CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0654 CO-ORDINATED SCIENCES

0654/21 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.

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CAMBRIDGE
International Examinations

1 (a) (i) (electrons are) shared ;
electrons (are) transferred ; [2]

(ii) (covalent)
carbon and oxygen / the elements are both non-metals ; [1]

(b) (i) limewater ;
goes cloudy / white precipitate formed ; [2]

(ii) (method **A** chemical change)
reference to it being a new substance formed / a reaction is occurring between the acid and the carbonate / owtte ;

(method **B** physical change)
no new substance is formed / only a change of state is occurring / owtte ; [2]

(c) (i) hydrogen ; [1]

(ii) **P** iron
Q copper
R magnesium ; [1]

(iii) reference to reactivity order being magnesium (most) iron and copper (least) ;
reference to idea that rate of bubbling related to reactivity ; [2]

[Total: 11]

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

(ii) carbon dioxide + water ;
glucose + oxygen ; [2]

(b) (i) no significant change / decreased (slightly) ; [1]

(ii) absorption of mineral ions / nitrates **OR** little / nothing absorbed ;
[answer must match answer to **(b)(i)**] [1]

(c) (i) water is used in photosynthesis / as part of cells ; [1]

(ii) carbon dioxide ; [1]

(d) lack of (mineral) ions / nitrates / oxygen ; [1]

[Total: 8]

3 (a) (i) 30 (seconds) ; [1]

(ii) 15 (m / s) ; [1]

(iii) takes less time to stop / gradient is greater / line is steeper / speed decreases more quickly ;
[1]

(b) (i) volume = 0.35 m^3 ; [1]

(ii) (density) = $\frac{\text{mass}}{\text{volume}}$;
= $\frac{1000}{0.35}$ = 2857 ;

kg / m^3 ; [3]

(c) (i) temperature at which a solid turns into a liquid ; [1]

(ii) irregular arrangement ;
at least half the particles touching ; [2]

[Total: 10]

4 (a) (i) gaseous might be natural gas / methane / propane / butane / biogas ;
used for heating / cooking / lighting / vehicle fuel / burners ;

liquid might be LPG / liquid butane / gasoline / diesel / gasoil / aviation spirit (paraffin) / fuel oil / ethanol / alcohol / petrol ;
used for vehicle / aircraft / ship fuel / heating / lighting ;
(heating / lighting strictly only for butane, paraffin and ethanol) [4]

(ii) exothermic ; [1]

(b) reference to acid rain which damages building material ;
reference to damage to respiratory system ;
increases acidity of lakes / soil ; [max 2]

(c) (i) carbon dioxide / carbon monoxide ; [1]

(ii) powder has a greater surface area (mass for mass) ; [1]

(iii) spark may ignite coal dust ;
coal dust might burn rapidly / explode ;
may reduce oxygen / increase carbon dioxide / carbon monoxide ;
[max 2]

[Total: 11]

5 (a) (i) wire moves ; [1]

(ii) wire moves in opposite direction ; [1]

(iii) wire moves more ; [1]

(b) (i) electrons transferred ;
from cloth to balloon ; [2]

(ii) like charges repel ; [1]

(c) (i) so that all lamps get full mains voltage ;
so that all lamps operate independently / if one lamp blows the rest still work / you can have one light on without having them all on ; [2]

(ii) fuses cut electricity to a device if there is a power surge / too much current flows / a fault ;
(too much current) causes fuse to melt ; [2]

[Total: 10]

6 (a) direction of energy flow / energy transfer ; [1]

(b) grasses / trees ;
insects ;
leopard ; [3]

(c) (i) zebra / impala / baboon / insect ; [1]

(ii) grass / tree ; [1]

(d) by photosynthesis ;
using energy from the Sun ; [2]

(e) (i) less competition (for food) ; [1]

(ii) more predation (from cheetahs / hyenas / lions) ; [1]

[Total: 10]

7 (a)

name of particle	number in the nucleus
(proton)	17
neutron	18

1 correct = 1 mark, 3 correct = 2 marks ;; [2]

(b) (i) kill microorganisms ;
make water safe for humans ; [2]

(ii) → sodium chloride + iodine ;; [2]

(c) (i) electrolysis ; [1]

(ii) copper chloride ; [1]

(iii) orange coloured metal is copper and gas produced is chlorine ; [1]

[Total: 9]

8 (a) (i) thermal ; [1]

(ii) light ; [1]

(iii) kinetic ; [1]

(b) water is heated and turned to steam ;
drives turbine ;
drives generator ;
reference to kinetic energy ; [max: 3]

(c) (i) photographic film radiation badge / dosimeter ; [1]

(ii) wear protective clothing / gloves / stand behind lead screens ; [1]

(iii) cancer / mutation / radiation burns ; [1]

(d) radio waves ;
micro waves ; [2]

[Total: 11]

9 **(a)** place for development of the zygote / embryo / fetus / baby ; [1]

(b) **(i)** 0 and 4 ;
27 and 30 / 31 ; [2]

(ii) 12 / 13 / 14 / 15 / 16 ; [1]

(iii) so that the uterus (lining) is ready to receive a fertilised egg ; [1]

(c) ovary / ovaries ; [1]

(d) **(i)** joining / fusion of male gamete / sperm and female gamete / egg ; [1]

(ii) line drawn showing change from 26 / 27 days ;
shows an increase ; [2]

(iii) so it can continue to support the fertilised egg / AW ; [1]

[Total: 10]

10 **(a)**

property	*light*	*sound*
can be reflected	*yes*	*yes*
can travel through a vacuum	*yes*	*no*
is a transverse wave	*yes*	*no*
is part of the electromagnetic spectrum	*yes*	*no*

[4]

(b) **(i)** 20 (Hz) ;
to 20 000 (Hz) ; [2]

(ii) any value above 20 000 Hz ; [1]

(iii) speed = $\frac{\text{distance}}{\text{time}}$;
= $\frac{16.5}{0.05}$ = 330 (m / s) ; [2]

[Total: 9]

11 (a) **A** oesophagus ;
B stomach ;
C liver ; [3]

(b) production / secretion of digestive enzymes / insulin secretion / control of blood sugar ; [1]

(c) cannot release digestive enzymes ;
cannot digest food (fully) / pancreas may become digested ; [2]

(d) (i) movement of digested food molecules through the wall of the intestine ;
into the blood ; [2]

(ii) duodenum / ileum / small intestine ;
large intestine (colon / rectum) ; [2]

(iii) assimilation after absorption ;
assimilation is use / uptake of food by cells of the body ; [2]

[Total: 12]

12 (a) (i)

metal malleable,	*non-metal* not malleable / brittle ;
metal electrical conductor,	*non-metal* insulator ;
metal heat conductor,	*non-metal* insulator ;
metal ductile,	*non-metal* not ductile ;
metal lustrous,	*non-metal* not lustrous / dull ;
metal sonorous,	*non-metal* not sonorous ;
metal high density,	*non-metal* low density ;

[max 2]

(ii) (metallic) Group 2 contains metals / calcium is on left of Periodic Table / forms positive ions ; [1]

(iii) krypton / Kr ; [1]

(b) (i) (**X**) reference to lowest pH ; [1]

(ii) (**Y**) metal oxides are alkaline / have pH greater than 7 ; [1]

(c) (i) general statement that rusting requires air / oxygen and water present together ;

*test-tube **1*** (no rust) no water present ;
*test-tube **2*** (rust present) air / oxygen and water present ;
*test-tube **3*** (no rust) oxygen / air not present ; [max 3]

[Total: 9]