Rewarding Learning

General Certificate of Secondary Education
2012

Science: Double Award (Non-Modular)

Paper 1
Higher Tier

[G8404]

WEDNESDAY 30 MAY, AFTERNOON

MARK SCHEME

/ denotes alternative points
; denotes separate points
Comments on marking points are given in italics

		AVAILABLE MARKS
1	**(a)** 10; [1]	
	(b) **(i)** factor stops photosynthesis happening at maximum rate/factor that restricts the rate of photosynthesis/factor that stops reactions going faster/slows down P/S/slows down a process/factor that interferes with photosynthesis/prevents increase in photosynthesis; [1]	
	(ii) Line A – light; Line B – carbon dioxide; [2]	4
2	**(a)** **reflex arc** (need both words) [1]	
	(b) quick(er)/protection/automatic/without thought/quick/immediate/ fast/brain [1]	
	(c) must have both arrows going from stimulus to the sensory neurone to the spinal cord, and one from the spinal cord to motor neurone (need **both** correct for [1]); [1]	
	(d) relay/association/connector/intermediate; [1]	
	(e) contract/flex; [1]	5
3	**(a)** (**more**) blood to skin surface/blood capillaries widen/blood flow increase/ expand (**not** move)/blood flow directed to skin surface; heat lost by **radiation**; [2]	
	(b) sweat **evaporates**; using heat **from body**; [2]	4
4	increased heart rate; more oxygen into body/CO_2 out of body/more gas exchange/more air into lungs/body; liver; [3]	3

				AVAILABLE MARKS
5	**(a)**	Any **four** from: 1. record distance moved; 2. over a set time; 3. do at different temperature or describe how you change temperature; 4. reset bubble/reset using syringe; 5. keep named controlled variable the same i.e. windspeed/humidity/ surface area of leaves, same plant; 6. repeat and average/repeat for **reliability**	[4]	
	(b)	increase; more evaporation/faster evaporation/more water uptake/more transpiration/faster transpiration/more water through stomata;	[2]	6
6	**(a)**	so that CO_2 is not present in the air in flask 2 before the locust produces it by respiration/so that they know any CO_2 is produced by insect/locust or during experiment/to see if produced by insect/in respiration;	[1]	
	(b)	flask 2; clear/colourless; flask 3: milky white/cloudy;	[2]	
	(c)	no insect/replace with dead insect/beads/empty jar;	[1]	4
7	**(a)**	**(i)** Type of bacteria – nitrogen fixing; Source of nitrogen – nitrogen (in the air); **or** Type of bacteria – nitrifying bacteria; Source of nitrogen – ammonia;	[2]	
		(ii) denitrifying (bacteria);	[1]	
	(b)	spread slurry/brown manure/plough the plants back into the ground/ green manure/plant legumes/don't harvest crop/or leave plants/aeration/ ploughing but only with increasing nitrogen fixing/nitrifying bacteria;	[1]	
	(c)	active transport/uptake;	[1]	5
8	**(a)**	**(i)** Sun/sunlight ***not*** *light on its own*	[1]	
		(ii) vegetation → beetle → centipede → toad → fox; arrows in the correct direction from the plant	[2]	
		(iii) vegetation at bottom and largest; fox is the smallest and the top; shape symmetrical and in order; *allow consequential marking from their food chain*	[3]	
		(iv) fox	[1]	
	(b)	**(i)** 850 – (85 + 300 + 250) = 850 – 635 = 215 kJ; [1] for working if final answer is wrong	[2]	
		(ii) 85 kJ	[1]	10

AVAILABLE MARKS

9 **(a)** **(i)** to destarch it/so that any starch present at the end was made during the experiment; [1]

(ii) to kill the leaf/stop chemical reactions;
(boil in) alcohol/ethanol; [2]

(iii) turn off Bunsen burner/use an electric water bath; [1]

(iv) blue/black; [1]

(b) **(i)** the shape doesn't match/it fits with it/enzyme is specific/lock and key/specificity/substrate is specific/enzyme specific; [1]

(ii) more than two glucose molecules;
joined together; [2]

(iii) shape of enzyme/active site is changed by heat/denatured/enzyme changed shape; [1]

