UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2007 question paper

0654 CO-ORDINATED SCIENCE

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

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International Examinations

1 **(a)** coulombs;
current;
potential difference;
parallel; [4]

(b) **(i)** R = V / I ;
= 0.3/0.4; = 0.75 Ω; [2]

(ii) charge = current x time ;
= 0.4 x 60 = 24C; [2]

2 **(a)** **(i)** fractional distillation; [1]

(ii) lubricants / waxes / plastics / drugs / solvents / other correct; [1]

(iii) cool / pressurise; [1]

(b) carbon dioxide;
water / steam; [2]

3 **(a)** produces milk;
hair; [2]

(b) **(i)** growth / repair / named substance (e.g. enzymes); [1]

(ii) energy / insulation; [1]

(iii) forming, bones / teeth; [1]

(c) **(i)** no horns; [1]

(ii)

parents bull with no horns cow with no horns

Aa .....Aa.....

gametes (A) and (a) (A) and (a)

offspring male gametes

female gametes	A	a
A	AA no horns	Aa no horns
a	Aa no horns	aa has horns

chance of the calf having horns is 1 in 4 / 25 % ; [4]

4 **(a)** **(i)** time taken for half the atoms (in sample) to decay / time taken for count rate (of sample) to halve; [1]

(ii) has shorter half-life / decays faster;
therefore less radiation emitted / exposed for less time;
no beta emission / only emits gamma;
beta is more ionising (or description); [Max 3]

(b) **(i)** radiation can cause cancer / reference to ionization etc; [1]

(ii) gloves;
radiation badge;
protective clothing;
lead shielding; [Max 1]

5 **(a)** row of elements / elements in a line across the table / horizontal row of elements / elements whose atoms have the same number of electron shells; [1]

(b) **(i)** (**Q**)
protons are positive, electrons are negative;
more protons than electrons; [2]

(ii) (**R**)
(atoms have) same number of protons as electrons/ 17 p and 17 e;
nucleon number is sum of protons and neutrons / 17 + 18 = 35; [2]

(iii) atom 3;
outer shell electrons = group number; [2]

(c) **(i)** giant / lattice ; [1]

(ii) dissolve / melt;
electrolyse;
other correct detail of electrolysis; [max 2]

6 **(a)** **A** attracts insects;
B produces pollen/male gametes;
C accepts pollen/where pollination occurs; [3]

(b) sexual because, gametes / pollen / fertilisation / zygote, are involved; [1]

(c) a seed ; [1]

(d) drawing shows a fruit with features that would favour dispersal by animals (e.g. hooks, edible flesh);
labels indicate how the fruit would be dispersed (e.g. stick to fur, flesh eaten);
detail of dispersal (e.g. drops off fur, seeds egested); [3]

(e) **(i)** air, water and light;
all three correct for two marks; two correct for one mark
if soil included, minus one mark [2]

(ii) temperature / age of seeds; [1]

7 **(a)** **(i)** **C** & **D**; [1]

(ii) **A**; [1]

(iii) **B**; [1]

(b) **(i)** $\frac{\text{distance moved}}{\text{time taken}} = \frac{320}{20} = 16\ \text{m/s}$ [1]

(ii) KE = ½ mv^2;
= ½ x 1000 x 16 x 16 = 128 000 J; [2]

(c) **(i)** current = power / voltage;
= 60 / 12 = 5 A; [2]

(ii) 60 J; [1]

8 **(a)** **(i)** **D**;
highest pH (after reaction) / least acid remaining after reaction; [2]

(ii) **A**;
carbon dioxide produced;
colourless solution / magnesium not a transition metal; [max 2]

(iii) **D**;
blue solution formed / copper solutions can be blue;
no gas / oxides do not produce gas with acid; [max 2]

(b) fuel contains sulphur / sulphur compounds;
sulphur oxidises / burns to sulphur dioxide;
sulphur dioxide reacts and dissolves in water / rain; [max 2]

(c) add barium chloride / ethanoate / nitrate;
white precipitate / solid forms; [2]

9 **(a)** palisade (mesophyll) ; [1]

(b) chloroplasts ;
contain chlorophyll ;
absorb sunlight energy ; [max 2]

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

(ii) **C**;
water moves, from high <u>water</u> concentration to low / from low concentration to high; [2]

(d) root hairs;
xylem;
transpiration; [3]

(e) turgor – cells push outwards on one another;
xylem / lignin – provide strength; [2]

(f) **(i)** amylase / ptyalin; [1]

(ii) sugar / maltose / glucose; [1]

10 (a) vibration;
of water molecules/particles;
(accept compressions and rarefactions); [2]

(b) transverse;
wave motion is at right angles to direction of
movement of medium; [2]

(c) some molecules move faster than others/have more energy than others;
fastest can escape / particles with enough energy can escape;
overcome forces of attraction;
caused by heat;
particles near surface escape; [max 2]

(d) (i) straight line leaving the liquid;
bending away from normal; [2]

(ii) refraction; [1]

11 (a) hydrogen;
oxygen; [2]

(b) (i) nitrogen is too unreactive / bond in nitrogen molecule very strong; [1]

(ii) amino acid molecules link into long chains / polymerise; [1]

(c) weathering agent;
detail of what happens; [2]

e.g. ice forms in tiny cracks in surface;
expansion causes cracks to enlarge;

(d) (i) calcium / magnesium / iron; [1]

(ii) 4;
the lower the hardness the less soap is needed for a lather /
experiment 4 requires the least soap; [2]