

**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

General Certificate of Education O Level

**MARK SCHEME for the JUNE 2005 question paper**

**5054 PHYSICS**

5054/02

Paper 2 (Theory), maximum mark 75

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**June 2005**

**GCE O Level**

**MARK SCHEME**

**MAXIMUM MARK: 75**

**SYLLABUS/COMPONENT: 5054/02**

**PHYSICS  
Paper 2 (Theory)**



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### Section A

- 1 (a) arrow from Earth to Sun (by eye would pass through Sun) **B1**
- (b) (i) use of circumference/time **or**  $s=d/t$  **or** radius/t **C1**  
two speeds **clearly** found using circumference e.g. 970 and 942  
(allow conversion to other units) **A1**
- (ii) 258 (million km) **B1 4**
- 2 (a) straight line through optical centre by eye **M1**  
one other line from same point on object correctly to image on film **A1**
- (b) move lens towards object/to left/away from film **B1**
- (c) **1<sup>st</sup> and 2<sup>nd</sup> face** correct refraction for all rays shown **B1**  
dispersion into at least two rays at first face only **B1**  
colours marked on diverging rays outside prism  
(any 2 visible colours from spectrum, any order, accept letters) **B1 6**
- 3 (a) (i) (molecules) hit the wall/cylinder **B1**  
any other point to explain large pressure, e.g. small distance between  
molecules **or** hit often/frequently **or** many hit walls each sec **or** hit/move fast **B1**
- (ii) greater distance between molecules **or** fewer hit (per sec) **or** fewer molecules  
(in cylinder) **or** molecules leave cylinder **B1**
- (b)  $P_1V_1 = P_2V_2$  **or**  $PV = \text{constant}$  **B1**  
0.002. 200 = 1. V or 0.4 seen **C1**  
0.398 **or** 0.4 m<sup>3</sup> **A1 6**
- 4 (a) in river/(emerging from or entering) turbine house **B1**
- (b) (i) 0.9 **or** 90% **or** 0.47 **or** 47% (penalise unit error) **B1**
- (ii)  $P = E/t$  in symbols **or** any energy/any time **C1**  
30 x 60 **or** 1800 seen **C1**  
 $2.5 \times 10^6$  (W)  
(150 or 2.78MW score 2/3) **A1**
- (c) any sensible suggestion e.g. no costs for water/energy supply  
**or** less pollution (accept coal produces smoke/dust/harmful gases/CO<sub>2</sub>)  
**or** no need to transport coal **or** renewable  
**or** rapid response to power demand **or** less heat produced/more efficient **B1**
- (d) any sensible suggestion e.g. flooding **or** fish unable to pass **or** turbines kill fish  
**or** destroy habitats **or** less land **or** uses up large space **or** fells trees  
**or** unsightly/destroys scenery **or** lake/river silt up **or** more rain/evaporation **B1 7**
- 5 (a) arrows in A and C to right **B1**  
arrow in B to left **or** right if both A and C to left **B1**
- (b) (i) SNSN **or** NSNS **B1**

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- (ii) they/iron pieces attract/move together attraction of opposite poles/unlike poles/S and N e.c.f. (i) throughout **B1**  
**B1**
- (c) (i) opposite direction/reverses/poles change **B1**
- (ii) weaker (field) **or** (iron) demagnetises **B1 7**
- 6 (a) 3024 **B1**  
3.024 (or 1/1000 of previous answer) **B1**  
1.512 (or 1/2 of previous answer) **B1**
- (b) smaller resistance **accept** more current **B1**
- (c) heater uses more than 3A **accept** current 12.6A causes fuse to melt/blow/burn/break **B1**  
**B1 6**
- 7 (a) arrow anticlockwise anywhere near top line of circuit **B1**
- (b) LDR **or** light dependent resistor **B1**
- (c) less resistance of X **B1**  
same change in voltage as resistance (voltage decreases alone B1) **B1 4**
- 8 (a) 4.5 V **B1**
- (b)  $I = V/R$  in any form using symbols or words **B1**  
4.5/15 **C1**  
0.3 A **A1**
- (c) provides smaller (internal) resistance **or** lasts longer **or** less lost voltage **or** one (cell) fails others work **or** less heat/energy lost **B1 5**

