

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education

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

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

**0654/32**

Paper 3 (Extended Theory), maximum raw mark 120

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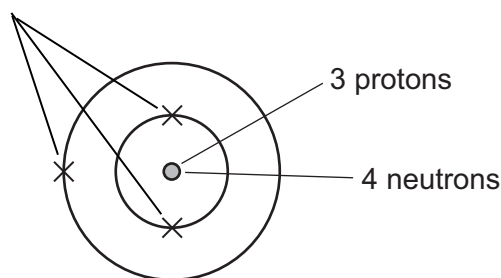
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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0654	32

- 1 (a) (i) mass 100 (kg) weight less than 1000 (N) ; [1]
- (ii) mass does not change / does not depend on gravitational field ;  
weight different because weight is effect of gravitational field on mass / owtte ; [2]
- (b) need resultant upwards force to accelerate the rocket ; [1]
- (c)  $(KE) = \frac{1}{2} mv^2$  ;  
 $= \frac{1}{2} \times 1\,500\,000 \times 10\,000 \times 10\,000$  ;  
 $= 7.5 \times 10^{13} (J)$  ;  
 $= 7.5 \times 10^{10} (kJ)$  ; [4]
- (d) sound cannot travel through space / a vacuum / without a medium ; [1]
- (e) turns atoms into ions ;  
by removal of electrons ; [2]
- [Total: 11]**
- 2 (a) X = umbilical cord ;  
Y = amnion / amniotic sac ; [2]
- (b) protection ;  
from mechanical damage / 'knocks and bumps' / owtte ; [2]
- (c) increased oxygen ;  
decreased carbon dioxide ;  
increased glucose / nutrients / named nutrient ;  
decreased urea / wastes ; [max 3]
- (d) carbon monoxide ;  
combines with haemoglobin / takes place of oxygen in the blood (cells) ;  
reduces oxygen transport in mother's blood ; [3]
- [Total: 10]**
- 3 (a) (i) H and He ; [1]
- (ii) neon ; [1]
- (iii) period 4 ; (allow 5/6/7) [1]

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0654	32

(b) (i) 3 electrons



3 protons indicated ;  
 4 neutrons indicated ;  
 3 electrons arranged in electron configuration of: 2,1 ; [3]

(ii) reference to increased number of electrons shells/orbits down the group ; [1]

(iii) fewer electron shells/orbits /reference to loss of electron shell/orbit ; [1]

(iv) (outer) electrons further from nucleus ;  
 if electrons further from nucleus then more easily lost/less strongly attracted to nucleus ; [2]

**[Total: 10]**

4 (a) (i) at the start/in first minute/in first few seconds ; [1]

(ii) high starch concentration/more starch/greater rate of molecular collision ; [1]

(iii) line sketched so that it is of same general shape ; (*but not levelling off above zero or at less than 4 mins*)  
 and above the 35 °C line ; [2]

(iv) higher temperature means molecules have more energy/greater speed/ORA ;  
 more frequent collisions (ORA)/more collisions that are successful/result in reaction ; [2]

(b) (i) X = capillary ;  
 Y = lacteal ; [2]

(ii) increased surface area (for absorption) ; [1]

(iii) molecules smaller/soluble ; [1]

**[Total: 10]**

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0654	32

- 5 (a)  $Al_2O_3$   
 $Fe_2O_3$   
 $NaCl$   
 $CuFeS_2$  ;;  
(1 mark for two or three correct, 2 marks for four correct) [2]
- (b) (i)  $2PbO + C \rightarrow 2Pb + CO_2$   
reactant formulae ; product formulae ; correctly balanced ; [3]
- (ii) lead ions gain electrons;  
electron gain is reduction ; (*allow*  $Pb^{2+} + 2e^- \rightarrow Pb$ ) [max 1]
- (c) becomes zero / no current registered / owtte ;  
electrolyte freezes ;  
ions no longer mobile ; [3]
- [Total: 9]**
- 6 (a)  $v = f \times \lambda$  ;  
frequency = 0.3 Hz ;  
 $0.3 \times 0.8 = 0.24$  (m/s) ; [3]
- (b) (i) machinery noise causes water particles to vibrate ;  
vibration is passed from particle to particle ; [2]
- (ii) any value greater than 340 m/s ;  
sound travels more quickly through liquids than gases ; [2]
- (c) (i) molecules have range of energies / some molecules move faster / have more energy than others / molecules gain energy from the Sun ;  
faster / more energetic molecules escape ;  
overcome forces between molecules / pull of other molecules ;  
leave as water vapour ; [max 3]
- (ii) (thermal energy =)  $mc\theta$  **OR**  $mc\Delta T$  ;  
=  $200\,000 \times 4200 \times 5$  (J) ;  
= 4200 (MJ) ; [3]
- [Total: 13]**

