PEARSON EDEXCEL IGCSE BIOLOGY · 4BI1

BIOLOGY



MARK SCHEME

SECTION 4: ECOLOGY AND THE ENVIRONMENT (PACK 3)

SCORE	PERCENTAGE
/209	%

STEMUP

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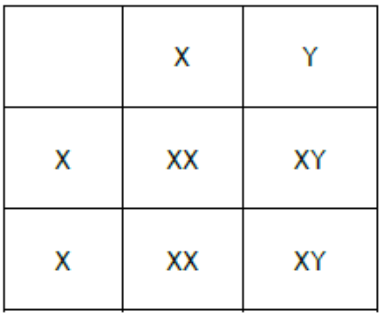
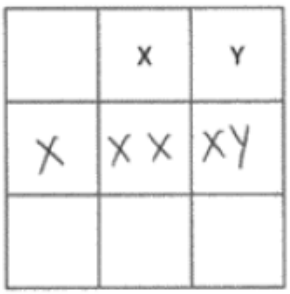
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Mark Scheme

Q1.

Question Number	Answer	Mark
(a)	Only A is correct as both are heterozygous *B is incorrect as both are not homozygous* *C is incorrect as both do not have long wings* *D is incorrect as one is not heterozygous and one homozygous*	**1**

Question Number	Answer	Mark
(b)(i)	An answer that makes reference to the following points: • female gamete(s) as X (1) • offspring as XX and XY (1)  This also scores 2  	**2**

Question Number	Answer	Mark
(b)(ii)	An explanation that makes reference to the following points: • random / role of chance / eq (1) • fertilisation / eq (1) • fewer Y sperm / more X sperm / Y sperm die / X sperm swim better / eq (1)	**2**

Question Number	Answer	additional guidance	Mark
(c)	An answer that makes reference to six of the following points: • C uses (rotting) apples and bananas (1) • O uses same flies / species / age /sex (1) • R uses several apples and bananas / repeat (1) • M1 counts / record number of flies / eq (1) • M2 measures after a <u>stated period</u> of time (1) • S1 controls age / number / mass / size of fruit / state of decomposition / no other fruit present / eq (1) • S2 controls temperature / light / oxygen / distance from fruit / size of room /container release same number of flies / eq (1)	not time to reach fruit	**6**

Q2.

Question Number	Answer	Mark
(a) (i)	An explanation that makes reference to two the following points: • as temperature increases so does (rate of) <u>photosynthesis</u> (1) • increased (kinetic) energy (of molecules) / molecules move faster / more collisions (1) • <u>optimum temperature</u> <u>for enzymes</u> (1) • more glucose / starch / sugar / carbohydrate / eq produced (1)	**2**

Question Number	Answer	Mark
(a)(ii)	An explanation that makes reference to two the following points: • it releases CO_2 (1) • CO_2 a reactant / used in / needed in / for photosynthesis / eq (1) • as CO_2 is limiting factor (1)	**2**

Question Number	Answer	Additional guidance	Mark
(b) (i)	An explanation that makes reference to the following points: • nitrate • for amino acids / proteins (1) • magnesium • for chlorophyll for chloroplasts (1)	Allow other minerals and their function **ignore** nitrogen eg phosphate for ATP / DNA can only gain function if mineral is correct	**2**

Question Number	Answer	Mark
(b) (ii)	An answer that makes reference to five of the following points: • increased soil concentration reduces water potential of soil (1) • prevents water uptake / absorption by osmosis / causes water loss (1) • so plant wilts / eq (1) • damaging effect of leaching / escaping / washing into rivers lakes / eq (1) • causes eutrophication (1) • leads to algal bloom/ plant growth in river / lake / eq (1) • loss of aquatic life / fish / water plants die /eq; • (may prefer to) use natural fertiliser / manure (1) • can produce organic earn more money (1) • other factors limit growth / there is excess fertiliser / not all fertiliser is used (1)	**5**

Q3.

