MARK SCHEME for the October/November 2006 question paper

0625 PHYSICS

0625/03   Paper 3 (Extended Theory), maximum raw mark 80

This mark scheme is published as an aid to teachers and students, 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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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1 (a) (i)   t   = v/g or 32/10   C1
             = 3.2 s   A1

(ii)   straight line starting at zero, inclined   C1
         line joining 0,0 and 3.2, 32, accept c.f. from time **(i)**   A1

(iii)   2.4 kg   A1   [5]

(b) (i)   take volume of water before use   B1
           (totally) immerse stone and take new volume   B1
           (Not clearly measured before and after C1)

(ii)   hang rock from balance and take reading   B1

(iii)   density = mass/volume   B1

(iv)   need to tie "sinker" or cork or press cork down   B1
         need volume with sinker then volume with sinker and cork or just completely submerge
         cork   B1   [6]

[Total: 11]

2 (a)   limit of proportionality (allow elastic limit)   B1   [1]

(b)   force is proportional to extension or in terms of doubling   B1   [1]

(c)   (up to Q extension proportional to force applied)
         Q to R extension/unit force more however expressed   B1   [1]

(d)   k   = force/extension or 8/2 or other correct ratio   C1
             = 4.0 N/mm   A1   [2]

[Total: 5]

3 (a)   p.e. lost   = mgh or 1 x 10 x 7   C1
                 = 70 J   A1   [2]

(b)   70 = 0.5 x m x v^2 or ecf   C1
         v^2 = 140 or 2 x p.e.   C1
         v = 12 m/s   A1   [3]

(c)   some p.e. changed to heat/sound/either one/work done against air resistance air/resistance acts
         against the motion   B1   [1]

[Total: 6]

4 (a) (i)   1 is 20°C
             2 is 15 ± 1°C, need both correct for a mark   A1

(ii)   more heat lost at higher temperature   B1   [2]

(b)   heat in = 60 x 210 or Wt or 12 600 (J)   C1
         heat in water = m x s x $\Delta\theta$ or 75 x s x 40   C1
         s = 12600/75 x 40   C1
             = 4.2 J/g °C   A1   [4]

(c)   outline correct, two wires with <u>clear</u> junction and a meter/datalogger/computer   M1
         labels, hot and cold junctions or clear, two different metals   A1   [2]

[Total: 8]

5 **(a)** **(i)** conduction   B1

      (ii) particles/atoms/ions vibrate or electrons move and carry energy   B1
           pass on energy from one particle to the next   B1
                            [3]

    (b) four surfaces facing <u>one</u> heat source   B1
           suitable detector e.g. thermometer behind surface-read all 4   B1
           precaution e.g. equal distance/time   B1
           (Can not score last two marks if experiment is totally wrong)   [3]

                                                 [Total: 6]

6 **(a)** completed path   B1   [1]

    (b) any two correct, -1 each incorrect
           virtual, inverted, same size as object   B2   [2]

    (c) angle of incidence zero/at right angles/along normal   B1   [1]

    (d) $1.5 = V_a/V_g = 3 \times 10^8/V_g$

                                                C1
           $V_g = 2 \times 10^8$ m/s   A1   [2]

    (e) angle of incidence = 45°, so angle of reflection = 45°, so ray turns through 90°
           OR angle i> angle c   B1
           so totally internally reflects   B1   [2]

                                                   [Total: 8]

7 **(a)** straight not circular or WTTE
           waves not same wavelength/same distance apart
           waves should extend into shadow area (more)   any 2   B2   [2]

    (b) diagram showing large flat piece   M1
           with circular edges (ignore any wavelength changes) but straight part must be (very) nearly
           equal to slit width   A1   [2]

    (c) speed   = 1.2 x 8   C1
                  = 9.6 cm/s   A1   [2]

                                                   [Total: 6]

8 **(a)** switch in correct position   B1   [1]

    (b) **(i)** rheostat/variable resistance symbol drawn   B1

      (ii) dot and R in line to 12 W lamp   B1   [2]

    (c) Question deleted

    (d) R   = V/I or 12/.3   C1
             = 4Ω   A1   [2]

    (e) **(i)** parallel circuit/all lamps connected separately across the 12V   B1

      (ii) 4 A   A1   [2]

                                                   [Total: 7]

9 **(a)** **(i)** connections one to each plate   M1
top one to +ve , bottom one to -ve   A1 [2]
(New PSU drawn C1)

   (ii) electrons negatively charged   B1
one plate positively charged, one negatively charged B1
electrons attracted to +/repelled by –   B1 [3]

 (b) **(i)** time base applied to X plates stated or described B1

   (ii) a.c. or varying voltage applied to Y plates   B1 [2]

 (c) 2 full waves, (equal about centre line)   B1 [1]

                   [Total: 8]

10 **(a)** A – resistor B – LDR C – transistor D – lamp (–1 each incorrect) B2 [2]

 (b) C   B1 [1]

 (c) resistance of LDR low in light, high in dark   B1
increase of resistance/potential in circuit cause transistor to conduct (V_{be} > 0.6 V) B1
switches lamp on   B1 [3]

                   [Total: 6]

11 **(a)** **(i)** atoms interact with by particle/photon not radiation B1
electron(s) removed to form ions   B1

   (ii) much greater mass or size/slower speed/more ion pairs/cm/larger charge B1 [3]

 (b) **(i)** any 2 correct   B2

   (ii) e.g. foil thickness described/outline diagram   B1
foil too thick less reading/notes on diagram to show method B1
other examples will occur, must have two clear points:
 e.g. 1. gamma rays aimed at cancer (not just radiation)
     focused on tumour
 e.g. 2. fission of heavy nucleus (accept named nuclide)
     leads to more fissions/chain reaction   [4]

                   [Total: 7]