

KENDRIYA VIDYALAYA SANGATHAN, RAIPUR REGION
SESSION ENDING EXAM (2024-25)
SUBJECT-PHYSICS (042)
CLASS-XI

MAX.M- 70

TIME – 3 hrs.

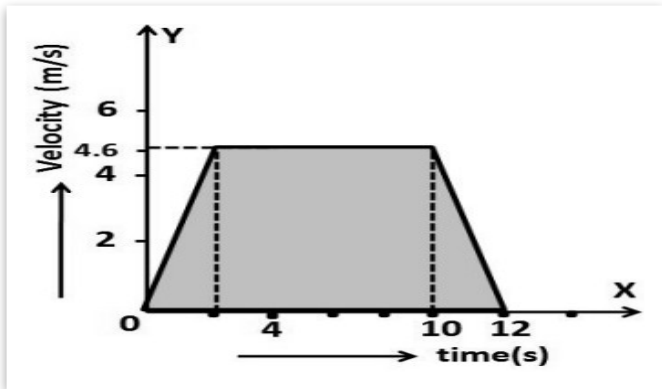
General Instructions

1. There are 33 questions in all.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
3. All the sections are compulsory.
4. Section A contains sixteen questions, twelve MCQ and four Assertion Reasoning based of 1 mark each, Section B contains five questions of two marks each, Section C contains seven questions of three marks each, Section D contains two case study-based questions of four marks each and Section E contains three long answer questions of five marks each.
5. There is no overall choice. However, an internal choice has been provided in one question in Section B, one question in Section C, one question in each CBQ in Section D and all three questions in Section E. You have to attempt only one of the choices in such questions.
6. You may use the following physical constants wherever necessary :
 $c = 3 \times 10^8 \text{ ms}^{-1}$
 $h = 6.6 \times 10^{-34} \text{ Js}$
 $\mu_0 = 4\pi \times 10^{-7} \text{ TmA}^{-1}$
Boltzmann constant $k = 1.38 \times 10^{-23} \text{ JK}^{-1}$
Avogadro's number $N_A = 6.023 \times 10^{23} / \text{mole}$
Radius of earth $R_e = 6.38 \times 10^6$
Mass of earth $m_e = 5.97 \times 10^{24} \text{ kg}$

Q. N.	SECTION – A (16X1= 16 M)	M
Q1	The angular frequency of oscillated particle of mass 'm' in spring of spring constant 'k' in simple harmonic motion will be a) $\sqrt{2m/k}$ b) $\sqrt{m/k}$ c) $\sqrt{m/2k}$ d) $\sqrt{k/m}$	1
Q2	At what angle do the two vectors (P + Q) and (P - Q) act so that the resultant is $\sqrt{3P^2 + Q^2}$. a) 60° b) 45° c) 120° d) none of this	1
Q3	The force $\vec{F} = 2\hat{i} + 3\hat{j} - \hat{k}$ N is applied on a body then it displaced $\vec{d} = \hat{i} + 2\hat{j} + 2\hat{k}$ m then work done by force will be a) 2J b) 10J c) 4J d) 6 J	1
Q4	A uniform chain of length l and mass m is lying on a smooth table and one-third of its length is hanging vertically down over the edge of the table. If g be the acceleration due to gravity, then the work required to pull the hanging part on the table is a) $\frac{mgl}{3}$ (b) $\frac{mgl}{18}$ (c) $\frac{mgl}{9}$ (d) none of this	1
Q5	Handle to open the door, is always provided at the free edge of a door. Why? a) To increase the torque (b) to increase distance r and decrease force (c) To decrease distance r and decrease force. (d) None of this.	1
Q6	At room temperature 27°C the wavelength of heat radiation is 400 nm. At what temperature the wavelength of radiation will be 300 nm. a) 400°C (b) 200°C (c) 20.25°C (d) 127°C	1
Q7	A rod of length L is rotating about an axis passing through its centre and perpendicular to its length. The radius of gyration for the rod is a) $L/12$ (b) $L/6$ (c) $L/\sqrt{12}$ (d) $L/\sqrt{6}$	1

