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**AGRICULTURE**

**0600/12**

Paper 1

**October/November 2019**

MARK SCHEME

Maximum Mark: 100

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**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.

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This document consists of **27** printed pages.

**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.

Question	Answer	Marks
1(a)	C;	<b>1</b>
1(b)(i)	A;	<b>1</b>
1(b)(ii)	C;	<b>1</b>
1(c)(i)	bacteria; nematodes; fungi; (earth)worms; mesofauna; <i>Accept plant root.</i> <i>Accept microorganism.</i> <i>Accept other correct examples.</i>	<b>1</b>
1(c)(ii)	shortage of oxygen for organism / anaerobic conditions; kills organisms, e.g. earthworms could die; nematode movement restricted; limit reproduction of microbes; fungal growth increases; earthworms come to the surface; (aerobic) bacterial action inhibited; higher proportion / number of anaerobic organisms; <i>Accept prevents aerobic respiration in roots.</i>	<b>2</b>

Question	Answer	Marks
2(a)	farming of aquatic organisms / fish / crustaceans / molluscs / aquatic plants / algae;	1
2(b)	<p><i>Explanation of benefit or problem needed for second mark, for example:</i></p> <p><i>benefit:</i> waste materials; can feed the fish;</p> <p>as a cheap source of feed; no need to buy extra food;</p> <p>cheap source of fertiliser; no need to buy (extra) fertiliser;</p> <p>can have fish crop ready at different time to livestock; results in a regular / extra cash crop / income;</p> <p>labour is available already; no additional cost;</p> <p>fish live under animal houses; uses same amount of land / so do not need to buy more;</p> <p>supply of water for poultry nearby; no need for pumps / pipes / additional water supply;</p> <p>protects the poultry from predators; bridge can be removed at night;</p>	4

Question	Answer	Marks
2(b)	<p><i>problem:</i> waste / pollution from animals goes into the water where the fish live; the fish could die;</p> <p>different equipment needed; this could be expensive / increase costs;</p> <p>eutrophication / lowers oxygen levels in water; aquatic organisms / fish may not be able to survive;</p> <p>continuous labour needed for livestock; may need to employ more people / increase labour costs; <i>Accept other valid responses.</i></p>	
2(c)	<p>if demand increases (and supply remains unchanged); this leads to higher price; <b>OR</b> if demand decreases (and supply remains unchanged); this leads to lower price;</p> <p><i>Allow equivalent responses, e.g. if supply increases (and demand remains unchanged); this leads to lower price; Accept associated impact on subsequent supply for 1 mark.</i></p>	<b>2</b>

Question	Answer	Marks
3(a)	A;	1
3(b)	the movement; in phloem; of soluble / dissolved; of synthesised / manufactured food / carbohydrates / sugars / products of photosynthesis; from leaves to other tissues / to all parts of the plant / source to sink (or vice versa); to storage organs;	3
3(c)	converted / made into; from (soluble / simple) sugars; into insoluble (compounds); sugars are soluble, so cannot be stored; complex carbohydrates; cellulose / starch; movements to / from storage organs (in phloem); example of specialised storage organ / tuber, e.g. potato; <i>Accept correct reference to osmotic effect.</i>	3

Question	Answer	Marks
4(a)	lots of pollen; light pollen; pollen blows away easily / easily released; at top of / tall plant; hanging / exposed anthers / stamens / male parts; tassel / stigma / style / silk / female parts hang outside; to collect pollen easily / sticky;	<b>4</b>
4(b)	the process by which pollen is transferred / pollen moves from the anther to the stigma;	<b>1</b>
4(c)	male gametes of a flowering plant are contained in pollen grains; a pollen tube grows into the stigma / through the style; into the ovary / to the ovules; ovules carry female gametes; fusion of male and female gametes / pollen cell nucleus fuses with ovule nucleus; zygote / embryo / seed forms;	<b>3</b>



Question	Answer	Marks
5(a)	<p><i>Irish potato:</i> tuber / seed potato; with eyes; chitting; tuber cutting / large potato cut in half; plant at appropriate depth;</p> <p><i>sugar cane:</i> stem cutting with shoot / sugar cane stem cutting of appropriate size; cut 'stem' / at angle; to expose more cambium / to produce more roots; add rooting hormone; place in water for roots to grow; plant half in soil;</p> <p><i>both:</i> appropriate distance apart (within row); ridges of soil / compost; destone / pick stones; fertiliser / manure / (organic) compost; detail, e.g. dug into soil; drainage / free-draining / gritty compost; appropriate spacing between rows; plant at start of rainy season / irrigate / water; ensure correct soil pH;</p>	4

