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1 (a) (i) **P** = red (blood) cell / erythrocyte / red corpuscle ; **R** RBC
Q = lymphocyte / T cell / B cell / monocyte ;
R = phagocyte / granulocyte / neutrophil / polymorph ; [3]

(ii) *max. 3 for either **Q** or **R***
allow ecf rules as follows:

*if **Q** is identified as phagocyte and **R** as lymphocyte accept correct functions for the names*
*if **Q** is identified as phagocyte and **R** as lymphocyte with functions as below – then allow to max. 4*
*If no names given in **(i)** allow functions as given below*

ref. to, fighting disease / defence against disease ; **A once only**
A destroy / kill, pathogen / named pathogen / bacteria / antigen / foreign body
R 'kill, infections / diseases'
(Q)
releases / produces / AW, antibodies ;
ref. to specificity ;
any function of antibodies ;
agglutination / described e.g. 'clumping' of bacteria
causing bacteria to burst / lysins
neutralising toxins / antitoxins
preventing viruses entering cells
immobilising bacteria
(R)
ingest / engulf / surround, bacteria / AW ; **R** 'eats'
ref. to digestion of bacteria / AW ; [max. 4]

(b) (i) **1** *idea that* the body recognises transplanted skin as, foreign / different / harmful ;
A ref. to recognition of antigen(s)
2 *idea of the* response of the immune system ; e.g. 'immune system attacks...'
3 further detail ;
e.g. white cells / named white cells, migrate to transplanted skin
ref. to antibodies
white cells attach to, foreign / transplanted, cells / tissue
foreign / transplanted, cells, killed / destroyed / AW

ignore ref to blood groups [max. 2]

(ii) ref. to means of protecting body from, foreign organism / disease / pathogen / parasites / AW ; **A** 'attacks' [1]

(iii) the body is unable to fight other infections / AW ; [1]
A the body is more prone to developing, cancer / tumours
A 'there is no immunity against…'
A 'unable to fight pathogens'

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2 (a) (i) accept other valid responses – must be long-term and not behavioural / social

1 liver, damage / failure / disease / cirrhosis ; **R** destroys **A** hardens
2 brain damage / loss of brain cells / loss of neurones / loss of memory / AW ;
3 cancer of correct named part of body ;
mouth / pharynx / oesophagus / gut / pancreas / liver / breast
4 stomach ulcers ;
5 heart disease / stroke / AW ;
6 high blood pressure / hypertension ;
7 alcoholism / addiction / dependence / tolerance ;
8 (risk of) damage, to fetus / pregnant woman's baby / fetal alcohol syndrome / AW ;
e.g. low birth weight / poor mental development
9 increased risk of miscarriage ;
10 malnutrition / named deficiency disease(s) ;
11 obesity / weight gain ;
12 loss in weight / wasting ; [max. 2]

(ii) (500 x 2 =) 1000 (cm^3) ; [1]

(b) (i) (nutrients are) large <u>molecules</u> / need to be small <u>molecules</u> ;
A complex / simple, <u>molecules</u>
(some nutrients are) insoluble / need to be soluble ;
must pass through, intestine wall / capillary wall ;
R ref. to absorption unqualified by wall(s) [max. 2]

(ii) small intestine / ileum / villi ; **A** duodenum [1]

(iii) fatty acids / glycerol / maltose / peptides / AW ; **R** fat / lactose / sucrose [1]

(c) (i) x 9.0 (%) ; [1]

(ii) as blood alcohol content of blood increases, so does risk of accident / AW ;
relevant comment on part of graph ;
use of figures ;
little increase in risk up to, 0.05 / 0.075, g 100 cm^{-3}
greater increase in risk above, 0.05 / 0.075, g 100 cm^{-3}
comparative use of figures – must use figures from both axes [max. 2]

(iii) 1 <u>depressant</u> ;
2 slows down nerve impulses ; **R** 'signals' / 'messages'
3 slows down / increases, reaction / response, time(s) ;
A ref to reflexes **R** reaction time decreases
4 e.g. for stimulus *or* response – traffic lights / braking / swerving / stopping / AW ;
5 blurred / double / impaired / poor, vision AW ;
6 poor / lack of, co-ordination / AW ; **A** dizziness
7 overconfidence / poor decision making / memory impaired ;
8 poor judgment (of distances) ;
9 sleep / drowsiness / less conscious / AW ;
10 poor concentration / less aware ; [max. 3]