Q8	A cricket ball of mass 150g is moving with a velocity of 12 m/s and is hit by a bat so that the ball is turned back with a velocity of 20 m/s. if duration on contact between the ball and bat is 0.01s the impulse of force is (a)7.4Ns. (b)4.8Ns. (c) 1.2Ns. (d)4.7Ns.	1
Q9	The amplitude of a simple harmonic oscillator is doubled, then (a) its energy is doubled. (b) maximum velocity is doubled. (c) time period is doubled. (d) time period remains same.	1
Q10	What types of waves are produced in the sonometer wire? (a)Transverse and stationary. (b)Transverse and progressive. (c) Longitudinal and progressive. (d) Longitudinal and stationary.	1
Q11	If a mercury drop is divided into 8 equal parts, its total energy (a) remains same (b) becomes twice (c) becomes half (d) becomes 4 times	1
Q12	A system provided with 200cal of heat and the work done by the system on the surrounding is 40J. then its internal energy become a) Increase by 600J. (b) decrease by 800J (c) increases by 800J (d) decreases by 50J.	1
	For Questions 13 to 16, two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below. a) If both Assertion and Reason are true and Reason is correct explanation of Assertion. b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion. c) If Assertion is true but Reason is false. d) If both Assertion and Reason are false.	
Q13	Assertion : A body may be accelerated even when it is moving uniformly. Reason : When direction of motion of the body is changing, the body must have acceleration.	1
Q14	Assertion : A body becomes mass-less at the centre of earth. Reason : This follows from $g' = g (1 - d/R)$	1
Q15	Assertion : The machine parts are jammed in winter. Reason : The viscosity of the lubricants used in the machines increases at low temperature.	1
Q16	Assertion : Internal energy of an ideal gas does not depend upon volume of the gas Reason: internal energy of ideal gas depends on the temperature of gas.	1
SECTION – B (5X2= 10 M)		
Q17	What is the angle of friction and find out the relation between coefficient of friction & angle of friction.	2
Q18	State Kepler's law of planetary motion. Write the relation between areal velocity & angular momentum of planet around the sun.	2
Q19	Draw Hookes law graph for metallic wire & labelled yield point & fracture point.	2
Q20	A geyser heats water flowing at the rate of 3.0 liters per minute from 27°C to 77°C. If the geyser operates on a gas burner, what is the rate of consumption of the fuel in terms of gram per minutes, if its heat of combustion is 4.0×10^4 J/g?	2
Q21	What is simple harmonic motion? Draw the graph of displacement, velocity & acceleration of particle in SHM have same time period 'T' but they have differ in phase. OR The piston in the cylinder head of a locomotive has a stroke (twice the amplitude) of 1.0 m. If the piston moves with simple harmonic motion with an angular frequency of 200 rev/min, what its maximum speed?	2

SECTION – C(7X3= 2 M)

Q22	The wavelength ' λ ' of matter wave may depend on plank constant ' h ' mass of the particle ' m ' and velocity ' v ' of the particle. Use the method of dimension to derive their relation.	3
Q23	The velocity time graph of an ascending passenger lift is given below. What is the displacement of the lift: (i) during the first two seconds (ii) between 2nd and 10th second (iii) during the last two seconds (iv) total displacement 	3
Q24	Explain why (1). Horse cannot pull a cart and run in an empty space. (2). It is easier to pull a lawn mower than to push it. Explain with graph. OR A monkey of mass 40kg climbs on a rope which stands a maximum tension of 600N. (i). Find the tension in rope if monkey climb up with an acceleration of 6m/s^2. (ii). Find the tension in rope if monkey move down with acceleration of 4m/s^2 (iii) In which of the following cases will the rope break, the monkey (given $g= 10 \text{ m/s}^2$)	3
Q25	State and prove the work- energy theorem for a constant force.	3
Q26	The escape velocity of a projectile on the earth surface is 11.2km/s . a body is projected out with thrice this speed. What is the speed of the body far away from the earth? Ignore the presence of the sun and other planets.	3
Q27	What is Adiabatic process? Derive the expression for work done in an Adiabatic Process.	3
Q28	State law of equi-partition of energy. Find the ratio of specific heat for mono-atomic and diatomic gases. Given that $\gamma = C_P/C_V$.	3

