

## **MARK SCHEME for the May/June 2007 question paper**

### **0653 COMBINED SCIENCE**

**0653/03**

Paper 3 (Extended Theory), maximum raw mark 80

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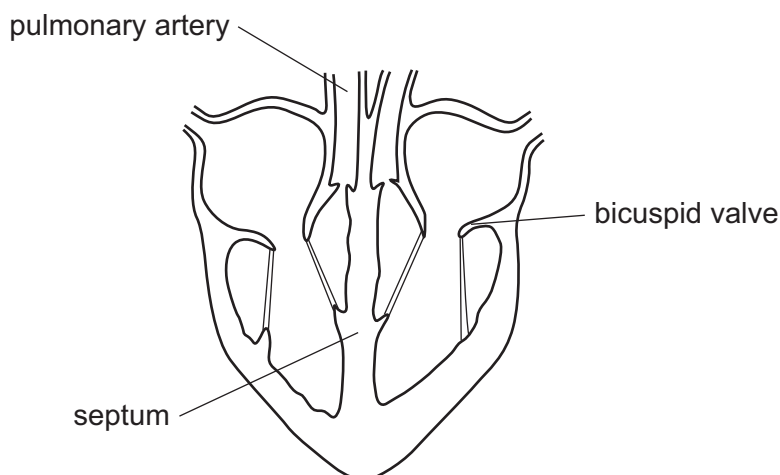
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1 (a) one mark for each correct label ; ; ;



[3]

(b) contains more muscle ;  
to provide, more force / high(er) pressure ;  
to push blood further round the body ;  
right ventricle only pushes blood to lungs ;

[max 2]

(c) aorta wall is thicker ;  
aorta lumen is smaller ;  
aorta wall is more elastic ;  
vein has valves ;

[max 2]

(d) muscle does not get oxygen ;  
so cannot respire ;  
so cannot contract ;

[max 2]

2 (a)  $A_2 = 0.015 \text{ A}$   
 $A_3 = 0.15 \text{ A}$  ;  
 $V_1 = 3 \text{ V}$  ;  
 $V_2 = 3 \text{ V}$  ;

[2]

(b) (i)  $V_p/V_s = N_p/N_s$  ; (or rearranged)  
 $25\ 000 / 400\ 000 = 20\ 000 / N_s$  ; (or alternative working method)  
 $(N_s) = 320\ 000$  ;

[3]

(ii) changing current causes changing magnetic field ;  
changing magnetic field induces voltage in secondary coil ;

[2]

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- 3 (a) in mixture:  
(particles / molecules) of the different gases are not bonded /  
gases have the same (chemical) properties as when not mixed /  
any proportions are possible /  
can be separated by physical methods ; [1]
- (b) (i) carbon monoxide / steam ;  
carbon / soot ; [2]
- (ii) shake with limewater ;  
goes cloudy ;  
shows carbon dioxide ;
- test with, cobalt chloride (paper) / anhydrous copper sulfate ;  
goes from, blue to pink / white to blue ;  
shows water ; [max 4]
- (c) (i) KOH ; [1]
- (ii)  $H^+ + OH^- \longrightarrow H_2O$  ; ; (left hand side and right hand side) [2]
- 4 (a) more species in the rainforest ;  
of plants and bats / figures quoted ; [2]
- (b) 14 species found only in the rainforest ; [1]
- (c) bats go to flowers for nectar ;  
pollination ; (not 'pollen dispersed')  
ref. to fertilisation following pollination ;  
beans form after, fertilisation / pollination ; [max 2]
- (d) stops rain hitting the ground directly ;  
more roots to soak up the water ;  
less run-off ;  
roots hold the soil ; [max 2]
- (e) (i) it reduces the number of pods infected ;  
compared with, the control / no treatment ;  
but does not completely eliminate infection / use of figures ; [max 2]
- (ii) takes time for the b.c. fungus to work ;  
any other relevant suggestion (related to a particular stage of the curve) ; [2]

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- 5 (a) (i) **B** because the line is horizontal ; [1]
- (ii) change of speed = 0 to 28 s /  $a = (v-u)/t$  ;  
1.4 m/s<sup>2</sup> ; [2]
- (iii) force = mass x acceleration ;  
= 1400 x 1.4 = 1960 N ; [2]
- (iv) working ;  
1036 m ; [2]
- (b) (i) road material expands when hot ; [1]
- (ii) rubber, can be compressed / is elastic / can stretch ; [1]
- (c) (less) explanation relating to resistances in parallel ; [1]
- 6 (a) any group 1 or calcium / strontium / barium ;  
reference to hydrogen ;  
(only) these metals produce hydrogen (rapidly) / at room temp / in cold water, when they  
react with water ; [3]
- (b) (i) oxidation / redox ; [1]
- (ii) oxygen / water / substances from the air, have reacted with the, iron / steel ;  
rust is (hydrated) iron oxide ;  
ref. to the combined mass of iron and other substances ; [max 2]
- 7 (a) similar shape with optimum at lower temperature ; [1]
- (b) as temperature rises (below optimum) movement of molecules increases ;  
more frequent collisions / more energetic collisions ;  
between enzyme and substrate ;  
  
beyond optimum enzymes denature ;  
they are proteins ;  
lose their shape at high temperatures ; [max 4]
- (c) plant cells at lower temperatures / plant enzymes work better where they live ; [1]

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- 8 (a) (i) infra-red / microwaves ; [1]
- (ii) 300 000 000 m/s ; [1]
- (iii) frequency / wavelength ; [1]
- (b) (i) breakdown of an (unstable) nucleus ; [1]
- (ii) Geiger-Müller tube ; [1]
- (iii) moves, towards negative plate / away from positive plate ;  
 moves, towards positive plate / away from negative plate ;  
 unaffected by plates ; [3]
- (iv) ionises ;  
 damages cells or DNA or mutates ;  
 cancer ;  
 skin burns ;  
 radiation sickness ; [max 2]
- 9 (a) (i) bromine ; [1]
- (ii) to form an electrolyte / to melt the lead bromide ;  
 enables ions to move ;  
 so that an electric current will flow through it ; [max 2]
- (b) (i) +2 ;  
 two -1 bromide ions balance the charge on the lead ion ; [2]
- (ii) (36) because bromine atom has 35 electrons / same number of electrons as proton number ;  
 has gained one electron / has single negative charge so one extra electron ; [2]
- (c) (i) shared pair ;  
 all other non-bonding electrons shown ; [2]
- (ii)  $\text{Si} + 2\text{Cl}_2 \longrightarrow \text{SiCl}_4$  ; ; (formula and balanced) [2]