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0654	32

- 7 (a) M  
E  
C  
E ;  
(1 mark for two or three correct, 2 marks for four correct) [2]
- (b) (i) (assume answers refer to **P** if the word *it* is used)  
**P** is more flammable/burns more easily/ORA ;  
**P** burns with cleaner flame/owtte ;  
**P** is less viscous/flows easily/easily moved around through pipes/owtte ; [max 2]
- (ii) carbon dioxide/CO<sub>2</sub> ;  
water (vapour)/H<sub>2</sub>O ;  
carbon monoxide/CO ; [max 2]
- (iii) ice ;  
low temperature of the air causes the water formed to freeze ; [2]
- (c) (i) family of compounds/hydrocarbons with similar properties/that have a  
general formula/that differ only by a CH<sub>2</sub> increment ; [1]
- (ii) 174 ± 10 °C ; [1]
- (iii) the larger/heavier/more C atoms in the molecules the higher the boiling  
point of the alkanes ;  
because the larger the molecules the greater attractive forces between  
molecules ;  
because the larger the molecules the more (heat) energy needed to separate  
them ; [max 2]
- [Total: 12]**
- 8 (a) less ;  
sulfur dioxide ;  
coal fired ;  
fossil ; [4]
- (b) (i) mosquito larva ;  
mosquito larva ;  
crayfish ; [3]
- (ii) below their ideal pH range/close to lowest tolerable pH ; [1]
- (iii) kills the trout/less trout to compete ; [1]

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0654	32

- (c) enzymes less effective/denatured ;  
 AVP e.g. increased aluminium levels/reduced levels of calcium or nutrients ; [max 1]

[Total: 10]

9 (a) (i)  $(\text{current} =) \frac{\text{power}}{\text{voltage}} ;$   
 $= \frac{11000}{220} = 50 (\text{A}) ;$  [2]

(ii)  $(R =) \frac{V}{I} ;$   
 $\frac{220}{50} = 4.4 (\Omega) ;$  (allow ecf) [2]

- (b) (i) voltmeter or symbol connected across rings ; [1]

- (ii) sine wave ;  
 constant amplitude ; [2]

- (iii) spin coil faster ;  
 stronger/larger magnetic field ;  
more turns on coil ; [max 2]

[Total: 9]

- 10 (a) ability to detect/sense changes in the environment/stimuli ;  
 and to respond ; [2]

- (b) (i) geotropism ; [1]

- (ii) (roots grow downwards so) can absorb water ;  
 can absorb mineral ions ;  
 better anchorage in soil ; [max 2]

- (stems grow upwards so) can reach light ;  
 for photosynthesis ; [2]

- (iii) accumulates on lower side ;  
 stimulates growth/elongation in stem ;  
 inhibits growth/elongation in root ; [3]

[Total: 10]

- 11 (a) hydrogen ;  
 copper chloride ;  
 potassium chloride and water ; [3]

- (b) (i)  $66 (\text{cm}^3) ;$  [1]

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge IGCSE – October/November 2014	0654	32

(ii) graph levels off / becomes horizontal ;  
 reaction slows down / stops no more CO<sub>2</sub> produced ;  
 (reaction stops) because calcium carbonate used up / (reaction slows)  
 because acid becomes less concentrated / calcium carbonate has less  
 surface area (as used up) ; [2]

(iii) maximum volume of CO<sub>2</sub> collected = 95 cm<sup>3</sup> ;  
 convert molar volume to 24 000 cm<sup>3</sup>/volume to 0.095 dm<sup>3</sup> ;  
 number of moles of CO<sub>2</sub> therefore = 95 ÷ 24000 = 0.0040 or 0.095 ÷ 24 =  
 0.0040 ; (allow 0.00396/0.00395/0.0039/0.004) [3]

[Total: 9]

12 (a) QR / 40–68 s ; [1]

(b) P or S / 0 s or 120 s ; [1]

(c) (acceleration =) change of speed / time or working /  $\frac{28}{40}$  ;  
 = 0.70 (m/s<sup>2</sup>) ; [2]

(d) area under graph ;  
 ( $\frac{1}{2} \times 40 \times 28$ ) + (28 × 28) + ( $\frac{1}{2} \times 52 \times 28$ ) OR working ;  
 = 2072 (m) ; [3]

[Total: 7]