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O Level

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Cambridge Ordinary Level

AGRICULTURE **5038/12**

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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 will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

Question	Answer	Mark
	Section A	
1(a)	B;	**1**
1(b)	D;	**1**
1(c)(i)	transpiration is the loss of water from plant tissue / leaves to the atmosphere;	**1**
1(c)(ii)	higher temperature, faster rate of transpiration; higher humidity, slower rate of transpiration; higher wind speed, faster rate of transpiration; light intensity, brighter, faster rate of transpiration;	**2**
	Total:	**5**

Question	Answer	Mark
2(a)	product relates to cereal crop chosen;	**1**
2(b)(i)	weed removal / clear the land; remove large stones; cultivate, e.g. plough / dig / turn soil over; prepare seedbed, e.g. rake / fine tilth; prepare holes / drills / pockets to receive seeds; add fertiliser to seedbed; add pesticide to seedbed / drills; pre-irrigate;	**3**

Question	Answer	Mark
2(b)(ii)	maintain nutrient levels; maintain soil water / irrigate appropriately; monitor and control pests; weed control method; specific husbandry example, e.g. support beans; pH maintenance, e.g. liming;	**3**
2(b)(iii)	*1 mark for any sign of ripeness relevant to named crop. Allow ECF if non-cereal crop named in **2(a)**.* sign of crop being ripe, e.g. yellow / brown; hard / dried up for cereal; texture / softness of crop; flavour / taste of crop; size of crop; sugar content; *Accept appropriate signs for given crop.*	**1**
2(b)(iv)	*One mark for method and one mark for appropriate reason related to method given.* e.g. using combine harvester; to harvest large area in a short time;	**2**
2(c)	dry: does not rot / fungi growth restricted / does not germinate or sprout; cool: remains dormant / fresh / does not germinate; dark: to prevent photosynthesis;	**2**
	Total:	**12**

Question	Answer	Mark
3(a)	D;	**1**
3(b)(i)	24 / 40; 60%; *Two marks for correct answer alone.*	**2**
3(b)(ii)	less fertile cows / cows could be ill / operator error / infertile bull or semen straw; timing of service not effective or cow not in season / incorrect feeding;	**1**
3(b)(iii)	lower milk yield; less cattle for meat; longer calving interval; fewer calves born; higher replacement costs for older cows; costs of repeat insemination;	**3**
3(b)(iv)	hormone treatment; good general health, e.g. feet; good feeding / supplements; use of teaser males; proper semen storage; trained inseminator; correct timing of insemination; breed with high fecundity; keep a bull with cows all the time;	**2**

Question	Answer	Mark
3(b)(v)	when females are on heat / timing of oestrus; number of offspring; year-on-year dates of pregnancy; which service methods (AI or natural) secured highest pregnancy rates for each female; productivity of offspring from different males; details of birth problems for females; *Accept other records relating to breeding.*	**2**
	Total:	**11**

Question	Answer	Total
4(a)(i)	A;	**1**
4(a)(ii)	liming / add lime;	**1**
4(b)(i)	bean / pea / groundnut etc.; cereal / grain crop; potatoes / yam / cassava (manioc) / carrots etc.;	**3**
4(b)(ii)	legume fixes nitrogen; different crops have different root systems / nutrients drawn from different depths of soil profile; different crops absorb different nutrients in different amounts; roots improve soil crumb structure; fallow period allows land to recover;	**3**
	Total:	**8**

Question	Answer	Mark
5(a)(i)	parents Dd dd; gametes D d d d; offspring Dd Dd dd dd; *Allow ECF for gametes and offspring if wrong parents shown.* *Award full marks for correct offspring.*	**3**
5(a)(ii)	dwarf;	**1**
5(a)(iii)	B; *(if correct cross shown in **(a)(i)**)* *Allow ECF based on answer of **(a)(i)**.*	**1**
5(b)	select dwarf varieties; cross dwarf varieties / take pollen from one dwarf plant to the stigma of another dwarf plant; isolate to prevent cross-pollination; select again for dwarfism / save seeds produced from this cross to grow on; continue over a number of generations; until pure breeding;	**2**
5(c)	harvesting easier with dwarf varieties; use less water; drought resistant; resistant to high winds; plants put less energy into stem and more into seed / crop;	**2**
	Total:	**9**

Question	Answer	Mark
6(a)	presence of rumen vs. simple stomach; multiple stomachs (or named / listed) vs. single stomach; named chamber (rumen, abomasum, omasum, reticulum) present in ruminant but absent in non-ruminant; *(1 mark for each chamber)* length of large intestine larger in non-ruminant; diameter of large intestine larger in ruminant; larger caecum in ruminant;	**3**
6(b)(i)	X marked on small intestine of cow;	**1**
6(b)(ii)	Y marked on large intestine of pig;	**1**
6(c)	egested as faeces / waste products; ref. to regurgitation of undigested material;	**1**
6(d)	reduces constipation; helps move food through / keeps digestive system moving; helps prevents cancers of the digestive system;	**1**
6(e)	waste gases are greenhouse gases; methane / carbon dioxide produced; affect global warming / climate change; large volumes of animal waste; animals waste is a source of pollution / disposal or storage issues / run-off into water courses;	**2**