[Total: 13]

3 **(a)** **(i)** fur / hair / whiskers / vibrissae ; **A** teat / nipple / breast / AW
external ears / pinna(e) ; **A** ear flaps [max. 1]

(ii) internal development / young develops in uterus / 'gives birth to live young' / AW ;
sweat glands ;
feeding of young with milk / breast feeding ;
mammary glands / breasts / nipples ; **R** if given in **(i)**
four types of teeth / named teeth (incisors, canines and molars) ; **A** two sets of teeth
three, bones in (middle) ear / ossicles ;
diaphragm ;
red blood cells without nuclei ;
neocortex ;
seven neck vertebrae ;
external testes ;
dentary / single bone forming lower jaw / secondary palate ; [max. 1]

(b) **(i)** (light conditions) bright / AW
(explanation) narrow / small, pupils ; **A** enlarged iris [2]

(ii) *answer must be linked with answer given in **(i)***
less light enters eyes / prevents too much light entering eyes / AW ;
receptors / retina / rods / cones / light sensitive cells, protected from damage / AW ;
R 'damage to eyes'
*allow ecf if **(b)(i)** incorrect*
more light enters eyes ;
enough light to stimulate, retina / rods / cones ; [2]

(c) ref. to, no cones present / <u>only</u> rods ;
R 'many rods' **R** no, yellow spot / fovea [1]

(d) ref to image (of zebras) on, fovea / retina ; **R** 'picture'
ciliary body / ciliary muscles, relax ; **R** 'cilia muscle'
suspensory ligament(s) becomes taut / AW e.g. 'pulled' ; **R** 'contract', 'stretched'
lens is, made thin(ner) / less convex / flat(ter) / AW ; *ignore* long
less refraction of light ; **A** bending, correct ref to focal length

R if answer implies that the iris is responsible for shape of lens
R change in iris for depth of field (would not change in this bright light) [max. 3]

(e) maintains natural habitat / AW ; e.g. prevent, human interference / development
prevention of extinction ;
less, hunting / poaching / killing / AW ;
tourism / economic reason ;
maintain (bio)diversity ;
maintain, gene, pool / diversity ; **A** ref to source of genes / alleles
maintain, food chains / balanced ecosystems ;
available for scientific study / AW ;
retain for future generations / AW ; e.g. aesthetic value
R any aspect(s) of management of reserves [max. 3]

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4 (a) (i) chloroplast ; **R** chlorophyll [1]

(ii) absorbs light / AW ; e.g. light energy → chemical energy
photosynthesis / equation / described ; e.g. 'to make glucose'
absorption of carbon dioxide ;
production of, starch / sucrose ; **R** 'food' [max. 2]

(b) (i) ref. to enabling leaf to float / buoyancy ;
ref to diffusion (of gases) ; **A** movement
access to, carbon dioxide ;
access to, oxygen ;
ref. to better access to light ; [max. 2]

(ii) *accept converse arguments*

stomata allow, carbon dioxide / oxygen / gases, to diffuse into / enter, leaf ;
water would enter (leaf) through stomata ;
carbon dioxide less able to enter ;
leaves would, not float / sink ;
carbon dioxide diffuses faster through air than through water / AW ; [max. 2]

(c) roots have access to oxygen ;
ref. to (aerobic) respiration ;
to provide, energy / ATP ;
A 'active uptake uses energy' **R** 'make / create, energy'
needed for active uptake of, minerals / nutrients / salts / ions / AW ; [max. 3]

[Total: 10]

5 **(a)** *idea that* gene(s) are transferred ; **A** genetic information / DNA **R** chromosome from one, species / organism, to another, species / organism ; [2]

(b) DNA / RNA / nucleic acid ; [1]

(c) **(i)** testosterone ; **R** spellings with 'oge' [1]

