

MARK SCHEME for the October/November 2008 question paper

0653 COMBINED SCIENCE

0653/03

Paper 3 (Extended 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.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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Page 2	Mark Scheme	Syllabus	Paper
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1 (a) (i) energy (transfer) ; [1]

(ii) energy lost between, organisms / levels / links in the chain ;
 detail of how it is lost ;
 not enough energy available to support, fifth link / predator of hawks ; [max 2]

(b) respiration (in insect) ;
 releases carbon dioxide (to the air) ;
 carbon dioxide absorbed by plant ;
 photosynthesis (in plant) ;
 combines carbon dioxide with water ;
 (produces glucose) in chloroplast ;

alternative starting point:

insect dies and, is decomposed/decays ;
 respiration (of decomposers) ;

then points 2 onward as above [max 4]

[Total: 7]

2 (a) black surfaces are better absorbers ;
 of, radiation / heat ;
 more heat means, particles move faster / bigger temperature rise ; [max 2]

(b) rays drawn as straight lines ;
 rays of light come together to a focus ; [2]

(c) (up/down) motion / kinetic energy, of waves ;
 makes generator / dynamo / magnet in coil, turn (to produce electricity) ; [2]

(d) measure mass and volume ;
 by using Eureka can / displacement method described ;
 divide mass by volume ; [3]

[Total: 9]

Page 3	Mark Scheme	Syllabus	Paper
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- 3 (a) 12 protons labelled and 12 neutrons labelled ;
electrons shown in three energy levels 2, 8, 2 ; [max 2]
- (b) (i) magnesium *ions* (are involved) ;
(magnesium ions) gain two electrons each ; [2]
- (ii) reference to charge balance / two negative charges on two chlorides
are needed to balance the double positive on magnesium ; [1]
- (c) (i) magnesium (atoms), become positive ions / lose electrons ;
electron loss is oxidation ; [2]
- (ii) H⁺ ions are reacting / concentration of H⁺ ions is decreasing / hydrogen is lost ;
the lower the H⁺ concentration the higher the pH ; [2]

[Total: 9]

- 4 (a) (i) **A** urethra ;
B bladder ; [2]
- (ii) **C** – carries urine (from kidneys to bladder) ;
D – makes sperm ; [2]
- (iii) **X** on sperm duct ; [1]
- (b) if environment changes ;
example – disease / predator / change in climate ;
some individuals may survive / not all will be killed ;
because they have advantageous characteristics ;
can breed and pass on these characteristics to their offspring ;
- idea that genetic disease may not be passed to offspring ; [max 3]

[Total: 8]

Page 4	Mark Scheme	Syllabus	Paper
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- 5 (a) (i) crude oil / petroleum (extracted from Earth) ;
oil is, refined / made into simpler mixtures ;
by fractional distillation ;
oil is heated ;
different products, distil / are collected, according to boiling point /
at different positions ; [max 2]
- (ii) $(13 \times 12) + (28 \times 1)$;
= 184 ; [2]
- (b) (i) gas **S** because it is oxygen ; [1]
- (ii) carbon / soot ;
results from incomplete combustion ; [2]
- (iii) reference to carbon monoxide / nitrogen dioxide ;
toxic / detail e.g. (CO) attaches to haemoglobin ; [2]
- [Total: 9]
- 6 (a) working ;
55 s plus or minus 2 ; [2]
- (b) same number of protons but different number of neutrons ; [1]
- (c) dangerous when, ingested / breathed in / inside the body ;
highly ionising ;
because, large mass / large charge / large particle / is helium nucleus ;
removes electrons ;
damages DNA / causes mutations ;
causes cancer ;
destroys / damages, cells ; [max 4]
- [Total: 7]

Page 5	Mark Scheme	Syllabus	Paper
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- 7 (a) keeping constant / keeping stable / maintaining ;
internal environment / environment of cells / conditions in the body ;
another example, e.g. temperature / water / salt ; [max 2]
- (b) (i) insulin ; [1]
- (ii) affects liver ;
which removes glucose from the blood ;
stores it as glycogen / glucose converted to glycogen ; [max 2]
- (c) higher concentration (of sugar) outside cell than inside ;
(cell) membrane is partially permeable ;
so water moves out of cells ;
cells, short of water / shrink / dehydrated ; [max 2]
- (d) (i) a lot of, energy / calories / kilojoules, in fat ;
lentils and rice mostly, carbohydrate / starch ;
less energy per gram in carbohydrates than fat ; [max 2]
- (ii) fatty diet linked to development of (coronary) heart disease ;
build up of cholesterol in arteries ;
blockage of coronary artery ;
stops oxygen getting to heart (muscle) ;
heart muscle stops working ; [max 2]
- [Total: 11]**

- 8 (a) **B, C or D ;**
A ; [2]
- (b) (i) calcium carbonate → calcium oxide + carbon dioxide;
all formulae in equation match words and are correct ;
 $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$; [3]
- (ii) limewater / calcium hydroxide (solution), goes cloudy; [1]
- (iii) add (dilute) acid / heat further ;
if (more) gas is produced then not all calcium carbonate has reacted / ora ; [2]
- (iv) soil is too acidic / pH too low (for the intended crop)/calcium carbonate reacts with
excess acid / neutralises ; [1]
- [Total: 9]**

Page 6	Mark Scheme	Syllabus	Paper
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- 9 (a) (i) $6\ \Omega$ and $4\ \Omega$ in series ; [1]
- (ii) $6\ \Omega$ and $6\ \Omega$;
in parallel ;
 $1/R = 1/6 + 1/6 = 2/6$; [3]
- (b) (i) increase magnetic field ;
turn coil faster ;
increase number of turns ; [max 2]
- (ii) sine wave above and below x axis ;
(approx) constant amplitude ;
five waves ; [3]
- (c) contract, in winter/when cold ;
cables pulled closer together / explanation of damage caused / increased tension ; [2]

[Total: 11]