CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2013 series

0653 COMBINED SCIENCE

0653/33 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, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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1 **(a)** **(i)** **A** to cell membrane ;
B to cell wall / large vacuole ;

(ii) functions are uptake of water and mineral ions ;
partially permeable membrane allows (water to enter) by osmosis ;
has large surface area ;
increases (rate of) uptake (of water / mineral ions) ; [max 3]

(b) **(i)** water moved up through the stem / stalk ;
through xylem vessels ;
reference to transpiration ;
description of transpiration ;
veins contain xylem vessels ; [max 2]

(ii) slower rate of transpiration ;
water pulled up xylem / stem / stalk more slowly ;
ref. to decrease in rate of evaporation / diffusion, at lower temperature ;
particles / water molecules, have less kinetic energy / move more slowly ; [max 3]

[Total: 10]

2 **(a)** two of oxygen sulfur fluorine ;
both elements are non-metals / implication of non-metallic character ; [2]

(b) PH_3; / H_3P ;
hydrogen atoms have electron configuration of 1 ;
atoms share (pairs) of electrons ;
so that each has filled shells ;
(correct bonding diagram scores max2 of last three points) [max 3]

(c) barium, magnesium, chloride,(allow hydrogen) ;;
(all 3 for 2 marks any 2 for 1 mark max 1 if sulfate suggested) [2]

(d) **Q**
hydrogen
P ;

Q more reactive than **H** because able to remove oxygen from it / owtte ;
P less reactive than **H** since unable to separate oxygen from it / owtte ; [3]

[Total: 10]

3 **(a)** decreases ;
decreases ;

(b) length ;
diameter ; [2]

(c) **(i)** (power =) voltage x current ;
= 3 × 0.6 = 1.8W ; [2]

(ii) work = force × distance and power = work/time ;
= 40 × 1.2/36 ;
1.33W ; [3]

(iii) energy lost (as heat /sound) ; [1]

(iv) efficiency = 1.33/1.8 × 100 ;
73.88% / 0.74 ; [2]

[Total: 11]

4 **(a)** **(i)** bacteria / Lactobacillus / Streptococcus ; [1]

(ii) to speed up the production of yoghurt ;
microorganisms work faster / better (at higher temperature) ;
ref. to optimum temperature for enzymes ; [max 2]

(b) **(i)** increased ;
use of data e.g. from 0.15% to 0.31% / by 0.16% ;
description of the variation in rate
e.g. rate of increase slowed after 6 hours ; [max 2]

(ii) added sugar increases the amount of lactic acid / fermentation /
rate of reaction / use of data to illustrate this ;
(microorganisms) convert sugar to lactic acid ;
more sugar increases rate of production of lactic acid ; [max2]

(c) area too small to support populations / reduction in biodiversity / extinction /
species become endangered / lack of opportunity to find new medicines ;
due to reduction of habitat ;

flooding / leaching of minerals ;
due to rain falling directly on soil / lack of protection of tree canopy / increased runoff ;

soil erosion ;
due to lack of tree roots ;

drought ;
due to lack of transpiration by trees to form rain (leading to desertification) ;

CO_2 levels in the atmosphere increase ;
due to fewer trees to photosynthesise/ less photosynthesis to remove carbon dioxide ;
also due to burning trees produce CO_2 / rotting trees produce CO_2 by respiration of microbe

carbon dioxide traps long-wave radiation / infra-red / heat / thermal energy /is a greenhouse gas ;
reduces rate of loss of heat from the Earth's surface / increases global warming ;

[Total: 11]

5 **(a)** pass gas into limewater ;
goes cloudy / milky / precipitate forms ; [2]

