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COMBINED SCIENCE

0653/32

Paper 3 Extended Theory

October/November 2016

MARK SCHEME

Maximum Mark: 80

Published

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- 1 (a) (i) X-rays (no mark)
reference to highest frequency / $v = f\lambda$ / as f increases, λ decreases ; [1]

(ii)

	X-rays	ultra-violet		infra-red		radio waves
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radio (waves) in correct box ; [1]

- (b) (i) 3×10^8 m/s because all e/m waves travel at same speed ; [1]

- (ii) $v = f\lambda$;
 $\lambda = 3 \times 10^8 / 200 \times 10^6 = 1.5$ (m) ; [2]

- (c) (i) kinetic ;
sound ; [2]

- (ii) (higher pitch) A **and** (larger amplitude) A ; [1]

- (d) closer together in compression / further apart in rarefaction ; [1]

- 2 (a) atomic / proton (number) ; [1]

- (b) (i) F ;
H ;
B, E, F (any order) ; [3]

- (ii) high density ;
high melting point ;
coloured compounds ;
(act as) catalysts ;
(also allow any general metal property) [max 2]

- (c) $3+ / Al^{3+}$;
 $2- / O^{2-}$; [2]

- (d) Mg_3N_2 ; [1]

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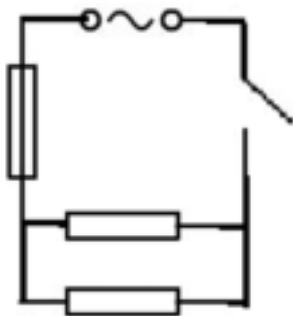
- 3 (a) from the top, label lines going to
the nucleus ;
the cell membrane ;
the cytoplasm ; [3]

- (b) (i) contains chloroplasts ;
which contain chlorophyll ;
which trap sunlight/absorb light energy ;
and turn light energy into chemical energy ; [max 2]

- (ii) $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
formulae ;
balancing ; [2]

- 4 (a) (i) length ; [1]

(ii)



- a.c. supply, fuse, resistor, switch symbols ;;
(any 2 correct, 1 mark; all 4 correct 2 marks)
resistors in parallel ;
supply, switch, fuse all in series, fuse controlling both parallel branches ; [4]

- (b) distance between molecules in gas greater than in liquid ;
reference to increase in (steam) pressure/pressure forces steam out ; [2]

- (c) metals expand on heating ;
brass expands more than steel ;
so bends and breaks contact ; [max 2]

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- 5** (a) stopwatch / timer ; [1]
- (b) (i) CO₂/gas produced/lost from the reaction ;
CaCO₃ used up/no CaCO₃ left ; [2]
- (ii) steeper initial line starting at same point ;
levels off at same mass ; [2]
- (iii) increases ;
more effective/successful collisions between particles /
particles collide more often/more chance of collisions ;
[max1] if no reference to both particles and collisions [2]
- (c) (1st) filtration ;
(2nd) evaporation/heating/crystallisation ; [2]
- (d) (1st) chlorine and calcium identified ;
(2nd) at correct electrodes ; [2]
- 6** (a) (i) arrow drawn going from plasma into alveolus ; [1]
- (ii) thin wall ;
good blood supply/many capillaries ;
large surface area (of alveolus) ;
moist surface ; [max 2]
- (b) (i) 0.6 dm³ ; [1]
- (ii) (0.6 × 3 =) 1.8 (dm³) ; [1]
- (c) (i) became faster ;
became deeper/owtte ; [2]
- (ii) to get more oxygen (to the cells) ;
for respiration ;
to release energy/for muscle contraction ;
to remove carbon dioxide more quickly ; [max 3]

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- 7 (a) weight of ball (+ cords) ;
effect of Earth's gravitational field (*accept* gravity) on mass of ball etc ;
(*allow* both marks if second point is made without first) [2]
- (b) (i) (total) upward force increases in proportion to / with extension / in accordance with Hooke's Law ; [1]
- (ii) 100 (N) ;
when cords are fully stretched, no further movement / change in length / forces balanced ; [2]
- (c) (i) $(KE =) \frac{1}{2} mv^2 / \frac{1}{2} \times 0.055 \times (20)^2 ;$
= 11 (J) ; [2]
- (ii) PE gained = KE lost = $mgh / h = 11 \div (0.055 \times 10) ;$
= 20 (m) ; [2]
- 8 (a) wood ; [1]
- (b) (i) reference to difference in molecular size ;
reference to difference in intermolecular forces (of attraction) ; [2]
- (ii) C_8H_{18} ; [1]
- (iii) cracking ; [1]
- (iv) test bromine / bromine water ;
propene result decolourises
and
octane result no change ; [2]

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- 9 (a) Sun ;
environment ;
water flea ;
turtle ; [4]
- (b) two food chains correctly written (at least as far as the small fish) showing small fish in different trophic levels ;
ref. to small fish at level 3 or 4 in the chosen food chains ; [3]
- (c) eutrophication ;
reference to
increased algal / surface plant growth ;
restricted light ;
failure of photosynthesis (in underwater plants) ;
death / decomposition of underwater plants ;
removal of oxygen from water (by respiring decomposers) ;
death / suffocation of underwater animals ; [max 2]