Physics Intermediate 2 2002

Section A

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

2002 Physics Intermediate 2

Sample Answer and Mark Allocation	Notes	Marks
21. (*a*) $E_p = m\,g\,h$ (½) $E_p = 2750 \times 10 \times 122$ (½) $E_p = 3\,355\,000$ J (½) (½)		2
(*b*) (i) $E_w = F\,d$ (½) $E_w = 200\,000 \times 383$ (½) $E_w = 76\,600\,000$ J (½) (½)		2
(ii) $E = P\,t$ (½) $76\,600\,000 = P \times 1800$ (½) $P = 42\,560$ W (½) (½)	43000 W → 42556 W	2
(*c*) <u>potential energy</u> lost **(1)** by <u>descending</u> capsules **(1)**		2
NOTE: If in (*b*)(i) 200 N used this will give in (*b*)(ii) P = 43 W → 42·556 W NOTE: If in (*b*)(ii) 30 used for time this will give P = 2 553 333 W Deduct ½ for arithmetic Deduct for significant figures		**Total 8**

2002 Physics Intermediate 2

Sample Answer and Mark Allocation	Notes	Marks
22. (*a*) horizontal motion is constant speed **(1)** vertical motion is (constant) acceleration **(1)** **OR** speed increasing **OR** faster **OR** acceleration due to gravity **OR** force of gravity **OR** pull of gravity **OR** weight		2
(*b*) (i) 8 m/s **(1) OR (0)**		1
(ii) light gate (at exit of firing device) **(1)** diameter of ball measured **(½)** time for ball to cut light beam measured **(½)** speed = $\frac{\text{diameter}}{\text{time}}$ **(1)** **OR** speed = $\frac{\text{distance}}{\text{time}}$ if distance previously specified		3
(iii) distance = area under graph **(½)** distance = $\frac{1}{2} \times 0{\cdot}25 \times 2{\cdot}5$ **(½)** distance = 0·313 m **(½) (½)**	0·3 m → 0·3125 m	2
(*c*) d = v t **(½)** 2·8 = v × 0·25 **(½)** v = 11·2 m/s **(½) (½)**		2
		Total 10

NOTES:

(*b*)(ii) 2 light gates gives zero marks

(*b*)(ii) If computer used then all inputs to the computer (diameter, time) must be mentioned.

2002 Physics Intermediate 2

Sample Answer and Mark Allocation	Notes	Marks
23. (*a*) F = m a (½) 14 250 **(1)** = 9500 × a (½) a = 1·5 m/s^2 (½) (½)		3
(*b*) 15 250 N **(1) OR (0)**		1
(*c*) greater <u>air</u> resistance on bales **(1)** **OR** greater <u>air</u> friction on bales frictional force will reach 15 250 N at lower speed **(1)**		2
		Total 6

NOTES:

(*a*) Any other force value gives maximum formula mark.

(*c*) Accept greater wind resistance.
Do not accept less aerodynamic
less streamlined
But linking less aerodynamic with more friction is ok.

2002 Physics Intermediate 2

Sample Answer and Mark Allocation	Notes	Marks
24. (*a*) $\frac{N_s}{N_p} = \frac{V_s}{V_p}$ (½) **OR** Turns ratio $= \frac{230}{25} = 9{\cdot}2$ **(1)** $\frac{N_s}{1840} = \frac{25}{230}$ (½) $\frac{1840}{9{\cdot}2} = 200$ **(1)** $N_s = 200$ **(1)** NOTE: ½ unit deduction for wrong unit.		2
(*b*) $E = P\,t$ (½) $E = 90 \times 50$ (½) $E = 4500\,J$ (½) (½)		2
(*c*) $E_H = c\,m\,\Delta T$ (½) $E_H = 386 \times 0{\cdot}03 \times 350$ (½) $E_H = 4053\,J$ (½) (½)		2
(*d*) heat energy lost **(1) OR** heat lost **OR** energy lost to surroundings **(1) OR** to air **OR** to atmosphere **OR** to heating element		2
(*e*) heat → electrical **(1)**		1
NOTES: (*d*) Do not accept Not 100% efficient (*e*) Do not accept heat → electricity		**Total 9**

