Version 1.0: 0607

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Biology 6416

Specification B

BYB4 Energy, Control and Continuity

Mark Scheme

2007 examination - June series

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Question 1

(a)	(i)		Pyruvate / pyruvic acid;	1
	(ii)		Carbon dioxide;	1
(b)			Cytoplasm/cytosol;	1
(c)	(i)		ATP production inhibited / stops;	1
	(ii)	1	No <u>reduced</u> NAD (released);	
		2	No pyruvate / link reaction / Krebs cycle inhibited;	
		3	Movement of electrons / protons / hydrogens (down the chain) stops; *(Accept no electrochemical gradient)*	
		4	No (release of free) energy (to phosphorylate ADP); *(Do not accept "produced")*	3 max

Total 7

Question 2

(a)	(i)		Photoreceptors / rods / cones / light sensitive cells; Action potentials/impulses, along sensory neurones/optic nerve/ to the brain;	2
	(ii)		Less light to enter / in bright light / parasympathetic, causes constriction of pupil; Contraction of circular muscles; More light to enter / in dim light / sympathetic, causes dilation of pupil; Contraction of radial muscles; Correct references to TS;	3 max
(b)	1		Lens moves (forward in the octopus) / human lens does not move;	
	2		Ciliary muscle causes movement / human muscle contracts to change shape;	
	3		Lens remains the same shape / human lens accommodates/fatter/ rounder;	
	4		No suspensory ligaments / human eye suspensory ligaments slacken;	
	5		Refraction/amount of bending is the same / refraction greater in humans;	
	6		Pupil becomes wider in octopus / humans stays the same or constricts;	4 max

Total 9

Question 3

(a) 4; 1

(b) (First division meiosis) **C**

(Second division meiosis) **B**; 1
(*both correct 1 mark)*

(c) Random alignment / independent assortment;
Different combinations of (maternal and paternal) chromosomes / alleles;

OR

Crossing over;
Different combinations of alleles;

OR

Mutation;
Different/ new alleles/genes; 4 max

Total 6

Question 4

(a) Arrow away from / out of CNS, along motor neurone; 1

(b) Sensory (area) / cerebral / cortex; 1
(Hemispheres must be qualified)

(c) Bind to receptors;
Postsynaptic membrane;
Acetylcholine cannot bind / competes with acetylcholine / complementary to receptor;
Reduce / stop depolarisation / description; 4

Total 6

Question 5

(a) hhDD, hhDd; 1
(*both correct 1 mark)*

(b) Epistasis;
One gene controlling /inhibiting the expression of another; 2

(c) Gametes correct HD, Hd, hD, hd, hd (*correct for both parents);*

Genotypes HhDd, Hhdd, hhDd, hhdd ;

Phenotypes wiry wiry non-wiry, short non-wiry, long

Ratio 2 1 1 ;
3

Total 6

Question 6

(a) Maintaining a constant internal environment; 1

(b) Binds to (specific) receptor;
On muscle / liver cell;
Activation of enzymes (in liver);
Hydrolysis of glycogen;
(Facilitated) diffusion of glucose out of (liver cells) cells;
Increases blood glucose levels; 4

(c) (i) 0 / zero; 1

(ii) 1 Filtration, out of blood (plasma) /into renal capsule;
2 (Hydrostatic) pressure ;
3 PCT;
4 All reabsorbed;
5 Active transport; 3 max

Total 9

Question 7

(a) NADPH / reduced NADP; 1

(b) (i) 2; 1

(ii)
1 Less GP;
2 Reduced amount of TP / GALP / carbohydrate;
3 Less RuBP regenerated / made;
4 Less CO_2 taken up / less fixation; 3 max

(iii) High levels of oxygen reduce photosynthetic rate, effect greater at higher temperatures;
Higher concentration more effective competitor / more RuBP combines with oxygen (instead of carbon dioxide) / greater chance of binding with the active site / colliding with the enzyme; 2

Total 7

Question 8

(a)	(i)	Label myelin sheath on neurone;	1
	(ii)	No saltatory conduction / description / all sections depolarise; Slower transmission / reduced frequency / arrival of impulses to muscle;	2
(b)	1	Entry of calcium ions (presynaptic membrane);	
	2	Vesicles fuse with membrane / exocytosis /release TS;	
	3	Neurotransmitter diffuses;	
	4	Binds to receptors, postsynaptic / membrane / muscle membrane;	
	5	Depolarisation / sodium ions enter;	
	6	Release of calcium ions (from within the muscle);	
	7	Removes tropomyosin / bind to troponin;	
	8	Exposing binding sites on the actin;	
	9	Cross bridge formation / myosin binds;	
	10	Myosin head moves / pulls the actin along;	
	11	Rachet mechanism / description /detach and reattach;	
	12	ATPase activated;	7 max
(c)	(i)	1.3, Maximum overlap / muscle (fully) contracted / actin sites all occupied / no further cross bridge formation;	1
	(ii)	Actin and myosin, no overlap / completely separated; No cross bridge formation ; The muscle cannot contract;	2 max
	(ii)	Muscle is contracting; Because binding sites available / interactions can occur;	

Total 15

Question 9

(a)		Smaller groups within big groups / hierarchical; Based on similarities / features in common / named example; Evolutionary relationships / common ancestry / phylogentic ;	3
(b)	(i)	Class, *Drosophila melanogaster ;*	1
	(ii)	1, 6, 7, 2, 3, 4, 5;	1

(c)	1	Geographical Isolation of fruit flies;	
	2	No interbreeding / gene flow;	
	3	Range of habitats / environmental conditions;	
	4	Different selection pressures in separate populations;	
	5	Mutation;	
	6	Variation amongst fruit flies;	
	7	Some more suited to environment than others /differential survival;	
	8	Beneficial allele /gene passed on;	
	9	(Populations) unable to produce fertile offspring / reproductively isolated;	6 max
(d)	1	Hawaiian islands isolated / Britain less isolated;	
	2	Few colonising species;	
	3	More environments / niches/habitats available / more suitable environments;	
	4	Less competition;	
	5	Adapted;	
	6	British % 0.15, Hawaiian % 7.70 / higher proportion of insects in Hawaii;	
	7	Rapid evolution of species of drosophila;	4 max

Total 15

QWC 1