

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

## **MARK SCHEME for the October/November 2015 series**

### **0654 CO-ORDINATED SCIENCES**

**0654/21**

Paper 2 (Core Theory), maximum raw mark 120

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- 1 (a) (i) 5 ; [1]  
(ii) neutron ; [1]  
(iii) electron ; [1]
- (b) decreases ;  
because elements change from metals to non-metals ; [2]
- (c) (i) covalent ; [1]  
(ii) it would be slower / it would not work ; [1]
- (d) (i) nitrogen ; [1]  
(ii) phosphorus **and** potassium ; [1]
- [Total: 9]**
- 2 (a) X = chloroplast ;  
Y = nucleus ; [2]
- (b) carbon dioxide / CO<sub>2</sub> ;  
water ; [2]
- (c) (oxygen) from photosynthesis ;  
(CO<sub>2</sub>) from respiration ; [2]
- (d) (i) transport (of water / minerals) / support ; [1]  
(ii) dead / no chloroplasts ; [1]
- [Total: 8]**
- 3 (a) point has small area and therefore high pressure therefore sinks in ;  
disc/ski has large area therefore small pressure therefore doesn't sink in ; [2]
- (b) (i) sound waves are reflected ; [1]  
(ii) 166 (m) ; [1]
- (iii) (speed =)  $\frac{\text{distance}}{\text{time}}$  ;  
=  $\frac{166}{0.5} = 332 \text{ (m/s)}$  ; (*allow ecf from (ii)*) [2]

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- (c) (i) (B – no mark)  
particles are touching and randomly arranged ; [1]
- (ii) (A – no mark)  
particles are touching and regularly arranged ; [1]
- (d) liquid particles gain kinetic energy and move faster ;  
fastest particles are able to overcome forces of attraction forces ;  
fastest/most energetic/with most KE particles escape from liquid ; [max 2]
- [Total: 10]**
- 4 (a) not expressed in the presence of the dominant allele / not expressed when heterozygous ;  
allele requires the identical allele to be seen ; [max1]
- (b) (i) NN, nn ; [1]
- (ii) Nn ; [1]
- (c) normal, normal ;  
Nn, Nn ;  
N, n, N, n ;  
NN, Nn, Nn, nn (in Punnett square) ;  
3:1 ; [max 4]
- (d) less able to find food / find a mate / escape predators ;  
so, less likely to survive / reproduce ; [2]
- [Total: 9]**
- 5 (a) (i) W ;  
contains nitrogen (with C, H and O) ; [2]
- (ii) Y and Z ;  
contain **only** hydrogen and carbon ; [2]
- (b) (i) ethene molecules contain double bond and / or ethane all single bonds ; [1]
- (ii) (with ethane) no change / no reaction ;  
(with ethene) bromine solution decolourised ; [2]
- (c) (i) (addition) polymerisation / self addition ; [1]
- (ii) poly(ethene) / polyethene / polythene ; [1]

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- (d) (i) carbon dioxide ; [1]
- (ii) goes milky / goes milky then clears ; [1]
- [Total: 11]**
- 6 (a) rays of light pass through optical fibre ;  
angles approximately correct and all reflections occurring on fibre wall ; [2]
- (b) chemical ;  
kinetic ; [2]
- (c) less ionising so less damage caused to tissue / can pass through tissue / not absorbed by tissue ; [max 1]
- (d) X-rays;  
viewing bones in the body ;  
(allow any correct electromagnetic wave and use) [2]
- [Total: 7]**
- 7 (a) any part of the nervous system except brain / spinal cord ; [1]
- (b) (i) response to a stimulus / response to protect body;  
immediate / automatic / without conscious thought ; [2]
- (ii) carry impulses / AW from receptors to CNS ;  
carry impulses / AW from CNS to effectors / muscle ;  
reference to sensory neurons / motor neurons ; [max 2]
- (c) (carried) in the blood ;  
destroyed by the liver ; [2]
- [Total: 7]**
- 8 (a) (i) weaker / less attraction where filler is ; [1]
- (ii) no – aluminium is not magnetic ; [1]
- (iii) positive paint droplets attracted to negative panel because opposite charges attract ;  
paint droplets repel each other and spread out because like charges repel ; [2]

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- (b) (i) all symbols correct ;  
two lamps connected in parallel with battery ;  
switch in correct place ; [3]
- (ii) voltmeter drawn across battery ; [1]
- (iii)  $I = \frac{V}{R}$  ;  
 $= \frac{12}{2.5} = 4.8 \text{ (A)}$  ; [2]
- (iv)  $1.25 \Omega$  ; [1]
- (v) charge / electrons ; [1]
- (c) conduction / convection ; [1]
- (d) to allow for expansion in hot weather ;  
flexible material fills gap but can be squashed ; [2]

[Total: 15]

