CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2012 series

0654 CO-ORDINATED SCIENCES

0654/22 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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CAMBRIDGE
International Examinations

1 **(a)**

statement given	*word required*
a particle with an negative electrical charge	electron ;
measures electrical current	ammeter ;
unit of potential difference	volt ;
does not conduct electricity	insulator ;

[4]

(b) **(i)** goes out ;
incomplete circuit ; [2]

(ii) so that they can be individually turned on and off ;
so that they all get the full mains voltage ;
so that if one fails the rest still operate ; [max 2]

(iii) $R = R_1 + R_2$;
= 2.4°(Ω) ; [2]

[Total: 10]

2 **(a)** **(i)** **A** ;
B, **E**, **F** ; [2]

(ii) starch / cellulose / sugar / any other correct ; [1]

(iii) 0.04 ; (allow 0.03) [1]

(b) passing out food that has not been digested ;
through the anus / as faeces ; [2]

(c) **(i)** increase (in number of worms emerging) to maximum then decrease;
maximum response at 460/500 Hz ;
idea of steeper decrease than increase ; [max 2]

(ii) to prevent extinction (of earthworms) ;
reference to effect on food chains / ecosystem ;
because they improve the soil structure;
because they improve soil fertility;
other valid point ; [max 2]

(iii) less likely to be killed by moles ;
more likely to breed ; [2]

[Total: 12]

3 **(a)** **(i)** 7 ;
>7 to 14 **and** <7 to 1; [2]

(ii) meter is more accurate / precise / quantitative reference / litmus paper only shows that solution is acidic ; [1]

(iii) add the barium chloride to the acid ;
white precipitate / solid indicates sulfuric acid / sulfate (ions) / no reaction shows nitric acid ; [2]

(b) **(i)** any Group 1 (also strontium / barium) ;
reference to explosive / corrosive substances (splashing onto skin / eyes) ; [2]

(ii) pops ;
hydrogen given off ; [2]

(iii) add acid to mixed metals (in beaker) ;
reference to adding excess acid e.g. until bubbling stops ;
magnesium reacts / dissolves ;
copper does not react / does not dissolve ;
filter off the copper ; [max 3]

[Total: 12]

4 **(a)** chemical energy in muscles ;
kinetic energy changes to gravitational potential energy as she takes off ;
only gravitational potential energy at top of jump ;
gravitational potential energy changed back to kinetic energy as she falls ;
heat / sound energy on landing ; [max 3]

(b) gravity ;
the Earth ; [2]

(c) **(i)** water / liquid turns to water vapour / gas ;
(as) particles / molecules get further apart ;
heat is needed/used to cause evaporation ;
(more) energetic particles escape (from surface) ;
able to overcome attractive forces of other particles / break bonds between liquid particles ; [max 2]

(ii) average energy of remaining particles is less ;
energy taken from surroundings to do this ; [max 1]

[Total: 8]

5 **(a)** **(i)** glucose / carbohydrate / sugar + oxygen ;
carbon dioxide + water ; [2]

(ii) suitable temperature / warmth ;
water / moisture ; [2]

(b) **(i)** as a control / to check that difference (in measurement) was caused by germinating / living seeds ; [1]

(ii) increased rate of respiration with increased temperature / positive correlation ;
10 °C rise doubles rate ; [2]

(iii) no respiration / very little respiration ;
enzymes do not work at high temperatures / enzymes denatured ; [2]

[Total: 9]

6 **(a)** **(i)** thermal / light / sound (any two for 1 mark) ; (allow KE) [1]

(ii) increases the rate ; [1]

(b) **(i)** **B** ;
Al has 13 protons ;
particle **B** is uncharged / also has 13 electrons ; [3]

(ii) **A** and **D**;
(**A** is) ion of oxygen and (**D** is) ion of aluminium ;
metals and non-metals bond ionically / owtte ;
they have opposite electrical charges / they attract each other ; [max 3]

(c) **(i)** oxygen ; [1]

(ii) firework mixture needs oxygen to burn ;
potassium perchlorate produces oxygen (when heated) ;
idea that oxygen needs to be produced in situ / air cannot easily get into firework mixture ; [max 2]

[Total: 11]

7 **(a)** (visible) light ;
infra-red ;
microwaves ; [3]

(b) (i) nucleus splits ; [1]

(ii) destroys / damages cells / DNA ;
causes cancer / mutations / radiation burns ; [1]

(iii) work behind protective screen ;
wear badge ;
wear protective clothing ; [max 2]

[Total: 7]

8 (a) (i) **C** – scrotum ;
D – urethra ; [2]

