

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

## **MARK SCHEME for the October/November 2014 series**

### **0653 COMBINED SCIENCE**

**0653/31**

Paper 3 (Extended Theory), maximum raw mark 80

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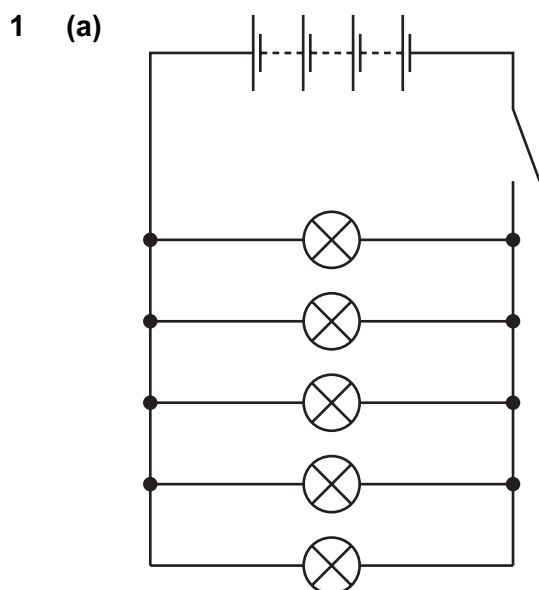
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symbols all correct ;  
 circuit connected correctly (allow  $\pm 1$  cell or lamp) ;

[2]

(b) (i)  $5 \times 0.5 = \underline{2.5}$  (A) ;

[1]

(ii) (R =)  $V/I$  (or words) ;  
 $= 6 / 2.5 = \underline{2.4}$  ( $\Omega$ ) ;

[2]

(c) series: all bulbs go out **AND** parallel: rest of bulbs stay alight ;

[1]

[Total: 6]

2 (a) **B C** ;  
**(B C) D A** ;  
 (allow 1 mark if both **B** and **A** are correctly located)

[2]

(b) (i) catalyst ;

[1]

(ii) increases rate / frequency of collision of particles ;  
 increases speed of reaction / increases surface area (of catalyst) ;

[2]

(iii) (petroleum) jelly  
 (diesel) oil  
 (refinery) gas  
 in order ;

[1]

(iv) (petroleum) jelly  
 (diesel) oil  
 (refinery) gas  
 in order ;

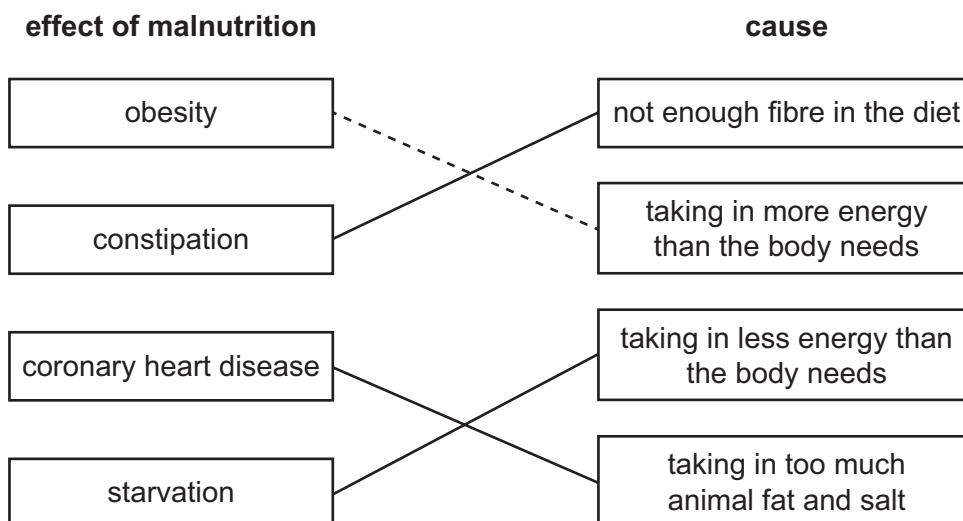
[1]

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- (v) the higher the boiling point the longer / larger the molecules ;  
reference to greater / stronger intermolecular forces ; [2]  
(allow reference to intermolecular bonds)

[Total: 9]

3 (a) (i)



correctly completed diagram ;; [2]  
(3 correct = 2 marks, 2 or 1 correct = 1 mark)

- (ii) example of fruit or vegetable containing fibre ;  
provides bulk to propel food through the intestines ; [2]
- (iii) any food rich in carbohydrate or fat / carbohydrate or fat (no mark)  
reference to reducing energy intake / avoiding the carbohydrate or fat content of the stated food ; [1]

- (b) (i) more females than males / fewer males than females took exercise ;  
more normal weight than obese / fewer obese than normal weight took exercise ; [2]
- (ii) reference to small sample size ;  
reference to the lack of information about variables that should be controlled (if the study were to be extended) ;  
reference to the need for information gathered over a longer time period ; [max 2]

[Total: 9]

