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

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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 × *g* (= 80 × 10) ; [1]
800 N (accept use of (9.8 or 9.81 N kg^{-1}) ; [1]

(ii) Use of weight × distance (= 800 × 6.0) (ecf) ; [1]
= 4800 (N m) ; [1]

(iii) decreases ; [1]
(moment = force × 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]

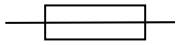
(ii) poisonous / toxic / prevents transport of oxygen in blood / bonds with haemoglobin ; [1]

(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 Ω ; [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]

12 (a) randomness of decay ; [1]

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

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

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

[Total 5]