**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International General Certificate of Secondary Education


# MARK SCHEME for the October/November 2015 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.

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**1** **(a)** atom of an element with same number of proton / proton number ; [1]
different number of neutrons / nucleon or neutron number; [1]

(if no reference to 'number' 1 max, for both proton and nucleon)

**(b)** atomic / proton number ; [1]
mass / nucleon number ; [1]

**(c)** 2 electrons in first level and 4 in outer level; [1]

**[Total 5]**

**2** **(a)** Arrow from **C** ; [1]
vertically downwards ; [1]

**(b)** **(i)** Use of mass $\times g$ (= 80 $\times$ 10) ; [1]
800 N (accept use of (9.8 or 9.81 N kg$^{-1}$) ; [1]

**(ii)** Use of weight $\times$ distance (= 800 $\times$ 6.0) (ecf) ; [1]
= 4800 (N m) ; [1]

**(iii)** decreases ; [1]
(moment = force $\times$ distance from **X**) distance decreases owtte ; [1]

**[Total 8]**

**3** brass ; [1]
graphite / sulfur ; [1]
air ; [1]
graphite ; [1]
chlorine ; [1]

**[Total 5]**

**4** **(a)** conduction ; [1]

**(b)** copper fastest, iron slowest ; [1]
brass quicker conductor than aluminium ; [1]

**[Total 3]**

**5 (a) (i)** loses one / an electron ; [1]

  **(ii)** $Cl^-$ ; [1]
  18 ; [1]

  **(b)** 8 electrons round chlorine ; [1]
  shared pair between hydrogen and chlorine ; [1]

  **(c)** sodium hydroxide / sodium oxide ; [1]
  Water ; [1]

  **OR**

  sodium carbonate / hydrogencarbonate ; [1]
  water AND carbon dioxide ; [1]

  (accept correct formulae)

[Total 7]

**6 (a) (i) I** clearly marked equal distance behind the mirror as object is in front and in line
  with the object ; [1]

  (accept very small angle between incident and reflected ray, < 5°)

  **(ii) Ray** 1 correctly reflected back along its own path ; [1]

  **(iii)** Ray 2 correctly reflected ; [1]

  **(iv)** normal drawn and 'r' correctly identified ; [1]

  **(v)** Ray 1 correctly continued along its own path ; [1]
  Ray 2 correctly continued along its own path ; [1]

  **(vi) E** at a suitable point with between the rays [1]

  **(b)** angle of reflection = angle of incidence ; [1]

  **(c)** virtual (accept cannot be projected onto a screen) ; [1]

[Total 9]

**7 (a)** nitrogen – 2 ; [1]
  hydrogen – 8 ; [1]
  oxygen – 4 ; [1]

  (can be listed in any order with the correct number)
  (award one mark if all three names correct and no other marks gained)

**(b)** 40 + 12 + 48 ;                                                                 [1]
100 ;                                                                                     [1]

(correct final answer with no working scores 2 marks, ignore any unit given)

**(c) (i)** any number between 4 and 6.9 ;                                 [1]

(4 is acceptable but 7 is not)

**(ii)** 7 ;                                                                                  [1]

**[Total 7]**

**8 (a)** balloons are charged (by rubbing)                                   [1]

(accept charge transferred from jumper to balloon or vice versa)

both have same charge (accept both positive / negative) ;        [1]
like charges repel ;                                                                  [1]

**(b)** water conducts (charge) ;                                                 [1]
water removes charge / balloons discharged ;                         [1]

**[Total 5]**

**9 (a)** any one from:
coloured ions / compounds / ;
more than one ion formed / different oxidation states / *variable valencies* ;
useful catalysts / form complexes ;
high densities / melting points ;                                              [1]

(accept conducts electricity or energy)

**(b)** arsenic / selenium / bromine / krypton ;                            [1]

**(c) (i)** malachite / copper pyrites ;                                           [1]

**(ii)** gold / silver / mercury/platinum ;                                     [1]

**(iii)** unreactive ;                                                                    [1]

**(d) (i)** no reaction / no change / OWTTE ; [1]
copper formed / iron dissolves / solution turns colourless; [1]

**(ii)** iron is more reactive than copper ; [1]
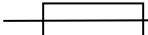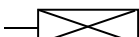
**[Total 8]**

**10 (a) (i)** heat / energy given out ; [1]

**(ii)** $2C_2H_2 + 5O_2 \rightarrow 4CO_2 + 2H_2O$ ; [2]
(all formulae correct – 1 mark; correct balancing – 1 mark)

**(b) (i)** carbon monoxide ; [1]

**(ii)** poisonous / toxic / prevents transport of oxygen in blood / bonds
with haemoglobin ; [1]

**(c) (i)** members differ by $CH_2$ / same general formula / functional group ; [1]

(accept similar chemical properties / physical properties increase down series)

**(ii)** ethane has carbon-carbon single bond ; [1]
ethaene has carbon-carbon double bond ; [1]

**[Total 8]**

**11 (a)** correct circuit diagram for fuse ⊣▭⊢ ; [1]
(accept ⊣⊠⊢ )

**(b)** use of $R = V / I$ ( =12 / 3.2) ; [1]
= 3.75 ; [1]
ohm or $\Omega$ ; [1]

**(c)** 5 A ; [1]
must be greater than 3.2 A (accept for 13 A fuse) ; [1]
and smallest above 3.2 A / relevant comment re 13 A fuse ; [1]

(If 3 A is chosen and reason given is that it is the nearest to current allow 1c).

**(d) (i)** lamp correctly drawn in parallel with the original lamp ; [1]

**(ii)** circuit current / current through fuse now larger ; [1]
greater than 5 A / = 6.4 A ; [1]

**[Total 10]**

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**12 (a)** randomness of decay ;  [1]

**(b) (i)** $4600\,\text{s}^{-1}$ (Bq) ;  [1]

**(ii)** Indication on graph of finding time at which count rate halves ;  [1]
$25 \pm 2\,\text{s}$ ;  [1]

**(c)** Protective clothing / use tongs / short exposure time / shielding etc. ;  [1]

[Total 5]