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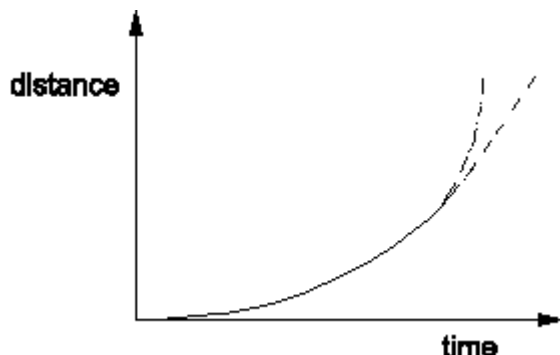
- 4 (a) (i) initial between 8 and 14 to 7 (final) ; [1]  
(ii) purple / blue to green ; [1]
- (b) (i)  $KCl$  ;  
 $H_2O$  ; [2]
- (ii) repeat without indicator / use pH meter / use indicator paper ;  
using same volume(s) of solution(s) ;  
evaporate (the water from the neutral mixture) / heat (the solution) then cool ; [3]
- (c) reference to the involvement of ions / ionic compound / particles with opposite charges ;  
the idea of strong forces / bonds between particles that must be broken /  
ions must be separated ;  
(breaking bonds / separating ions) requires a large amount of energy ; [max 2]
- [Total: 9]**
- 5 (a) **X** label line to green area and **Y** label line to white area ;  
green area containing chlorophyll / chloroplasts only in cell **X** /  
white area does not contain chlorophyll / chloroplasts shown in cell **Y** ; [2]
- (b) (i) black or shaded in area matching green area of leaf and indicated as black ; [1]
- (ii) chlorophyll / chloroplasts traps light energy ;  
for photosynthesis ;  
which makes (glucose / sugar which leads to ) starch ; [3]
- (c) acid denatures enzyme ;  
no longer optimum pH / owtte ;  
changes shape of enzyme / active site / substrate no longer fits active site ; [3]
- [Total: 9]**

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6 (a) (i) P and R ; [1]

(ii) R ;  
(R) is the weight ; [2]

(iii)



(ignore whether curve becomes linear or continues to curve)

[1]

(b) (i) gravitational / potential energy and kinetic energy ; (both required) [1]

(ii) (rest of energy transferred to) heat / sound ; [1]

(c) (i)  $(720 \times 1000) \div 3600$  / 200 (m/s) ; [1]  
(OR  $200 \times 3600/1000 = 720$  km/h )

(ii)  $(KE =) \frac{1}{2} m v^2$  ;  
 $= \frac{1}{2} \times 200\,000 \times 200 \times 200 = 4\,000\,000\,000$  (J) ; [2]  
(allow ecf from (c)(i) )  
(allow answers in kJ or MJ provided unit is stated)

[Total: 9]

7 (a) (i) starch digested to glucose / sugar ;  
(glucose / sugar) absorbed and taken to cells (of sheep) ;  
(glucose broken down by) respiration ;  
(respiration produces ) carbon dioxide /  
carbon dioxide breathed out into the air ; [max 3]  
(allow reference to respiration and exhalation in the wild cat)  
(allow correct reference to the formation and release of methane)

(ii) decomposers ;  
feed on dead / decaying organisms / feed on waste from organisms ;  
release carbon / carbon dioxide (into the air) ;  
by respiration ; [max 3]

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(b) (i) increases level of carbon dioxide / carbon monoxide ;  
 reduces oxygen level ;  
 increases sulfur dioxide level ; [max 2]

(ii) *carbon dioxide*:  
 (increases) global warming / described consequence  
 e.g. changed rainfall patterns / floods and or droughts ;

*sulfur dioxide*:  
 causes acid rain / described consequence  
 e.g. chemical weathering of structures / damage to trees or aquatic organisms ;  
 reference to harmful effects in relation to breathing ;  
 (allow other valid answers) [max 1]

**[Total: 9]**

8 (a) (i) number of vibrations / waves per second / unit of time ; [1]

(ii)

highest frequency			lowest frequency			
(gamma radiation)	<b>X-rays</b>	<b>ultra-violet</b>	(visible light)	<b>infra-red</b>	(microwaves)	(radio waves)

all three correctly named ;  
 and in correct positions ; [2]  
 (allow 1 mark if two are correctly named and located)

(b) (i) move further apart / increase distance between them ;  
 decrease / weaken / get less ;  
 quicker / more rapidly / faster / further apart ; [3]

(ii) infra-red radiation (from Sun warms water) ;  
 (energy from sun) absorbed by water (molecules) ;  
 which move faster / gain kinetic energy. ;  
 forces between molecules are weakened / broken ;  
 (molecules) evaporate / leave the (liquid) surface / turn to gas / vapour ; [max 2]

(c) (i) sound is a longitudinal wave ;  
 sound needs medium to travel through ;  
 space is a vacuum / owtte ; [max 2]

(ii) 8 minutes / the same time / they travel at the same speed, because all  
 electromagnetic waves travel at the same speed through space / vacuum ; [1]

**[Total: 11]**

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- 9 (a) (i) exothermic ; [1]
- (ii) chemical (potential) → thermal / heat / kinetic ; [1]
- (iii) aluminium (gains oxygen and) is oxidised ;  
iron (oxide) (loses oxygen and) is reduced ; [2]  
*(allow correct references to electron gain by iron and electron loss from aluminium)*
- (iv) iron will not react with / reduce aluminium oxide ;  
iron is lower in the reactivity series / less reactive than aluminium ; [2]
- (b) (i) cations / aluminium ions migrate / move / are attracted to the cathode  
/ negative electrode ;  
electrons flow on to ions / ions gain electrons ;  
the idea that the ions are discharged as the result of electron gain ; [max 2]
- (ii) oxygen ; [1]

**[Total: 9]**