

FIRST YEAR HIGHER SECONDARY EXAMINATION, MARCH 2023

Part -III

PHYSICS

Maximum: 60 Scores

FY - 424

Date: 21.03.2023

ANSWER KEY (unofficial)**HSPTA KANNUR**

| Qn No. | Qn Sub No. | Scoring Indicators | Split score | Total |
|--------|------------|--------------------|-------------|-------|
|--------|------------|--------------------|-------------|-------|

Answer any 5 questions from 1 to 7. Each carries 1 score**[5x 1 = 5]**

| | | | | |
|---|--|---------------------------------|---|---|
| 1 | | (iv) 10^{-10} m | 1 | 1 |
| 2 | | mass | 1 | 1 |
| 3 | | True | 1 | 1 |
| 4 | | Centre of mass | 1 | 1 |
| 5 | | Fusion/Freezing/ solidification | 1 | 1 |
| 6 | | Temperature | 1 | 1 |
| 7 | | (c) Frequency | 1 | 1 |

Answer any 5 questions from 8 to 14. Each carries 2 scores**[5 x 2 = 10]**

| | | | | |
|----|----|--|---|---|
| 8 | | $t=u/g$ | 2 | 2 |
| 9 | | A vector whose magnitude is zero is called a null vector or zero vector <ul style="list-style-type: none"> The result of multiplication of a real number with null vector is a null vector itself. Null vector have no specific direction. | 2 | 2 |
| 10 | a) | The spring force is a conservative force. | 1 | 2 |
| | b) | | 1 | |
| 11 | | <ul style="list-style-type: none"> Mass Distribution of mass around the axis of rotation. The axis chosen (Any two) | 2 | 2 |

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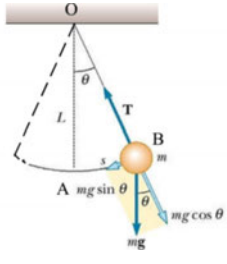
| Qn No. | Qn Sub No. | Scoring Indicators | Split score | Total |
|--------|------------|---|-------------|-------|
| 12 | a) b) | (ii) $t_1 = t_2$ Kepler's Second law/Law of area, Law of conservation of angular momentum. | 1 1 | 2 |
| 13 | | a) Due to surface tension liquid appears spherical in shape because out of different shape with constant volume spherical shape has least surface area. b) Due to the presence of the free liquid surface and surface tension comes into play. | 1 1 | 2 |
| 14 | | A - conduction B - convection | 2 | 2 |

Answer any 6 questions from 15 to 21. Each carries 3 scores

[6 x 3= 18]

| | | | | |
|----|----------|--|-------------|---|
| 15 | a) b) | a) A stone projected vertically upwards, at the maximum height the velocity is zero but it is still accelerating due to gravity. b) Proof of $S = ut + \frac{1}{2}at^2$ or any other proof. | 1 2 | 3 |
| 16 | a) b) | a) Law of conservation of linear momentum b) Recoil speed of the gun is very low due to its large mass. $mu + MV = 0$ $V = - mu/M$ $M \gg m$, hence V is very small. | 1 2 | 3 |
| 17 | | a) Young's modulus b) Steel, because its young's modulus is more than that of rubber. c) Compressibility = $\frac{1}{Bulk modulus}$. Compressibility of water is $0.5 \times 10^{-9} m^2 N^{-1}$ | 1 1 1 | 3 |
| 18 | a) b) | Yes, When water flowing in a broader pipe enters into a narrow pipe, velocity increases and hence pressure decreases. According to Bernoulli's principle as velocity of flow increases pressure decreases. The coefficient of viscosity for a fluid is defined as the ratio of shearing stress to the strain rate. Or $\eta = \frac{Fl}{vA}$ | 2 1 | 3 |
| 19 | a) b) | The heat energy given to a system will be used partly for increasing the internal energy and the rest for doing work. Or $\Delta Q = \Delta U + \Delta W$ | 1 2 | 3 |

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|--------|------------|--------------------|-------------|-------|
|--------|------------|--------------------|-------------|-------|

