2020 YIJC JC2 H1 Physics Prelim P1 MCQs Solution

Ques	Ans	Ques	Ans	Ques	Ans	Ques	Ans	Ques	Ans	Ques	Ans
1	**A**	6	**B**	11	**B**	16	**D**	21	**D**	26	**C**
2	**A**	7	**C**	12	**C**	17	**A**	22	**B**	27	**D**
3	**C**	8	**C**	13	**B**	18	**B**	23	**A**	28	**C**
4	**C**	9	**D**	14	**B**	19	**A**	24	**A**	29	**A**
5	**D**	10	**B**	15	**D**	20	**B**	25	**A**	30	**B**

MCQs Solution

S/N	Answer	Explanation
1	**A**	$Q = It$ SI base units of charge = Ampere seconds Option B : [F] = [m][a] = kg m s^{-2} Option C : [R]=[P]/[I^2] = kg m^2 s^{-3} A^{-2} Option D : [P]=[W]/[t]= kg m^2 s^{-3}
2	**A**	For force of 4 N and 6 N Maximum = 4 + 6 = 10 N Minimum = 6- 4 = 2 N The force will range from 2 N to 10 N depending on the angle between them, hence 1 N is not possible.
3	**C**	Vertical component of velocity on striking ground $= v_{final} \sin\theta = \sqrt{2gh}$ ----------(1) Horizontal component remain constant = $v_{final} \cos\theta = v$ ----------(2) (1)/(2) $\tan\theta = \frac{\sqrt{2gh}}{v}$ Angle θ is largest when h is the largest and v the smallest.
4	**C**	In the presence of air resistance, the drag force which is acting in opposite direction to motion, hence upwards, will increase and causes the net resultant force acting on the object to reduce to zero when it equals and opposte to the weight. Hence the acceleration will decrease and reach zero (state of terminal velocity).

5	**D**	At point A : object just reached the ground for the first time At point B: object just about the leave the ground after first bounce At point C: object reached the maximum height after first bounce At point D: object just reached the ground for the second time
6	**B**	Use s= ut + ½ ut^2 (evacuated tube implies no air resistance) L = ½ $g(T)^2$ S = ½ g $(T/2)^2$ =1/4 L = 0.25 L
7	**C**	For a system where no net external force acts, the linear momentum is conserved. For inelastic collision, kinetic energy is not conserved.
8	**C**	Change in momentum = (0.44 x 32) = 14.1 kg m s^{-1} Since $F_{ave} = \frac{\Delta (mv)}{\Delta t} = \frac{14.1}{9.2 \times 10^{-3}} = 1.53 \times 10^3 N$
9	**D**	This is a statement of Newton's third law. The force exerted on the man's feet by the floor is always equal in magnitude but opposite in direction to the force exerted on the lift floor by his feet.
10	**B**	By conservation of momentum 2m (4v) + 3m(-2v) = (5m) V_{final} $V_{final} = \frac{2}{5}$ v
11	**B**	Tension in the cord = 900 N Torque on disc = 900 x 0.20 = 180 Nm Torque due to *F* = *F* x 1.20 = 180 *F* = 180/1.2 = 150 N
12	**C**	By Hooke's law, $F = kx$ $k = \frac{F}{x}$ $k = \frac{200}{0.01} = 2.0 \times 10^4$ N m^{-1}
13	**B**	(Note *F* is the x-axis here instead) Work done is the area of graph bordering the displacement axis.

14	**B**	The loss in gravitational potential energy is equal to the gain in kinetic energy and work done against air resistance. Thus the loss in gravitational potential energy is greater than gain in kinetic energy.
15	**D**	Work done by person= gain in GPE of box + work done against friction $= mgh + fd$, where d is the distance moved along the slope. $= 200\times1.5 + 150\times1.5/\sin(30°) = 750$ J
16	**D**	The total forward force produced, $F = f + ma = 160 + 1200\times0.20 = 400$ N Total power output developed = $Fv = 400\times10 = 4.0$ kW
17	**A**	Power supplied, $P = \frac{mgh}{t} = mgv$ Since the vertical speed is constant for the first 5 seconds and becomes zero for the next 5 seconds, power supplied will be of a constant value for the first 5 seconds and zero power supplied for the next 5 seconds.
18	**B**	Since there is a <u>resultant force</u>, the object cannot be in equilibrium. The resultant force is the <u>horizontal component of T</u>, providing the centripetal acceleration.
19	**A**	Once the object leaves the track, neither friction nor the contact force act on it, leaving just its weight as the net force.
20	**B**	$\frac{GMm}{R^2} = mR\omega^2 = mR\left(\frac{2\pi}{T}\right)^2$ $T^2 = \left(\frac{4\pi^2}{GM}\right)R^3$, thus $\left(\frac{R_X}{R_Y}\right)^3 = \left(\frac{T_X}{T_Y}\right)^2 = \left(\frac{8}{1}\right)^2$ $\frac{R_X}{R_Y} = \left(\frac{8}{1}\right)^{\frac{2}{3}} = 4$
21	**D**	As voltage across the lamp increases, its temperature increases, leading to more vigorously vibration of lattice ions. The rate of collision between free electrons and lattice ions increases which cause greater scattering of the electrons. This leads to an increases in resistance.
22	**B**	Since the length of the wire is connected into the circuit, the current passing through the two cross-sections R and S is the same, i.e. the rate of flow of charge is the same.

