

Kendriya Vidyalaya Sangathan, Lucknow Region**Session-2022-23(SEE)**Subject-Physics (Theory) Class-11th

Maximum Marks: 70 Marks

Time Allowed: 3 hours.

General Instructions:

- (1) There are 35 questions in all. All questions are compulsory.
- (2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.
- (3) Section A contains eighteen MCQ of 1 mark each, Section B contains Seven questions of two marks each, Section C contains five questions of three marks each, section D contains three long questions of five marks each and Section E contains two case study based questions of 4 marks .
- (4) There is no overall choice. However, an internal choice has been provided in section B, C, D and E. You have to attempt only one of the choices in such questions.
- (5) Use of calculators is not allowed.

Section-A

Q.N	Question	
1	In a circuit, the resistance is 10.845Ω and current is 3.23 A. Its potential difference with proper significant figures will be($V=IR$) (a) 35.0 V (b) 35.00 V (c) 35.02 V (d) 35.03 V	1
2	A force is given by: $F = a t^2 + b t + c$ (where t is time). What are the dimensions of a and b? (a) $[M L T^{-4}]$ and $[M L T^{-3}]$ (b) $[M L^2 T^{-3}]$ and $[M L^2 T^{-4}]$ (c) $[M L^4 T^{-2}]$ and $[M L^3 T^{-2}]$ (d) $[M L T^{-2}]$ and $[M L^2 T^{-2}]$	1
3	A diatomic molecule has how many degrees of freedom (a) 3 (b) 4 (c) 5 (d) 6	1
4	What does the speedometer of a vehicle measures? (a) Average speed (b) Average velocity (c) Instantaneous velocity (d) Instantaneous speed	1
5	A force of 5N changes the velocity of a body from 10m/s to 20 m/s in 5 second. How much force is required to bring about the same change in 2 second? (a) 12.5 N (b) 13N (c) 125N (d) 10N	1
6	The safe speed of a vehicle on a horizontal circular road is independent of (a) Mass of vehicle (b) Coefficient of friction between road surface and tyre of vehicle (c) Radius of curve (d) Acceleration due to gravity	1
7	Reason of weightlessness in satellite is :- (a) Zero gravity (b) Centre of mass (c) Zero reaction force (d) None of above	1
8	With the increase in the temperature the coefficient of viscosity of liquid (a) increases (b) decreases (c) remains same (d) none of the above	1
9	Two soap bubbles have radii in the ratio of 4:3. What is the ratio of work done to blow these bubbles? (a) 4:3 (b) 16:9 (c) 9:16 (d) 3:4	1
10	Which of the following gives the correct relationship between C_p and C_v value of a given gas? (a) $C_p/C_v = R$ (b) $C_p - C_v = R$ (c) $C_v - C_p = R$ (d) $C_v/C_p = R$	1
11	According to First law of Thermodynamics: (a) Total potential energy of a system during a process remains constant (b) Total energy of a system remains constant (c) Work-done of a system is equal to the heat transferred to the system	1

	(d) Work done is equal to change in mean kinetic energy.	
12	<p>Moon has no atmosphere because</p> <p>(a) The r.m.s. velocity of all gases is more than the escape velocity from moon's surface</p> <p>(b) Its surface is not smooth</p> <p>(c) It is quite far away from the earth</p> <p>(d) It does not have population and plants</p>	1
13	<p>What is the value of the Gravitational potential energy at Infinity?</p> <p>(a) Zero (b) Infinity (c) One (d) None of the above</p>	1
14	<p>In which of the following examples of motion, can the body be considered approximately a point object:</p> <p>(a) A railway carriage moving without jerks between two stations.</p> <p>(b) A monkey sitting on top of a man cycling smoothly on a circular track.</p> <p>(c) A spinning cricket ball that turns sharply on hitting the ground.</p> <p>(d) A tumbling beaker that has slipped off the edge of a table.</p>	1
15	<p>A diatomic gas molecule has translational, rotational and vibrational degrees of freedom. The C_p/C_v is</p> <p>(a) 1.67 (b) 1.4 (c) 1.29 (d) 1.33</p>	1

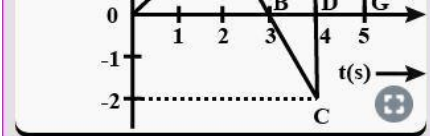
Q.No. 16 To 18

Two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

- (a) Both A and R are true and R is the correct explanation of A.
 (b) Both A and R are true and R is NOT the correct explanation of A.
 (c) A is true but R is false.
 (d) A is false and R is also false.

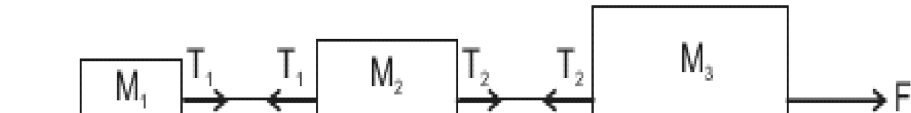
16	<p>Assertion (A) : A player lowers his hands while catching a cricket ball.</p> <p>Reason (R) : This increases the time of catch.</p>	1
17	<p>Assertion (A) : Electron Volt and Joule are the units of energy used in modern physics and mechanics respectively.</p> <p>Reason (R): Different types of energies require different units in SI.</p>	1
18	<p>Assertion(A): Value of radius of gyration of a body depends on axis of rotation.</p> <p>Reason: Radius of gyration is root mean square distance of particle of the body from the axis of rotation.</p>	1