Question Number	Answer	Mark
(a)(i)	An explanation that makes reference to 3 of the following points. • (sulfur dioxide) released dissolves in water (vapour) (1) • forms sulfuric acid (1) • acid rain (1) • causes damage to plants / deforestation / eq (1) • breathing problems for humans / animals / eq (1) • death of fish /aquatic organisms / eq (1)	**3**

Question Number	Answer	additional guidance	Mark
(a)(ii)	• less burning / use of fossils fuels / named fossil fuel / low sulfur fuel / named example of alternative to using fossil fuels / eq (1)	allow examples use public transport / use wind power / cycling / electric/hybrid vehicles / etc	**1**

Question Number	Answer	additional guidance	Mark
(b)	An answer that makes reference to 6 of the following points. • C with and without HCO_3 / changes concentrations of HCO_3 (1) • O use same species / age / size / strain / type of seedling /eq (1) • R repeat (for each concentration of HCO_3) (1) • M1 measure / yield / height / mass / count number of leaves / number of plants that germinate / eq (1) • M2 after stated time 48 hours + (1) • S1 control light / CO_2 / temperature /eq (1) • S2 control compost / water / humidity / moisture /minerals / fertiliser/ volume of solution / eq (1)	not just same time for M2	**6 Exp**
		Total = 10	

Q4.

Question Number	Answer	Additional guidance	**Mark**
(a)	An answer that makes reference to six of the following points: • C chickens kept indoors and outdoors (1) • O same age / size / mass / same breed / species/ sex (1) • R repeat / uses a large number (1) • M1 measure mass / length / weight (1) • M2 measure after stated time period (1) • S1 control food / diet /eq (1) • S2 control water / lighting / bedding / size of pen (1)	Not just use chickens Ignore size Ignore control temperature	**6**

Question Number	Answer	Mark
(b)	The only correct answer is B biuret reagent A is not correct as Benedict's reagent is not used C is not correct as ethanol is not used D is not correct as iodine is not used	**1**

Question Number	Answer	Additional guidance	Mark
(c)	An explanation that makes reference to the following points: • large(r) surface area to volume ratio (1) • (more) heat energy / loss (1) • respiration produces heat / replaces heat / eq(1) • maintain body temperature / keep warm / prevent cooling /eq (1)	Allow smaller vol to sa ratio Allow converse for large chicken	**4**
			Total 11

Q5.

Question Number	Answer	Additional guidance	Mark
(a)	Temperature (1)	allow heat loss / temperature loss	**1**

Question Number	Answer	Mark
(b)	An answer that makes reference to **one** of the following points: • (to prevent) volume / surface area affecting heat loss / eq • valid comparison / fair test / eq	**1**

Question Number	Answer	Additional guidance	Mark
(c)	• covered 40 ÷ 80 x 100 = 50 % (1) • uncovered 36 ÷ 80 x 100 = 45 % • difference = 5 (2)	allow 1 mark for 45 or 50 full marks for correct answer	**2**

Question Number	Answer	additional guidance	Mark
(d)	An answer that makes reference to four of the following points: • less heat loss if indoors / eq (1) • depends upon outside temperature different in hot country (1) • but only small / 5% difference / eq (1) • animals move around less (1) • more energy for growth / making meat / eggs / milk / less energy used to keep warm /eq (1) • diseases easier to spread (1) • protected from predators (1) • ethical objection / cruel / quality of life idea / eq (1) • eat variety of food outdoors / taste/ eq (1)	allow converse ignore natural	**4**

Question Number	Answer	additional guidance	Mark
(e)	An answer that makes reference to the following points: • use beakers / containers of different sizes / different volumes (1) • keep beakers out of box / keep beakers under box (1)	allow different volumes of water ignore animals	**2**
			Total 10 marks

Q6.

Question Number	Answer	Additional guidance	Mark
(a)	An explanation that makes reference to two of the following points: • as distance from city centre increases, percentage coverage by lichen increases (1) • more cars in city centre / more car pollution in city centre (1) • more sulfur dioxide in city centre (1)	**Allow** correlation idea eg as lichen increases so does distance **Allow** converse **Allow** converse **Allow** converse	**2 grad**

Question Number	Answer	Additional guidance	Mark
(b)	An answer that makes reference to three of the following points: • measure area of lichen (1) • measure the (total) area of stone (1) • divide (lichen) cover by total area and x 100 (1) • repeat (to find mean) (1)	**Allow** use a grid / quadrat to measure percentage cover / count **squares** with lichen	**3 exp**

