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)

UNIVERSITY of CAMBRIDGE
International Examinations

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)	**1st and 2nd 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 = constant	**B1**	
		0.002. 200 = 1. V or 0.4 seen	**C1**	
		0.398 **or** 0.4 m^3	**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**	
		2.5×10^6 (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_2 **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**	

(ii) they/iron pieces attract/move together e.c.f. **(i)** throughout **B1**
attraction of opposite poles/unlike poles/S and N **B1**

(c) (i) opposite direction/reverses/poles change **B1**

(ii) weaker (field) **or** (iron) demagnetises **B1** **7**

6 **(a)** 3024 **B1**
3.024 (or1/1000 of previous answer) **B1**
1.512 (or ½ of previous answer) **B1**

(b) smaller resistance **accept** more current **B1**

(c) heater uses more than 3A **accept** current 12.6A **B1**
causes fuse to melt/blow/burn/break **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
accept equation but must be written in words or defined symbols **B1**

(iii) constant increase in speed/velocity in 1sec/ /same time interval
or rate of change of speed/velocity constant **or** Δv proportional to time
or acceleration constant **with time** **B1**

(iv) 25/10 e.c.f. time interval from graph **C1**
2.5 m/s^2 accept -ve **A1**

(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 **or** only backwards force **or** resultant/net backwards force **B1**
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**
particles/molecules/atoms vibrate (accept electrons move if roof metal) **B1**
(energy passed) from particle to particle (by collision)
or no net movement of medium **B1**
convection from roof
(warm) air (in contact with roof) expands (ignore particles expand) **B1**
(air) density decreases **B1**
hot air (not heat) rises **B1**
radiation from roof
sensible comment on radiation, e.g. infra-red, electromagnetic, a wave **B1**

(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)

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 -> 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.