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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

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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]

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

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

(ii) carbon dioxide; [1]

(iii) copper oxide + carbon → 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]

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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]

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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]

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

(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]

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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]