

MARK SCHEME for the October/November 2007 question paper

0654 CO-ORDINATED SCIENCE

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) coulombs;
current;
potential difference;
parallel; [4]
- (b) (i) $R = V / I$;
 $= 0.3/0.4; = 0.75 \Omega$; [2]
- (ii) charge = current x time ;
 $= 0.4 \times 60 = 24C$; [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

(A)

(a)

female gametes

(A)

(a)

| | |
|----------------|-----------------|
| AA no horns | Aa no horns |
| Aa no horns | aa has horns |

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

[4]

| Page 4 | Mark Scheme | Syllabus | Paper |
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- 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]

| Page 5 | Mark Scheme | Syllabus | Paper |
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- 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) $\text{KE} = \frac{1}{2} mv^2$;
 $= \frac{1}{2} \times 1000 \times 16 \times 16 = 128\,000 \text{ J}$; [2]
- (c) (i) current = power / voltage;
 $= 60 / 12 = 5 \text{ A}$; [2]
- (ii) 60 J; [1]

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- 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 water 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]

| Page 7 | Mark Scheme | Syllabus | Paper |
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- 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]