2004 Physics

Intermediate 2

Finalised Marking Instructions

2004 Physics Intermediate 2

Marking scheme

Section A

1.	A	11.	D
2.	C	12.	E
3.	B	13.	B
4.	E	14.	E
5.	C	15.	A
6.	D	16.	D
7.	E	17.	C
8.	C	18.	A
9.	D	19.	B
10.	C	20.	D
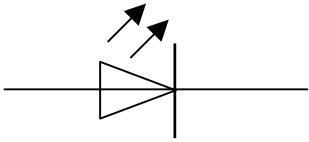
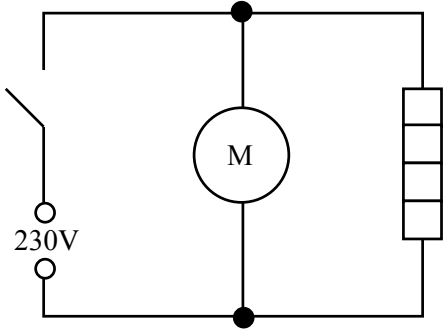| 2004 Physics Intermediate 2		
Sample Answer and Mark Allocation	**Notes**	**Marks**

21. (a) $E_P = m\,g\,h$ (½)
           $E_P = 1\cdot2 \times 10 \times 0\cdot2$ (½)
           $E_P = 2\cdot4\,J$ (½) (½)
		2

(b) $E_K = E_P$ (½)
         $\tfrac{1}{2}\,m\,v^2 = 2\cdot4$ (½)
    $0\cdot5 \times 1\cdot2 \times v^2 = 2\cdot4$ (½)
          $v = 2\ m/s$ (½)
		2

(c) $(1\cdot2 + 2\cdot8)\,v = 1\cdot2 \times 2$ (½)(½) $v = 0\cdot6\ m/s$ (½) (½)		2

(d)   one light gate just after collision point   (½)
        measure <u>length</u> of cart A or card on cart A   (½)
        clock or computer   (½)
        measure time for card to pass through light gate   (½)
        calculate speed using $\dfrac{\text{length of card}}{\text{time on clock}}$ (1)
		3

		Total 9

Sample Answer and Mark Allocation	Notes	Marks
22. (a) (i) 2s (1)	½ unit deduction	1
(ii) The train starts to decelerate (after 2s) OR reaction time of driver (1)		1
(b) $a = \dfrac{v - u}{t}$ (½) $= \dfrac{10 - 45}{14}$ (½) $= -2{\cdot}5 \text{ m/s}^2$ (½)(½)		2
(c) distance gone = area under graph (½) $= \left(2 \times 45\right) + \left(14 \times 10\right) + \left(\dfrac{1}{2} \times 14 \times 35\right)$ (½) $= 475 \text{ m}$ (½) (½) Yes – train is travelling at right speed (1)		3
		Total 7

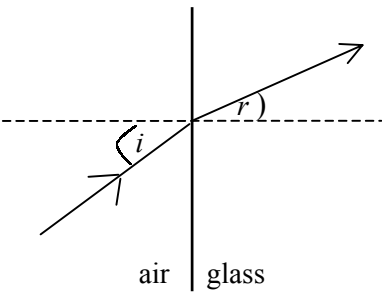| Sample Answer and Mark Allocation	Notes	Marks
23. (a) $E_W = Fd$ (½) $= 84\,000 \times 12$ (½) $= 1\,008\,000$ (J) (½) $E_W = P\,t$ (½) $1\,008\,000 = P \times 240$ (½) $P = 4\,200$ W (½)		3
(b) $P = I\,V$ (½) $= 16 \times 400$ (½) $= 6\,400$ W (½) (½)		2
(c) % efficiency $= \dfrac{\text{Power out}}{\text{Power in}} \times 100$ (½) $= \dfrac{4\,200}{6\,400} \times 100$ (½) $= 65 \cdot 6\%$ (½) (½)		2
(d) power supplied will have to be greater (1) to give kinetic energy to wheel OR to overcome maximum friction force at start OR to provide unbalanced force at start (1)		2
		Total 9

Sample Answer and Mark Allocation	Notes	Marks
24. (a) electrical (energy) $\rightarrow$ heat (energy) (1)		1
(b) resistance wire OR element OR coil (of wire) OR resistor (1)		1
(c) $E_H = cm\,\Delta T$ (½) $= 2\,400 \times 0{\cdot}4 \times 5$ (½) $= 4\,800$ J (½) (½)		2
(d) $E_H = P\,t$ (½) $4\,800 = P \times 240$ (½) $P = 20$ W (½) (½) Assume that no heat (or energy) lost to surroundings/air/beaker OR All heat (or energy) retained by liquid (1)		3
		Total 7