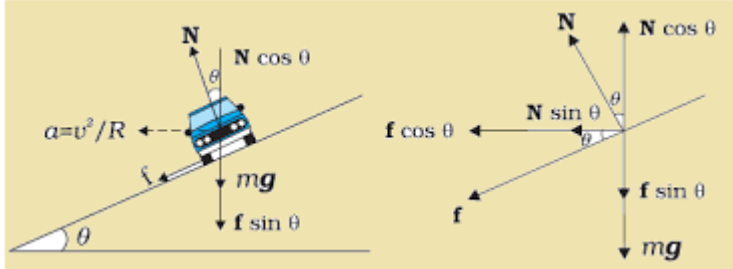
| | | | | |
|----|----|--|-------------|---|
| | | Derivation of $W = RT \ln \frac{v_2}{v_1}$ | | |
| 20 | | <p>a) The law of equipartition of energy states that for a system in equilibrium at a temperature T K, the total energy is distributed equally among each degree of freedom. Each degree of freedom has an energy $1/2K_B T$ for a gas molecule.</p> <p>b) Hydrogen, density of hydrogen is less than that of oxygen. Or, RMS velocity of hydrogen greater than that of oxygen.</p> <p>c) The temperature of a gas is a measure of average kinetic energy of the molecules of the gas. As the gas heated kinetic energy of the molecules increases thereby temperature.</p> | 1 1 1 | 3 |
| 21 | a) |  <p>Derivation of $T = 2\pi\sqrt{\frac{l}{g}}$</p> | 2 | 3 |
| | b) | No. The pendulum does not oscillate (time period is infinity) in the spaceship as the acceleration due to gravity inside it is zero. | 1 | |

Answer any 3 questions from 22 to 25. Each carries 4 scores

[3 x 4 = 12]

| | | | | |
|----|----|--|---|---|
| 22 | a) | The dimensions of all the terms in an equation should be the same. | 1 | |
| | b) | It is dimensionally correct. $[ML^2T^{-2}] = [ML^2T^{-2}]$ | 2 | 4 |
| | c) | i) 5 ii) 5 | 1 | |

| Qn No. | Qn Sub No. | Scoring Indicators | Split score | Total |
|--------|------------|--------------------|-------------|-------|
|--------|------------|--------------------|-------------|-------|

| | | | | |
|----|----|--|---|---|
| 23 | a) |  | 2 | 4 |
| | b) | Derive the expression $V_o = \sqrt{Rg \tan \theta}$ | 2 | |
| 24 | a) | Lorry has greater momentum, momentum $P = \sqrt{2mE}$. If kinetic energy (E) are the same, $P \propto \sqrt{m}$ That is heavier body (lorry) will have greater momentum. | 1 | 4 |
| | b) | The work-energy theorem states that work done on a body is equal to the net change in its energy. $W = \Delta KE$ (derivation) | 3 | |
| 25 | a) | i) Standing waves are produced when two waves having the same amplitude and frequency, travelling in opposite directions, superimpose. | 1 | 4 |
| | | ii) Derivation (first and second harmonics of stretched string) | 2 | |
| | b) | Node | 1 | |

Answer any 3 questions from 26 to 29. Each carries 5 scores

[3 x 5 = 15]

| | | | | |
|----|----|---|---|---|
| 26 | a) | Parabola | 1 | 5 |
| | b) | Derivation of maximum height $h_m = \frac{u^2 \sin^2 \theta}{2g}$ | 2 | |
| | c) | $h = \frac{u^2}{2g}$, $R_{max} = \frac{u^2}{g}$ and $R_{max} = 2h$ | 2 | |
| 27 | a) | When there is no external torque, the total angular | 1 | 5 |

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|--------|------------|---|-------------|-------|
| | | momentum of a body is constant. $l\omega = \text{constant}$ | | |
| | b) | i) moment of inertia increases, speed decreases ii) speed increases | 2 | |
| | c) | Derivation of $\frac{dL}{dt} = \tau_{ext}$ | 2 | |
| 28 | a) | (iv) 11km/s. Escape velocity is independent of angle of projection. | 1 | 5 |
| | b) | Derivation of v_e . | 3 | |
| | c) | Less gravitational force. RMS velocity of air molecules is more than the escape velocity of moon. | 1 | |
| 29 | a) | (i) Acute. (For pure water and glass (without grease) angle of contact is zero) | 1 | 5 |
| | b) | Derive the expression $h = \frac{2T\cos\theta}{r\rho g}$ | 3 | |
| | c) | $h \propto \frac{1}{r}$ | 1 | |

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