Rewarding Learning

General Certificate of Secondary Education
2011

Science: Physics

Paper 1
Higher Tier

[G7604]

WEDNESDAY 25 MAY, MORNING

MARK SCHEME

1 (i) Average speed = distance/time [1]
                = 36/3 [1]
                = 12 (cm/s) [1]

(ii) Initial speed = 2 × ave speed   or ave speed = ½ (u + v) [1]
          = 24 (cm/s)   12   = ½ × (u + 0) [1]
          ecf for Av speed

(iii) Straight line of negative slope [1]
From (0,24) to (3,0)   1 each point [2]
Allow ecf for velocity from (ii)

(iv) a = (v − u)/t or equivalent [1]
  = (0 − 24)/3   ecf from (ii) for u [1]
  = − 8   ignore − sign. [1]

(v) F = ma or F = md e.c.f. for a [1]
    = 0.075 × 0.08   [failure to convert g to kg *and* cm/s^2 to m/s^2 [4]
    = 0.006 (N)   give a max of 4 marks] [1]

(vi) Gravity/weight/component of weight [1]

(vii) They are equal/same [1]

(viii) Average speed = 12 (cm/s)   ecf from (i) [1]
Average velocity = 0 [1]

(ix) Momentum = mass × velocity (speed)   ecf for velocity [1]
              = 0.075 × 0.2 [1]
              = 0.015   failure to convert to kg give 3 marks [1]
                kg m/s [1]

25

2 **(a)** Renewable – wind/wave/tidal/geothermal/biomass/hydro(electric)/solar or Sun
Non-renewable – any fossil fuel/nuclear/uranium/peat [3]
½ each round down

(b) (i) 14580 J [1]

(ii) PE = mgh [1]
14580 = 90 × 10 × h   ecf from (i) [2]
H = 16.2 (m) [1]

(iii) KE = ½ mv² no ecf [1]
= ½ × 90 × 15² [1]
= 10125 (J) [1]

(iv) Energy wasted = 14580 − 10125 [1]
= 4455 (J) Allow ecf from (iii) for KE [1]
and from (i) for P.E.

(c) (i) Black [1]

(ii) Infra-red or IR [1]

(iii) B and A receives heat by convection *and* **radiation** [1] [2]
B and C receives heat by radiation only [1]

(d) Shiny outside   Poor emitter of radiation [1]
Shiny inside   Good reflector/poor absorber of radiation [1]

(e) In metals(copper) electrons [1]
and collide with ions (atoms) either [1] [4]   25
In glass atoms [1] vibrate more/faster [1]
QWC [2]

Response	Mark
Candidates describe in detail using good spelling, punctuation and grammar the main points shown above. The form and style is of a high standard and specialist terms are used appropriately at all times.	2
Candidates make some reference to the main points shown above using satisfactory spelling, punctuation and grammar. The form and style is of a satisfactory standard and they have made some reference to specialist terms.	1
Candidates make little reference to the main points shown above using limited spelling, punctuation and grammar. The form and style is of a limited standard and they have made no use of specialist terms.	0

6349.01

3 **(a) (i)** I same distance behind mirror as O in front (± 1 div) (2 mm) [1]
accept a dot unlabelled

(ii) Ray from O to mirror [1]
Reflected ray comes from I no ecf for position of I [1]

(b) (i) Parallel rays converge to a point to the right of lens on p-axis [1]
Focal length marked distance from lens to this point [1]

(ii) Both parallel rays diverge [1]

(iii) Place lens in front of a screen [1]
Move lens toward/away from screen or adjust position [1]
Until sharp image is seen/image is in focus [1]
Identify or measure distance from lens to screen/lens to image [1]

(iv) Mark and label both focal points   3 cm from lens [1]
(Accept dots for label)

(v) Ray from top of object through centre of lens undeviated [1]
Ray parallel to principal axis refracted through focus [1]
Rays produced *back* until they meet [1]
Top of image marked at intersection, bottom on
principal axis [1]
Arrow from object on at least one ray [1]
Contradictory arrow no mark – only on real rays

(vi) Light only appears to come from it/cannot be projected to a
screen/Rays do not meet to form it [1]

(vii) Height consistent with candidate's diagram [1]

(viii) Image distance consistent with candidate's diagram [1]

(ix) Eye marked to the right of the lens [1]

(c) (i) Straight line from X to hypotenuse of prism [1]
REFLECTED RAY at right angles to incident ray [1]

(ii) Total internal reflection occurs at prism/TIR occurs [1]
angle of incidence in the glass is greater than the critical angle [2]

25

6349.01

4 **(a)** **(i)** He lost electrons [1]

      (ii) STATEMENT (2) is correct [1]

      (iii) Q = It or equivalent   (wrong equation no marks [1]
          I = $8 \times 10^{-6}/1 \times 10^{-3}$ incorrect physics) [1]
            = 8×10^{-3} or 0.008A or 8 mA [1]

          or $\dfrac{1}{125}$ A

(b) **(i)** Earth to metal case/sole/parts [1]
       Live to the fuse [1]
       If live touches metal case [1]
       Surge of/Large current flows/low resistance path/current goes
       through earth wire [1]
       Blows fuse [1]

      (ii) P = IV or equivalent [1]
          I = 2200/240 [1]
           = 9.17 (9.2) (A)   9 ⅙ (A) [1]

(c) **(i)** R = V/I [1]
         = 1.5/0.25 [1]
           = 6 (Ω) [1]

      (ii) Bulbs in parallel [1]
       Battery in series with bulbs [1]
       Switch in series with battery [1]
       All symbols correct [1]

(d) **(i)** Ammeter in series with box [1]
       Voltmeter in parallel with box [1]
       Variable resistor (for a series of values) [1]
       Correct symbols providing circuit includes sealed box [1]
       accept Ⓥ or Ⓐ in series

      (ii) Diode [1]   25

5 (a) (i)

Electron	(1/1840)	−1	8	Outside nucleus
Neutron	1	0	9	In the nucleus
Proton	1	+1	8	In the nucleus

½ each round up

[6]

(ii) $^{17}_{9}$ O ringed

[1]

(iii) Has not same number of protons/atomic number

[1]

(b) (i) The activity/reading reaches a maximum/increases/starts

[1]

(ii) Activity recorded without any source present/activity from surrounding materials

[1]

(iii) $^{24}_{11}$ Na + γ

[3]

(iv) Every half life the activity halves worth [1]
15 hr = 500   30 hour = 250   45 hours = 125

[3]

(v) 15 hrs long enough *to be detected*
1 minute too short *to be detected*
1 year *dangerous radiations* for too long

[1]
[1]
[1]

(c) (i) Fission (correct spelling only)
Heavy nucleus splitting/breaking (up)
if $\left(\begin{array}{c}\text{Heavy}\\\text{Large}\end{array}\right)$ atom splitting only [1]

[1]
[2]

(ii) Fusion (correct spelling)
Light joining
nuclei joining

[1]
[1]
[1]   25

Total   **125**