

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

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

**0654 CO-ORDINATED SCIENCES**

**0654/33**

Paper 3 (Extended Theory), maximum raw mark 120

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1 (a) (i) fat ;  
vitamin D ; [2]

(ii)  $\frac{825}{275}$  ;  
 $\times 100 = 300$  ; [2]

(b) may not be absorbed as efficiently ;  
may be more than the baby needs ;  
some nutrients destroyed during preparation/storage ; [max 1]

(c) contains antibodies ;  
cheaper ;  
no need for sterilisation/etc. ;  
always available ;  
helps in forming mother-baby bond ;  
at the right temperature ;  
reduced chance of the mother developing breast/ovarian cancer ; [max 2]

[Total: 7]

2 (a) (i) neutralisation ; [1]

(ii) idea of greater precision/accuracy ; [1]

(b) (i) evidence of moles = concentration  $\times$  volume ;  
use of volume in  $\text{dm}^3$  ;  
(e.g.  $0.1 \times 20.0/1000 = \underline{0.002}$  (moles) )  
**OR**  
(conversion of  $\text{cm}^3$  to  $\text{dm}^3$  )  $20.0 \div 1000$  ;  
(moles = concentration  $\times$  volume)  $0.1 \times 0.02$  or 0.002 moles ; [max 2]

(ii)  $40 \text{ cm}^3$  ;  
this is volume required for neutrality/pH 7 ; [2]

(iii) any idea that amounts of acid and alkali are the same at the neutral point ;  
so if twice the volume of acid then acid concentration is half of alkali  
 $= 0.1 \div 2 = \underline{0.05}$  ( $\text{mol}/\text{dm}^3$ ) ;  
**OR**  
no. of moles HCl = no. of moles NaOH/0.002 ;  
concentration of HCl =  $\frac{\text{moles}}{\text{volume}} = \frac{0.002}{40 \times 10^{-3}} = 0.05$  ; [max 2]

[Total: 8]

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3 (a)

(gamma)	X-ray	ultraviolet	(visible)	infra-red	(micro-waves)	radio
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[1]

(b) black surfaces are better (radiation) absorbers than white surfaces ; [1]

(c) (i) label line where both rays meet ; [1]

(ii) real image can be formed on screen/virtual image cannot ; [1]

(d) (i) (pressure =)  $\frac{\text{force}}{\text{area}}$  ;  
 evidence of multiplication by 2/use of area of 24 cm<sup>2</sup> ;  
 $= \frac{20}{24} = 0.83 \text{ (N/cm}^2\text{)} ;$  [3]

(ii) 8300 (Pa) ; [1]

(e) (i) collide with walls of container ;  
force of collisions exerts a pressure ; [2](ii)  $P_1V_1 = P_2V_2$  etc. ;  
 $P_2 = 20\,000 \times \frac{0.015}{0.065} = 4615 \text{ (kPa)} ;$  [2]**[Total: 12]**

4 (a)  $2\text{Mg(s)} + \text{CO}_2\text{(g)} \rightarrow 2\text{MgO(s)} + \text{C(s)}$   
 1 mark: correct formulae ; 1 mark: balanced ; 1 mark: state symbols ; [3]

(b) (i) Mg ion moves/is attracted to the negative electrode/cathode ;  
 Mg ion moves because of the attractive force between opposite charges ;  
 Mg ion is discharged/gains 2 electrons ; [3](ii) magnesium is reactive/too reactive/aqueous solution produces hydrogen  
 and not magnesium ; [1](iii) chlorine ;  
 $\text{Cl}_2$  ; [2]**[Total: 9]**

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5 (a) meiosis ;  
different ;  
halved ;  
haploid ; [4]

(b) repair/replacement ;  
growth ;  
asexual reproduction ; [3]

[Total: 7]

6 (a) distance = area under graph **or** working ;  
 $= (\frac{1}{2} \times 30 \times 20) + (30 \times 20) + (\frac{1}{2} \times 20 \times 20) = 1100 \text{ (m)} ;$  [2]

(b) (work done =) force  $\times$  distance ;  
 $800 \times 1500 = 1200000 \text{ (J)} ;$  [2]

(c) (i) (power =)  $V \times I ;$   
 $= 12 \times 4.5 = 54 \text{ (W)} ;$  [2]

(ii) (resistance =)  $\frac{V}{I} ;$   
 $= \frac{12}{4.5} = 2.7 \text{ } (\Omega) ;$  [2]

(iii) use of  $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} ;$   
 $= \frac{1}{2.7} + \frac{1}{24}$  so  $R_T = 2.43 \text{ } (\Omega) ;$  [2]

[Total: 10]

7 (a) xylem ; [1]

(b) water evaporates by transpiration ;  
which causes a tension/pull from above ;  
water moves down water potential gradient ;  
cohesion/cohesive (forces) between water molecules ; [4]

(c) (i) (coloured) water does not move as far ; [1]

(ii) (coloured) water does not move as far ; [1]

[Total: 7]

