MARK SCHEME for the October/November 2015 series

0654 CO-ORDINATED SCIENCES

0654/23	Paper 2 (Core Theory), maximum raw mark 120

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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1 **(a)** **(i)** fat ;
protein ;
calcium ; [max 2]

(ii) iron ; [1]

(iii) has more fat ; [1]

(b) **(i)** *(1.50)*
15 ;
6 ; [2]

(ii) no, because large amount is needed to meet vitamin C requirement ; [1]

(iii) bleeding gums ;
poor skin / bruising ;
scurvy ; [max 2]

(c) **(i)** prevents constipation / promotes peristalsis ; [1]

(ii) (named) cereal grain / fruit / vegetable *;* [1]

[Total: 11]

2 **(a)** **(i)** idea of greater precision / accuracy ; [1]

(ii) neutralisation ; [1]

(iii) salt ;
water ; [2]

(b) **(i)** *(first 35 cm^3)* decreased slowly / decreased from pH 13 to 12 ;
(next 10 cm^3) decreased rapidly / more quickly / decreased from pH12 to 2 ; [2]

(ii) 40 (cm^3) ;
evidence of finding the volume at pH = 7 ; [2]

(iii) take same amount / 20.0 cm^3 of alkali ;
add 40 cm^3 of the acid *(allow ecf from (ii))* ; [2]

(iv) white solid / solid sodium chloride ; [1]

[Total: 11]

3 (a) (i)

(gamma)	X-rays	ultraviolet	(visible)	infra-red	(microwaves)	radio waves

(all four correct 2 marks, any two correct 1 mark) ;; [2]

(ii) microwaves ; [1]

(b) (i) label line at base of fire / label line where both rays meet ; [1]

(ii) 55 (mm) ± 1 mm ; [1]

(c) particles <u>constantly</u> in motion ;
collide with walls of container ;
force of collisions exerts a pressure ; [max 2]

(d) weight (of penguin) ;
(surface) area of foot / feet ; [2]

(e) diagram **B** *(no mark)* particles are touching and randomly arranged ;
*(if **A** or **C** – 0 marks even with correct explanation)* [1]

[Total: 10]

4 (a) (i) magnesium + carbon dioxide → magnesium oxide + carbon ; [1]

(ii) oxidation is gain of oxygen and reduction is removal of oxygen ;
magnesium gains oxygen and is oxidised ;
carbon dioxide loses oxygen and is reduced ; [max 2]

(b) (i) anode clearly labelled ; [1]

(ii) chlorine ;
Cl_2 ; [2]

(c) (i) carbon ;
carbon dioxide ; [2]

(ii) test the electrical conductivity of the product / lead will conduct electricity ; [1]

[Total: 9]

5 **(a)** **(i)** asexual ;   [1]

  (ii) no gametes / fertilisation involved ;
   genetically identical ;   [max 1]

 (b) **(i)** photosynthesis ;   [1]

  (ii) <u>sexual</u> reproduction ;   [1]

 (c) **(i)** anther / stamen ;   [1]

  (ii) sepal ;   [1]

 (d) because the fruits develop from the flowers ;   [1]

                                                                                                                    [Total: 7]

6 **(a)** **(i)** crosses (X) marked on graph at 13–14 s, 71 s, 105 s and 150 s ;   [1]

  (ii) 13–14 (s) ;   [1]

  (iii) 20 (s) ;   [1]

  (iv) **C–D or G–H** ;
   graph goes down ;   [2]

 (b) **(i)** thermal energy produces increased particle vibration ;
   particle vibration is passed on from particle to particle ;
   metals are good thermal conductors ;   [max 2]

  (ii) gas around filament heats up / gas expands ;
   gas rises / gas less dense ;   [2]

  (iii) *wavelength:* distance between two waves ;
   but distance between two peaks / two troughs / two identical points on consecutive waves ;
   frequency: number of waves produced per second / number of waves passing a fixed point per second ;   [3]

 (c) **(i)** (current) = $\dfrac{\text{voltage}}{\text{resistance}}$;

   $= \dfrac{12}{4} = 3$ (A) ;   [2]

  (ii) 8 (Ω) ;   [1]

                                                                                                                    [Total: 15]

7 (a) xylem ;   [1]

(b) evaporation of <u>water</u> ;
from surfaces of mesophyll cells ;
followed by loss of <u>water</u> vapour ;
by diffusion ;
out through stomata ;   [max 4]

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

[Total: 6]

8 (a) petroleum ;
fractional distillation ;   [2]

(b) (i) carbon dioxide ;
water ;   [2]

(ii) reference to carbon monoxide / incomplete combustion ;
which are toxic / which could poison people ;   [2]

(c) (i) hydrocarbon will decolourise bromine ;
if it is unsaturated ;   [2]

(ii)

carbon – carbon double bond ;
4 × H **and** all else correct ;   [2]

[Total: 10]

9 (a) no resultant force because constant speed ;   [1]

(b) three straight lines ;
horizontal lines from boat and into eye ;
internal reflection shown at both prisms ;   [3]

(c) (i) lead / concrete / aluminium ;   [1]

(ii) geiger counter / GM tube, etc. ;   [1]

[Total: 6]

10 (a) (i) deforestation ;   [1]

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

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

   (c) (i) grow / photosynthesise more (because not eaten by okapis) ;   [1]

   (ii) have less food / must find alternative food sources ;
   (accept: more competition for food / migration)   [1]

                                                                                                         [Total: 7]

11 (a) (i) neon ;   [1]

   (ii) proton / atomic number / number of electrons ;   [1]

   (iii) 9 protons ;
   10 neutrons ;   [2]

   (b) (i) sodium chloride ;   [1]

   (ii) reference to loss of electron(s) / loss of outer shell ;   [1]

   (iii) balance of charge / protons and electrons in the atom ;
   excess of electrons in the ion / gains electrons ;   [2]

   (c) silver nitrate ;
   white precipitate ;   [2]

                                                                                                         [Total: 10]

12 (a) (i) 5 000 000 (N) ;   [1]

   (ii) need positive resultant, for upward motion / acceleration ;   [1]

   (iii) chemical, thermal (heat), kinetic ;;
   (all three for 2 marks, any two for 1 mark)   [2]

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

(ii) speed = $\dfrac{\text{distance}}{\text{time}}$;

$= \dfrac{225\,000\,000}{750} = 300\,000\,(\text{km} / \text{s})$; [2]

(c) (i) ionising radiation that humans are exposed to / radiation that is always there ; [1]

(ii) rocks ; [1]

[Total: 9]

13 (a) (i) increased rate of breathing ;
increased depth of breathing / volume of breaths ; [2]

(ii) less oxygen / O_2 ; *(reject: **no** oxygen)*
more carbon dioxide / CO_2 ;
more water vapour ;
warmer ; [max 2]

(b) (i) increased heart / pulse rate ;
increased blood glucose ;
AVP ; [max 2]

(ii) chemical / substance produced by a gland ;
carried in the blood ;
alters the activity of target organ(s) ;
destroyed by the liver ; [max 3]

[Total: 9]