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Rewarding Learning

General Certificate of Secondary Education
2012

Science: Biology

Paper 2
Higher Tier

[G0904]

WEDNESDAY 20 JUNE, MORNING

MARK SCHEME

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					AVAILABLE MARKS
1	(a)	(i)	Coal/oil;	[1]	
		(ii)	Any **two** from: CO/CO_2; SO_2/SO_X; NO_2/NO_X;	[2]	
		(iii)	Soot covers leaves/blocks stomata; (Must affect **outside** of leaf)	[1]	
		(iv)	Less light enters leaf/trapped by chlorophyll/ Less gas exchange; Less photosynthesis;	[1] [1]	
		(v)	Any **two** from: Renewable sources of energy; Scrubbers in factory chimneys; Catalytic converters; Increased use of public transport/example described; Increased insulation; Burn less fossil fuels; Use unleaded petrol;	[2]	
	(b)	(i)	Landfill;	[1]	
		(ii)	Any **two** from: Smell; Unsightly; Disease; Attracts unwanted birds/gulls/animals/rodents/foxes; Leaching of toxins to ground/water; Needs **large area** of land/damages habitats/needs long time;	[2]	
		(iii)	Incineration/burning/composting/recycling;	[1]	
	(c)	(i)	Knock;	[1]	
		(ii)	Red squirrels decreasing; Grey squirrels increasing; (**Reject** a description of numerical values)	[2]	
		(iii)	Any **three** from: Grey squirrels – Eat wider range of food; Outcompete them for habitats; Higher reproduction rate; Resistant to/carrier of virus (parapox);	[3]	18

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AVAILABLE MARKS

2 **(a)** **(i)** A – **Spongy mesophyll**;
B – **Lower** epidermis;
C – Stoma(ta); [3]

(ii) Allows (maximum amount of) light into leaf/cells/mesophyll/chloroplasts;
Thin (leaf);
Large **surface area** (for light absorption); [3]

(iii) 8 (arbitrary units); [1]

(iv) Any **two** from:
Thickened **inner** walls;
Chloroplasts present;
Smaller vacuole;
No cuticle; [2]

(v) Any **three** from:
Carbon dioxide ; / By diffusion; / Through stomata; **or** Water / From xylem; / By osmosis;
Into mesophyll cell/chloroplast/air space/vacuole/any appropriate named structure; [3]

Quality of written communication [2]

(b) **(i)** Kill the leaf/break down cuticle/cells to allow chemicals to enter;
Remove chlorophyll/green colour/decolorise leaf; [2]

(ii) Any **one** from:
Turn off Bunsen/no naked flames;
Wear goggles; [1]

(iii) Dip(ped) in water; [1]

(iv) Starch;
Yellow-brown to blue-black; [2]

(v) Starch all used (up)/not present;
By respiration; [2]

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AVAILABLE MARKS

3 **(a)** **(i)** nn;
Normal wing; [2]

(ii) Wings can't be used/can't fly;
to get food/find mate/escape (predators); [2]

(iii) Length of DNA/chromosome;
In nucleus; [2]

(b) **(i)** NN, Nn;
Nn, nn; [2]

(ii) 3:1; [1]

(iii) 16, 4; [1]

(iv) 4:1; [1]

(v) Any **one** from:
Random process;
Large numbers required/small numbers produced in this case; [1]

(c) **(i)** Males: Testosterone;
Females: Oestrogen; [2]

(ii)

Secondary sexual characteristic	Males	Females	
Voice deepens	✓	✗	[1]
Growth of body and pubic hair	✓	✓	[1]
Menstruation begins	✗	✓	[1]
Sexual awareness	✓	✓	[1]

[4]

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					AVAILABLE MARKS
4	(a)	(i)	Bacterium;	[1]	
		(ii)	Prevents bacteria/microorganisms reproducing;	[1]	
		(iii)	Temperature does not get high enough; Microorganisms not killed/can grow/can reproduce;	[2]	
		(iv)	Microorganisms can only reproduce **slowly** at 4º C;	[1]	
		(v)	Any **two** from: Wash hands/utensils before handling food; Keep raw and cooked food apart; Allow cooked food to cool before refrigerating; Ensure reheated food reaches a high temperature; Cover food; Obey use by dates; Avoid hand to mouth actions/described;	[2]	
	(b)	(i)	So person does not catch the disease/microorganism/bacterium;	[1]	
		(ii)	Antigen;	[1]	
		(iii)	White blood cell (lymphocyte) recognises antigen/structure X;	[1]	
		(iv)	Phagocyte;	[1]	
		(v)	Nucleus;	[1]	
		(vi)	Any **three** from: Antibodies; Attach to/clump microorganisms; Prevent microorganisms reproducing/spreading; Makes easier target for phagocyte;	[1] [2]	
		(vii)	Stage 5 – White blood cell (phagocyte) **engulfs** the microorganisms; Stage 6 – White blood cell (phagocyte) **digests** microorganisms;	[2]	
		(viii)	Antibiotic;	[1]	18