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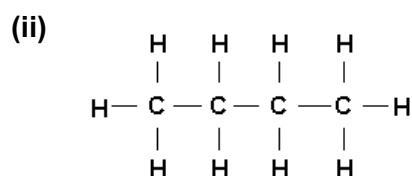
8 (a) petroleum/crude oil ;  
fractional distillation ; [2]

(b) (i) nitrogen combines with oxygen ;  
both these gases are contained in air/high temperature facilitates combination ; [2]

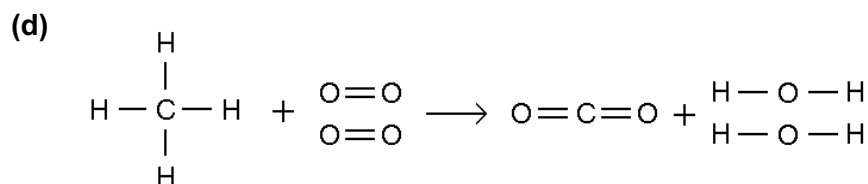
(ii) reference to formation of acidic rain or its effects ;  
reference to harmful effects on respiratory systems ; [max 1]

(iii) (waste gases pass over) catalytic converter/a catalyst ; [1]

(c) (i) hydrocarbon/general formula  $C_nH_{2n+2}$  ;  
containing only single bonds/which is saturated ; [2]



four carbon atoms in chain ;  
 $2n+2$  hydrogen atoms and no other element ;  
only C-H single bonds ; [3]



1 mark for correct diagrams for **oxygen** and **water** ; 1 mark: balanced ; [2]

[Total: 13]

9 (a) (i) aluminium/lead/concrete ; [1]

(ii) 3 half-lives ;  
900 (years) ; [2]

(b) wires cut magnetic field/changing magnetic field ;  
induces current/emf ;  
direction of relative movement changes every half turn ;  
current changes direction every half turn ;  
slip rings maintain continuous connection ; [max 3]

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(c) easier/quicker to magnetise iron ;  
easier/quicker for iron to lose its magnetism/ steel forms permanent magnet ; [max 1]

(d) (charge =) current  $\times$  time ;  
=  $24 \times 60 = 1440$  ;  
C ; [3]

**[Total: 10]**

10 (a) (i) nowhere for the animal to live ;  
loss of food sources ; [2]

(ii) logging ;  
building of roads/towns/factories ;  
farming ;  
fuel ; [max 2]

(iii) loss of soil/flooding/build-up of carbon dioxide/global warming ; [1]

(b) control of hunting/nature reserve/conservation area ;  
(captive) breeding programmes ;  
alternatives to timber/control of deforestation/replanting ;  
AVP ; [max 2]

(c) part of the food chain/AW ; [1]

**[Total: 8]**

11 (a) (i) increases (from Li) to C/positive in Groups I to IV ;  
decreases from N (to Ne)/negative in Groups V to VIII ;  
maximum occurs at carbon ; [max 2]

(ii) silicon/Si ; [1]

(b) reference. to allotropes/two allotropes correctly named/reference to different  
structures/correct detail of structures, e.g. reasonable diagrams/idea that atoms  
have different spacing ; [max 1]

(c) 16 electrons ;  
arranged 2,8,6 ; [2]

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(d) (i) ionic/electrovalent ; [1]

(ii) LiF ;  
 then [max 2] from:  
 reference to complete outer shells ;  
 detail of electron transfer, e.g. Li atom lose one electron and F atom gains one ;  
 detail of ionic charges, i.e.  $\text{Li}^+$  and  $\text{F}^-$  ; [max 3]

[Total: 10]

12 (a) 70 (kg) ;  
 mass does not depend on/ change with gravitational field strength ; [2]

(b)  $(KE =) \frac{1}{2} mv^2$  ;  
 $= \frac{1}{2} \times 1\,500\,000 \times 2\,500 \times 2\,500 = 4.7 \times 10^{12}$  (J) ;  
 $= 4.7 \times 10^9$  (kJ) ; [3]

(c) (i) sound waves cannot travel through space/vacuum **or** sound waves  
 need a medium ; [1]

(ii)  $((\text{speed} =) \frac{\text{distance}}{\text{time}} =) \frac{2.25 \times 10^{11}}{750} \text{ or } 2.25 \times 10^8 \times \frac{1000}{750}$   
 $= (3 \times 10^8 \text{ m/s})$  ; [1]

(iii)  $3 \times 10^8$  (m/s) ; [1]

[Total: 8]

13 (a) release of energy ;  
 inside cells/by breaking down food substances ;  
 using oxygen ; [3]

(b) (i) does not use oxygen ; [1]

(ii) releases less energy ; [1]

(c) (i) kills (unwanted) microorganisms ;  
 prevents spoilage/production of toxins ; [2]

(ii) respire anaerobically ;  
 produces alcohol ;  
 produces carbon dioxide ; [3]

(iii) poisoned by alcohol/no sugar/glucose left/AVP ; [1]

[Total: 11]