

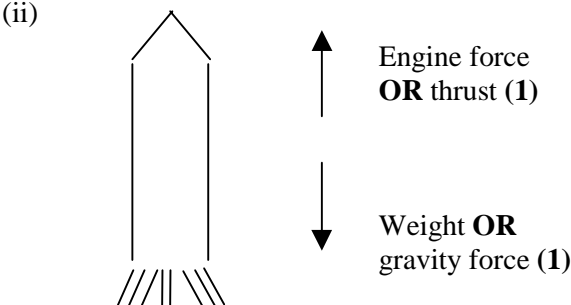
2003 Physics Intermediate 2

Marking scheme

Section A

1.	A	11.	C
2.	D	12.	B
3.	E	13.	A
4.	C	14.	D
5.	A	15.	A
6.	C	16.	B
7.	C	17.	D
8.	E	18.	E
9.	D	19.	E
10.	C	20.	B

2003 Physics Intermediate 2					
Sample Answer and Mark Allocation			Notes	Marks	
21.	(a)	$E_p = mgh$ (½) $E_p = 1400 \times 10 \times 30$ (½) $E_p = 420\,000\text{ J}$ (½) (½)	Allow $g = 9.8\text{ N/kg}$	2	7
	(b)	(i) $a = \frac{v-u}{t}$ (½) $a = \frac{20-0}{5}$ (½) $a = 4\text{ m/s}^2$ (½) (½)		2	
	(ii)	$d = \text{area under graph}$ (½) $d = (\frac{1}{2} \times 5 \times 20) + (\frac{1}{2} \times 3 \times 20)$ (½) $d = 80\text{ m}$ (½) (½) OR $d = \bar{v}t$ (½) $d = 10 \times 8$ (½) $d = 80\text{ m}$ (½) (½)		2	
	(iii)	<u>Less friction</u> (1) OR <u>Less resistive force</u> OR <u>Smaller unbalanced force</u>		1	

Sample Answer and Mark Allocation		Notes	Marks	
22.	(a) (i)	$W = mg$ (½) $W = 2.5 \times 10^6 \times 8.4$ (½) $W = 2.1 \times 10^7 \text{ N}$ (½) (½)	2	9
	(ii)		2	
	(iii)	$F = 3.8 \times 10^7 - 2.1 \times 10^7 = 1.7 \times 10^7 \text{ (N)} \text{ (1)}$ $F = ma$ (½) $1.7 \times 10^7 = 2.5 \times 10^6 \times a$ (½) $a = 6.8 \text{ m/s}^2$ (½) (½)	3	
	(b)	Acceleration on Y is less (1) Smaller unbalanced force (1) OR greater weight OR because of air resistance OR greater gravitational field strength	2	

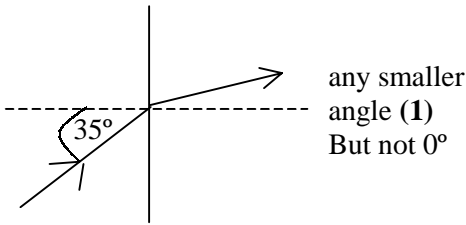
Sample Answer and Mark Allocation		Notes	Marks	
23.	(a) (i)	$d = vt$ (½) $0.1 = v \times 0.05$ (½) $v = 2 \text{ m/s}$ (½) (½)	2	9
	(ii)	momentum before = $1.6 v$ (½) momentum after = 2.6×2 (½) $1.6 v = 5.2$ $v = 3.25 \text{ m/s}$ (½) (½)	2	
	(b) (i)	$E_k = \frac{1}{2} mv^2$ (½) $= 0.5 \times 2.6 \times 4^2$ (½) $= 20.8 \text{ J}$ (½) (½)	2	
	(ii)	$E_k = Fd$ (½) $20.8 = 2.6 \times d$ (½) $d = 8 \text{ m}$ (½) (½)	2	
	(c)	So that the speed is measured before it changes (1) OR because there will be friction OR before friction slows it down OR before friction affects it OR before cars slow down OR to get the fastest speed	1	

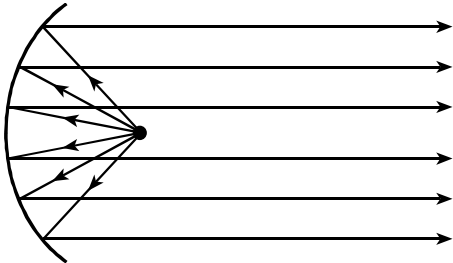
Sample Answer and Mark Allocation		Notes	Marks	
24.	(a) $P = \frac{V^2}{R}$ (½) OR $P = IV$ $11.5 = I \times 23$ $I = 0.5\text{A}$ (1) $11.5 = \frac{23^2}{R}$ (½) $V = IR$ $23 = 0.5 \times R$ $R = 46 \Omega$ (1) $R = 46 \Omega$ (½) (½)	Can start with 46 Ω and proceed to 11.5 W	2	9
	(b) (i) $\frac{230}{10}$ (½) = 23 V (½)		1	
	(ii) If one lamp breaks, the others go out (1) OR non independent switching		1	
	(c) (i) $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \dots$ (½) $\frac{1}{R_T} = \frac{1}{46} + \frac{1}{46} + \dots$ (½) $\frac{1}{R_T} = \frac{10}{46}$ $R_T = 4.6 \Omega$ (½) (½)		2	
	(ii) (A) Turns ratio = 10 : 1 (1) $\frac{V}{230} = \frac{1}{10}$ (½) $V = 23\text{V}$ (½)		2	
	(B) All bulbs in parallel have <u>23V</u> across them so they operate at normal brightness (1)		1	