Question Number	Answer		Mark
(c)	An answer that makes reference to six of the following points: • C seeds exposed to SO_2 and not exposed to SO_2 / different concentrations of SO_2 (1) • O same species / age / variety/ type of seed (1) • R lots of seeds / repeat experiments (1) • M1 measure temperature change (1) • M2 using thermometer (1) • S1 thermos flask to contain seeds / insulate / prevent heat loss / eq (1) • S2 same moisture / humidity oxygen / water carbon dioxide / same starting temperature / light intensity / wash seeds with disinfectant / time / eq (1)	**Allow** seeds with metabisulphite and seeds without	**6 exp**
			Total 11 marks

Q7.

Question Number	Answer	Mark
(a)	The only correct answer is C the organisms of all species in a habitat A is not correct as is not a community B is not correct as is not a community D is not correct as is not a community	**1**

Question Number	Answer	Additional guidance	Mark
(b)(i)	• $1.5 \times 10^4 = 15\,000$ • $2.5 \div 15\,000 =$ • 1.7×10^{-4} (3)	award full marks for correct numerical answer without working 1 mark for $2.5 \div 15000$ or $2.5 \div 1.5 \times 10^4$ 2 marks for 0.00017 2 marks for 17×10^{-5} allow $1.67 \times 10^{-4} = 3$ allow 1.66 recurring $\times 10^{-4} = 3$	**3**

Question Number	Answer	additional guidance	Mark
(b)(ii)	• correct order / names (1) • correct pyramid / shape / eq (1)	ignore shape ignore names	**2**

Question Number	Answer	additional guidance	Mark
(c)(i)	An explanation that makes reference to the following points: • undigested / not absorbed / waste / faeces / not assimilated / eq (1) • contains energy / cellulose (1)	cellulose not digested = 2 marks energy trapped in faeces = 2 marks	**2**

Question Number	Answer	Mark
(c)(ii)	An answer that makes reference to two of the following points: • respiration / heat loss (1) • movement / eq (1) • uneaten / die / not consumed /eq (1) • excretion (1)	**2**
		Total 10 marks

Q8.

Question Number	Answer	Mark
(a)	The only correct answer is C producers A is not correct as it is not decomposers B is not correct as it is not primary consumers D is not correct as it is not secondary consumers	**1**

Question Number	Answer	Mark
(b)	The only correct answer is **C** $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ A is not correct as it is not photosynthesis B is not correct as it is not photosynthesis D is not correct as it is not photosynthesis	**1**

Question Number	Answer	additional guidance	Mark
(c)(i)	An explanation that makes reference to two of the following points: • so that starch is used up / no starch present / remove starch / destarch / no starch made / eq (1) • in respiration (1) • prevent photosynthesis (1)	to show that any starch present is the product of photosynthesis in the light scores mp 1 and mp3	**2**

Question Number	Answer	Mark
(c)(ii)	A description that makes reference to two of the following points: • use water bath / eq (1) • extinguish Bunsen flame / no contact with flame / eq (1) • as ethanol flammable / eq (1)	**2**

Question Number	Answer	Mark
(c)(iii)	leaf from light turns blue black / blue / black / purple **and** leaf from dark stays brown / yellow orange / no change /eq (1)	**1**

Q9.

Question Number	Answer	Mark
(a)(i)	S scale linear and uses at least half the grid (1) L line straight, neat and through points (1) A axes labelled 'mean height in mm' and 'time in weeks' (1) P points plotted correctly (1) K each line labelled with correct temperature (1)	**5**

Question Number	Answer	Mark
(a)(ii)	An answer that makes reference to three of the following points: • higher temperatures produce more growth / faster growth / eq (1) • enzymes (1) • more kinetic energy (1) • more frequent collisions / enzyme substrate complexes form faster / eq (1) • faster respiration (1)	**3**

Question Number	Answer	Mark
(a)(iii)	• (shell) height / growth of shell / (1)	**1**

Question Number	Answer	Mark
(a)(iv)	• uses group / uses many / calculates mean / repeat / eq (1)	**1**