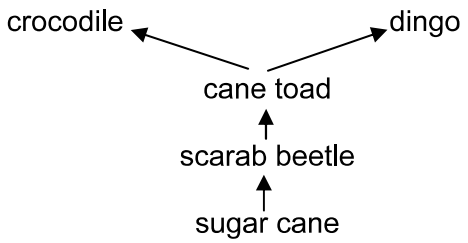
(ii) voice will break / AW ;
hair on, chest / face / under arms / in pubic area / around sex organs ;
shoulders broaden ;
muscle develops ;
penis enlarges ; } **A** genitals, grow / enlarge
testes / scrotum, enlarge ; }
produce, sperm / seminal fluid / AW ;
named behavioural change ; [max. 2]

(d) **(i)** (x axis) time / years / months ;
(y axis) number of toads / number of individuals / population / AW ;
R 'toads' unqualified **A** 'amount of toads'
S shaped curve ;
exponential / log, phase labelled on straight part of curve (bracket or line) ; [4]

put ticks and crosses in a column on right hand side of answer

(ii) (lack of) food / prey ; **A** fewer scarab beetles
ref. to habitat change or damage ;
change in temperature / global warming ;
ref. to pollution ;
(bacterial) disease / parasite ;
(lack of) breeding places ;
shortage of water / drought ; [max. 1]

(e) **(i)** *ignore references to virus*



ignore dingo → crocodile / ora

i. arrows must point from food to feeder (even if incorrect organisms) ;
ii. all five organisms included in correct order with lines even if no arrows ;
A if more organisms included [2]

(ii) *no other answers are acceptable*
(carnivore) cane toad + dingo + crocodile ;
(herbivore) scarab beetle ;
(producer) sugar cane ; [3]

[Total: 16]

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6 (a) (i) *accept converse argument*
(more) black moths eaten (by, predators / consumers) ;

(because) black moths, are not camouflaged / do not 'blend in' / AW ; [max. 1]

(ii) ***either***
more black moths would be caught ; **A** numerical answer – see Table 5.1

black moths have better camouflage / AW ;

accept converse argument

or
less of both varieties recaptured ;

death due to the pollution ; [max. 2]

(b) (i) (first heading) phenotype ;
(second heading) genotype ; [2]

(ii) (dominant wing colour) pale / speckled ; **A** white [1]

(explanation)

(pale / speckled) appears when,
the dominant allele / **G**, is present ;
in, heterozygous / **Gg** (moths) ;

accept black only appears when, homozygous / **gg** / AW ; [max. 1]

(c) 1 discontinuous variation ;
2 (wing colour determined by) a, gene / few genes ; **A** ref to alleles
3 black is recessive / pale is dominant ;
4 explanation of inheritance ; *must include ref. to, terms / genotypes*
(black) inherited when parents are, homozygous recessive / **gg**, or heterozygous
(pale) inherited when only one parent has, dominant allele / **G** / AW ;
5 ref to, sexual reproduction / meiosis ; **A** mating / breeding / fertilisation [max. 3]

(d)

- *accept other letters*
- *ignore any row headings in candidate answers*
- *answer may be given with a Punnett square*
- *gametes may be accepted in the Punnett square even if not labelled as such*
- *gametes do not have to be circled*
- *accept contents of Punnett square as F_1 genotypes*

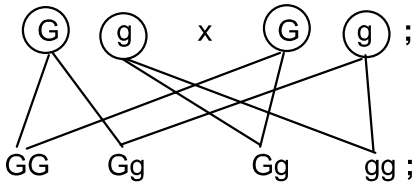
- *allow ecf if incorrect parental genotypes but only for gametes and F_1 to max 2*
- *allow ecf if no genotype for parent and gametes are wrong – allow F_1 and phenotype to max 2*

put ticks and crosses in a column on right hand side of answer

genotype of parents Gg x Gg ;

gametes (G) (g) x (G) (g) ;

lines must be correct for F_1 genotype mark



F_1 GG Gg Gg gg ;

phenotypes pale pale pale black ;

proportion 0.25 / ¼ / 25% / 1 in 4 ;

A 1 black to 3 pale but **(R)** 1 in 3 or 3:1 [5]

(e) (i) <u>mutation</u> ; [1]

(ii) UV light / (ionising) radiation / X rays / (named radioactive) chemical(s) ;
A nuclear fall out [max. 1]

[Total: 17]