SHRI VIDHYABHARATHI MATRIC HR.SEC.SCHOOL
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COMMON QUARTERLY EXAMINATION 2018

STD: XI 22.09.2018 **MARKS : 70**

XI PHYSICS ANSWER KEY

Q.NO	SECTION - I	MARKS
1	c) rad s^{-2}	1
2	a) 273.16 K	1
3	c) 9.86	1
4	d) both a and b	1
5	a) 1 ms^{-2}	1
6	d) 20 ms^{-1}	1
7	b) force and motion in different direction	1
8	a) inertia of direction	1
9	d) μ_s mg cosθ	1
10	b) zero	1
11	c) 3.6 x 10^6 J	1
12	c) e = 1	1
13	a) pure rotation	1
14	b) Ml^2 / 12	1
15	d) force acting on particle	1
Q.NO	**SECTION-II**	**MARKS**
16	i) only one unit for one physical quantity – rational system of units ii) derived units can be easily obtained from basic and supplementary units - coherent system of units iii) metric system – multiples and submultiples can be expressed as powers of 10 (any two points)	2

17	ratio of mean absolute error to the mean value (or) relative error or fractional error = mean absolute error / mean value	2
18	Vector which denotes the position of a particle at any instant of time, with respect to some reference frame or coordinate system.	2
19	For maximum range, angle of projection $\theta = 45^0$ Range $R = \frac{u^2 \sin 2\theta}{g}$ $\because \theta = 45^0$ maximum range $R_{max} = \frac{u^2}{g}$ $R_{max} = \frac{98 \text{ x } 98}{9.8} = 980$ m (without unit reduce ½ mark)	½ ½ 1
20	If a very large force acts on an object for a very short duration, then the force is called impulsive force or impulse (or) $J = \int_{t_i}^{t_f} F.dt$ (1 mark)	2
21	If a system of three concurrent and coplanar forces is in equilibrium, then Lami's theorem states that the magnitude of each force of the system is proportional to sine of the angle between the other two forces (or) $\frac{\lvert\vec{F_1}\rvert}{sin\alpha} = \frac{\lvert\vec{F_2}\rvert}{sin\beta} = \frac{\lvert\vec{F_3}\rvert}{sin\gamma}$ (1 mark)	2
22	Power is defined as the rate of work done or energy delivered. its dimension is $[ML^2T^{-3}]$ (or) power p = workdone (W) / time taken (t) [1/2 mark]	1 1
23	The two objects should stick together permanently after collision such that they move with common velocity. In that collision linear momentum is conserved but KE is not conserved)	2
24	In the absence of external torque, the angular momentum of rigid body or system of particles is conserved. If $\tau = 0$ then $\frac{dL}{dt} = 0$; L = constant (1 mark)	2

Q.NO	SECTION-III	MARKS
25	The dimensional formula for planck's constant h – $[ML^2T^{-1}]$ c – $[LT^{-1}]$ G – $[M^{-1}L^3T^{-2}]$ $\frac{hc}{G} = \frac{[ML^2T^{-1}][LT^{-1}]}{[M^{-1}L^3T^{-2}]}$ = $[M^2]$	2 1
26	Any six points (each points carries ½ mark)	6 x ½ = 3
27	Any two equations (derivation for each equation carries 1 ½ marks)	2 x 1 ½ = 3
28	Yes, it is possible. If two objects A and B travel in the same direction with same velocity their relative velocities $V_{AB} = V_A - V_B = 0$ Also $V_{BA} = V_B - V_A = 0$ (since velocity of each object is same) Each object will appear to be at rest with respect to other (or any similar reasonable explanation award 3 marks)	1 1 ½ ½
29	Free body diagram T = mg = 400 g x 9.8 ms^{-2} = 0.4 kg x 9.8 ms^{-2} = 3.92 N	1 ½ ½ 1
30	If a particle is in uniform circular motion, there must be centripetal acceleration towards the centre of the circle. If there is acceleration, then there must be some force acting on it with respect to an inertial frame. This force is called centripetal force. $F_{CP} = \frac{mv^2}{r}$ or $m\omega^2 r$	2 1
31	Work done W = F dr cosθ = 25 x 15 x cos 30^0 = 324.75 J (without unit reduce ½ mark)	1 1 1