Question Number	Answer	Additional guidance	Mark
(b)(i)	• 1.2 – 0.3 = 0.9 • 0.9 ÷ 1.2 × 100 = 75 (2)	Award full marks for correct numerical answer without working Award one mark for 0.9 or 0.75 or ÷ 1.2	**2**

Question Number	Answer	Additional guidance	Mark
(b)(ii)	An explanation that makes reference to the following points: • eat plants / producers (1) • cannot digest parts / (primary consumer) produces more faeces / more inedible parts /more waste egested (1)	Allow converse for secondary consumer for both MPs	**2**

Question Number	Answer	Additional guidance	Mark
(c)	An explanation that makes reference to the following points: • more respiration / higher metabolic rate (1) • maintain body temperature / more movement / activity / eq (1) • heat loss / eq (1)	Allow converse for snail for all MPs	**2**
			Total = 16 marks

Q10.

Question Number	Answer	Mark
(a)(i)	The only correct answer is D oak tree A blackbird is not correct as it is not the producer B centipede is not correct as it is not the producer C earthworm is not correct as it is not the producer	**1**

Question Number	Answer	Mark
(a)(ii)	The only correct answer is A blackbird is a secondary and tertiary consumer B earthworm is not a secondary and tertiary consumer C ground beetle is not a secondary and tertiary consumer D sparrowhawk is not a secondary and tertiary consumer	**1**

Question Number	Answer		Mark
(b)(i)	An explanation that makes reference to the following: • some light / colours / wavelengths reflected (1) • light falls on flowers / not on leaves / some does not fall on chloroplasts / chlorophyll / eq (1)	ignore shade allow not enough chloroplasts	**2**

Question Number	Answer	additional guidance	Mark
(b)(ii)	• producer to primary consumer 1.4 / 87 x 100 = 1.61 % (1) allow 1.6% • primary to secondary consumer 1.6 / 14 x 100 = 11.4 % (1) allow 11% 11.43% or ENERGY LOST producer to primary 98.4% (1) ENERGY LOST primary to secondary 88.6% (1) so student is incorrect primary to secondary consumer most efficient	must calculate % to score allow 1 mark for each correct calculation allow calc of energy lost	**2**

Question Number	Answer	Mark
(c)(i)	• involuntary / automatic / does not involve the brain / spontaneous / without thinking / unconscious / eq (1)	**1**

Question Number	Answer	additional guidance	Mark
(c)(ii)	• protects from predators / only exposes hard shell /eq (1)	ignore danger / harm /injury	**1**

Question Number	Answer	additional guidance	Mark
(c)(iii)	An answer that makes reference to four of the following: • (gene) mutation/ mutated gene / eq (1) • variation (1) • woodlice that roll up survive / not eaten /eq (1) • reproduce / eq (1) • pass on alleles/ genes (for rolling behaviour) (1)	 allow converse allow converse not just pass on mutation /behaviour	**4**

Q11.

Question Number	Answer	Additional guidance	Mark
(a)	An answer that makes reference to the following points: • no chloroplast / no chlorophyll (1) • wall made of chitin (1)	allow plant cell has chlorophyll/ chloroplast cellulose cell wall ignore references to shape	**2 grad**

Question Number	Answer	Mark
(b)(i)	An explanation that makes reference to two of the following points: • aerobic respiration (1) • more energy / ATP (1) • anaerobic respiration produces alcohol (1) • kills yeast cells / eq (1)	**2 exp**

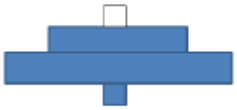
Question Number	Answer	Additional guidance	Mark
(b)(ii)	An explanation that makes reference to two of the following points: • affects growth / kills yeast cells (1) • compete for / use up glucose (1) • remove pathogens (1)	Ignore 'competition' unqualified	**2 grad**

Question Number	Answer	Additional guidance	Mark
(b)(iii)	An answer that makes reference to three of the following points: • species of yeast / type of yeast / yeast from same batch (1) • temperature (1) • pH (of solution) (1) • concentration of glucose (1) • depth of sample (1) • view at same magnification / same area of field of view (1)	Allow same source of yeast Ignore light intensity Ignore volume of sample Ignore volumes of gases/named gases	**3 exp**

Question Number	Answer		Mark
(b)(iv)	An answer that makes reference to the following point: • reliable because results are similar / concordant / eq OR • not reliable because insufficient repeats / only three repeats done / eq		**1 grad**
			Total 10 marks

Q12.