Question	Answer	Marks
5(b)	<p><i>asexual:</i> are clones / uniformity / all offspring genetically identical; are identical to parents / each other; have only one parent; disease may affect all the individuals in a population / prone to extinction; offspring produced from vegetative parts of plant;</p> <p><i>sexual:</i> different to their parents; some genetic variation; need two parents; male and female (gametes) needed;</p>	<b>2</b>
5(c)	<p><i>Explanation needed for second mark, for example:</i></p> <p>weeds compete for water; prevent germination / seedling plants growing;</p> <p>weeds compete for nutrients; yields / growth rate can be reduced / stopped / reducing growth rate / photosynthesis;</p> <p>weeds compete for space / weeds have a very fast growth rate; crops (roots) do not grow as well;</p> <p>reduce sunlight availability to the crop; less photosynthesis;</p> <p>weeds act as a host for crop disease / weeds can harbour pests; crop yield decreases / plants die;</p> <p>weeds can be toxic; crop plants die / harvested crop is toxic to humans or animal;</p>	<b>2</b>

Question	Answer	Marks
6(a)(i)	use labelled containers / original container; read storage instructions / follow specific guidance; locked storage / store out of reach of children; keep in original container; throw away when out of date; bunded store; labelling / signage, e.g. caution; store in cool place / away from sunlight; store in dry place;	<b>2</b>
6(a)(ii)	prevent skin contact / following procedure for removing PPE without contamination; avoid breathing fumes; washed out equipment / wash immediately; rinse nozzles / prevent blockage; leave empty / clean; safe disposal of PPE / wash clothing; prevent dangerous chemicals mixing; update records; put remaining chemicals back into safe storage; tighten / check lids on containers; do not eat / drink until washed hands etc.; wash hands;	<b>2</b>

Question	Answer	Marks
6(b)	<p><i>Up to two marks for procedures alone.</i> <i>Explanation of reason for procedure needed for full marks.</i></p> <p>do not spray on a windy day; to avoid chemical drift;</p> <p>do not spray in a location of beneficial insects; avoid killing / reducing contribution of pollinators etc.;</p> <p>do not spray near other plants; to avoid damaging non-target species;</p> <p>do not spray when rain is due; to avoid run-off;</p> <p>do not spray near water / do not wash the sprayer in a stream etc. ; avoid pollution of water / damage to aquatic life;</p> <p>do not spray near hedgerows etc. ; to avoid damage to habitats;</p> <p>use suitable dilution of spray; to avoid toxicity;</p> <p>check the weather / spray at the correct time of day; to avoid affecting pollinators etc. ;</p> <p>monitoring / predicting pest number; to minimise chemical used / number of applications to effectively control pests;</p> <p>use selective insecticides; do not harm non-target species;</p>	4

Question	Answer	Marks
7(a)	0.16(\$)	<b>1</b>
7(b)	material prices differ; posts vary in cost; some fences need more wire / multi vs single strand wire; some fences need more posts; different post spacing; labour requirement / complexity of installation; transport of fencing materials to farm / fencing site; some fences are specialised / manufacturing costs can vary; optional treatments to wire;	<b>2</b>
7(c)	hammer / post knocker; screwdriver crowbar; spade; nails; file / rasp; plumb line; spirit level; saw; spanner; brush; sprayer; auger / specialised tool for digging holes; tape measure / equivalent device;	<b>2</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
7(d)	<p><i>Explanation needed for second mark, for example:</i> does not rot / corrodes much more slowly; so will last longer / not need replacing;</p> <p>not eaten by termites etc. ; so last longer;</p> <p>saves money (over time): as fewer posts need to be purchased;</p> <p>stronger fence; which will manage larger animals;</p>	<b>2</b>

Question	Answer	Marks
8(a)(i)	<p><i>1 mark for each organ labelled in its correct relative position.</i></p> <p>stomach; small intestine; caecum; large intestine;</p>	<b>4</b>
8(a)(ii)	large intestine / colon;	<b>1</b>
8(b)	<p>cut by teeth; masticated / chewed; tongue rolls; peristalsis / gut wall / contractions of oesophagus; churning in stomach; <i>Accept grinding in gizzard.</i></p>	<b>3</b>
8(c)	<p>enzymes begin the digestive process in the mouth / break down proteins / convert insoluble molecules into soluble molecules / break down cellulose / starches / other foodstuff / larger molecules into smaller ones to enable intestines to absorb nutrients / act as catalysts to speed up digestion;</p>	<b>1</b>

