UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2008 question paper

0653 COMBINED SCIENCE

0653/02 Paper 2 (Core 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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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1 (a) (i) energy transfer ;

(ii) 2 producers and 6 consumers ;

(iii) all of them ; [1]

(b) (i) breaking down food / large molecules / compounds ;
so that it / they can be absorbed / more easily get into the blood ; [2]

(ii) by teeth / chewing / grinding / mechanical / physical digestion ;
by enzymes ;
(allow two marks for two enzymes with correct detail) [2]

(c) carbon dioxide from air (into plant leaf) ;
photosynthesis (in plant) ;
combines carbon dioxide with water ;
(produces glucose) in chloroplast ; [max 2]

[Total: 9]

2 (a) (i) arrows vertically downward and upward ;
labeled weight / gravitational pull and <u>upthrust</u> ; [2]

(ii) balanced (no mark)
ball isn't accelerating / decelerating / changing speed ; [1]

(b) 0.3 ; [1]

(c) (i) (up/down) motion / kinetic / movement energy of waves (produces movement) ;
which makes generator turn to produce electricity /
moves magnet in a coil / moves a turbine ; [2]

(ii) solar / sunlight ;
HEP ;
geothermal ;
wind ;
tides ;
biomass ; [max 1]

(d) UV ; [1]

(e) rays are straight lines ;
rays come to a focus somewhere between the line of incident rays; [2]

[Total: 10]

3 (a) (i) crude oil / petroleum ;

(ii) boiling point / boiling range / other correct ;

(iii) carbon dioxide ;
water ; [2]

(iv) reference to carbon dioxide (levels increasing / out of balance) ;
carbon dioxide able to trap (radiant) heat / description of process ;
reference to greenhouse effect / global warming ; [2 max]

(b) (i) **R** – nitrogen ;
S – oxygen ;
(allow one mark if both names given but reversed) [2]

(ii) (argon is a) noble gas / unreactive (with body tissue) / stable ;
atoms have full outer shell ; [2]

[Total: 10]

4 (a) (i) (speed =) distance ÷ time / (S =) D ÷ T ;
(accept recognised symbols but not units in the formula)
(= 100/14.4) = 6.94 (m/s) ; [2]

(ii) (acceleration =) change of speed ÷ time ;
(accept recognised symbols but not units in the formula)
(= 5 ÷ 3 =) 1.67 (m/s^2) ; [2]

(b) kinetic energy changes into potential (as she jumps up) ;
at top of jump only potential energy ;
potential energy changes to kinetic energy coming down ;
kinetic energy lost as sound/heat on landing ;
chemical energy to kinetic energy within a correct context ; [max 3]

[Total: 7]

5 (a) (i) insulin ;

(ii) pancreas ;

(iii) affects liver ;
which removes glucose (from the blood) ;
(liver) stores it as glycogen / changes it into glycogen (within liver) /
glycogen produced ; [max 2]

(b) (i) a lot of, energy / calories / kilojoules, in fat ;
lentils and rice mostly carbohydrate ;
less energy per gram in carbohydrates than fat ; [max 2]

(ii) stops blood getting to heart muscle ;
so heart muscle is short of oxygen / oxygenated blood;
general ref. to respiration ;
(implied heart) muscle stops working ; [max 2]

[Total: 8]

6 (a) (i) protons neutrons electrons ; [1]

(ii) atoms contain 12 protons ;
(reject 12 electrons)
and 12 neutrons ;
nucleus contains 24 nucleons ; [2 max]
(reject relative atomic mass is 24)

(b) (i) magnesium + oxygen → magnesium oxide ; [1]

(ii) magnesium oxide / MgO ;
metal bonded to non-metal ;
(accept description in terms of electron transfer) [2]

(c) (i) (**A**)
reaction is between metal and an acid ;
which produces hydrogen gas ; [2]

(ii) (element)
only contains one type of atom / only one kind of chemical symbol /
a compound is two or more elements
joined together / has a formula with more than one chemical symbol;
hydrogen / H is found in the Periodic Table ;
cannot be broken down simplified ; [1 max]

(iii) magnesium sulphate / (excess) sulphuric acid; [1]
(accept correct formulae of these substances)

[Total: 10]

7 **(a)** Geiger-Muller / GM tube (detector) / counter/scalar (measurer) / spark counter ;
(accept any detector even if non-quantitative)

(b) only dangerous if breathed in or ingested / ionising radiation ;
helium nuclei / large particles ;
highly ionising ;
(ionisation occurs when) electrons removed (from atoms or molecules) ;
damages / cells / DNA / causes mutations ;
causes cancer ;
kills cells ; [2 max]

(c) use ;
description ; [2]
e.g. sterilising hospital equipment ;
radiation destroys germs/bacteria on instruments ;
e.g. measurement of thicknesses ;
thickness related to % of radiation penetrating ;
e.g. use of radioisotopes in medical context / used in medicine / in hospitals ;
as tracers / selectively absorbed by organs for diagnosis or cure ;
(reject any ref. to weaponry)

[Total: 5]

8 **(a)** **(i)** **D** ;

(ii) **B** ;

(iii) **C** ;

(iv) **A** ; [4]

(b) **X** on sperm duct close to testis ; [1]
(allow anywhere from top of testis to where sperm duct goes behind bladder
but not on urethra)

(c) **(i)** labels to cell membrane ;
nucleus ;
cytoplasm ; [max 2]

(ii) tail for swimming ;
only 23 chromosomes / half usual number of chromosomes, so correct number after fertilisation ;
small size so less energy needed to swim ;
streamlined so that it can move more easily ;
enzymes in head to digest a way into the egg ; [max 2]

[Total: 9]

9 (a) (i) **A** ;
H or **G** ;

(b) (i) (calcium carbonate → calcium oxide +) carbon dioxide ; [1]
(CO_2 **not** acceptable as alternative)

(ii) (thermal) decomposition ; [1]

(iii) add (dilute) acid / further strong heat ;
bubbles of gas which turn limewater milky ;
then not all calcium carbonate has reacted/ora ; [3]

[Total: 7]

10 (a) (i) on
off
on ;; (all correct = 2, two correct = 1) [2]

(ii) cell/battery ; [1]

(b) 6 Ω and 4 Ω ;
in series ; [2]

[Total: 5]