Sample Answer and Mark Allocation			Notes	Marks
25. (a)	steps down the voltage OR lowers/reduces the voltage	(1)		1
(b)	$\dfrac{Vs}{Vp} = \dfrac{Ns}{Np}$	(½)		
	$\dfrac{Vs}{230} = \dfrac{50}{2\,000}$	(½)		
	$Vs = 5\cdot75\,V$	(½) (½)		2
(c)	$Is\,Vs = Ip\,Vp$	(½)		
	$Is \times 5\cdot75 = 0\cdot024 \times 230$	(½)		
	$Is = 0\cdot96\ A$	(½) (½)		2
(d)	$v = f\lambda$	(½)		
	$3 \times 10^{8} = 1\,800 \times 10^{6} \times \lambda$	(½) (1 for speed)		
	$\lambda = 0\cdot167\ m$	(½) (½)		3
				Total 8

Sample Answer and Mark Allocation	Notes	Marks
26. (a) (i) (total internal) reflection (1)		1
(ii) (1)		1
(iii) $V_R = 12 - 1·8$ $= 10·2V$ (1) $V = IR$ (½) $10·2 = 0·1 \times R$ (½) $R = 102\,\Omega$ (½) (½)		3
(b) (i) (n-channel enhancement) MOSFET (1)		1
(ii) less light, <u>resistance of LDR</u> increases (1) <u>voltage across LDR</u> increases OR gate voltage increases (1) MOSFET switched on OR MOSFET conducts (1)		3
		Total 9

Sample Answer and Mark Allocation	Notes	Marks
27. (a) $\quad$ P $= \dfrac{V^2}{R}$ $\qquad$ (½) $\qquad 575 = \dfrac{230^2}{R}$ $\qquad$ (½) $\qquad$ R $=$ 92 Ω $\qquad$ (½) (½) OR $\qquad$ P = IV $\qquad$ 575 = I × 230 $\qquad$ I = 2·5 (A) $\qquad$ (½) $\qquad$ V = IR $\qquad$ 230 = 2·5 × R $\qquad$ (½) $\qquad$ R = 92 Ω $\qquad$ (½) (½)		2
(b) $\qquad$ parallel circuit (1) $\qquad$ circuit components (1) $\qquad$ NB mark in order		2
(c) $\quad$ no effect on the speed $\qquad$ (1) $\qquad$ (in parallel circuit) motor still has 230 V across it $\quad$ (1)		2
		Total 6

Sample Answer and Mark Allocation	Notes	Marks
28. (a) energy (1)		1
(b) 300 MHz (1) others are reflected by ionosphere OR it is only one to pass through ionosphere (1)		2

(c)   total distance $= 2 \times 36\,000$ km $= 7 \cdot 2 \times 10^7$ m   (1)
 	
           $d = v\,t$ (½)
   $7 \cdot 2 \times 10^7 = 3 \times 10^8 \times t$ (½)
           $t = 0 \cdot 24$ s   (½) (½)
		3

		Total 6

Sample Answer and Mark Allocation	Notes	Marks
29. (a) (i) coverging OR convex (1)		1
(ii) $P = \dfrac{1}{f}$ (½) $= \dfrac{1}{0\cdot5}$ (½) $= 2\,D$ (½)(½) choose the $+\,2\cdot0\,D$ label (1)		3
(b) correct refracted ray (½) normal (½) angle i (½) angle r (½)		2
		Total 6

Sample Answer and Mark Allocation	Notes	Marks
30. (a) fission (1)		1
(b) neutrons go on to cause further fissions OR neutrons cause chain reaction OR neutrons go on to split other nuclei (1)		1
(c) boron rods absorb neutrons (1)		1
(d) H $=$ DQ (½) $=$ $\left(2\times10^{-3}\times3\right)+\left(5\times10^{-6}\times10\right)$ (½) (½) (½) $=$ $0\cdot00605$ Sv (½) (½) (Note: the first and second ½ marks for the substitution are for correct data)		3
(e) (i) no release of gases OR more energy from less fuel than fossil fuels OR conserves fossil fuels (1) (ii) <u>radioactive</u> waste OR decommissioning power stations OR possibility of specified types of accident (1)		2
		Total 8

Sample Answer and Mark Allocation	Notes	Marks
31. (a) (count rate) decreases (1)		1
(b) alpha would not penetrate the <u>aluminium</u> foil OR alpha would be stopped by the <u>aluminium</u> foil (1)		1
(c) (i) electrons removed from atoms OR electrons added to atoms		1
(ii) distance specified clothing shielding time direction monitoring regulations (1) (1) any two		2
		Total 5

[END OF MARKING INSTRUCTIONS]