(ii) **A** carries, sperm / semen ;
B produce fluid, for sperm to swim in / containing sugar ; [2]

(iii) label to testis ; [1]

(b) (i) nucleus ; [1]

(ii) male is XY and female is XX ;
X chromosome from egg and either X or Y from sperm ; [2]

(c) from mother to baby in uterus ;
from mother to baby in breast milk ;
sharing needles
blood transfusion ; [max 2]

[Total: 10]

9 (a) (i) chlorine / an element cannot be broken down into simpler substances ;
compounds can be simplified / are made of (different) elements ;
chlorine / an element made of one type of atom ;
compounds contain different atoms bonded together ; [max 2]

(ii) litmus / Universal Indicator paper / solution ;
bleached ; [2]

(b) (i) liquid ;
solid ; [2]

(ii) chlorine reacts with (sodium) bromide ;
releasing / displacing bromine ;
bromine is orange ; [max 2]

[Total: 8]

10 (a) amplitude labelled ;
wavelength labelled ;
correct dimensions ; [3]

(b) (i) **A** is louder than **B** ; [1]

(ii) **X** has higher pitch ; [1]

(c) radiation ;
(only) radiation can travel through vacuum / conduction and convection need medium ; [2]

(d) (i) labelled where rays meet ; [1]

(ii) 59.0 mm ; [1]

(iii) an image which can be projected onto a screen ; [1]

(e) density = mass/volume ;
= 10/4 = 2.5 (g/cm^3) ; [2]

(f) ray continued as series of straight lines ;
angles approximately correct ; [2]

[Total: 14]

11 (a) (i) sugar and starch ; [1]

(ii) protein ; [1]

(iii) **A** and **C** ; [1]

(iv) **A** / **C** ; [1]

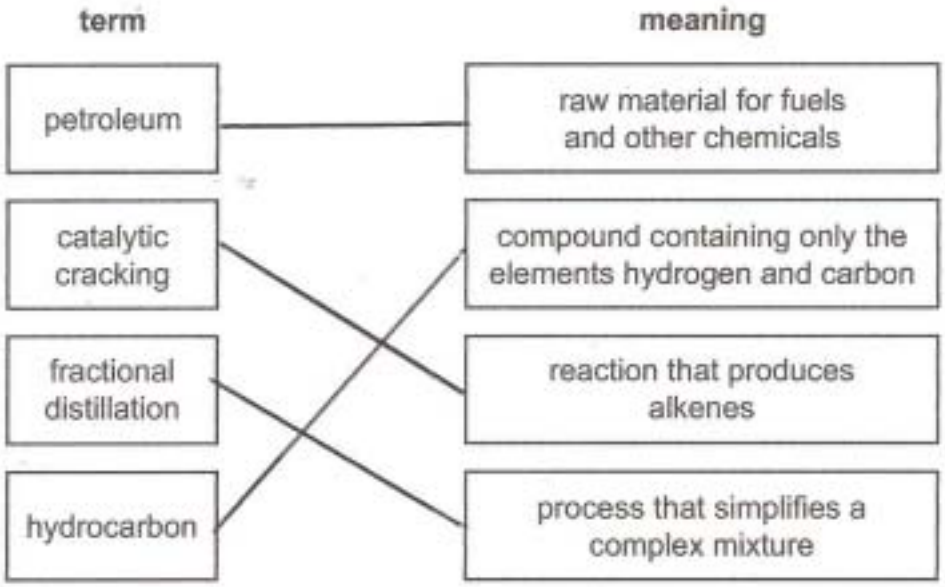
(b) (i) weak bones / rickets ; [1]

(ii) tiredness / anaemia ; [1]

(c) correct reference bacteria ;
bacteria feed on sugar ;
bacteria produce acids ;
acid dissolves tooth enamel ; [max 3]

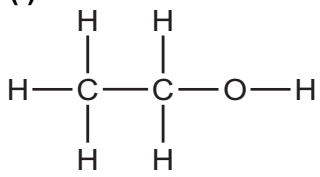
[Total: 9]

12 (a)



(all correct – 3, 2 correct – 2, 1 correct – 1) ;;; [3]

(b) (i)



[1]

(ii) ethene + steam ⟶ ethanol ; (allow (hot) water vapour) [1]

(c) (i) an unsaturated compound is produced / compound with double bonds / ethene / alkene ; [1]

(ii) aluminium oxide is a catalyst ;
aluminium oxide only speeds up reaction / is not a reactant / is not changed chemically ; [2]

(d) poly(ethene) / polythene ;
(addition) polymerisation ; [2]

[Total: 10]