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Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

0653/33

Paper 3 Extended Theory

October/November 2016

MARK SCHEME

Maximum Mark: 80

Published

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- 1 (a) (i) work done = force $\times$ distance / $F \times d / 300 \times 0.4$;
= 120 ;
J ; [3]
- (ii) 120 (J) ;
allow ecf from (i) [1]
- (b) (i) $KE = \frac{1}{2} mv^2 / \frac{1}{2} \times 0.1 \times (30)^2$;
= 45 (J) ; [2]
- (ii) efficiency = energy out / energy in $\times 100$ (or equivalent) ;
= $(45 / 120) \times 100 = 37.5$ (%) ; [2]
- (iii) (slowed down by) air resistance / friction / other reasonable opposing force ; [1]
- 2 (a) (i) stopwatch / timer ; [1]
- (ii) calcium / Ca ; [1]
- (b) *concentration*
higher concentration increases speed / less time for the reaction ;
higher number of particles / particles are closer together ;
(so) particles collide more often ;
temperature
Higher temp increases speed / less time for the reaction ;
particles have more energy / are moving faster ;
(so) particles collide more often / particles collide with more energy /
more successful collisions ; [max 4]
- (c) calcium
magnesium
zinc
iron
copper ;
all 5 correct [1]
- (d) (test-tube A) tin is less reactive than magnesium ;
(test-tube B) lead is more reactive than copper ; [2]

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- 3 (a) (i) blood passes through the heart twice for each circuit/there are two circulation paths – one to the lungs and one to the body ; [1]
- (ii) **C and** the aorta ;
takes blood from left ventricle /chamber with the thickest wall / blood has to go greater distance / owtte ; [2]
- (iii) (valves)
prevent backflow of blood ;
(wide lumen)
reduces resistance of blood flow ; [2]
- (b) (i) to supply more oxygen / glucose (to the cells / muscles) ;
for respiration ;
to release / supply more energy (for contraction of muscles) ;
to remove carbon dioxide more quickly ; [max 3]
- (ii) any suitable activity, e.g. walking **and**
activity is more energetic / active / uses more oxygen than sitting but is less energetic / active / uses less oxygen than running ; [1]
- 4 (a) (i)
- | | | | | | | | |
|-----------------|--|--------------|--|-----------|--|-------------|--|
| Gamma radiation | | ultra-violet | | infra-red | | radio waves | |
|-----------------|--|--------------|--|-----------|--|-------------|--|
- infra-red ;
in correct box ; [2]
- (ii) All e/m waves travel at same (high) speed (*in vacuo*) ; [1]
- (b) (i) (matt) black ; *accept* reasonable alternatives that have a deep hue, e.g. deep (or dark) blue
black is a better absorber of i/r ; [2]
- (ii) conduction ;
convection ; [2]
- (iii) water expands on heating ;
heated / hot / warm water less dense than cold, (so rises while cold sinks)
; owtte [2]

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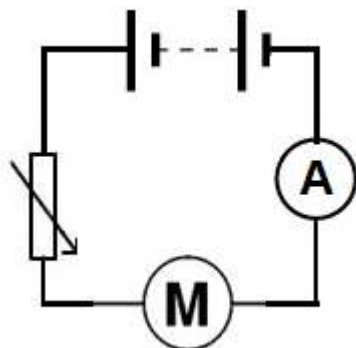
- 5 (a) (i) methane ; [1]
- (ii) fossil / non-renewable ;
fractional distillation ; [2]
- (b) C_8H_{18} ;
 C_2H_4 ; [2]
- (c) (i) contains carbon & hydrogen ;
and one of
a compound / molecule ;
only ; [2]
- (ii) C_6H_{12} because (general formula is) C_nH_{2n} / unsaturated / contains a
double bond ; [1]
- (iii) bromine / bromine water ;
(alkanes) no change
and
(alkenes) decolourised ; [2]
- 6 (a) (stamen)
longer / found dangling outside the flower ;
(stigma)
feathery / larger / found outside the flower ; [2]
- (b) slide 1 – no mark
smaller / lighter therefore can be carried by the wind ;
smoother surface therefore less friction / air resistance ; [max 1]
- (c) (i) any two from
increased rate of transpiration (at 27 °C) / more water lost from plant ;
molecules have more (kinetic) energy ; [2]
- (ii) any value less than 1.1 cm because the rate of evaporation / transpiration is
lower in humid conditions ; [1]
- (d) root X – no mark
it has root hair cells ;
larger surface area for absorption of water ; [2]
- (e) traps light energy ;
converts it to chemical energy / glucose ; [2]

