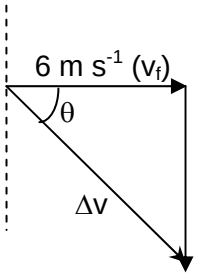
JURONG JUNIOR COLLEGE
PHYSICS DEPARMENT
2015 Preliminary Examinations
8866 H1 Physics Paper 1 Solutions

Qn	Ans	Suggested solution
1	**C**	Student A's results: mean value = 1.62 x 10^{-2} V, spread = 0.07 x 10^{-2} V Student B's results: mean value = 1.69 x 10^{-2} V, spread = 0.01 x 10^{-2} V Student C's results: mean value = 1.65 x 10^{-2} V, spread = 0.05 x 10^{-2} V Student D's results: mean value = 1.65 x 10^{-2} V, spread = 0.02 x 10^{-2} V The actual potential difference is 1.65×10^{-2} V. Hence, student C's results are <u>accurate</u> (low systematic errors => mean value close to actual value) but <u>not precise</u> (high random errors => large spread).
2	**C**	Change in velocity $\Delta v = v_f - v_i$ $= v_f + (-v_i)$  Hence, $\lvert\Delta v\rvert = \sqrt{6^2+8^2}$ = 10 m s^{-1} $\theta = \tan^{-1}(8/6)$ $= 53°$ Angle = (90°-53°) east of south
3	**B**	*h* remains zero even as *t* is already non-zero, meaning there is a time lag between starting the stopwatch and releasing the ball.
4	**C**	Average speed $= \dfrac{\text{total distance travelled}}{\text{total time elapsed}} = \dfrac{(20)(2.0)+(30)(2.0)+(40)(8.0)}{2.0+2.0+8.0} = 35 \text{ m s}^{-1}$
5	**B**	$\left[s_y = u_y t + \frac{1}{2}a_y t^2\right] 1.2 = \frac{1}{2}(9.81)t^2 \rightarrow t = 0.495 \text{ s}$ $\left[s_x = u_x t + \frac{1}{2}a_x t^2\right] s_x = (2.0)(0.495) = 0.99 \text{ m}$
6.	**A**	The area under the F-x graph is the work done by the force stretching the spring.
7.	**D**	For spring in parallel, they share the load. Total extension is 2x+ x= 3x
8.	**A**	Total clockwise moment = 20 x 3 = 60 Nm. Total anti-clockwise moment = 5 x 2 + 10 x 2 = 30 Nm. Resultant moment = 60- 30 = 30 Nm
9.	**C**	Options **A** and **B** are inconsistent with Newton's 3rd law. Option **D** is a correct statement but does not show that the passenger in the car will experience a bigger force. The car and thus the passenger will experience a larger change in velocity since the car has a much smaller mass.
10.	**B**	Area *A* correctly depict the change in momentum under the *F-t* graph. Thus change in velocity will be area A/ mass.

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11.	**B**	By principle of conservation of momentum, both $^{218}_{86}\text{Rn}$ and $^{4}_{2}\text{He}$ will have the same magnitude of momentum but in opposite direction, since the initial total momentum is zero.
12.	**B**	Work done against friction = $F \times D = \frac{1}{2}mv_0^2$ Required work done against friction = $F \times 3D = 3FD = \frac{1}{2}mv_1^2$ $\therefore 3FD = \frac{1}{2}mv_1^2 \Rightarrow 3(\frac{1}{2}mv_0^2) = \frac{1}{2}mv_1^2 \Rightarrow v_1 = \sqrt{3}v_0$
13.	**D**	Work done on the car = Gain in KE = ½ mv^2
14.	**B**	Work done on the gas = - $p\Delta V = -(3.0 \times 10^4)(0.0025 \times 0.005) \approx -0.38$ J
15	**D**	By definition.
16	**D**	Since the diameter of P is two times the diameter of Q, its cross-section area will be four times, its resistance will be one quarter and its current will be four times.
17	**B**	Recall the current-voltage graphs of these three circuit components.
18	**B**	The current through the 1 Ω resistor is 3 A and the current through the 3 Ω resistor is 1 A. If the 1 Ω resistor is removed, the current will decrease by 3 A.
19	**C**	A: 1 Ω // 1 Ω // 1 Ω = 0.33 Ω B: 1 Ω // (1 Ω + 1 Ω) = 0.67 Ω D: 1 Ω + (1 Ω // 1 Ω) = 1.5 Ω
20.	**A**	Amplitude *represented by* 7/5 = 1.4 divisions Period = 1/50 = 20 ms *represented by* 1 division
21.	**C**	Radiowave has longer wavelength than ultraviolet.
22.	**D**	Factual Question
23.	**D**	When both slits are opened, $I = k(A + A)^2 = 4kA^2$ When only one slit is opened, $I' = kA^2 = I/4$

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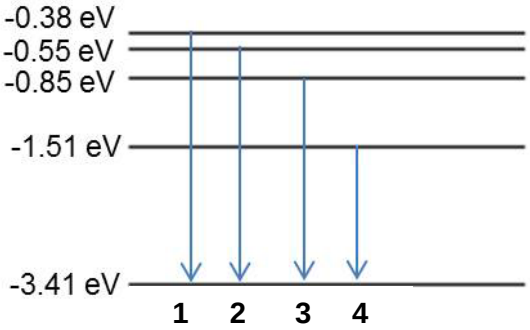
24.	**C**	Nodes are formed at closed end of a tube while anti-nodes are formed at the open end of a tube. At a node, the neighbouring air molecules are either all moving away from it or all moving towards it.
25.	**D**	
26.	**B**	Using Fleming's LHR, the torque experienced should be clockwise. $\tau = BIL \times L = 0.01 \times 2.0 \times 0.25^2 = 1.3 \times 10^{-3}$ Nm
27.	**A**	X will experience a repulsive force due to Y and an attractive force due to Z. As Y is closer, the repulsive force is greater, thus X will experience a force away from its centre.
28.	**C**	The minimum photon energy required to emit photoelectrons is the work function. Hence, work function of platinum = 2 x (work function of calcium) E = 2 x (work function of calcium) work function of calcium = $\frac{E}{2}$
29.	**A**	Sub $p = \frac{h}{\lambda}$ into $K = \frac{p^2}{2m}$ $\lambda^2 = \frac{h^2}{2mK}$
30.	**C**	 Photons emitted from transition 1 have a larger frequency than photons emitted from transition 4. The spacing between lines in the line spectrum is proportional to the ***difference in energy gaps***. Hence the 2 lines representing transitions 2 and 3 must be closer to line for 1 than that for 4.

~ THE END ~