

**MARK SCHEME for the May/June 2009 question paper
for the guidance of teachers**

5090 BIOLOGY

5090/02

Paper 2 (Theory), maximum raw mark 80

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Section A

- 1 (a) wilting/ed / flaccid (**R** plasmolysed) ; [1]
- (b) (i) *Mark the first, one per line from:*
 low humidity / dry air AW (**R** 'humidity') ;
 wind ;
 lack of (available) water / drought ;
high or raised temperature / hot / warm (**R** warmth, temp. unqualified) ; [max 2]
- (ii) (**A** even if condition is inaccurate)
evaporation / (evapo) transpiration ;
 water loss faster than rate of water uptake AW ;
 loss of water from cells (**R** plant) ;
 loss of turgor / flaccidity / ref. pressure AW (**R** plasmolysed) ;
 loss of support (**R** droop / wilt) ; [max 4]
- (c) (T.S. can score stoma size and labels only)
 (labels – in either drawing) guard cell(s) + stoma(ta) ;
 (drawings, must be 2) sausage shaped, touching at top and bottom in both ;
 larger stoma in left-hand drawing ; [3]
- 2 (a) $Dd \times Dd$ (**R** if wrong symbols used) ;
 $D \quad d \quad D \quad d$ (*) ;
 (* = **A** if correctly deduced from wrong cross) ;
 $DD \quad Dd \quad Dd \quad dd$ (*) ;
 1 : 2 : 1 (look for link with genotypes) ;
 3 : 1 ;
 + yellow : grey ;
 correct ref. gametes (**A** even if qualifying incorrect cross) ; [6]
- (b) DD (**A** e.c.f. for incorrect symbols) ;
 ref. 1 in 4 would be DD ;
 leaves ratio 2 yellow : 1 grey ; [3]
 (**A** explanation on diagram – accept on (a) so long as linked)
- 3 (a) (i) (*in either order – one per line, mark the first.*) Any **two** from :
 bacteria, fungi, protozoa / protocists, algae ; [2]
 (**A** named examples from different groups. For **one** mark max. **A** saprotrophs etc.)
- (ii) virus ;
 'live' only on living material / host AW / are not living / do not respire ; [2]
 (**A** they do not live there / do not cause decomposition)
- (b) any named ion / breakdown product of protein / fat / carbohydrate ;
 (**A** alcohol / CO₂) ;
 digestion / breakdown / decomposition + original substrate (named) ; [2]
 (**A** conversion) (**R** compost) (**A** nitrogen fixation)

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- (c) (i) respiration (of microorganisms) (R 'of compost') ;
releases energy / heat (A produces heat AW) ;
(R produces, makes etc.) ;
plenty of food / nutrients (or named) (R compost) (for microorganisms) ; [max 2]
- (ii) different microorganisms (thrive at different temperatures) ;
ref. to link between temperature and enzyme action ;
Any two from:
ref. effect of pH, lack of food, build-up of waste products, competition ; [max 2]
(R compost)
- 4 (a) (i) ureter (*accurate spelling*) ; [1]
- (ii) wave like / rhythmic AW ;
contraction of muscles (if named must be circular) ;
pushes urine (or description of) (R urea alone) ;
to bladder ; [max 3]
- (b) renal artery ;
C has thinner walls (or described) than D (o. r. a.) ;
C has wider (lumen AW) than D (o. r. a.) ; [3]
- (c) (water lost as) ref. sweat ;
more AW + urea (in urine) ;
blood concentration has to be maintained ;
more water (re)absorbed in kidneys / less water in urine / urine more
concentrated ; [max 3]
- 5 (a) penicillin or any other named antibiotic ; [1]
- (b) 1990 to 1994 (or any figure(s) within those dates) ; [1]
- (c) antibiotic treatment too readily / over-prescribed ;
antibiotic treatment withdrawn too early / did not finish the course ;
mutation or described ;
new varieties of bacteria ;
resistant AW (A tolerant) (R immune) ;
reproduction (of resistant strain) / ref. passing on genes ; [max 5]
- (d) (i) *Any two from:* no longer cured the disease AW, expensive (at higher dosage),
more effective treatment available, use different antibiotic ; [max 2]
- (ii) *Any two from:* different antibiotic, barrier nursing, antibacterials,
general cleanliness, vaccination, isolation, one OVP ; [2]

[Total: 50]

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Section B

- 6 (a) (i) (fats) carbon / (C) + hydrogen / (H) + oxygen / (O) ;
- (ii) (proteins) C + H + O + N (ignore other possibilities such as S) ; [2]
(A names)
- (b) (i) (carbohydrates) respiration (or process described) ;
energy + release (A source of, R words that imply production) ;
a named use of energy within the body ;
use for fibre or roughage / for gut peristalsis ;
- (ii) (vitamins) e.g. of **two** named vitamins ;;
function / deficiency symptom or disease linked to correct vitamin ;
- (iii) (water) solvent ;
medium for (R helps) chemical reactions / enzyme activity ;
transport medium ;
much of (AW) cell / body / blood content is water ;
(needed to replace that) lost in sweat / urine / breath ; [max 8]
(R simple references to temperature control)

[Total: 10]

- 7 (a) $C_6H_{12}O_6$ / glucose / hexose / monosaccharide / simple sugar (I yeast) ;
 $2C_2H_5OH + 2CO_2$ / alcohol or ethanol + carbon dioxide ; [2]
(I any refs. to energy)

- (b) (i) (breathing) fast(er) | A 'breathe more' for *one* mark ;
deep(er) | ;
(heart beat) fast(er) | A 'more' ;
 | for ;
more powerfully / larger stroke volume AW | *one* mark ;
(A ref. higher blood pressure) ;
faster circulation of blood ;
supplying more AW oxygen* / compensation for lower O_2 concentration ;
removing more AW carbon dioxide* ; [max 4]
[* or in (ii)]

- (ii) (muscles) increased + supplies of glucose (to muscles) ;
increased + work-rate (person) / contraction (muscle) ;
faster + respiration (in muscle cells) ;
more + energy ;
increased supply of O_2 [* or in (i)] ;
increased removal of CO_2 [* or in (i)] ;
delays lactic acid production / removes lactic acid ; [max 4]

[Total: 10]

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8E (a) (nitrates) reduced (to zero) protein / amino acid manufacture ;
 poor / stunted / restricted AW + growth (A no) ;
 (magnesium) yellow leaves / chlorosis ;
 less / no chlorophyll ; [max 3]

(b) thin + short distance for gases to move ;
 thin + ref. light penetration ;
 flat / broad / large surface area / rt. angles to sun + more (AW) light absorption ;
 (with large surface area, 'more' not required after +)
chloroplasts ;
 in mesophyll (or named) ;
 epidermis / cuticle + transparent for light entry ;
 stomata / pores + gas movement (I water vapour) ;
 air spaces + gaseous movement (I water vapour) ;
 by diffusion ;
 cell surfaces + large surface area for CO₂ entry ;
 presence of vein / v.b. / xylem + to bring water / phloem to remove products ; [max 7]

[Total: 10]

8O(a) long / microscopic or very small ;
 large surface area ;
increases / maximum + uptake ;
 water / ions / oxygen absorbed ;
 in contact with soil water / between soil particles ; [max 4]

(b) xylem ;
 brings water ;
 leaf cell contents more concentrated ;
 water leaves xylem by osmosis ;
 water (film) on (surfaces of mesophyll) cells ;
 evaporates + air spaces ;
 increased / high humidity inside leaf ;
 concentration gradient (or described) ;
diffusion ;
 through stomata / pores ; [max 6]

[Total: 10]