**FINAL EXAMINATION (2018-2019)**

**PHYSICS – THEORY** **No. of printed pages: 3**

**INDIAN SCHOOL SOHAR**

**CLASS: XI** **MAX. MARKS: 70**

**DATE: 21/02/2019** **DURATION: 3Hrs**

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**General Instructions:**

**1. All questions are compulsory. There are 27 questions in all .**

**2. Questions 1 to 5 carry one mark each, questions 6 to 12 carry two marks each, questions 13 to 24 carry three marks each, questions 25 to 27 carry five marks each.**

**3. There is no overall choice. However, internal choice has been provided in two questions of one mark, two questions of two marks, three questions of three marks and all three questions of five marks each.**

**4. You have to attempt only one of the given choices in such questions.**

**5. Use of calculator is not permitted**

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## SECTION-A

1. Draw a graph to show the variation of potential energy (U) with position (x) for a spring attached to a rigid support at one end and to a block at the other end . Justify the graph .

**OR**

1. Draw a graph to show the variation of kinetic energy (k) with position (x) for a spring attached to a rigid support at one end and to a block at the other end . Justify the graph. (1)

2. Define a Parsec (**OR)** a light year. (1)

3. Define molar specific heat capacity. Mention its formula. (1)

4. Why water on a clean glass surface tends to spread out while mercury on the same surface tends to form a drop. (1)

5. If the momentum of an object is reduced to half of its original value. How does its K.E. change?

## SECTION-B

6. Establish the relationship between torque and moment of inertia.

**OR**

6. Define radius of gyration. On what factors does it depend. (2)

7. Mention any two rules for rounding off the number. Give examples. (2)

8. Derive the expression Cp – Cv = R. (2)

9. Two masses $M_1$= 5kg and $M_2$ = 10 kg are connected at the ends of an inextensible string passing over a frictionless pulley. What will be acceleration of the masses when the masses are released. (2)

10. Show that the average kinetic energy of a gas molecule is directly proportional to the temperature of the gas.

**OR**

10.Derive an expression for the pressure of an ideal gas. (2)

11. A particle executing linear SHM has a maximum velocity of 40 cm/s and a maximum acceleration of 50 cm /$s^2$. Find its amplitude and the period of oscillation.
(2)

12. Mention the scientific principle of the technology of (i) electric generator (ii) aeroplane (iii) Lasers (iv) Radio and Television. (2)

**SECTION-C**

13. (i)Write the equations of motion of a freely falling body.
(ii) Draw graph to show variation of acceleration with time and distance with time for a freely falling body. Justify the graphs. (3)

14.(a) Mention the mathematical expressions of cosine law and sine law of vector addition.
(b)A particle starts from rest and moves with an acceleration of 2 m/$s^2$ for 10 s. After that, it travels for 30 s with constant speed and then undergoes a retardation of 4 m/$s^2$ and comes back to rest. What is the total distance covered by the particle. (3)

15. What is impending motion. The kinetic energy of a body increases by 300 %. How much will the linear momentum of the body increase ? (3)

16.Define inertia. A car starts from rest , accelerates at the rate of '*f* ' through the distance S, then continues at constant speed for time *t* and then retards at the rate of *f*/2 to come to rest. If the total distance travelled is 5 S, then find S.
(3)

17. State Hooke's law of elasticity. A solid cube is subjected to a pressure of $5\times10^5$ N/$m^2$. Each side of the cube is shortened by 1%. Find the volumetric strain and the bulk modulus of elasticity of the cube. (3)

18. Why does earth impart same acceleration due gravity to all the bodies? Obtain an expression for the energy of an orbiting satellite. (3)

19. An object is placed at (i) 10 cm (ii) 5cm in front of a concave mirror of radius of curvature 15 cm. Find the position, nature, and magnification of the image in each case. (3)

20.(i) Define average acceleration. Mention its expression.
(ii) A cricket ball is thrown at a speed of 28 m/s in a direction $30^0$ above the horizontal. Calculate (a) the maximum height (b) the time taken by the ball to return to the same level. (3)

21. Define a vector product. State and mention one rule to describe the direction of its resultant. Mention the properties of a vector product of two vectors.

**OR**

21. State the Bernoulli's principle. Hence derive an expression for the speed of incompressible fluid using a Venturi-meter. (3)

22. Derive an expression for work done in an adiabatic process. (**OR**)

22. Derive an expression for work done in an isothermal process. (3)

23. Describe an activity to explain the term thermal conductivity and hence derive its formula with help of a diagram. "Cooking vessels have copper at its bottom". Why. (3)

24. State the principle of conservation of mechanical energy. Hence derive an expression of $v_f$ and $v_h$ for a ball of mass 'm' dropped from a height 'H', where 'h' is an intermediate height.

**OR**

24. State the Kepler's law of areas with the help of a diagram. Prove it for the Sun at the origin and a planet with the position and momentum **r** and **p** respectively. (3)

## SECTION-D

25.(a) Explain Doppler effect in sound. Obtain an expression for apparent frequency of sound when source and observer are in motion.

(b) A equation of a plane progressive wave is given by $y(x,t)= 10 \sin 2\pi ( t – 0.005 x)$ where x and y are in cm and t is in seconds. What is the amplitude, frequency, wavelength and velocity of the wave .

**OR**

25.(a) What are forced oscillations. Derive an equation for the amplitude of forced oscillations.

(b) A body oscillates with SHM according to equation, $x = 5 \cos (2\pi t + \pi/4)$. At t = 1.5 s, calculate the displacement, speed and acceleration of the body. (5)

26.(a) What is a heat engine. Describe the steps involved in the working of a heat engine with the help of a schematic diagram.

(b)Derive an expression for ratio of specific heat for monoatomic and polyatomic gases.

**OR**

26.(a) Explain with the help of diagram how the motion of bob in a simple pendulum perform SHM. Justify your answer graphically.

(b) Explain the relation in phase between displacement, velocity and acceleration in SHM, graphically and mathematically. (5)

27.(a) Explain the types of thermal expansions with the help of mathematical expressions.

(b) A 10 kW drilling machine is used to drill a bore in a small aluminium block of mass 8.0 kg. How much is the rise in temperature of the block in 2.5 minutes, assuming 50% of the power is used up in heating the machine itself or lost to the surroundings. Specific heat of aluminium = 0.91J/gC

**OR**

27.(a) Define angle of contact. Derive an expression for the rise of liquid in a capillary tube?

(b) Two small drops of mercury , each of radius R coalesce to form a single large drop. Find the ratio of the total surface energies before and after the change. (5)