

Mark Scheme (Results) January 2007

GCE O Level

GCE O level Physics (7540/01)

Notes on the mark schemes

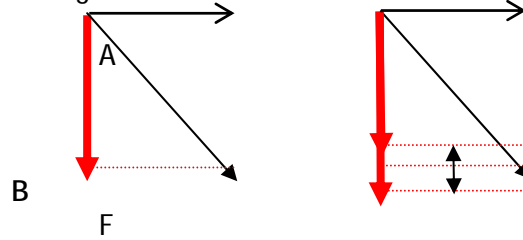
Abbreviations used in the scheme

UP	unit penalty
TE	transmits the error
OWTTE	or words to that effect
SF	significant figures
SFP	significant figure penalty
MAX	maximum
dop	dependent on previous

7540 Paper 01

1. (a) force B starting downwards from top of F or end of A 1

ending level with bottom of F 1



2nd mark dependent on 1st
 Note tolerance for 2nd mark as shown on right hand diagram

(b) not Newtons 3rd not same (value, magnitude or size) (1)
 not equal

not in opposite direction (1)

not acting on different bodies (1)
 acting on the same body

'not equal and opposite' scores 2 max 2

(c)(i) force friction 1
 (spelling not important)

(ii) which force C 1
 the arrow on the ground

Supervisor's note
 C with anything else e.g. G not acceptable

(Total 6 marks)

2.	(a)(i)	acceleration	$20 \div 3$	1
			6.7 or 6.67 or 6.66 m/s ² i.e correct rounding - not 6.6	1
			deduct 1 mark for incorrect or missing unit	
			accept the following units : m/s/s ms ⁻²	
	(ii)	weightless?	No	1
	(iii)	reason	acceleration would have to be 10 (m/s ²) not falling with acceleration of free fall acceleration is less than free fall acceleration is less than 10 (m/s ²) acceleration is not equal to g acceleration is less than g	1
			accept 'a' instead of 'acceleration' do not accept acceleration is greater than g	
	(iv)	mass	stays the same nothing unchanged no change	1
	(v)	distance fallen	$s = (v+u) t/2$ $s = \frac{1}{2} a t^2$ $= (20 \times 3) / 2$ $= \frac{1}{2} (20/3) \times 3^2$ $= 30 \text{ m}$ UP $= 30 \text{ m}$	1 1
			deduct 1 mark for incorrect or missing unit	
	(b)	accelerates?	velocity changes or direction changes do not accept 'speed' changes	1

(Total 8 marks)

3. (a) **heat energy** = $2 \times 5 \times 60$ 1
= 600 J or 0.6(00) kJ UP 1
(2 × 5 = 10 J scores 1)
accept the following units : j Ws
alternative :
(0.002 x 5) / 60 = 0.000166 kWh
- (b) **processes** convection (1)
radiation (1)
evaporation (1)
perspiration
sweating
do not accept 'conduction' max 2
- (c) **water** water is a better conductor than air 1
greater rate of flow of heat or heat loss (from foot to water) 1
allow reverse arguments

(Total 6 marks)

4. (a) clockwise moment $= 2 \times 0.4$ 1
 $= 0.8 \text{ Nm}$ UP 80 Ncm 1
 accept 0.8 nm or 80 ncm
- (b) why clockwise? CoG is to right of pivot (1)
 weight of rule exerts a clockwise moment (1)
 CM > ACM (1)
 max 2
- (c) position of 0.5 N $CM = 0.8 + 0.10 = 0.90$ 1
 $ACM = 0.90 = 0.8 + (0.5x)$ 1
 $x = 0.2 \text{ m}$ to the left of pivot UP 1
 0.2 m scores 2
 left of pivot scores 3rd mark
 allow error carried forward from (a) for CM

(Total 7 marks)

5.	manner	random uneven zig-zag jiggly haphazard irregular	1
	spacing	larger greater wider bigger longer more	1
	speed	decreases falls reduces lessens gets smaller	1
	temperature	absolute zero absolute zero temperature	1
	value	-273 °C 0 K -273 C 0 °K do not allow 0 °C or 0 C	1

(Total 5 marks)

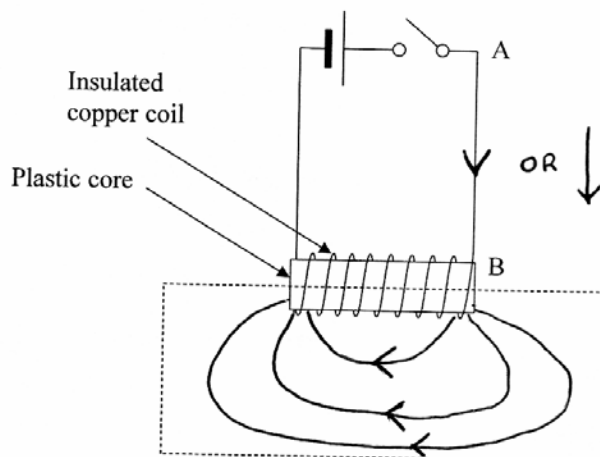
6.	(a) (i)	charging	friction / rubbing (with cloth/silk/fur but not a conducting material)	1
	(ii)	explanation	They /electrons are <u>transferred/ travel/ move/go</u> (from cloth) <u>to</u> strip 2 nd mark dependent on 1st	1 1
	(b) (i)	Effect on bar	(They /electrons) move <u>to right/</u> away from polythene strip do not accept movement of positive charges do not accept on the diagram like / same charges repel (do not accept poles)	1 1
	(ii)	strip moves	(plastic) strip is (also) charged (with) negative charge/ same charge as polythene (do not accept poles for either mark) 'strip is negatively charged' scores 2	1 1

