CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2013 series

0652 PHYSICAL SCIENCE

0652/21 Paper 2 (Core Theory), maximum raw mark 80

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)** to prevent ink dissolving/running into the water/samples mix ; [1]

(b) insoluble (in water) ; [1]

(c) **(i)** three [1]

(ii) both have one colour/spot in common/both composed of 2 colours ;
both have one colour different ; [2]

[Total: 5]

2 **(a)** **(i)** 75, 51, 27, 3 – all correct ±1 cm ; [1]

(ii) travels equal distances ;
in equal time intervals ; [2]

(iii) choice of any two correct distances and times, e.g. (0,0) and (96, 0.80) ;
use of change of distance/time ;
120 cm/s ; [3]

(b) (constant) acceleration ; [1]

[Total: 7]

3 **(a)** nitric acid ;
potassium hydroxide/potassium carbonate ; [2]

(b) neutralisation ; [1]

(c) any two valid points:
evaporate (to concentrate solution) ;
cool/allow crystals to form ;
filter and dry ; [max 2]

[Total: 5]

4 **(a)** **(i)** convection ; [1]

(ii) candle heats the air (accept heats smoke) ;
air expands ;
becomes less dense (so rises) ; [3]

(b) **(i)** infra-red radiation/visible light ; [1]

(ii) the hot rocks heat the air ; [1]

[Total: 6]

5 **(a)** $2H_2 + O_2 \rightarrow 2H_2O$
(correct formulae – 1 mark ; correct balancing – 1 mark) ; [2]
(accept $H_2 + O \rightarrow H_2O$ for 1_c)

(b) oxygen added / oxidation number increases / loses an electron ; [1]

(c) only water produced / no carbon dioxide produced / no acidic gases produced ; [1]

(d) needs to be manufactured / not found naturally / made from methane / etc. ; [1]

[Total: 5]

6 **(a)** refraction ; [1]

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

(ii) unchanged ; [1]

(iii) decreases ; [1]

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

(ii) travel at the same speed ; [1]

[Total: 6]

7 **(a)** 7 electrons in outer shell ; [1]

(b) fluorine (accept bromine) ; [1]

(c) bromine / iodine / astatine ; [1]

(d) **(i)** sodium chloride (accept common salt) ; [1]

(ii) ionic ; [1]

(e) sodium / magnesium / aluminium ; [1]

[Total: 6]

8 **(a)** an electric current has a magnetic field ; [1]

(b) **(i)** nails move towards the iron (accept attracted to) ;
iron is magnetised ; [2]

(ii) nails fall to the ground ;
iron loses magnetism / iron is easily demagnetised / does not retain magnetism ; [2]

(iii) nails move towards the steel (accept attracted to) ;
nails remain on the steel when switch is opened ; [2]

[Total: 7]

9 **(a)** filtration ;
chlorination / ozonation ; [2]

(b) turns blue / white to blue ; [1]

(c) boil / freeze ;
100 °C (at 1 atm pressure)/0°C; [2]

[Total: 5]

10 **(a)** **(i)** 12 (Ω) ; [1]

(ii) use of $V = IR \rightarrow I = 6/12$
= 0.5 A ; [2]

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

(ii) in parallel over the 4 Ω resistor ; [1]

(iii) Use of $V = IR = 0.5 \times 4$ (ecf);
= 2 V ; [2]

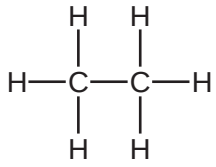
(c) **(i)** correct connection ; [1]

(ii) current greater than in 5.1 ;
with simple explanation e.g. resistance less in parallel circuit ; [2]

[Total: 10]

11 **(a)** any two from:
similar chemical properties ;
members differ from each other by CH_2 ;
gradation in physical properties ;
same functional group ; [max 2]

(b) CH_4 ;



;

C_3H_8 ; [3]

(c) fuel ; [1]

(d) **(i)** alkanes have only single bonds / saturated ; [1]
alkenes have (at least one) double bond / unsaturated ; [1] [2]

(ii) bromine water / bromine ; [1]
decolourised ; [1] [2]

[Total: 10]

12 **(a)** **(i)** splitting of an atomic nucleus ; [1]
detail; e.g. into two (more or less) equal parts / with the release of energy / large nucleus ; [1] [2]

(ii) kinetic energy ; [1] [1]

(b) very high pressure or temperature / shield outside from radioactive emissions / to protect in case of catastrophic failure ; [1] [1]

[Total: 4]

13 **(a)** 101 ; [1]

(b) potassium is 39 × 3 = 117(g) ;
whole molecule is 212 *or PO_4 is 95*;
which is less than triple potassium *or which is less than K_3* ; [3]
(accept correct calculation of % potassium, etc.)

[Total: 4]