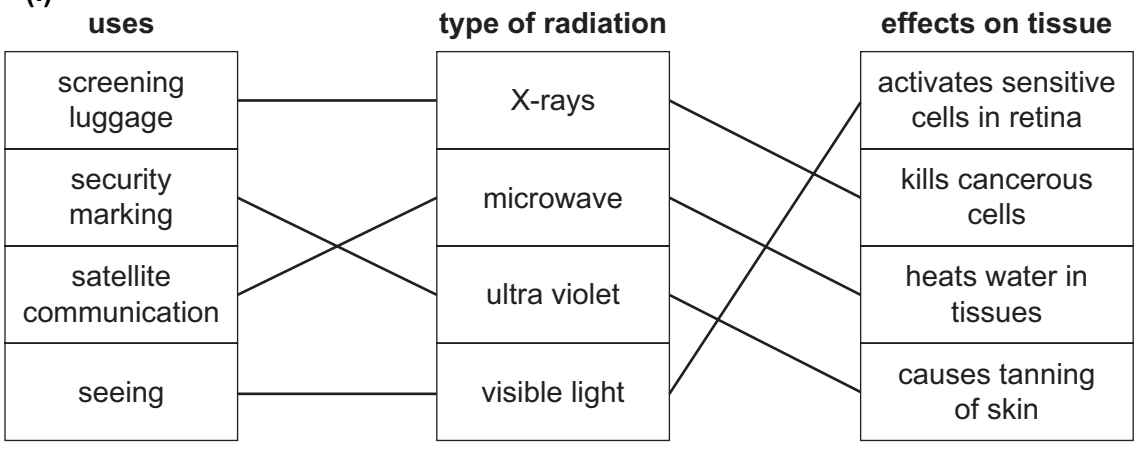
(b) **(i)** the greater the acid concentration the higher the rate ;
ref. to direct proportionality ; [2]

(ii) ref. to reaction occurring as the result of particle collisions /
ref. to the identity of colliding particles ;
higher concentration means higher frequency of collision ; [2]

(iii) temperature affects rate of reaction ;
so control needed so rate investigation data is valid / ref. to fair test ;
additional collision theory detail related to rate ; [max 2]

[Total: 8]

6 **(a)** **(i)**



[4]

(ii) wave speed ; [1]

(b) waves are reflected along fibre ;
reference to total internal (reflection) ;
angle (of incidence) is greater than critical angle ;
no light escapes ; [max 2]

(c) **(i)** two rays reflected at the mirror entering the eye with angles correct by inspection ; [1]

(ii) two construction lines drawn back from the mirror locating **X** ;
X labelled in correct position by inspection ; [2]

[Total: 10]

7 **(a)** **(i)** **A** trachea ;
B lung ; [2]

(b) **(i)** (net) movement of molecules ;
from region of high concentration to low concentration /
down a concentration gradient ; [2]

(ii) more energy used / more muscle contraction ;
reference to (more / faster) respiration ;
so more carbon dioxide produced (in cells) ;
so greater diffusion gradient (from cells to blood) ; [max 3]

[Total: 7]

8 **(a)** **(i)** C_8H_{18} ; [1]

(ii) it is a <u>hydrocarbon</u> containing only single bonds / a saturated <u>hydrocarbon</u> / it conforms to the general formula C_nH_{2n+2} ; [1]

(b) molecules in gasoline (on average) are smaller / lighter ;
so attractive forces between molecules in gasoline are lower ;
so less energy needed to separate molecules (in gasoline) ;
so are less entangled (than in diesel) ; [max 2]

(c) **(i)** orange solution becomes colourless ; [1]

(ii) addition ; [1]

(iii) $C_2H_4 + 3O_2 \longrightarrow 2CO_2 + 2H_2O$;;; [3]
(LHS formulae; RHS formulae; then balanced)

[Total: 9]

9 **(a)** **(i)** KE = ½ mv^2 ;
= ½ × 400 × 5 × 5 = 5000J ;

(ii) not moving ; [1]

(b) heat transferred from hands / body to sweat / heat absorbed by sweat from golfer's hands / body/heat energy in hands / body reduced by sweating ;

kinetic energy of water molecules increases / water molecules move faster ;

faster moving / more energetic (water) molecules escape / leave the surface / water (sweat) molecules turn to gas/vapour ;

ref. to break bonds /break forces of attraction between molecules ;

(KE) / energy of (remaining) water molecules (in sweat) decreases ; [max 2]