cea

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]
$\qquad\qquad\qquad$ = 36/3 [1]
$\qquad\qquad\qquad$ = 12 (cm/s) [1]

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

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

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

(v) F = ma or F = md e.c.f. for a [1]
$\quad$ = 0.075 × 0.08 $\quad$ [failure to convert g to kg *and* cm/s^2 to m/s^2 [4]
$\quad$ = 0.006 (N) $\qquad$ 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) $\qquad\qquad$ ecf from (i) [1]
Average velocity = 0 [1]

(ix) Momentum = mass × velocity (speed) $\qquad$ ecf for velocity [1]
$\qquad\qquad$ = 0.075 × 0.2 [1]
$\qquad\qquad$ = 0.015 $\qquad$ failure to convert to kg give 3 marks [1]
$\qquad\qquad\quad$ 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 mv^2 no ecf   [1]
= ½ × 90 × 15^2 [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

3 **(a)** **(i)** I same distance behind mirror as O in front ($\pm$ 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

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 $\frac{1}{125}$ 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

AVAILABLE MARKS

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]
1 minute too short *to be detected* [1]
1 year *dangerous radiations* for too long [1]

(c) **(i)** Fission (correct spelling only) [1]
Heavy nucleus splitting/breaking (up) [2]
if $\left(\begin{array}{c}\text{Heavy}\\\text{Large}\end{array}\right)$ atom splitting only [1]

(ii) Fusion (correct spelling)
Light joining [1]
nuclei joining [1]
[1]   25

Total   **125**