(c) Any **two** (adaptation with corresponding explanation) from:
Adaptation – microvilli/large surface area;
Explanation – increased absorption area/for quicker/more absorption;
not *easier*
or
Adaptation – lots of them;
Explanation – more absorption/quicker absorption;
or
Adaptation – thin epithelium/one cell thick/thin walls;
Explanation – short diffusion distance;
or
Adaptation – permeable or semi-permeable;
Explanation – to allow molecules to pass across;
or
Adaptation – good blood supply/blood supply close to the wall;
Explanation – maintain diffusion/concentration gradient/quick distribution around body;
or
Adaptation – villi can move/muscle in villi;
Explanation – to allow more glucose/products of digestion to come in contact;
or
Adaptation – lacteal;
Explanation – to allow absorption of fats/fatty acids and glycerol; [4]

(d) **(i)** hepatic portal vein; [1]
insulin; [1]
glycogen; [1]
urea; [1]

(ii) removed because it is **toxic**/harmful/poisonous;
removed by kidney; [2]

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				AVAILABLE MARKS
10	**(a)**	**(i)**	arrow lungs to LA; LV to aorta past split towards head and arms; [2]	
		(ii)	X on LV; [1] *must be inside the heart and below the level of the valve*	
		(iii)	A – renal **artery**; B – vena cava; [2]	
	(b)	**(i)**	coronary (artery); [1]	
		(ii)	no oxygen/sugar (**not** just blood); no respiration/no energy; [2]	
	(c)	**(i)**	engulfs/surround/absorb/takes in/ingest; digest/break down/dissolve; [2] *if in wrong order then maximum* [1]	
		(ii)	Any **two** from: • dead/weakened dose of microbe/disease • presence of antigen • antigen or microbe or disease recognised by WBC • **lymphocyte** produces antibodies [2] ***not** a small dose*	
		(iii)	don't have to get sick/less disease in population/don't catch dangerous disease/long lasting/permanent/get memory cells; [1]	
		(iv)	in mother's milk/by injection (**of antibodies**)/across placenta; [1] ***not** booster on own (unless explained), **not** vaccination*	14

				AVAILABLE MARKS
11	**(a)**	**(i)**	minerals run-off (via drainage ditch)/slurry run-off/run-off of fertiliser/ leaching/organic waste/septic tank contents/sewage; [1]	
		(ii)	Any **five** from: • increase in growth of algae/algae bloom • algae block out light from the other underwater plants • they can't photosynthesise • algae and plants **die** • bacteria start to **decay** algae and plants (decompose/break down) • **bacteria respire and use up oxygen**; • fish and other animal life die [5]	
	(b)	**(i)**	quadrat; [1]	
		(ii)	identify plant species; estimate percentage cover; calculate average/record; and repeat several times for reliability in one area; repeat in the other area; (Any **four**) [4] *if use co-ordinates/line transect/belt transect/belt transect/throw/ random numbers* Quality of written communication [2]	
		(iii)	temperature; thermometer; sun/light; light meter/LDR; pH; pH meter; rain/rainfall; rain gauge/measuring cylinder; wind; anemometer; soil moisture; moisture meter or oven – described; humidity; hygrometer; (Any **two** pairs) [4]	17

					AVAILABLE MARKS
12	**(a)**	**(i)**	GG; Gg;	[2]	
		(ii)	Gg and Gg parents; Punnett; cross correct; circle around gg;	[4]	
		(iii)	two Punnett squares; both cross with gg (for second mark);	[2]	
		(iv)	if any offspring are white (then tawny parent was heterozygous)/ if no white offspring it is not heterozygous (Gg);	[1]	
	(b)	**(i)**	camouflaged/hiding/blending; easier to hunt/easier to escape predator (when young)/to reproduce;	[2]	
		(ii)	(survival to) breed/reproduce; pass on allele for gold colour/pass on genes; **or** converse for white lions	[2]	
	(c)	**(i)**	isolate human gene/DNA that codes for insulin; remove the plasmid (from bacterium)/from ring of DNA; cut plasmid (open); join plasmid and human gene; put (it) back into the bacterium;	[5]	
		(ii)	place in fermenter/bioreactor/tank; bacteria multiply/reproduce/divide/mitosis; **or** bacteria multiply; separation/purification/extracted/harvested;	[2]	
	(d)	**(i)**	T; *on left* A; *on right* *if A and T in wrong order then* [1]	[2]	
		(ii)	double; helix;	[2]	
		(iii)	protein/polypeptide/dipeptide;	[1]	
		(iv)	X-ray (diffraction/crystallography); Wilkins/Franklin; 3D structure/**model**; Watson/Crick; complementary base pairing; Chargaff; (Any **two**)	[4]	29
				Total	**120**