### Section B

- 9 (a) (i) y axis labelled speed or m/s **and** x axis labelled time or s **B1**  
straight line from 0,0 to  $t = 20$ , speed = 25 **B1**  
uniform speed from  $t = 20$  to 50 **and** uniform deceleration from  $t = 50$  to 60 **B1**
- (ii) acceleration = change in velocity/time or per unit time **or** rate of change of velocity with time **B1**  
accept equation but must be written in words or defined symbols
- (iii) constant increase in speed/velocity in 1sec/ /same time interval **or** rate of change of speed/velocity constant **or**  $\Delta v$  proportional to time **or** acceleration constant **with time** **B1**
- (iv) 25/10 e.c.f. time interval from graph **C1**  
2.5 m/s<sup>2</sup> accept -ve **A1**

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- (b) (i) weight/gravitational force (accept gravity) **downwards**  
normal/reaction/contact force/force from ground **upwards**  
air resistance/drag **or** friction (due to air) **backwards or** opposite to train  
(direction)  
braking force **or** friction **or** resistive force **backwards or** same direction as air  
drag  
tractive **or** thrust **or** driving force **or** force of engine **forwards** ANY 4 **B4**  
accept from diagram (-1 each wrong force more than 4)
- (ii) 1. unbalanced **since** forward force > backwards force **or** resultant/net  
**forward** force **B1**  
2. balanced **since** forward force = backwards force **or** forces cancel **or**  
zero resultant **B1**  
3. unbalanced **since** backwards force > forwards force **B1**  
**or** only backwards force **or** resultant/net backwards force  
accept sizes of forces from lengths of arrows on diagram
- (c) sketch graph with **axes labelled** and non straight line **B1**
- 10 (a) (i) 25% **B1**
- (ii) **conduction through roof** **B1**  
particles/molecules/atoms vibrate (accept electrons move if roof metal)  
(energy passed) from particle to particle (by collision)  
**or** no net movement of medium **B1**  
**convection from roof** **B1**  
(warm) air (in contact with roof) expands (ignore particles expand)  
(air) density decreases **B1**  
hot air (not heat) rises **B1**  
**radiation from roof** **B1**  
sensible comment on radiation, e.g. infra-red, electromagnetic, a wave
- (iii) (carpet) traps air **B1**  
carpet/air is a bad conductor/good insulator  
**or** convection reduced **in trapped air** **A1**
- (b) (i) X = (\$) 800 **B1**  
Y = (\$) 100 **B1**
- (ii) B (allow 1 mark for e.c.f. from (i)) **M1**  
comparison of installation cost **or** energy saving/year **or** payback time **A1**
- (iii) walls thicker/cavity insulation/insulated/made from insulating material  
floors thicker/made from insulating material (e.g. polystyrene, wood)  
painting walls/roof white (inside or outside)  
draught prevention/closing windows/closing doors/stop (hot) air escaping  
using curtains/shutters  
fewer windows/double glazing windows  
reducing temperature inside house ANY 2, 1 from each line **B2**  
(ignore insulating roof)

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- 11 (a) (i) nucleus or small central area shown on diagram **M1**  
containing neutrons and protons **A1**  
electrons in orbits (accept shown on diagram around nucleus) **B1**
- (ii) emission of at least one of alpha/beta/gamma (radiation/particles)  
random or spontaneous (emission)  
from **unstable** atom/nucleus/substance **or** becomes stable ANY 2 **B2**  
from nucleus **B1**
- (iii) sensible statement but not just a list of the causes of background radiation  
e.g. unavoidable **or** naturally occurring **or** from surroundings/environment **or**  
present without source **or** there all the time etc. **B1**
- (iv) any halving **or** 820 **or** 419 **or** 410 **or** 223 **or** 209(.5) **or** 210 **or** 2 half lives  
seen **C1**  
205 **A1**
- (b) (i) 84 **B1**  
proton number increases by 1 **or**  $n \rightarrow p + e$  **or** correct equation with  ${}_{-1}\beta$  or  ${}_{-1}e$  **B1**
- (ii) alpha **B1**  
loses two protons or proton number or atomic number decreases by 2 **B1**  
loses two neutrons or nucleon number or mass number decreases by 4 **B1**
- (iii) different proton numbers **B1**

Max 1 unit penalty per question. No significant figure penalties.