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					AVAILABLE MARKS
5	(a)	(i)	A, G, C; ([–1] for each wrong up to maximum [–2])	[2]	
		(ii)	X-ray crystallography/diffraction;	[1]	
		(iii)	Crick and Watson;	[1]	
		(iv)	Double helix;	[1]	
		(v)	Genes/bases; Codes for; amino acids;	[3]	
	(b)	(i)	A – Stirrer;	[1]	
		(ii)	Nutrients;	[1]	
		(iii)	To maintain (optimum) temperature/prevent high temperatures; Could cause death/denaturing of genetically engineered bacterium;	[2]	
		(iv)	Any **two** from: pH; O_2 (concentration); CO_2 (concentration); Amount/concentration of nutrient/sugar/glucose;	[2]	
	(c)	(i)	Enzyme used;	[1]	
		(ii)	Step 3 – Human **insulin gene** inserted into bacterial **chromosome/plasmid**; Step 4 – Bacterial **chromosome/plasmid** placed into **bacterium**;	[2]	
		(iii)	Divides/reproduces/clones; Produces (genetically) **identical** copy;	[2]	
		(iv)	Any **two** from: Extracted/separated from bacterial culture; Purified/concentrated; Packaged/sterilized;	[2]	
		(v)	Any **one** from: Animal insulin not the same/does not work as well; Concentration not known; Allergic response/side effects; No ethical issue with use of animal material/described; Get larger quantities produced;	[1]	22

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					AVAILABLE MARKS
6	(a)	(i)	(Biological) catalyst; Digests protein;	[2]	
		(ii)	Amino acids;	[1]	
	(b)	(i)	Accurate plots (×2); Line drawn; Line labelled;	[4]	
		(ii)	Any **two** from: Size/surface area/of film; Temperature; Type of film/thickness of coating; **Volume/concentration** of protease;	[2]	
		(iii)	6; minutes;	[2]	
		(iv)	Correct reference to **rate of reaction/digestion**; Optimum at pH2;	[2]	
		(v)	Enzyme A; Optimum at acid pH (as in stomach);	[2]	
		(vi)	Film coating not clear/not digested; Enzymes are specific; Lipase would not react with protein substrate/only reacts with lipids/fats;	[3]	18

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					AVAILABLE MARKS
7	(a)	(i)	A – Blood; B – Amniotic fluid;	[2]	
		(ii)	Any **two** from: Carried in the umbilical vein; Diffuses; Across placenta/villi;	[2]	
		(iii)	Carbon dioxide; Urea;	[2]	
		(iv)	Large surface area; Thin (membrane)/short diffusion distance/capillaries **close** to surface; Good blood supply/maintains concentration (diffusion) gradient;	[3]	
	(b)	(i)	To **increase the chance** of a sperm reaching/fertilizing the egg;	[1]	
		(ii)	Sperm carry X **or** Y chromosome; Eggs carry **only** X chromosome;	[2]	
		(iii)	Dairy farmers prefer female calves/beef farmers prefer male calves;	[1]	
		(iv)	Glucose – provides energy (food) for sperm; Antibiotics – kill pathogens which could damage sperm/embryo/ infect cow;	[2]	
		(v)	Can be used after bull is dead/appropriate time reference; Easily transported;	[2]	
		(vi)	Embryo transfer – Placing embryos into host/another female (cow); IVF – Fertilization in (glass) dish/outside female's body;	[2]	
		(vii)	Pedigree embryo has qualities of pedigree mother and father; Qualities of non-pedigree mother are not transferred to embryo;	[2]	
		(viii)	More expensive/more skilled;	[1]	22

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				AVAILABLE MARKS
8	(a)	(i)	**Chemical** messenger; Transported **in the blood**; [2]	
		(ii)	Insulin; [1] Liver; [1] Fight/fright/stress; [1] Adrenal gland; [1] [4]	
		(iii)	**Heart** – **Increased** heart rate; Increased blood flow (to muscles); **Muscles** – More oxygen/glucose; **More** respiration; **Bronchioles** – Dilate; More O_2 **absorbed**/CO_2 **released**/**gas exchange**; [6]	
		(iv)	Blood is diverted away from skin/to other organs; [1]	
		(v)	Blood glucose level **monitored by pancreas**; **Correct reference to** insulin production; Brings blood glucose level back/return to **normal**; [3]	
	(b)	(i)	Similarity – Both increase/rise; Difference – Gradients differ/A steeper than B/A always above B/higher than B; [2]	
		(ii)	Any **two** from: Different masses/blood volume; Gender; B more alcohol tolerance/more used to heavy drinking/good liver function; Amount of food in stomach; Duration of drinking; [2]	
		(iii)	Any **two** from: Impaired judgement/described/Increased risk of accidents; Increased risk of cancer/liver disease (cirrhosis)/other appropriate health issues; Social effects; [2]	22
			Total	**160**