Question number	Answer	Mark
(a)	Vole	**1**

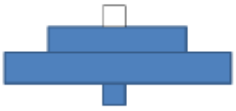
Question number	Answer	Additional guidance	Mark
(b)(i)	A drawing that includes the following points: • organisms named (1) • in correct order (1) • correct shape (1)		3

Question number	Answer	Mark
(b)(ii)	A description that makes reference to the following points: • larger base for oak tree (1) • pyramid/equivalent shape described (1)	2

Question number	Answer	Additional guidance	Mark
(b)(iii)	An explanation that makes reference to three of the following points: • not all energy transferred between each level (1) • less energy at each stage (1) • fewer organisms/less biomass supported (1) • example of energy loss, e.g. to enable respiration/not all organism eaten/not all digested/some excreted/equivalent (1)	reject energy used in respiration	3

Q13.

Question number	Answer	Mark
(a)	Vole	1

Question number	Answer	Additional guidance	Mark
(b)(i)	A drawing that includes the following points: • organisms named (1) • in correct order (1) • correct shape (1)		3

Question number	Answer	Mark
(b)(ii)	A description that makes reference to the following points: • larger base for oak tree (1) • pyramid/equivalent shape described (1)	2

Question number	Answer	Additional guidance	Mark
(b)(iii)	An explanation that makes reference to three of the following points: • not all energy transferred between each level (1) • less energy at each stage (1) • fewer organisms/less biomass supported (1) • example of energy loss, e.g. to enable respiration/not all organism eaten/not all digested/some excreted/equivalent (1)	reject energy used in respiration	3

Q14.

Question number	Answer	Mark
(a)(i)	B	1

Question number	Answer	Mark
(a)(ii)	C	1

Question number	Answer	Additional guidance	Mark
(b)	Division • 25 000 ÷ 4 = 6250 days (1) Division • 6250 ÷ 365 = 17.1 years (1) Addition • 2017 + 17.1 years = 2034 (1)	award full marks for correct numerical answer without working	3

Question number	Answer	Mark
(c)(i)	An explanation that makes reference to the following two points: • heart rate increases (1) • because adrenaline is released (1)	2

Question Number	Answer	Mark
(c)(ii)	A description that makes reference to the following two points: • one area where rhino are monitored and one area where they are not/monitored and unmonitored rhinos in same area (1) • count/compare the number of deaths (1)	2

(Total for question = 9 marks)

Q15.

Question Number	Answer	Mark
(a)(i)	C primary consumer *A is not correct as krill is not a predator* *B is not correct as prey is not a trophic level* *D is not correct as krill is not a secondary consumer*	**1 comp**

Question Number	Answer	additional guidance	Mark
(a)(ii)	A sketch that shows the following points: • upright pyramid shape (1) • names in correct order: plants at bottom, krill in middle. whale at top (1)	 ignore names ignore shape	**2 grad**

Question Number	Answer	Additional guidance	Mark
(b)	division 10 000 ÷ 1.6 = 6 250 s division ÷ 60 = 104.17 / 100 / 104 / 104.16 recurring or 1.6 x 60 = 96 cm^2 per minute 10 000 ÷ 96 = 104.17 / 100 / 104 / 104.2 / / 104.167 104.16 recurring	award full marks for correct numerical answer without working allow 100 mins as 2 sig figs allow 1 mark for dividing by 1.6 or dividing by 96	**2 exp**

Question Number	Answer	Mark
(c)	An answer that makes reference to the following points: • use container of sea water (1) • add same / stated number/ amount/ count number / mass of microscopic plants (1) • add stated number / mass of krill (1) • leave for same / stated time / measure time taken to (1) • (re)measure number / amount/mass / percentage change in plants(1) • repeat /eq (1)	**4 exp**

Question Number	Answer	Mark
(d)	An explanation that makes reference the four of the following points: • fewer whales / whales die / migrate (1) • ice melts (1) • no / less surface for microscopic plants (1) • so fewer microscopic plants (available) (1) • fewer krill / krill die / migrate (1) • carbon dioxide causes acidification (1) • could affect krill (eggs) (1)	**4 exp**
		Total = 13 marks

Q16.

