high level of automation / monitoring; provides ideal growing conditions for plants, e.g. pH; water flows in a cycle; (increase land availability) no need for soil in hydroponics so land available for crop production; no need to use quality agricultural land for hydroponics so land available for crop production; no need for ideal climate for hydroponics so can grow in otherwise unsuitable areas; closed system so water is conserved to be used in other areas for crop production;	**5**

Question	Answer	Marks
14(a)	*Explanation required for each mark.* monoculture damages the soil structure therefore weakening the crumb structure increasing erosion; use of inorganic fertilisers alone reduces the humus content of soil, humus binds the soil particles together helping to reduce erosion; use of machinery damages soil structure, e.g., causes soil pans over which the soil can slip; cultivation of marginal land can lead to desertification and loss of soil; use of machinery / mechanisation allows cultivation of steep slopes increasing the likelihood of land slippage; increasing the stocking density of animals removes vegetation / soil cover and tramples soil increasing erosion / can cause capping / soil pans / compaction reducing water / root penetration increasing erosion; removal of trees and hedges, which acted as windbreaks increases soil erosion; high levels of pesticide may kill beneficial soil organisms increasing the possibility of erosion through lack of binding / crumb structure; overirrigation may wash soil away increasing soil erosion;	**6**
14(b)	adding organic matter to the soil / improving soil humus; use drip irrigation rather than flooding irrigation etc.; terracing; minimal cultivation; planting wind breaks / maintain hedges / tree cover; avoid use of heavy machinery (causing compaction); varying the depth of ploughing; create drainage ditches / build bunds to divert water; use of mulch; maintaining a cover crop; use crop rotations; contour ploughing; maintain correct stocking levels; reduce use of insecticides / inorganic fertiliser;	**5**
14(c)	capillary water is the water in the spaces between soil particles; hygroscopic water is the thin film of water around individual soil particles; capillary water can be taken in by plant roots; hygroscopic water is too tightly held to the soil particles so the plants cannot take it in;	**4**