Sample Answer and Mark Allocation		Notes	Marks	
25.	(a) $V = IR$ $0.8 = 0.005 \times R$ $R = 160 \Omega$ (1)	Any two points on the graph correctly used		7
	$V = IR$ $1.6 = 0.02 \times R$ $R = 80 \Omega$ (1)		3	
	As voltage increases R decreases (1)			
(b)	(i) 1.6 V (1)		1	
	(ii) Voltage across $R = 3.4 \text{ V}$ (1) $V = IR$ (1/2) $3.4 = 0.02 \times R$ (1/2) $R = 170 \Omega$ (1/2) (1/2)	Voltage used must be 5 – b (i) answer. Any other voltage is wrong physics 1/2 maximum	3	

Sample Answer and Mark Allocation		Notes	Marks	
26.	(a) (i)	$E_H = \ell m$ (½) $E_H = 3.34 \times 10^5 \times 0.05$ (½) $E_H = 16\,700\text{ J}$ (½) (½)	2	8
	(ii)	$E = Pt$ (½) $16700 = P \times 300$ (½) $P = 55.7\text{ W}$ (½) (½)	2	
	(b) (i)	Transistor (1)	Not MOSFET	
	(ii)	Resistance increases (1)		
	(iii)	Voltage across thermistor rises (½) above 0.7 V (½) Transistor switches on (½) current passes through warning light (½)	2	

Sample Answer and Mark Allocation				Notes	Marks	
27.	(a)	(i)	Protons + neutrons	(1) or (0)		
		(ii)	Fission (NOT chain reaction)	(1)	1	6
		(iii)	Uranium or fuel is used up	(1)	1	
		(iv)	Radioactive waste OR they are radioactive OR they give out radiation	(1)	1	
	(b)		$E_H = c m \Delta T$ $166 \times 10^6 = 830 \times 2000 \times \Delta T$ $\Delta T = 100^\circ\text{C}$	(1/2) (1/2) (1/2) (1/2)	2	

Sample Answer and Mark Allocation				Notes	Marks	
28.	(a)	(i)	35° (1) ½ unit deduction		1	7
		(ii)			1	
	(b)	B (½) C (½) Angle of incidence must be smaller than the critical angle (1)		If A mentioned then zero marks	2	
	(c)	(i)	Diverging OR concave (1)		1	
		(ii)	$P = \frac{1}{f}$ (½) $P = \frac{1}{-0.2}$ (½) $P = -5\text{ D}$ (½) Choose lens Q (½)	no unit deduction unless wrong unit	2	

Sample Answer and Mark Allocation					Notes	Marks	
29.	(a)	(i)	Solar cell	(1)	Not solar panel	1	9
		(ii)	$Q = I t$ $Q = 4.5 \times 300$ $Q = 1350 \text{ C}$	(1/2) (1/2) (1/2) (1/2)		2	
<p>(b)</p>  <p>Shape (1) Arrows (1)</p>							2
<p>(c)</p> <p>P X rays (1/2)</p> <p>Q Infrared (1/2)</p>							1
<p>(d)</p> <p>Correct frequency = $8 \times 10^9 \text{ Hz}$ (1)</p> <p>$v = f \lambda$ (1/2)</p> <p>$3 \times 10^8 = 8 \times 10^9 \times \lambda$ (1/2)</p> <p>$\lambda = 3.75 \times 10^{-2} \text{ m}$ (1/2) (1/2)</p>							3

Sample Answer and Mark Allocation			Notes	Marks	
30.	(a)	(i)	The number of decays per second (1) OR radioactive emissions per second OR disintegrations per second OR nuclei which break up per second		9
		(ii)	20000 10000 halving (½) 5000 4 half lives (½) 2500 1250 activity = 1250 Bq (½) (½)		2
	(b)		gamma (1) <u>beta</u> absorbed by aluminium (1)		2
	(c)	(i)	$D = \frac{E}{m}$ (½) $5 \times 10^{-5} = \frac{E}{0.5}$ (½) $E = 2.5 \times 10^{-5} \text{ J}$ (½) (½)		2
		(ii)	$H = DQ$ (½) $H = 5 \times 10^{-5} \times 20$ (½) $H = 1 \times 10^{-3} \text{ Sv}$ (½) (½)	More than one radiation used gives ½ only	2

[END OF MARKING INSTRUCTIONS]