Q29	Read the following paragraph and answer the questions The centre of mass of a body or system of a particle is defined as a point where the whole of the mass of the body or all the masses of a set of particles appeared to be concentrated .When we are studying the dynamics of the motion of the system of a particle as a whole, then we need not worry about the dynamics of individual particles of the system. Rather than we have to focus on the dynamic of a unique point corresponding to that system. 	4
	(i) A fire cracker following a parabolic path explodes in mid-air. The centre of mass of all the fragment will follow a path a) Along horizontal (b) along vertical (c) along same parabola (d) along circle (ii) Under what condition centre of mass of rigid body coincide with geometrical centre of the body? (a) When volume is same (b) when body has uniform mass density (c) body has irregular shape (d) none of this (iii) The length of second hand of a clock is 10cm. The speed of the tip of the second hand in cm/sec is a) $\pi/6$ (b) $\pi/3$ (c) $\pi/4$ (d) $\pi/8$ (iv) The angular momentum of a car of mass 2000kg moving in a circular track of diameter 100m with a speed of 40m/s in $\text{kgm}^2\text{s}^{-1}$ (a) 6×10^6 (b) 4×10^6 (c) 8×10^6 (d) 6×10^8 OR (v) Two particles of masses 1kg and 3kg separated by 1m. find the location of centre of mass (a) 0.75 m from 1kg body (b) 0.6m from 1kg body (c) 0.4m from 1kg body (d) 0.5m from each body	4
Q30	A banked turn (or banking turn) is a turn or change of direction in which the vehicle banks or inclines, usually towards the inside of the turn. For a road or railroad this is usually due to the roadbed having a transverse down-slope towards the inside of the curve. The bank angle is the angle at which the vehicle is inclined about its longitudinal axis with respect to the horizontal.  (i). Which force provides the required centripetal force in banked circular road with friction?	4

	(a). $N \sin \theta + f \cos \theta$ (b). $N \sin \theta - f \cos \theta$ (c). $N \sin \theta$ (d). $f \sin \theta + N \cos \theta$ (ii). What happen to the maximum possible velocity in banked circular road without friction if radius of road is doubled / (a). 2 times increase (b). 2 times decrease. (c). 4 times increase (d). $\sqrt{2}$ times of original value. (iii). With what maximum speed a car can turn round a curve of 100m radius in a level road if the coefficient of friction between the road and tire is 0.5. (given $g = 10 \text{ m/s}^2$) (a). 15m/s (b). $20\sqrt{3} \text{ m/s}$ (c). $10\sqrt{5} \text{ m/s}$ (d). $20\sqrt{5} \text{ m/s}$ (iv). What will be the maximum possible velocity in a banked circular road of radius r without friction if angle of banking is 45 degrees? (a). $\sqrt{3rg}$ (b). $\frac{\sqrt{rg}}{3}$ (c). $\sqrt{rg}$ (d). $\sqrt{5rg}$. OR (v) Which force will provide required centripetal force in a cycle or motor cycle moving in a level circular road with normal reaction N. (a). $N \cos \theta$ (b). $N \sin \theta$ (c). $\frac{\sin \theta}{N}$ (d). $\frac{\cos \theta}{N}$	
SECTION -E		
Q31	(a) A projectile is fired with velocity u making an angle θ with the horizontal. Derive the expression for (i) horizontal range (ii) time of flight (iii) maximum height. (b) A particle projected with a velocity 'u' so that its horizontal range is twice the maximum height. Find the horizontal range of it. OR (a) Define centripetal acceleration. Derive expression for centripetal acceleration. (b) The angular velocity of the particle moving in a circle of radius 50cm is increased in 5minutes from 100 rpm to 400 rpm. Find angular acceleration in terms of radian /sec².	5
Q32	(i) State and prove Bernoulli's theorem. (ii) write any two applications of Bernoulli's theorem. OR (a). What is capillarity? Derive expression for height of liquid in a capillary tube. (b). Derive the expression for excess pressure inside of liquid drops due to surface tension of liquid.	5
Q33	(a) Write expression for speed of sound as per Laplace correction. (b) What happen to speed of sound if pressure is doubled? (c) Why sound travel faster in moist air than in dry air? (d) At what temperature will the speed of sound in air be 3 times its value at 0° C? OR (a). What are beats? Write the essential condition for formation of beats. (b). Draw standing wave pattern for first mode (fundamental frequency) and write formula for fundamental frequency in 1. Vibrating string. 2. Open organ pipe.	5

	3. Closed organ pipe.	
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