2002 Physics Intermediate 2

Sample Answer and Mark Allocation	Notes	Marks
25. (*a*) (i) $V_1 = 1{\cdot}8\,V$ (½) $V_2 = 1{\cdot}2\,V$ (½)		1
(ii) $V_S = 3{\cdot}0\,V$ **(1)** Must be sum of (a)(i) ½ unit deduction		1
(*b*) $\frac{V_1}{V_2} = \frac{R_1}{R_2}$ (½) **OR** $\frac{1{\cdot}8}{1{\cdot}2} = \frac{R_1}{2000}$ (½) $R_1 = 3000\,\Omega$ (½) (½) $V = IR$ (½) $1{\cdot}2 = I \times 2000$ $I = 0{\cdot}0006\,A$ (½) $V = IR$ $1{\cdot}8 = 0{\cdot}0006 \times R$ $R = 3000\,\Omega$ (½) (½)	**OR** $V_1 = \frac{R_1}{R_2} \times V_s$ $1{\cdot}8 = \left(\frac{R_1}{R+2000}\right) \times 3$ $R_1 = 3000\,\Omega$ **OR** 1·2:2000 1·8:3000	2
(*c*) light intensity is decreasing **(1)** V_1 is increasing **(1)** resistance (of LDR) is increasing **(1)**		3
		2
NOTES : (*c*) Statement of intensity decreasing alone gets zero marks. (*c*) Statement of intensity decreasing followed by wrong explanation gets 1 mark. (*c*) V_1 increases (anywhere in answer) **(1)** $V_1 \uparrow \Rightarrow R \uparrow$ **OR** $V_1 \downarrow \Rightarrow R \downarrow$ **(1)** $R \uparrow \Rightarrow I \downarrow$ **OR** $R \downarrow \Rightarrow I \uparrow$ **(1)**		

2002 Physics Intermediate 2		
Sample Answer and Mark Allocation	**Notes**	**Marks**
25. (*d*) $\underline{V_2}$ is below 0·7 V between 20 s and 50 s **(1)** transistor is switched off **(1)**	Independent marks	2
		Total 9

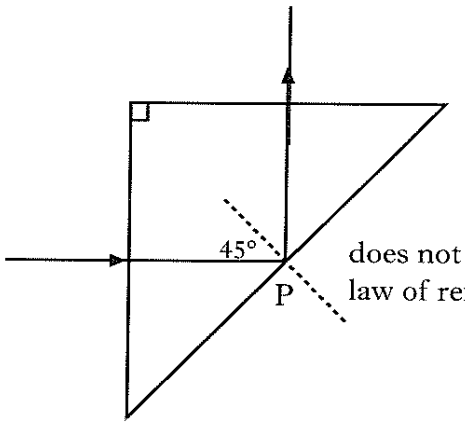
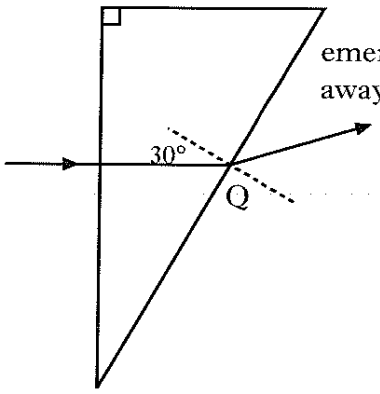
2002 Physics Intermediate 2

Sample Answer and Mark Allocation	Notes	Marks
26. (*a*) P = IV (½) 40 = I × 230 (½) I = 0·174 A (½) (½) 0·2 → 0·1739 A		2
(*b*) V = IR (½) **OR** $P = \frac{V^2}{R}$ (½) 230 = 0·174 × R (½) R = 1322·5 Ω (½) (½) $40 = \frac{230^2}{R}$ (½) R = 1322·5 Ω (½) (½)	**OR** $P = I^2R$ (½) $40 = (0{\cdot}174)^2R$ (½) R = 1322·5 Ω (½)(½)	2
(*c*) Position 1 **(1)** Maximum voltage (across motor) **(1)** **OR** maximum current (in motor) **OR** 230 V across motor **OR** no extra resistance to decrease current		2
(*d*) Voltage across R_x = 230 − 180 = 50 V **(1)** V = IR (½) 50 = 0·25 × R (½) R = 200 Ω (½) (½)		3
NOTES: (*c*) Position 1 (only) = zero marks Position 1 followed by wrong explanation = 1 mark Voltage <u>through</u> motor = zero marks (*d*) Any other voltage than 50 V is wrong physics and gets ½ formula mark only.		**Total 9**

