Paper 1 MCQs Solution Template:

S/N	Answer	Explanation
1	D	$[I] = [P]/[A] = [E]/[A][t] = [m][g][h]/[A][t] = kg(ms^{-2})m/(m^2)(s) = kg\ s^{-3}$
2	A	Inaccurate => high systematic error Precise => low random error
3	D	Maximum displacement is equivalent to greatest area under the v-t graph Acceleration at Q is zero (turning point)
4	A	With air resistance, the object's velocity increases at a decreasing rate before reaching terminal (constant velocity) after some time. This is observed in the gradient of s-t graph in choice A. Initial gradient of s-t graph should be zero since object has zero velocity (released from rest) at t = 0.0 s.
5	D	$s_x = vt$ $s_y = ½\ gt^2$
6	B	Vertically: (Downwards taken as positive) $s_y = ½\ g\ t^2$ $t^2 = 2s_y/g$ --- (1) t is dependent on s_y (vertical height) which is the same in both case and independent of u_x.
7	D	By conservation of Momentum and total KE, the glider maintains at constant speed but moves in opposite direction after elastic collision with the buffer.
8	A	By Conservation of Momentum
9	A	$20(-6) +12(15) = (20+12)\ v$ $v = 1.9\ m\ s^{-1}$
10	B	Newton second law
11	A	Area under the F-t graph
12	B	A: False (work done on trolley by cord is positive) C: False (work done on person by trolley is negative) D: False (friction on wheel of trolley is rightwards, work done on person by reaction force resultant of friction and normal force is negative)
13	C	Constant speed, net force is zero. $F_{engine} = F_{Drag} = kv^2$ $P_{engine} = F_{engine}\ v = kv^2\ (v) = kv^3$
14	D	Input power = output power/efficiency = 1000 MW/0.45 = 2220 MW = 2200 MW
15	D	$I = P/4\pi r^2$ $I \propto P/r^2$ $I'/I = (P'/P)(r/r')^2$ $I'/3 = (2P/P)(3/5)^2$ $I' = P/4\pi 3^2 = 3.0\ W\ m^{-2}$ $I' = 2.2\ W\ m^{-2}$
16	D	Conditions of interference.
17	D	$x = \frac{\lambda D}{a}$
18	B	When stationary waves form, L = multiples of half wavelengths i.e. $L = n\ \frac{\lambda}{2}$

		thus $\lambda = \frac{2L}{n}$ $f = \frac{c}{\lambda} = \frac{nc}{2L}$
19	**C**	$\lambda_a = 2L$ $\lambda_b = 4L$ $\lambda_c = 2L$ $f_a = v/2L$ $f_b = v/4L$ $f_c = v/2L$ Hence $f_a : f_b : f_c = 2:1:2$
20	**D**	I-V characteristic of filament lamp
21	**B**	I-V characteristic of thermistor
22	**D**	The two 1 Ω are in parallel with each other. resistance = 0.5 Ω It is then in series with the 2 Ω on top, hence resistance = 2 + 0.5 = 2.5 Ω The above calculated resistance is in parallel with the 7 Ω (5 Ω and 2 Ω resistors which are in series).Hence effective resistance = 1 / (1/7 +1/2.5) = 1.84 Ω
23	**A**	$V_B = 8 \times 3/8 = 3V$ $V_A = 8 \times 2/8 = 2$ V Pd =1V If V_B= 0V(earth) V_A= -1 V
24	**B**	Voltmeter resistance = 2R, as the effective resistance =R When the voltmeter is connected to R , the effective resistance = 0.67 R The potential difference across voltmeter= 6 x 0.67/2.67= 1.5 V
25	**C**	F = BIL --- (1) [65/100] F = BIL sin (90 – θ) = BIL cos (θ) --- (2) (2)/(1): $\theta = 49^o$
26	**D**	$B_{solenoid}$ is leftwards while I is rightwards Hence, $\theta = 180^o$, F = BIL sin θ = 0 N Wire will remain stationary.
27	**B**	$E = Nhc/\lambda$ $N = E\lambda/hc = (400 \times 10^{-3})(1.06 \times 10^{-6})/(6.63 \times 10^{-34})(3 \times 10^8)$ $= 2.13 \times 10^{18}$
28	**B**	I = (Np/t)(h/A)(f) [f, h and A constant] I α (Np/t) α (Ne/t)
29	**C**	Atom X must gain energy to be excited, the other atom must have lost energy.
30	**C**	$\lambda = h/mv = (6.63 \times 10^{-34})/(9.11 \times 10^{-31})(3.25 \times 10^7) = 2.24 \times 10^{-11}$ m