Question Number	Answer	Mark
(a)(i)	The only correct answer is B as there are three producers in the web *A is incorrect as there is not one producer in web* *C is incorrect as there are not four producers in web* *D is incorrect as there are not nine producers in web*	**1**

Question Number	Answer	Mark
(a)(ii)	The only correct answer is C as there are four secondary consumers in the web *A is incorrect as there is not one secondary consumer in the web* *B is incorrect as there are not three secondary consumers in the web* *D is incorrect as there are not seven secondary consumers in the web*	**1**

Question Number	Answer	Additional guidance	Mark
(b)(i)	• (eye) sight / vision / seeing / visual / optic / eq (1)	Allow any word that implies vision no credit for retina / eyes No credit for sight and smell	**1**

Question Number	Answer	Additional guidance	Mark
(b)(ii)	• 530 ÷ 30.0 • 18 / 17.7 / 17.67 17.6(recurring)	award full marks for correct numerical answer without working also allow any version of 17.667 17.6667 etc one mark for 530 ÷ 30.0 or 17.6	**2**

Question Number	Answer	Mark
(c)	An explanation that makes reference to two of the following points: • anaerobic respiration (1) • provide energy / ATP (1) • less / need more/ without oxygen (1)	**2**

Q17.

Question Number	Answer	Mark
(a)		**3**

number of organisms	8
number of producers	1 / one
number of primary consumers	2 / two
number of food chains	10 / ten

Question Number	Answer	Additional guidance	Mark
(b)	An explanation that makes reference to the following points: • respiration / movement / heat loss (1) • egested / undigested / faeces / not absorbed / not assimilated (1) • excreted / urine / urea (1) • uneaten (1) • death / <u>decomposition</u> (1)	Mp1 Ignore exercise / metabolism Mp3 excreted from the digestive system = 0	**4**

Question Number	Answer	Additional guidance	Mark
(c)	An answer that makes reference to four of the following points: • <u>variation</u> / <u>variety</u> / <u>varied</u> (1) • mutation (1) • longer beak means more worms/food / longer beak can reach deeper for worms/food (1) • <u>survival</u> and reproduction / breeding / offspring (1) • pass on gene / allele / DNA (1)	Allow converse for Mps 3, 4 and 5 mutation passed on = 1	**4**

Q18.

Question Number	Answer	Additional guidance	Mark
(a)(i)	An answer that makes reference to one of the following points: • cellulose (1) • glucose (1) • starch (1)	Allow named carbohydrate	**1 grad**

Question Number	Answer	Additional guidance	Mark
(a)(ii)	An answer that makes reference to two of the following points: • add ethanol (1) • add to water and look for white emulsion (1)	Allow Sudan III (1) turns red (1)	**2 grad**

Question Number	Answer	Mark
(a)(iii)	**all of** C H O N S **and no others** or **all of** carbon hydrogen oxygen nitrogen sulfur /sulphur **and no others**	**1 grad**

Question Number	Answer	Additional guidance	Mark
(b)	An explanation that makes reference to three of the following: • cell wall not broken down / cell wall not digested / cell wall still there (1) • (cell wall made of) <u>cellulose</u> / requires <u>cellulase</u> (1) • (cell) contents / organelles / named organelle(s) digested / broken down (1) • by enzymes (1)	Ignore cell membrane in mp1 Mp3 naming organelles alone is insufficient Mp4 refers to enzyme action on cell contents / organelles	**3 exp**