23	**A**	$R = \frac{\rho l}{A}$ For largest resistance, the wire should have the largest length and smallest area. In addition, the temperature of the wire should be the greatest.
24	**A**	The 3 Ω and 6 Ω resistors are connected in parallel while both the 2 Ω resistors are connected in parallel. The effective resistance of the two sets of parallel resistors are 2 Ω and 1 Ω respectively. Thus, according to potential divider rule, $V_1 > V_2$. The two sets of parallel resistors are then connected in series with each other. Thus the current flowing into the two sets of parallel resistors is the same, though the individual current to the resistor may not be the same. Having the same p.d. across the first set of parallel resistors, the smaller resistance of 3 Ω allows a greater current to flow through. Conversely, having the same p.d. across the second set of parallel resistors, the equal resistance of 2 Ω allows the same current to flow through. Hence, $I_1 > I_2$
25	**A**	The fixed resistor and the potentiometer is connected in series. Using potential divider rule, $V_o = \frac{R_o}{R_{total}} \times E$ For the minimum output voltage, R_O = 0 Ω. Hence the V_O = 0 V For the maximum output voltage, R_O = 20 Ω. Hence the V_O = 6 V
26	**C**	p.d. across battery = p.d. across L + p.d. across M 20 = 7 + p.d. across M p.d. across M = 13 V p.d. across battery = p.d. across L + p.d. across N + p.d. across Q 20 = 7 + 4 + p.d. across Q p.d. across Q = 9 V p.d. across battery = p.d. across P + p.d. across Q 20 = p.d. across P + 9 p.d. across P = 11 V
27	**D**	Since the voltmeter reading is zero, the potential across the two points of the voltmeter is the same, i.e. the p.d. of Q and p.d. of S is the same $V_Q = V_S$ Using potential divider rule for P and Q and then for R and S, $\frac{Q}{P+Q} \times E = \frac{S}{R+S} \times E$ $Q(R+S) = S(P+Q)$ $QR + QS = PS + QS$ $PS = RQ$

28	**C**	$F = BIL \sin\theta$ $0.024 = 0.50 \times I \times 0.10 \sin 90°$ $I = 0.48$ A The current-carrying conductor in a rightward magnetic field experiences a downwards magnetic force. Using Fleming's Left Hand Rule, the direction of current is X to Y.
29	**A**	Current in the adjacent loops of the spring are parallel giving rise to attractive magnetic force between adjacent loops; spring is compressed.
30	**B**	When the speed of the electron is halved, the magnitude of the upwards electric force remain unchanged while the magnitude of the downwards magnetic force is halved. Hence the resultant force is now acting upwards, deflecting the electrons upwards.

Paper	Topic (eg 1, 2)	LO (eg a, b)	A		B	
			Question	Marks	Question	Marks
1	1	d	1	1		
1	1	i			2	1
1	2	e			3	1
1	2	f	4	1		
1	2	c	5	1		
1	2	e			6	1
1	3	i	7	1		
1	3	f			8	1
1	3	g			9	1
1	3	i			10	1
1	4	g			11	1
1	4	a	13	1	12	1
1	5	c	14	1		
1	5	a			15	1

1	5	l			16	1
1	5	k			17	1
1	6	f			18	1
1	6	f	19	1		
1	6	h			20	1
1	7	f	21	1		
1	7	a			22	1
1	7	h			23	1
1	8	e			24	1
1	8	f			25	1
1	8	e			26	1
1	8	f			27	1
1	9	g			28	1
1	9	j	29	1		
1	9	n	30	1		
	Total			10		20
	%			33%		67%