Question	Answer	Mark
6(f)	less energy lost as ruminants are primary consumers; can digest cellulose / fibre / more material; grass is an abundant resource; can be inefficient conversion due to fermentation (anaerobic); *ORA for non-ruminant.*	**2**
	Total:	**11**

Question	Answer	Mark
7(a)	C;	**1**
7(b)(i)	*nitrogen:* deficiency seen first in older leaves / stunted growth / pale green / chlorotic / yellow / weak and/or spindly new growth; *potassium:* purple spots on leaves / brown curling leaf tips / scorched leaves / poor flowering or fruiting / yellowing of leaves;	**2**
7(b)(ii)	add manure; add blood meal (fish and bone); add compost; plant legumes;	**2**

Question	Answer	Mark
7(c)(i)	superphosphate; bone meal; CIRP; greensand; named phosphorus compounds; *Allow any suitable named phosphorus-containing fertiliser*.	**1**
7(c)(ii)	potash; poultry manure; guano; named potassium compounds; *Allow any suitable named potassium-containing fertiliser*.	**1**
7(d)	a fertiliser containing two or more nutrients;	**1**
	Total:	**8**

Question	Answer	Mark
8(a)	do not spray on windy day; so the herbicide does not drift; do not spray near water / do not wash out sprayer in a stream; to avoid water pollution; do not spray near hedgerows, etc.; to avoid impact on non-target species; use recommended dilution of spray; to reduce toxic effects; safe disposal of containers / gloves / mask / clothes; to avoid contamination; wear goggles; to protect eyes; wear mask; to prevent inhalation / swallowing / protect mouth and face; wear gloves; protect hands and skin;	**4**
8(b)	10; *(Accept 10.25)* litres / L or dm^3; *(Allow 10 000 cm^3 (or 10 250 cm^3))*	**2**
	Total:	**6**

Question	Answer	Mark
	Section B	
9(a)	particle size, smaller for clay than sandy; water-holding capacity, greater for clay than sandy; drainage, better for sandy than clay; sandy soils warm up more quickly than clay soils at same temperature; workability, easier for sandy than clay; air spaces, larger for sandy than clay; level of organic matter, higher for clay than sandy; nutrient content, higher for clay than for sandy; clay soils more likely to crack than sandy soils; pH, sandy soils tend to be lower pH than clay soils; *(Accept clay soils are colder, stickier, heavier for 1 mark each. ORA)*	**5**
9(b)	in the nitrogen cycle nitrogen is made available to plants; this enhances soil fertility; plants cannot absorb nitrogen from the air; free-living bacteria fix atmospheric nitrogen; nitrogen-fixing bacteria in root nodules of legumes fix atmospheric nitrogen; nitrogen needed to make plant proteins for growth; lightning fixes atmospheric nitrogen; nitrogen from decay of organic material, e.g. dung / urine; nitrogen is recycled when dead plants / animals decay; produces ammonium compounds; action of named bacteria or bacteria type; production of nitrites and then nitrates;	**7**

Question	Answer	Mark
9(c)	higher temperature, increased photosynthesis / respiration; higher temperature, increased rate of transpiration; higher temperature, higher rate of chemical reactions; higher temperature, more evaporation of water / excessive water loss; higher temperature, wilting / water stress / drought; stomata close and plant cannot absorb carbon dioxide for photosynthesis; extreme high temperatures can denature enzymes / reduce or stop activity; colder temperatures, ice crystal formation / frosted cells; cells burst, plant death; colder temperatures, dormancy or slowed growth; some crops require a period of cold, e.g. conifers, Brussels sprouts;	**3**
	Total:	**15**

Question	Answer	Mark
10(a)	feed required; extra requirement on top of the maintenance ration; for growth / lactation / reproduction / eggs etc.;	**3**
10(b)	*No mark for the name of the animal, award marks for features appropriate to the named animal.* e.g. size, height / area / internal space; roof, materials; roof, pitch / gutters; walls, material appropriate to animal; floor, material; drainage; door(s), appropriate for named animal; windows, style e.g. wire / glass; water supply, troughs / water bowls / pipes / drinkers; ventilation, mechanical / fan / opening / closing windows; heating method / insulation, if required for named animal; feeding, proximity to source of feed / ease of access for machines for feed delivery / racks / rings / troughs; lighting if needed for named animal or farming activities; technology example, e.g. CCTV / eq. to monitor animals / security; isolation facilities; ease of cleaning; location / topography; legislation and codes of practice; environmental modifications, e.g. solar panels, wind turbine; risk minimisation, e.g. fire / pollution / disease; *Credit further description of each point to a maximum of 2 marks per point.*	**7**