Question Number	Answer		Mark
(c)	An explanation that makes reference to six of the following points: <u>In support</u>: 1. can control growth rate (of grass) / give optimum conditions / controlled conditions / eq (1) 2. less chance of grass being eaten by insects / pests (1) 3. less wastage of minerals / reference to draining back minerals (1) 4. uses less land / space (than equivalent number of fields) (1) 5. fields can be used to grow other crops (1) 6. grass available in dry or cold part of the world / grass (harvest/growth) less weather dependent (1) 7. (fresh) grass available all year / continuous supply of (fresh) grass / higher yield (1) 8. animals move less / less (animal) heat loss, so more energy for (animal) growth (1)	Mp7 Ignore 'enough grass' 'lots of grass' unqualified	**6 exp**
	<u>Not in support</u>: 9. lighting / heating / electricity costs money (1) 10. expensive to build / high initial cost for building/machinery (1) 11. needs labour to fill trays / fill building (1) 12. lacks aesthetic appeal / eq (1) 13. manure not spread on fields (1) 14. animals are not able to graze at will / not free range (1)	Economic arguments in mp9, mp10, mp11 must be qualified - 'needs a lot of money'/eq alone is insufficient	
			Total 13 marks

Q19.

Question Number	Answer	additional guidance	Mark
(a)	An answer that makes reference to three of the following points: • quadrat (1) • repeat (1) • random / using coordinates / eq (1) • count / how many / amount / number /eq (1) • divide total /eq (count) by (area / number of) quadrats /eq (1)	use quadrat**s** scores mp1 and mp 2	**3**

Question Number	Answer	additional guidance	Mark
(b)	An answer that makes reference to five of the following points: • BC numbers decline slower / CC numbers lower at start / February / eq (1) • CC numbers lower in some / April/ June / August / stated months /eq (1) • BC numbers are (overall) lower / eq (1) • BC stays low / less variable / CC go up and down / eq (1) • BC no need to reapply / insects reproduce / eq (1) • BC less risk of pollution / eq (1) • BC less risk of resistance /eq (1) • BC is specific / not affect (other) food chains /eq (1) • BC no bioaccumulation / eq (1) • BC could become pest /eq(1)	allow converse allow biomagnification	**5**
			Total = 8 marks

Q20.

Question Number	Answer	Mark
(a)(i)	**The only correct answer is C chitin glycogen** A is not correct as it is not cellulose and glycogen B is not correct as it is not cellulose and starch D is not correct as it is not chitin and starch	**1**

Question Number	Answer	Mark
(a)(ii)	**The only correct answer is B fungus** A is not correct as it is not a bacterium C is not correct as it is not a plant D is not correct as it is not a protoctist	**1**

Question Number	Answer	Mark
(b)(i)	**Only correct answer is B** **glucose → ethanol + carbon dioxide** A is not correct as it is not the correct equation C is not correct as it is not the correct equation D is not correct as it is not the correct equation	**1**

Question Number	Answer	additional guidance	Mark
(b)(ii)	• restriction / endonuclease / ligase (1)	allow correctly named endonuclease	**1**

Question Number	Answer		Mark
(b)(iii)	• contains new DNA / new gene / foreign DNA / foreign gene / altered genes / DNA from other organism/ DNA from other species / gene from other organism / gene form other species / contains gene for digesting cell walls / contains gene for digesting cellulose / gene for cellulase / eq /		**1**

Question Number	Answer		Mark
(b)(iv)	An answer that makes reference to two of the following points: • less burning of fossil fuels / eq (1) • less carbon dioxide in air / carbon neutral / plants use CO_2 (in photosynthesis) / eq (1) • less trapping of heat / less greenhouse effect / eq (1) • uses renewable resource (1)	allow named fossil fuel	**2**

Question Number	Answer	Additional guidance	Mark
(c)(i)	• 2.2 – 1.25 = • 0.95 ÷ 1.25 = 0.76 • × 100 = 76% (2)	award full marks for correct numerical answer without working allow 2.2 -1.3 =0.9 0.9÷1.3 = 0.69 ×100 = 69% allow 2.2 – 1.2 =1 1÷ 1.2= 0.8 0.8×100 = 80% allow 1 mark for dividing by mass of normal yeast / 1.2 to 1.3 percentage between 69 and 80 (2)	**2**

Question Number	Answer	additional guidance	Mark
(c)(ii)	An answer that makes reference to two of the following points: • running out of glucose / food / eq (1) • (build-up of) ethanol (1) • yeast cells die (1)	allow one mark for oxygen becomes available ethanol kills the yeast = mp2 and mp3	**2**
			Total 11 marks