Question	Answer	Marks
9(a)	<p><i>dominant:</i> is expressed in the phenotype (over a recessive allele / even when in heterozygous form / only one copy / a trait which appears in offspring if it is present in one parent;</p> <p><i>allele:</i> is a(n alternative) / (different) version of a gene;</p>	2
9(b)(i)	<p><i>1 mark for genotypes of parents:</i> Gg x Gg;</p> <p><i>1 mark for gametes of parents:</i> G g G g <b>OR</b> diagram to show this, e.g. punnet square or crossed lines;</p> <p><i>1 mark for offspring genotypes:</i> gg Gg Gg GG;</p> <p><i>1 mark for offspring genotypes linked to offspring phenotypes with ratio demonstrated, e.g.:</i> gg yellow, Gg green, Gg green, GG green;</p>	4
9(b)(ii)	<p>novelty value / specific market demand / speciality product / higher price / may have better yield / may be less attractive to pests; <i>Accept other valid suggestions.</i></p>	1
9(c)(i)	<p>genetic modification; identify desired colour; select gene; from another species; gene transferred; (via) bacteria / eq.; <i>Accept growing in medium; with appropriate colour;</i></p>	2
9(c)(ii)	<p>possible loss of organic status / personal beliefs / customer's safety concerns / lack of demand / cost of process / lack of technical expertise;</p>	1



Question	Answer	Marks
10(a)	animals enclosed / use of fencing; increased stocking rate; larger number of animals per unit area; grazing is controlled; example, e.g. strip grazing; high levels of inputs / management of grazing area; example of input, e.g. nitrogen fertiliser;	<b>4</b>
10(b)	<p><i>Maximum 4 marks for collection or supply alone.</i></p> <p><i>collected by:</i>            from river;            use of pump to remove water;            collect rain water;            from roof / into tank;            from borehole;            from reservoir / pond / use of dam;            settling / filtration method;</p> <p><i>supplied by:</i>            high / consistent / enough pressure;            use of pump to supply water;            use of pipes;            pipe-joining detail;            taps;            ditches;            buckets / watering can;            irrigation method;</p>	<b>6</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
10(c)	different paddocks / grazing areas / fields; enable animals to be kept in a defined area;  pasture can be 'rested'; to allow pasture regrowth / more photosynthesis / recovery;  more forage produced; therefore sustains more animals;  use all available grass / saved for conservation; maximises utilisation / yield of forage;  animals forced to eat all the available grass; reducing wastage;  grass regrows regularly; pasture is more nutritious;  easier animal management / husbandry; can avoid pest / disease build-up in areas;	<b>5</b>

Question	Answer	Marks
11(a)	applied to plant; absorbed through plant structures; circulates throughout the plant's tissues / reaches all parts of the plant; translocated; in the phloem; pest ingests poison when feeding on the plant; kills the pest;	<b>3</b>
11(b)	named relevant pest, e.g. aphid / Bagrada bug / mealy bug / scale insect / other correct example; takes nutrients; decreased growth rates / lack of vigour / low yield; plant loses water; plant wilts; toxic saliva; transmit diseases / viruses / blight; coat with 'honeydew' / spreads fungus / reduces fungicide effectiveness; reduced photosynthesis; mottled leaves; yellowing; stunted growth; curled leaves; browning; wilting; death;	<b>6</b>

Question	Answer	Marks
11(c)	biological control; control using a natural enemy / predator / which feeds on / destroys pest / reduces pest population; example of biological control; use of sterile males to restrict breeding success; pheromone traps to attract and kill pest; use of bacteria / virus / nematodes / parasite / pathogens to kill pest; cultural control; use crop rotation to break life cycle of pest; burning to kill pest; remove residue / field trash; ploughing to expose eggs or larvae; weeding / plant alternative crops to remove pest host; use clean / certified planting material / resistant varieties to remove pest burden; plant nursery crops to enable more robust seedlings to be transplanted; time planting / harvest to avoid pest build up; nets / traps / hand picking / washing to remove pests; strip planting / companion cropping to dissuade pests from crop; physical barriers, e.g. netting to prevent pest reaching crop;	<b>6</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
12(a)	removal / carrying away of soil; by water; by wind;	<b>3</b>
12(b)	open ditches; drainage pipes / tiles; mole drains; sub-soiler use; free-draining gravel layer; pump to remove water; removed to ponds / reservoir; dam / bund / wall / door / dykes; sacrificial flooding of other areas; planting water-hungry crops;	<b>6</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
12(c)	<p>reduction in crop yield; so less to sell in market;</p> <p>reduction in pasture yield; shortage of conserved fodder; animals do not have enough food; so production is lower; animals need to be sold;</p> <p>need to use drought-resistant varieties; additional cost;</p> <p>lack of drinking water / water available for crops; animals / crops can die / do not grow well / animals may need to be sold;</p> <p>need to irrigate / provide drinking water; increasing costs of production;</p> <p>lower output; reduce profitability;</p> <p>farms may need to charge higher prices; which could reduce demand;</p>	<b>6</b>