(Total 7 marks)

7.	(a)(i)	Current	2500 / 230 (accept 2.5/230)	1
			= 10.9 A UP	1
			accept 11 A, 10.87 A, 10.8696 A, 10.86957 A, 10.869562 A not 10.86 A or 10.8 A	
	(ii)	Energy	2.5 x 12	1
			= 30 kWh or 30	1
			2 nd line scores both marks	
			any other unit cannot score 2 nd mark e.g. 30 kW/h	
	(b)	Earth wire	1. (earth wire has) low resistance	(1)
			2. large current flows to earth	(1)
			3. fuse wire has low melting point	(1)
			4. fuse wire melts/breaks (ignore blows)	(1)
			5. breaks circuit / stops current (not controls or reduces current)	(1)
			one mark per point, max 3 marks	max 3

(Total 7 marks)

8.



(a) (i) **current** arrow from A to B either on AB or next to it 1

(ii) **lines** at least two (curved) lines within dotted box. Lines can be solid or dashed and must not cross. Ignore any lines outside dotted box. 1

correct direction on at least one correct line without contradiction 1

must carry error forward from (i). If arrow goes from B to A in (i) then direction of curves must be from left to right.

If (a)(i) is blank mark to scheme

(b) **greater** 1. more /greater/larger current or voltage or emf or more cells (1)

2. more / larger number of turns / coils (1)

3. (soft) iron core (1)

4. turns closer together (1)

max 3

(Total 6 marks)

9.	(a)(i)	neutrons	136 136 neutrons 136 neutrons and 86 protons not 136 neutrons and 86 electrons	1
	(ii)	electrons	86 86 electrons	1
	(b)(i)	background	1. radiation from surroundings 2. radiation when no other sources are present 3. radiation present all the time 4. accept radiation from a named source e.g air /building materials/ in food/ cosmic rays/ radon/ <u>radiation</u> from the sun do not accept sunlight or sunshine	1
	(ii)	checking backgr	1. measure count away from house or outside house 2. count for long time (greater than 1 minute) or repeat counts 3. measure count in house 4. make sure no other sources present 5. compare/subtract two sets of counts	(1) (1) (1) (1) (1)
			Any three points - one mark each	max 3

(Total 6 marks)

10. (a) table

Radio waves	Micro-waves	Infra red	(Visible) light	Ultra violet	X-rays	Gamma rays
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UV or ultra violet in any box 1

All five answers in correct boxes 2

three answers in correct boxes scores 1 mark

(b) (i) **property** Transverse (waves) accept any recognisable spelling 1

Do not allow 'same speed'

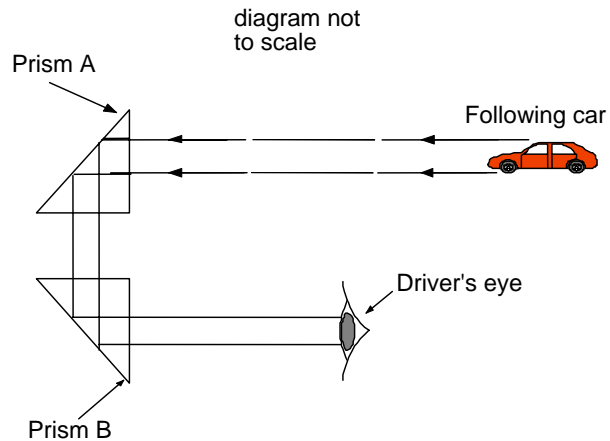
(ii) **frequency** $3 \times 10^8 / 2 \times 10^3$ 1

= 150 000 Hz or 1.5×10^5 Hz /Hertz/hz/(waves) per second/cycles per second/cps 1

Unit required for 2nd mark

(Total 6 marks)

11. (a) rays



lines from car continued to back surface of prism A, turned 90° and travelling down to prism B 1

lines continued vertically through top face of prism B, turned 90° and travelling horizontally to eye (dependent on previous mark) 1

(b) (i) TIR letter T next to angled face of either or both prism at points where rays turn 90° 1

Any shown T must be in the correct position

- (ii) reason
1. reference to correct angle of incidence (1)
 2. being greater than critical angle/ 42° (1)
This mark is not dependent on the 1st
 3. light travelling from high(er) RI (refractive index) towards lower RI (1)

do not accept 'density'

Any two points - max two marks max 2

(c) problem (image) upside down/inverted/wrong way up 1

(Total 6 marks)

TOTAL FOR PAPER 70 marks