32	A force is said to be conservative force if the work done by or against the force in moving the body depends only on the initial and final positions of the body and not on the nature of the path followed between the initial and final positions. A force is said to be non conservative if the work done by or against the force in moving a body depends upon the path between the initial and final positions.	1 ½ 1 ½
33	The centre of mas of the body is defined as a point where the entire mass of the body appears to be concentrated. The center of gravity of a body is the point at which the entire weight of the body acts irrespective of the position and orientation of the body	1 ½ 1 ½
Q.NO	**SECTION-IV**	**MARKS**
34 (a)	(i) convert a physical quantity from one system of units to another (ii) check the dimensional correctness of a given physical equation (iii) establish relations among various physical quantities. $s = ut + \frac{1}{2} at^2$ Substituting dimensions $[L] = [LT^{-1}][T] + [LT^{-2}][T^2]$ $[L] = [L] + [L]$ The equation is dimensionally correct	3 1 1
34 (b)	<u>**Types of equilibrium**</u> Translational equilibrium Rotational equilibrium static equilibrium dynamic equilibrium stable equilibrium unstable equilibrium neutral equilibrium Explanation with suitable examples	2 3
35 (a)	<u>Triangulation method</u> diagram explanation $\tan \theta = h / x$ height $h = x \tan \theta$	 ½ 1 ½ ½

	<u>Radar Method</u>	
	Diagram	½
	Explanation	1
	speed = distance travelled / time taken distance d = speed of radio waves x time taken	½
	$d = \frac{v \times t}{2}$	½
35 (b)	diagram	½
	$u_1 > u_2$	½
	For elastic collision, the total linear momentum and kinetic energies of the two bodies before and after collision must remain the same.	½
	$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$	½
	Or $m_1(u_1 - v_1) = m_2(v_2 - u_2)$	
	$\frac{1}{2}m_1u_1^2 + \frac{1}{2}m_2u_2^2 = \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2$	½
	upto $u_1 + v_1 = v_2 + u_2$ $u_1 - u_2 = v_2 - v_1$	1
	upto $v_1 = \left(\frac{m_1 - m_2}{m_1 + m_2}\right)u_1 + \left(\frac{2m_2}{m_1 + m_2}\right)u_2$	1
	$v_2 = \left(\frac{2m_1}{m_1 + m_2}\right)u_1 + \left(\frac{m_2 - m_1}{m_1 + m_2}\right)u_2$	½
36 (a)	Two vectors A and B are represented by the two adjacent sides of a triangle taken in the same order. Then the resultant is given by the third side of the triangle taken in the reverse order.	1
	diagram	½
	Explanation	½
	Derivation of magnitude of resultant $R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$	2
	Derivation of direction of resultant $\alpha = \tan^{-1}\left(\frac{B\sin\theta}{A + B\cos\theta}\right)$	1

36 (b)	Parallel axis theorem states that the moment of inertia of the body about any axis is equal to the sum of its moment of inertia about a parallel axis through its centre of mass and the product of mass of the body and square of the perpendicular distance between the two axis diagram Explanation $I = \sum m(x+d)^2$ $I = \sum m(x^2 + d^2 + 2xd)$ $I = \sum (mx^2 + md^2 + 2dmx)$ $I = \sum mx^2 + \sum md^2 + 2d\sum mx$ The term, $\sum mx = 0$ because, x can take positive and negative values with respect to the axis AB. The summation $(\sum mx)$ will be zero. upto $I = I_C + Md^2$	1 ½ ½ ½ 1 ½ 1
37 (a)	Diagram Explanation horizontal distance travelled by the projectile $v_x = u_x + a_x t = u_x = u\cos\theta$ $x = u\cos\theta . t$ or $t = \frac{x}{u\cos\theta}$ $v_y = u\sin\theta - gt$ $y = u\sin\theta\, t - \frac{1}{2}gt^2$ $y = u\sin\theta \frac{x}{u\cos\theta} - \frac{1}{2}g\frac{x^2}{u^2\cos^2\theta}$ $y = x\tan\theta - \frac{1}{2}g\frac{x^2}{u^2\cos^2\theta}$	1 1 ½ ½ ½ ½ 1
37 (b)	Difference between static and kinetic friction any five points	5 x 1 = 5

38 (a)	Correct statement three laws Explanation	3 2
38 (b)	Statement Work done by the force on the body changes the kinetic energy of the body. This is called work-kinetic energy theorem. W = Fs F = ma upto $w = \frac{1}{2}\,mv^2 - \frac{1}{2}\,mu^2$ $KE = \frac{1}{2}\,mv^2$ change in KE $\Delta KE = \frac{1}{2}\,mv^2 - \frac{1}{2}\,mu^2$ W = ΔKE work done by force is positive – KE increases work done by force is negative – KE decreases no work done by force – no change in KE or body moves with constant speed provided its mass remains constant	1 ½ 1 1 ½ 1

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