Question	Answer	Marks
13(a)	create resistant varieties; selective breeding; identify plants that are not affected by a disease; cross these plants only; discard susceptible offspring / do not use for breeding; repeat this process; creates a resistant population;	4
13(b)	<p><i>means of infection:</i>            pathogen / infectious agent / spores;            fungus lives in soil / water,            fungus enters host through roots / leaves;            fungus spreads to other plants via air / roots / water;</p> <p><i>effects:</i>            kills the plant;            rot / mould;            toxins produced;            reduces photosynthesis / blocks light;            blocks vascular tissue / xylem;            prevents water uptake by roots;            plants could fall down;            unsightly markings on flowers / fruit;            reduced yield;            reduced quality of product;            reduced market value;            possible toxic effects;            reduced storage quality / shelf life;            contamination of harvested crop;</p>	5

Question	Answer	Marks
13(c)	<p>any correct example of a fungal plant disease, e.g. damping off / mildew / rice blast / rust / wilt / rots / blight / blotch / smut / ergot;</p> <p>fungicides; kill fungus on growing or mature plants / fruits;</p> <p>avoid using an excess of nitrogen-based fertiliser; this encourages soft growth; therefore more susceptible to fungal diseases;</p> <p>seed treatment; know seed is fungus-free;</p> <p>soak seeds in hot water; to kill spores;</p> <p>use certified seeds; know seed is fungus-free;</p> <p>use resistant varieties; crop is not affected by fungal disease;</p> <p>select seedlings showing no symptoms; reduces fungal burden in crop;</p> <p>crop rotation / isolation; disrupts pathogen life cycle / prevents transfer of infectious agent;</p> <p>good hygiene / cleanliness; use clean tools or machinery / remove crop residues / affected plant parts; reduces transport of spores to crop;</p>	<b>6</b>



<b>Question</b>	<b>Answer</b>	<b>Marks</b>
13(c)	use atmospheric solutions / improve ventilation; low humidity reduces fungal spread;  enough space between plants; low density of plants slows fungal spread;  grow plant in area less suited to fungal disease; lower frequency of fungal disease;  timing of planting; to avoid times when fungus very active;  use layer of mulch; to prevent rainfall spreading fungal spores to crop;  biological control; for example use of another fungus, which attacks pathogenic fungi;	

Question	Answer	Marks
14(a)	different types of agricultural practices; arable; livestock; other named commercial activity; together / combined; on a single farm; income through different sources;	3
14(b)	<p><i>advantages:</i>            simpler management;            fewer different types of machinery needed;            may be only one main type of pest to target;            may be only one main weed to be controlled;            specific fertiliser strategy possible;            consistent method of processing and storage;            less training needed / workers require smaller range of skills / build up expertise;            high yield of one crop means easier marketing;            allows economies of scale;</p> <p><i>disadvantages:</i>            same crop year after year damages soil;            possible soil erosion;            single pest type can destroy the whole crop;            pest / disease builds up on crop year after year;            one crop may be more vulnerable to specific environmental problems;            farm has no other crop to provide an income;            specific nutrients can become depleted;            soil pan formation;            rely on synthetic / bought in fertiliser / manure;            increased environmental / pollution risk due to chemical use;</p>	6

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
14(c)	source of nutrients; N/P/K/ other identified nutrients; also source of micronutrients / trace elements; warms the soil; higher germination rate / improved plant growth; increased number of soil microbes; increased number of other soil organisms, e.g. earthworms; creates a healthy loam; prevents leaching of nutrients; reduced water run-off / better drainage; reduced erosion; increases levels of organic matter; improves soil structure; less compacted; more friable / better texture / crumb structure / soil easier to work; greater aeration; increased (aerobic) root respiration; increased water-holding capacity; increased water infiltration / more water available to crops;	<b>6</b>