Catholic High School | O-Level Physics <u>5059</u> Nov <u>2016</u> Suggested Answers

NOT	IN SYLLABUS:
<u>P1:</u>	-
<u>P2:</u>	-

Paper 1 [40 marks]

1	С	11	B	21	B	31	D	
2	D	12	Α	22	С	32	D	
3	С	13	B	23	D	33	D	
4	С	14	С	24	Α	34	С	
5	Α	15	С	25	В	35	В	
6	Α	16	B	26	Α	36	D	\mathbb{Z}
7	С	17	Α	27	D	37	Α	
0	D	10	D	20	n	20	D	- NO
8	B	18	D	28	В	38	D	
8 9	B	18 19	A D	28 29	C B	38 39	B	

***Q.1: C** (B is incorrect.)

- *Q. 8: B The distribution of material within the bottle ensured that the centre of mass is originally at point Y. However, the extra sand sinks to a level that is above the original position of the centre of mass and so the centre of mass rises. (C is incorrect.)
- *Q. 13: B A question that concerns kinetic energy does not always require the answer obtained to be squared. (D is incorrect.)
- *Q. 32: D Option B: The resistance of the ammeter was not equal to that of the lamps. Option C: There should be less current in the branch with the greater resistance. (B and C are incorrect.)
- *Q. 36: D The compass needle is needed to retain its magnetised state in order to reveal the direction of the magnetic field. (C is incorrect.)
- *Q. 37: A The coil reaches equilibrium in a vertical position. (B is incorrect.)
- *Q. 39: B Although a transformer requires an alternating supply, the a.c. is not converted to d.c. at any stage. (C is incorrect.)
- *Q. 40: C The current in Y does not decrease in order for the power supplied to stay the same. (D is incorrect.)



6 ai





		a positive electrical charge.					
		bi Negative	1				
		Positive					
		bij The charges on the bottom of the	1				
		metal strip is closer to the sphere	-				
		and hence the force is larger					
		and hence the force is larger.					
7	а	$V_{\text{out}} = \frac{R_{\text{resistor}}}{R_{\text{resistor}}} \times V_{\text{total}} = \frac{600}{100 \times 10000} \times 12$	1				
		$R_{\text{resistor}} + R_{\text{LDR}} = 600 + 8000$	1				
	hi	$V_{across fixed resistor - V_{across fixed res$	1				
	hii	$\frac{V_{\text{resistor}}}{V_{\text{resistor}}} = \frac{V_{\text{10tal}}}{V_{\text{0ut}}} = \frac{12 - 0}{-\frac{4}{\sqrt{10tal}}} = \frac{12}{\sqrt{10tal}} = 1$	1				
	UII	$\frac{1}{V_{\text{LDR}}} = \frac{1}{R_{\text{LDR}}} \Longrightarrow \frac{1}{8} = \frac{1}{R_{\text{LDR}}}$					
		$R_{\rm LDR} = 8000 \times \frac{8}{2} = 16000\Omega(3{\rm s.f.})$	1				
			1				
	с	V_{out} before swapping V_{out} after swapping					
		Bright 0.837 V 12 - 0.837 = 11.2 V					
		Dark 8.0 V 12 - 8 = 4 V					
		In bright light, the new V_{out} (across the fixed resistor) is 11.2 V, and the	1				
		lamp is switched on.	1				
		As the level of light falls, the new V_{out} decreases, and the lamp starts to	1				
		dim until it switches off (when $V_{out} = 4$ V).	1				
8	а	Moment due to spring					
		woment due to spring					
		11 N om duo to contract. 20 N om duo to weight					
		on fixed connection of iron arm					
		Taking moments about the pivot.					
		Clockwise moment = Anticlockwise moments					
		F(25) = 11 + 30					
		F = 1.64 N (3 s.f.)	1				
	b	When a larger current flows in the circuit, the steel core is magnetized and	1				
		attracts the iron arm, causing it to rotate anticlockwise about the pivot.					
	c	The core is made of steel, which is a hard magnetic material and is	1				
		difficult to demagnetise.	-				
C	\square	Even after the fault in the circuit is rectified, the steel core will still be					
	\sim	magnerised and will attract the contacts					
9	ai	A high-pitched sound is a sound that has a high frequency.	1				
-	aii	As the car reverses towards the wall, the beens increase as distance	1				
		decreases.	-				
		The number of beeps is constant at 4 from $140 - 100$ cm, then 10 beeps					
		from $80 - 40$ cm and finally 20 beeps from $20 - 0$ cm.	1				
	aiii	Device B is more sensitive (or gives a better indication of the distance	1				
	um	from the wall) as the no of beens increases generally with every 20 cm	1				
	1	Device A gives the same number of beens over a larger distance (e.g. Λ					
1		bevice A gives the same number of beeps over a larger distance (e.g. 4					
		beens over 40 cm from $140 - 100$ cm)	1				
	bi	beeps over 40 cm, from $140 - 100$ cm).	1				



Е		2. Fire caused by damaged insulation, damp conditions or the high voltage or by overloading the socket or circuit.	
	bi	$I = (n_0 \text{ of } lamps)(\frac{P}{2}) = (26)(\frac{12}{2}) + (5)(\frac{40}{2}) + (4)(\frac{18}{2})$	2
		= 2.54 A (3 cf)	1
	bii	$\frac{-2.34 \text{ A}}{3 \text{ A}}$ (3.8.1.)	1
	UII	Note: fuse ratings are in whole no 1	1
	ci	$P = I^2 R$	1
		$R = \frac{P}{I^2} = \frac{5.0}{65^2} = 0.00118 \Omega (3 \text{ s.f.})$	1
	cii	$P = I^2 R (P \propto R)$ and $R = \rho \frac{L}{L} (R \propto L)$	1
	1	Thus power lost is directly proportional to the length of the section.	
	cii	$P - I^2 R (P \propto R)$ and $R - o^{\frac{L}{2}} (R \propto \frac{1}{2})$	1
	2	Thus now relation inversely propertional to the cross sectional area of the	
		section	
11	ai	An alternating voltage is a voltage that is changing in magnitude and	1
0	ui	direction.	
-	aii	The changing magnetic field around the primary coil causes a change in	1
		magnetic flux linkages in the secondary coil, hence inducing a voltage.	
	aiii	The iron core concentrates the magnetic flux linkages between the primary	1
		and secondary coils.	
	b	$\frac{N_p}{N_s} = \frac{V_p}{V_s}$	
		$\frac{1}{N_s} = \frac{1}{8.0}$	
		$N_{\rm s} = 16.7 \; (3 \; {\rm s.f.})$	1
		The smallest number of <i>complete</i> turns is <u>17</u> .	I
	ci	iron core	2
	••	primary coll secondary coll	-
	CII	Efficiency refers to the ratio of the useful energy/power output to the total	1
	ciii	Power in primary coils $P = IV = (0.022)(230) = 5.06 W$	
		Power in secondary coils, $P_p = IV = (0.022)(250) = 5.00$ W Power in secondary coils, $P_s = IV = (0.50)(8.0) = 4.0$ W	1
		Efficiency = $\frac{\text{Output power}}{\text{Input power}} = \frac{4.0}{5.06} = 0.791 \text{ or } 79.1\% \text{ (3 s.f.)}$	1