Section-B

19	Write the factors on which the surface tension of a liquid depends.	2
20	<p>The velocity-time graph of a particle moving along a straight line is shown in the figure gives below. Calculate the distance and displacement of the particle in 5 seconds.</p>  <p>OR</p> <p>The distance travelled by an object moving with uniform acceleration in 7th and 9th second are respectively 20m and 24 m. What distance will it travel in 15th second?</p>	2
21	<p>A shell of mass 25g is fired by a gun of mass 15 kg. If the muzzle speed of the shell is 80m/s, what is the recoil speed of the gun?</p> <p>OR</p> <p>Explain why it is easier to pull a lawn roller than to push it?</p>	2

22	How much should a spring of indefinite length be compressed to have a potential energy equivalent to a ball of mass 6 kg raised to a height of 120 m above the ground? Let the spring have a stiffness of $k = 100 \text{ N/m}$ and assume $g = 10 \text{ m/s}^2$.	2
23	Stationary waves are produced in a 10 m long stretched string. If the string vibrates in 5 segments and wave velocity is 20 m/s, then find the frequency of the stationary wave.	2
24	The period of the satellite of the earth is 5 hours if the separation between the earth and the satellite is increased to 4 times the previous value then what will be the new time period of the satellite?	2
25	Find The temperature at which the rms speed of a gas molecule become double its value at 0°C .	2

Section-C

26	State and prove work energy theorem for variable force acting on an object.	3
27	<p>The displacement of a particle is given by the expression $x=3t^2+7t-9$, where x is in meter and t is in seconds. Calculate the acceleration and draw velocity-time graph for the motion of the particle.</p> <p>OR</p> <p>Define Limiting static friction. Three blocks of masses $m_1 = 10 \text{ kg}$, $m_2 = 20 \text{ kg}$ and $m_3 = 30 \text{ kg}$ are connected by strings on smooth (avoid force of friction) horizontal surface and pulled by a force of 60 N. Find the acceleration of the system and tensions in the string.</p> 	3
28	<p>Define escape velocity and orbital velocity and prove that escape velocity is independent from the mass of a body projected.</p> <p>OR</p> <p>Define acceleration due to gravity. Show that the value of 'g' decreases with altitude?</p>	3
29	Define rotational torque. Establish a relation between angular momentum and rotational torque.	3
30	Write Newton's Formula for the speed of sound in air. What correction was made by Laplace in this formula?	3

Section-D

31	<p>State law of parallelogram of vectors addition .Find the magnitude and direction of the resultant of two vectors A and B in terms of their magnitudes and angle θ between them.</p> <p>OR</p> <p>(i) Prove that the path of projectile is parabolic.</p> <p>(ii) A Body is projected upwards with a velocity of 30 ms^{-1} at an angle of 30° with the horizontal. Determine</p> <p>(a)The range of the body</p> <p>(b) The maximum height attained by the body.</p>	5
32	<p>State and prove Bernoulli's theorem and write it's any two applications.</p> <p>OR</p> <p>Define terminal velocity.</p> <p>Prove that the terminal velocity of spherical object falling in a viscous medium is directly proportional to the square of the radius of the object.</p>	5
33	<p>(i) What do you mean by SHM? Write its characteristics.</p> <p>(ii) Prove that the total mechanical energy of a particle executing SHM always remain constant.</p> <p>OR</p> <p>(i) Define beats.</p> <p>(ii) Write the conditions for the formation of beats.</p> <p>(iii) Prove that the beat frequency is equal to the difference between the frequencies of the waves superpose.</p>	5

Section-E

34	<p>Case Study : THERMODYNAMIC PROCESSES</p> <p>Read the following paragraph and answer the questions.</p> <p>A process in which the temperature of the system is kept fixed throughout is called an isothermal process. The expansion of a gas in a metallic cylinder placed in a large reservoir of fixed temperature is an example of an isothermal process. (Heat transferred from the reservoir to the system does not materially affect the temperature of the reservoir, because of its very large heat capacity.) In isobaric processes the pressure is constant while in isochoric processes the volume is constant. Finally, if the system is insulated from the surroundings and no heat flows between the system and the surroundings, the process is adiabatic.</p> <p>(i) Name the physical quantities which remain constant in isobaric process.</p> <p>(ii) What is the isothermal process formula?</p> <p>(iii) Distinguish between the isothermal process and the adiabatic process.</p> <p>OR</p> <p>(iii) What is the mathematical form of the First Law of Thermodynamics in an isochoric process and adiabatic process?</p>	4
35	<p>Case Study : Third law of motion</p> <p>Read the following paragraph and answer the questions.</p> <p>the mutual forces between two bodies are always equal and opposite. This idea was expressed by Newton in the form of the third law of motion. To every action, there is always an equal and opposite reaction. Forces always occur in pairs. Force on a body A by B is equal and opposite to the force on the body B by A. The terms action and reaction in the third law may give a wrong impression that action comes before reaction i.e action is the cause and reaction the effect. There is no cause effect relation implied in the third law. The force on A by B and the force on B by A act at the same instant. By the same reasoning, any one of them may be called action and the other reaction. Action and reaction forces act on different bodies, not on the same body. Consider a pair of bodies A and B. According to the third law, $F_{AB} = -F_{BA}$ (force on A by B) = – (force on B by A) ,Thus if we are considering the motion of any one body (A or B), only one of the two forces is relevant. It is an error to add up the two forces and claim that the net force is zero.</p> <p>(i) When two bodies interact, they exert force on each other, and these forces are known as ____</p> <p>(ii) Define net force.</p> <p>(iii) If a person fires a number of bullets of mass 0.05kg each with a muzzle velocity of 1200ms^{-1} and experiences a total reaction force of 300N per second, then how many bullets did the person fired?</p> <p>OR</p> <p>(iii) What should be the amount of force needed to be applied to move the notebook which is having a mass of 300g placed on a table?</p>	4