Question	Answer	Mark
10(c)	direct contact; transfer of microorganisms; example, e.g. through lesions / spores / licking / rubbing etc.; indirect contact; example, walls / troughs / feed / water / machinery etc.; droplet contact; example, sneezing / coughing; airborne transmission; due to poor ventilation; faecal / oral; due to unclean housing / lack of hygiene; vector; example, human / cats / insects / rats / foxes / badgers;	**5**
	Total:	**15**

Question	Answer	Mark
11(a)	higher stocking rate; managed; paddocks / camps; strip grazing / rotational grazing; graze one area and move to another; allow regrowth; ref. to time frame / moving grazing area; higher inputs, e.g. fertiliser; labour, qualified;	**3**

Question	Answer	Mark
11(b)	fencing, e.g. enclosed / electric fence; prevents animal selectively grazing; prevents wastage of grass by trampling; inputs to improve quality of grass; choice of grass / forage species with high nutritional value / drought resistance / resistance to trampling / speed of regrowth / durability / perennial / palatability; *(Any two for 2 marks.)* inputs to improve productivity of grass; example, e.g. fertiliser / manure / liming; plant legumes; weed control / pest control; reduce competition / remove unpalatable / toxic species; irrigate to avoid drought; use of machinery to maintain or improve grass; cultivate / roll / harrow; increase density of grass; control timing of grazing; at best stage of growth; avoid damage when ground wet / frozen etc.;	**7**

Question	Answer	Mark
11(c)	increased stocking rate; more animals on same land; animals do not waste energy searching for food; less damage to land / poaching; food is consistent; food is fresh / clean; fodder can be cut when at best / highest nutritive value; greater (fodder) production from land; ration can be controlled; supplements can be added; can expand production without buying / renting more land; easier to control animals / maintain health;	**5**
	Total:	**15**

Question	Answer	Mark
12(a)	the movement of water; from a higher water concentration / lower solute concentration to a lower water concentration / higher solute concentration; *(Accept correct use of water potential.)* across a semi- / partially permeable membrane;	**3**
12(b)	root (hairs); root hairs increase surface area for absorption; root hairs grow between soil particles to reach soil water; nutrients are dissolved in water; nutrients enter root / root hairs and move through cells; diffusion; active transport; active transport requires energy; against concentration gradient; symbiotic relationships, e.g. microorganisms, to enhance nutrient uptake;	**6**

Question	Answer	Mark
12(c)	adding fertiliser / example; increases nutrient content of soil; planting legumes; increase nitrate content of soil; liming; to increase pH / reduce acidity; increase solubility of nutrients; mulching; reduces leaching of nutrients; can provide a source of nutrients; improve soil texture; to increase nutrient-holding capacity / good crumb structure increases nutrient-holding capacity; add organic material to improve soil structure; irrigation; to maintain water capacity / content of soil; drainage; to avoid waterlogging / maintain aerobic conditions; use of green manures; to add nutrient content to soil; use of cover crops; reduces leaching and loss of nutrients through erosion; use crop rotation; maximises utilisation of different nutrients; nutrients available at different soil depths to different crops;	**6**

Question	Answer	Mark
	burning vegetation; releases nutrients back into soil; removing weeds; to reduce competition for nutrients;	
	Total:	**15**

Question	Answer	Mark
13(a)	named biting and chewing pest, e.g. grasshoppers, locusts, termites, leaf miners and beetles; *(Allow ref. to animal herbivores.)* *Any three of:* roots, loss of ability to uptake nutrients and water / wilting; flower, loss of reproductive and fruiting ability; leaves, loss of photosynthetic tissue / loss of water; stem, loss of ability to transport sugars and water / plant falls down; fruit, is eaten; entry of disease / pathogens at wound site; pest spreads disease from plant to plant;	**4**

Question	Answer	Mark
13(b)	chemical methods; spraying / fumigation; contact / systemic; mode of action, selective or broad spectrum; example of specific chemical; cultural methods; break life cycle of pest; crop rotation; manual removal of pests; physical barriers; burning to remove residue / kill pests; ploughing to expose root pests; weeding to remove host plants; provide alternative host plants; plant resistant varieties; transplant nursery crops once established; timing of planting / harvest to avoid pest; use of traps; biological methods; introduce predator to eats / kill pest; specific example of predator and prey; boost predator population, e.g. by providing suitable habitats; remove competitors of predator; use of sterile males; use of pheromone traps;	**6**

Question	Answer	Mark
13(c)	effectiveness of method; cost vs. benefit; specific conditions, e.g. scale of problem / number of pests; cost of chemical; cost of specialist equipment; labour costs; training needs; health and safety considerations / operator safety; harm to (other) crop plants / neighbouring crops; risk of pollution / toxicity; need for safe withdrawal period; premium price for organic products; environmental considerations, e.g. damage to beneficial organisms; timing considerations, e.g. before pests populations peak / time of year; *Credit further description of each point to a maximum of 2 marks per point.*	**5**
	Total:	**15**