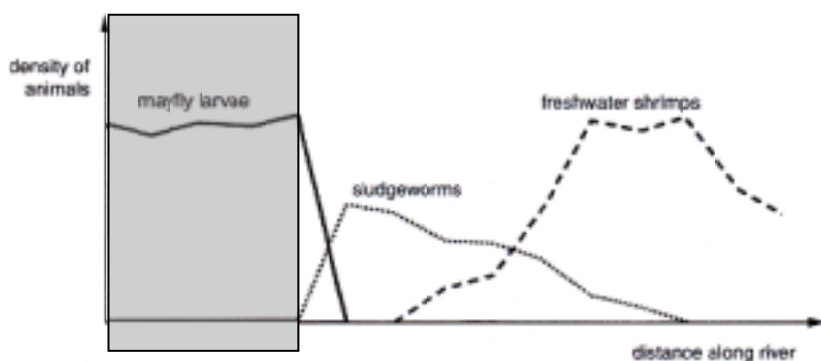
- 9 (a) (i) electrolysis ; [1]
- (ii) orange / brown vapour ; [1]
- (iii) ions no longer mobile ; [1]
- (b) reference to electron loss ; [1]
- (c) (i) hydrogen ; [1]
- (ii) lighted splint ;  
'pops' ; [2]
- (iii) solution becomes alkaline / sodium hydroxide is made ; [1]
- (d) (i) alloys are stronger / less easily broken ; [1]
- (ii) reduces the mass / weight of the aircraft ; [1]

[Total: 10]

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10 (a) mayfly larvae / caddis flies / freshwater shrimps / water lice / bloodworms ; [max 1]

(b) (i) arrow anywhere in the shaded area ;



[1]

(ii) (sewage)  
microorganisms ;  
respiration deoxygenates water ;  
which prevents respiration ;

(chemical waste)  
toxic ;  
heavy metal bioaccumulation ;

[max 3]

(c) (i) increased temperature of the Earth ;  
on average / at the Earth's surface ; [2]

(ii) burning of (carbon containing) fuels / named example ; [1]

(iii) reduced use of fossil fuels ;  
public transport ;  
alternative energy sources ;  
planting trees / controlling deforestation ;  
education / taxation / public awareness measures ; [max 2]

[Total: 10]

11 (a) force / weight ;  
(vertical) distance ; [2]

(b) (density =)  $\frac{\text{mass}}{\text{volume}}$  ;  
 $= \frac{4000}{3.9} = 1026 \text{ (kg/m}^3\text{)} ;$  [2]

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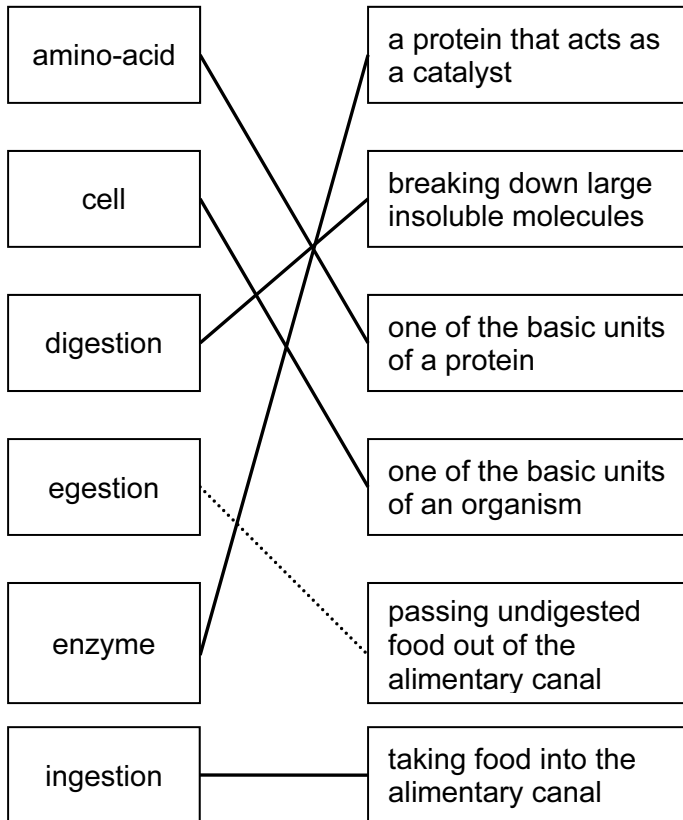
- (c) (i) (10 Hz – no mark)  
lowest frequency detected is 20 Hz ; [1]
- (ii) number of waves produced / passing a point per second ; [1]
- (iii) sound wave – arrow in same direction as wave movement ;  
water wave – arrow perpendicular to wave movement ; [2]

**[Total: 8]**

- 12 (a) hydrogen ;  
hydrochloric acid ;  
carbon dioxide + water ; [3]
- (b) (i) endothermic ; [1]
- (ii) reference to use of a suitable indicator / pH meter ;  
correct neutral colour / pH 7 ; [2]
- (c) decrease acid concentration ;  
decrease (acid) temperature ;  
decrease surface area / use larger pieces of calcium carbonate ; [3]
- (d) reference to decreasing acidity / neutralising acidic lake water ; [1]

**[Total: 10]**

13 (a)



5 or 4 correct = 4 marks, 3 correct = 3 marks, 2 correct = 2 marks, 1 correct = 1 mark [max 4]

(b) (i) anus ; [1]

(ii) fibre/roughage/cellulose ; [1]

[Total: 6]