Sample Answer and Mark Allocation	Notes	Marks
27. (*a*) movement of coil in magnetic field **(1)** **OR** movement of coil near magnet change in direction of coil ⟹ a.c. **(1)**		2
(*b*) greater number of turns in the coil **(1)** stronger magnetic field **(1)** **OR** stronger magnet **OR** more powerful magnet Do not accept bigger magnet louder sound bigger diaphragm Accept coils for turns		2
(*c*) voltage gain $= \frac{\text{output(voltage)}}{\text{input (voltage)}}$ **(½)** gain $= \frac{0{\cdot}5}{0{\cdot}002}$ **(½)** gain = 250 **(1)**	deduct ½ mark if unit given	2
		Total 6

2002 Physics Intermediate 2		
Sample Answer and Mark Allocation	**Notes**	**Marks**
28. (*a*) energy lost (on reflection) **(1)** **OR** sound absorbed by air/tube/end		1
(*b*) 6 ms **OR** 0·006 s **(½) (½)**		1
(*c*) d = vt **(½)** d = 340 × 0·006 **(½)** d = 2·04 m **(1)**		
length of the tube = $\frac{d}{2}$ = 1·02 m **(½) (½)**		3
(*d*) v = fλ **(½)** 340 = 1250 × λ **(½)** λ = 0·272 m **(½) (½)**		2
		Total 7

2002 Physics Intermediate 2

Sample Answer and Mark Allocation	Notes	Marks
29. (*a*)  does not emerge **(1)** law of reflection **(1)**	Ray must cross normal.	2
(*b*)  emerges **(1)** away from normal **(1)**	Ray must cross normal.	2
NOTE: (*b*) Accept partial internal reflection if refraction also shown.		**Total 4**

2002 Physics Intermediate 2

Sample Answer and Mark Allocation	Notes	Marks
30. (*a*) No. of decays = activity × time **(½)** $N = 1600 \times 10^6 \times 30$ **(½)** $N = 4{\cdot}8 \times 10^{10}$ **(1)** ½ unit deduction		2
(*b*) R 1600 6 half lives 800 400 48 days **(1)** 200 100 50 25 S 80 1 half life 40 74 days **(1)** Source R will be first **(1)**	Both R and S working must be shown. Idea of halfing gets ½ mark if working incomplete. Graphs acceptable	3
(*c*) gloves any two **(1) (1)** tongs film badge shortest time of exposure etc		2
NOTES: (*b*) Deduct ½ mark if calculation for R only goes as far as 50 MBq (*c*) Accept / Do Not Accept Avoid contact with skin / Goggles Point away from people / Protective clothing (alone) Don't eat/drink / Storage Lead apron/suit / Shielding (alone) Wash hands		**Total 7**

2002 Physics Intermediate 2			
Sample Answer and Mark Allocation		**Notes**	**Marks**
31. (*a*) (i) fission **(1)**		Fussion ✗ Fision ✓	1
(ii) slow neutrons down **(1)**			1
(iii) lower control rods **(1)** **OR** more control rods **OR** drop control rods in			1
(*b*) advantage	no greenhouse gases conserves fossil fuels a lot of energy from a little fuel, etc any one **(1)**	Pollution answers must be <u>specific</u>	
disdvantage	radioactive waste decomissioning stations etc any one **(1)**		2

NOTES:

(*b*) ADVANTAGE

<u>Accept</u>	<u>Do Not Accept</u>
No smoke	Cleaner
No polluting gases	Cheaper
No SO_2	More efficient
Will last longer	Won't run out

DISADVANTAGE

<u>Accept</u>	<u>Do Not Accept</u>
Reactor accidents	Nuclear weapons
Toxic waste	Dangerous if a leak
Workers exposed to radiation	Produces radioactive sources

Total 5

[END OF MARKING INSTRUCTIONS]