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7 (a) (i) 50 (cm) ; [1]

(ii) maximum displacement (from no displacement to peak) ; [1]

(b)



variable resistor symbol ; [3]
ammeter symbol ;
all connected in series to form a complete circuit ;

(c) (i) $R = V \div I / 3 \div 2$;
 $= 1.5 (\Omega)$; [2]

(ii) power = $V \times I / 3 \times 2$;
 $= 6 \text{ watt(s) / W}$; [2]

8 (a) solid at room temp/below melting point ; [2]
ions must be mobile ;

(b) ions move towards the anode/positive electrode ;
ions lose (two) electrons/(two) electrons move to the anode/ions are
discharged/become atoms ; [2]

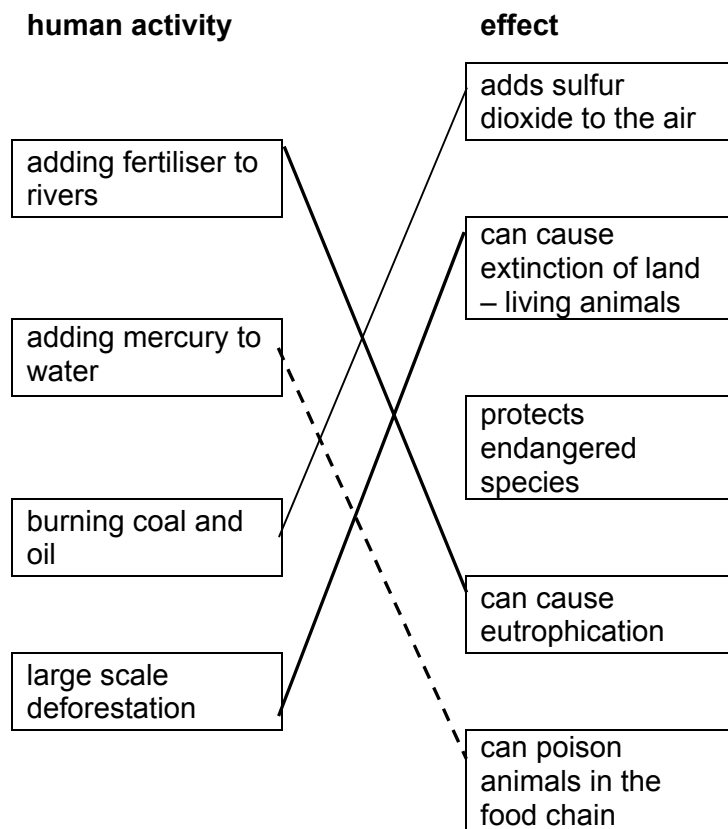
(c) reduced because it loses oxygen ;
accept aluminium (ions) gain electrons [1]

(d) 2 electrons in 1st shell and 8 in 2nd shell ; [1]

(e) ionic ;
metal and non-metal combined ; [2]

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9 (a)



[3]

(b) (i) burning fossil fuels / deforestation ;

[1]

(ii) (explanation of greenhouse gas) absorbs heat / infra-red radiation from the earth ;
 causes the temperature of the atmosphere to rise / global warming carbon dioxide is a greenhouse gas ;
 consequence, e.g. flooding / melting ice caps / changes in weather patterns / avp ;

[3]