CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the May/June 2015 series

0653 COMBINED SCIENCE

0653/32 Paper 3 (Extended Theory), maximum raw mark 80

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CAMBRIDGE
International Examinations

1 **(a)** 7 ;
number of outer electrons = Group number ; [2]

(b) **(i)** cobalt chloride test paper / anhydrous cobalt chloride ;
turns (from blue to) pink ;
OR
anhydrous copper sulphate ;
turns (from white to) blue ; [2]

(ii) $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$
formulae ;
balancing ;
states ; [3]

(iii) 2 shared pairs ;
4 non-bonding electrons on O ; [2]
(max 1 if any other error)

2 **(a)** large surface area ;
for rapid / efficient diffusion / uptake / absorption of water / ions / minerals / nutrients ; [2]
(allow a relevant named ion)

(b) breaking down large / insoluble molecules ;
into small / soluble molecules ;
that can be absorbed ; [max 2]

(c) **(i)** 40 °C ; [1]

(ii) from 10 °C to 30 °C
speed (of digestion) was increasing ;
due to more frequent collisions (between molecules) ;
molecules have more kinetic energy ;

above 50 °C
speed (of digestion) was decreasing ;
due to denaturation of the enzyme ;
shape of enzyme / active site is changing ; [max 4]
(two marks to be awarded for each temperature)

3 (a) (i) running at constant speed ; [1]

(ii) reference to low (forward) speed / speed decreasing ; [1]

(b) kinetic (energy) → gravitational (potential) / potential (energy) ;
potential (energy) → kinetic (energy) ; [2]

(c) (falls to zero then) accelerating / going faster ; [1]

(d) (distance =) ½ base × height / ½ × 1 × 4 ; [2]
= 2 (m)

(e) rise in temperature means particles vibrate more energetically / owtte ;
which increases (average) distance between particles / owtte ; [2]

4 (a) (i) **physical:** (iron oxide) settles / produced layers in rock /
iron compounds dissolved ;
chemical: compounds oxidised to iron oxide /
oxygen produced by bacteria ; [2]

(ii) chemical change produces a new substance / ora ; [1]
(allow other correct differences)

(b) (assume reference to ancient atmosphere if not specified)
difference: more carbon dioxide in ancient atmosphere ;
(allow other reasonable ideas based on the diagram
e.g. noble gases, polluting gases or water vapour)
similarity: nitrogen largest component ; [2]

(c) (i) carbon monoxide ; [1]

(ii) coke / coal and air / oxygen ; [1]

(iii) copper forms weaker bonds with oxygen than does iron ;
copper is lower than iron in the reactivity series ; [2]

(iv) (limestone / calcium carbonate decomposes to produce) calcium oxide ;
which reacts with silicon dioxide ;
to form molten slag / calcium silicate ;
which floats on / forms a separate layer on molten iron ; [max 2]

5 (a) (i) pulmonary artery correctly labelled ;
vena cava correctly labelled ; [2]

(ii) blockage / narrowing of coronary arteries ;
(due to) cholesterol / fat deposits / plaques ;
lack of oxygen supplied to heart muscle ; [max 2]

(b) (i) number of deaths (per 100 000 population per year) increased as the (average) number of cigarettes smoked increased ;
appropriate reference to figures ; [2]

(ii) less stress ;
less fat in the diet ;
more exercise taken ;
inherited likelihood (of developing CHD) ;
more people die from other causes ;
improved / more effective treatment for CHD available ; [max 2]

(c) cilia cannot (beat to) remove the mucus bacteria / pathogens ;
and then 1 from
bacteria / pathogens are trapped / contained in mucus OR
bacteria / pathogens stay in the lungs / breed in the mucus ; [max 2]

6 (a) (i) water goes up and down at right angles to direction of travel of wave / owtte [1]

(ii) oscillating spring / sound waves / avp ; [1]

(b) speed ; [1]

(c) (i) frequency less than lower limit of hearing ; [1]

(ii) (v =) $f\lambda$;
= $30 \times 1 = 30$;
unit: cm / s ; [3]
(unit must be consistent with working)

(iii) by vibrations (of air) ;
from particle to particle / through particles / by collision between particles ;
(in the form of) compressions and rarefactions / as longitudinal waves ; [max 2]

7 **(a)** **(i)** ethane ;
C_2H_6 ; [2]

(ii) fraction with higher boiling point (range) contains larger molecules ;
larger molecules have greater intermolecular forces ;
more energy required to overcome larger intermolecular forces ; [3]

(b) chloride / Cl^- ions move to anode / positive electrode ;
opposite charges attract ;
electrons pass from chloride / Cl^- ions to anode / positive electrode /
correct electrode equation ; [max 2]
(allow chloride ions are oxidised)

8 **(a)** **(i)** particles reduce amount of light (landing on the leaf) ; [1]

(ii) carbon dioxide prevented from entering leaf ; [1]

(b) **(i)** less photosynthesis to produce oxygen ;
reference to respiration by animals or decomposers using up oxygen ;
the combustion of wood ; [max 2]

(ii) less oxygen available for respiration ; [1]

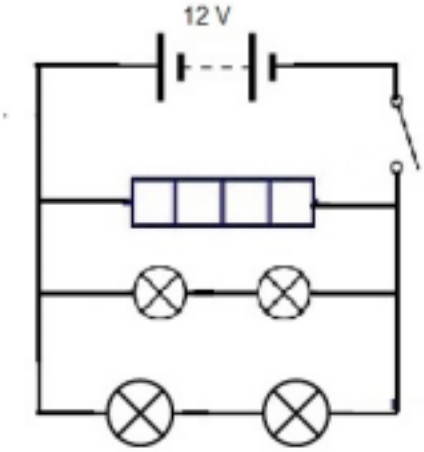
(c) global warming / increased greenhouse effect /
consequence of global warming described e.g. rising sea level /
climate change / examples of extreme weather events ; [1]

(d) water (vapour) / sulfur dioxide / nitrogen oxide(s) / carbon monoxide / soot ; [1]

9 **(a)** two points from
potential difference / volts / voltage ;
required to drive the current ;
6 (volts) required to allow lamp to work properly / safely ;

two points from
power / watts / wattage ;
energy / second transferred ;
120 (watts) is the safe maximum / owtte ; [max 4]

(b)



sidelamps remain in series with each other and each pair in parallel with the battery ;
heater, sidelamps, headlamps all in parallel ; [2]

(c) (I =) P / V or equivalent ;
(I =) 120 / 12 = 10 (A) ; [2]

(d) convection ; [1]