CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level

MARK SCHEME for the October/November 2013 series

8780 PHYSICAL SCIENCE

8780/02 Paper 2 (Short Response), maximum raw mark 30

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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International Examinations

1 systematic: always looking from above/below
random : looking from different angles [1]
both required

2 lower peak <u>and</u> higher modal energy [1]
starts at (0,0), crosses original line once only and asymptotic to *x*-axis [1]

3 **(a)** vanadium pentoxide / V_2O_5 / vanadium(V) oxide [1]

(b) a catalyst provides an alternative route of lower activation energy [1]
a (much) higher proportion of molecules now possess activation energy (and so a higher proportion of collisions are successful) [1]

4 **(a)** correct order of orbital levels (3d <u>above</u> 4s) [1]
correct maximum electron numbers s = 2(×2); p = 6(×3); d = 10(×1) [1]

(b) $(1s^2 2s^2 2p^6)\mathbf{3s^2 3p^6 3d^2}$ [1]

5 **(a)** (decreasing) acceleration then constant velocity/speed [1]

(b) any two from: [2]
initially weight of the ball is greater than the air resistance
friction/air resistance increases with increasing velocity/speed/as it falls
(at terminal velocity) frictional force/air resistance equals weight of sphere or resultant force is zero / forces balanced

6 **(a)** AgBr/silver bromide [1]

(b) red/orange/brown solution formed [1]
$Cl_2 + 2Br^- \rightarrow Br_2 + 2Cl^-$ [1]

7 (initiation stage) $Br_2 \rightarrow 2Br\bullet$ [1]

(propagation stages) $C_2H_6 + Br\bullet \rightarrow C_2H_5\bullet + HBr$ [1]
$C_2H_5 + Br_2 \rightarrow C_2H_5Br + Br\bullet$ [1]
ignore any termination equations and any dots on the 'wrong' carbon atom

8 **(a)** <u>use of</u> $v = f\lambda$ (e.g. $3 \times 10^8 = f \times 720 \times 10^9$) [1]
(f =) 4.2×10^{14} (Hz) [1]

(b) number of oscillations per unit time / number of wavelengths / wavefronts (passing a point) per unit time [1]

(c) $v = f\lambda$ and as f does not change, λ must decrease (o.w.t.t.e.) [1]

9 estimates of the mass of the cup of tea (50 – 750 g)
<u>and</u> the average M_r of a molecule (20 ± 5) [1]

amount of moles n = mass/M_r (= 2 to 50) [1]

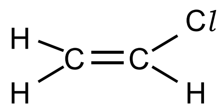
number of molecules = $N_A \times n$ (= 1×10^{24} to 3×10^{25}) [1]
allow e.c.f. throughout

10 random: the fluctuations in the count rate (for each time interval) [1]

spontaneous: the similar count rate / same average count rate (in the two experiments) [1]

11 **(a)** compound **A**:1-chloropropene [1]

compound **B**:



[1]

(b) (in compound **A**) there are difference groups in C1 and on C2 (o.w.t.t.e.) [1]

[Total: 30]