UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2007 question paper

0654 CO-ORDINATED SCIENCES

0654/02 Paper 2 (Core Theory), maximum raw mark 100

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.

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1 (a)

state	molecules have least energy	molecules have most energy	molecules are least strongly attracted to each other	molecules occupy fixed positions
ice	✓			✓
water				
steam		✓	✓	

one mark for each vertical column correct; [4]

(b) molecules leave surface;
faster molecules; [2]

(c) density = mass / volume = 7.36/8;
= 0.92 g / cm^3; [2]

2 (a) X anywhere within a lung; [1]

(b) (i) group of cells;
similar structure / carrying out the same function; [2]

(ii) Y in trachea or bronchus; [1]

(iii) goblet cells make mucus;
mucus traps, bacteria / viruses / particles;
cilia sweep them (upwards); [max. 2]

(c) (i) arrow from space in alveolus and into capillary / a red blood cell; [1]

(ii) diffusion; [1]

(iii) thin walls;
so diffusion happens quickly;

large surface area;
so more gas exchange at the same time;

blood takes oxygen away / brings carbon dioxide;
so a diffusion gradient is maintained; [max. 2]

3 **(a)** unreactive;
malleable;
electrical conductor;

(b) **(i)** 1; [1]

(ii) carbon dioxide; [1]

(iii) copper oxide + carbon $\rightarrow$ copper + carbon dioxide;; [2]

(c) (relatively) unreactive;
higher density;
forms coloured compounds (other than white);
transition metals and their compounds can be catalysts;
higher mpts / bpts; [max. 2]

4 **(a)** **(i)** forces are balanced / equal and opposite; [1]

(ii) distance travelled = speed × time;
20 × 30 = 600 m; [2]

(iii) work = force × distance;
= 800 × 600 J = 480 000 J; [2]

(b) 1.2 seconds;
reaction time / explain from graph; [2]

(c) **(i)** vibrations / compressions and rarefactions;
of air molecules / particles; [2]

(ii) louder; [1]

(d) **(i)** speed / transverse waves; [1]

(ii) wavelength / frequency; [1]

5 **(a)** **(i)** A;

(ii) Q;

(b) lubricating / reducing friction; [1]

(c) bone is harder than cartilage / bone does not bend as easily;
idea that bone is supportive;
idea that cartilage cushions joints or function related to bending;
protects named vital organ; [max. 3]

6 **(a)** **(i)** 24; [1]

(ii) many glucose molecules / monomers have linked together;
to form a long chain / a polymer is a long chain molecule; [2]

(b) **(i)** it contains elements other than C H and O / contains S and or N; [1]

(ii) would form sulphur dioxide when fuel burns;
sulphur dioxide harmful to humans / example;
sulphur dioxide corrosive / example; [3]

(c) **(i)** to relieve pain / if they had a headache / owtte; [1]

(ii) any sensible answer
e.g. so that people are not harmed by impurities /
action of drug known but not impurities; [1]

7 **(a)** **(i)** oxygen;

(ii) causes global warming / greenhouse effect / or description;

(b) **(i)** cannot be replaced / can only be used once; [1]

(ii) wind / sun / hydro / tidal / geothermal / waves / biomass etc.; [1]

(c) 60% of the energy in gas is transferred to heat the water etc.; [1]

(d) **(i)** transformer; [1]

(ii) reduce energy losses; [1]

(e) **(i)** a mixture of two or more metals; [1]

(ii) stronger / less likely to corrode / less reactive etc.; [1]

8 **(a)** **(i)** nucleus; [1]

(ii) DNA; [1]

(b) **(i)** change in, genes / chromosomes / DNA; [1]

(ii) it increases;
more steeply at higher X-ray doses; [2]

(iii) 6; [1]

(iv) ionising radiation;
removes electrons / damages DNA; [2]

(c) **(i)** 4; [1]

(ii) 7; (allow ecf) [1]

9 **(a)** filtration;
sedimentation / treatment with aluminium sulphate;
sterilisation / boiling / treatment with chlorine / ozone;
distillation; [max. 3]

(b) **(i)** calcium / magnesium; [1]

(ii) water (during water cycle) flows over different types of rock /
different salts dissolve from different types of rock; [1]

(iii) water and soap mixed / shaken;
if hard scum forms / little (or no) lather / excessive soap needed for lather; [2]

(iv) boil the water;
distillation;
use of ion exchange resin;
other correct; [max. 1]

(c) **(i)** sodium ion has a positive charge a sodium atom is uncharged;
because sodium ion has one less electron than sodium atom; [2]

(ii) (for both) the higher the temperature the higher the solubility;
solubility of KC*l* more sensitive to temperature / owtte; [2]

(iii) 33 ± 1 °C; [1]

10 **(a)** **(i)** electron; [1]

(ii) coulomb; [1]

(b) **(i)** greater than 40 Ω; [1]

(ii) less current flows; [1]

(c) **(i)** V = I × R; [1]

(ii) 12 V; [1]

(iii) 12 V; [1]

11 **(a)** caterpillars;

(b) sharp beak / sharp claws;
to, hold / kill, prey;
(accept other correct answers) [2]

(c) **(i)** photosynthesis; [1]

(ii) chlorophyll; [1]

(d) water enters roots by osmosis;
transpiration (from leaves);
reduces pressure;
water moves up xylem;
down pressure gradient; [max. 3]