PHYSICS

BOOKS - FULL MARKS PHYSICS (TAMIL ENGLISH)

SAMPLE PAPER - 2

Part I

1. The moment of inertia of a disc of mass M and radius R about an axis which is tangential to the circumference of the disc and parallel to the diameter is

A. $\dfrac{5}{4}MR^2$

B. $\dfrac{3}{2}MR^2$

C. $\dfrac{4}{5}MR^2$

D. $\dfrac{2}{3}MR^2$

Answer: A

2. A swimmer's speed in the direction of flow of river is $16kmh^{-1}$. Against the direction of flow of river, the swimmer's speed is 8 km h^{-1}. The swimmer's speed in still water and the velocity of flow of the river respectively are

A. $12kmh^{-1}, 4kmh^{-1}$

B. $4kmh^{-1}, 12kmh^{-1}$

C. $24kmh^{-1}, 16kmh^{-1}$

D. $16kmh^{-1}, 24kmh^{-1}$

Answer: A

3. Shear modulus is zero for

A. solids

B. liquids

C. gases

D. liquid and gases

Answer: C

4. If the length and time period of an oscillating pendulum have errors of 1% and 2% respectively. The error in the estimation of 'g' is

A. 0.01

B. 0.02

C. 0.03

D. 0.05

Answer: D

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5. A system of binary stars of masses m_A and m_B are moving is a circular orbits of radius r_A .and r_B respectively. If T_A and T_B

are the time periods of masses m_A and m_B respectively then,

A. $T_A = T_B$

B. if $m_A > m_B$ than $T_A > T_B$

C. If $r_B > r_A$ than $T_B > T_A$

D. $\dfrac{T_A}{T_B} = \left(\dfrac{r_A}{r_B}\right)^{3/2}$

Answer: A

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6. The temperature of a wire is doubled. The Young's modulus

of elasticity

A. will also double

B. will become four times

C. will remain same

D. will decrease

Answer: D

7. A small sphere of radius 2 cm falls from rest in a viscous liquid. Heat is produced due to viscous force. The rate of production of heat when the sphere attains its terminal velocity is proportional to

A. 2^2

B. 2^3

C. 2^4

D. 2^5

Answer: D

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8. The equations of two waves acting in perpendicular direction are given as $x = a\cos(\omega t + \delta)$ and $y = a\cos(\omega t + \alpha)$ where $\delta = \alpha + \pi/2$ the resultant wave represents

A. a parabola

B. a circle

C. an ellipse ·

D. a straight line

Answer: D

9. Two vibrating tuning forks produce progressive waves given

be $y_1 = 4\sin 500\pi t$ and $y_2 = 2\sin 506\pi t$ where t is in seconds

number of beats produced per minute is ....

A. 60

B. 3

C. 369

D. 180

Answer: D

10. If the temperature of the wire is increased, then the Young's modulus will

A. remains the same

B. decrease

C. increase rapidly

D. increase by very small amount

Answer: B

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11. A light string passing over a smooth light pulley connects two blocks of masses m_1 and m_2 (vertically). If the acceleration of the system is g/8 then the ratio of the masses is

A. $8:1$

B. $9:7$

C. $4:3$

D. $5:3$

Answer: B

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12. A perfect gas is contained in a cylinder kept in vacuum. If the cylinder suddenly bursts, then the temperature of the gas .

A. is increased

B. becomes OK

C. remains unchanged

D. is decreased

Answer: C

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13. The sample of gas expands from v_1 to v_2 The amount of workdone by the gas is greatest, when the expansion is,

A. adiabatic

B. isobaric

C. isothermal

D. equal in all cases

Answer: C

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14. The magnitude of the vector is

A. $\left|\vec{A}\right| = Ax^2 + Ay^2 + Az^2$

B. $\left|\vec{A}\right| = \left(Ax^2 + Ay^2 + Az^2\right)^{\frac{1}{2}}$

C. $(A_1 + A_2 + A_3)^2$

D. $A_1 \cos\theta + A_2 \cos\theta + A_1 A_2 \cos\theta$

Answer: B

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15. Two soap bubbles of radii in the ratio of 2 : 1. What is the ratio of excess pressure inside them?

A. $1:2$

B. $1:4$

C. $2:1$

D. $4:1$

Answer: A

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Part Ii

1. The position of an object moving along x axis is given by $x = a + bt^2$ here a= 8.5 m, $b = 2.5ms^{-2}$ and t is time in second. Calculate the velocity at t = 0 and t = 2 s and also calculate average velocity between t = 2 s and t = 4 s.

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2. Two vectors are given as $\vec{r} = 2\hat{i} + 3\hat{j} + 5\hat{k}$ and $\vec{F} = 3\hat{i} - 2\hat{j} + 4\hat{k}$. Find the resultant vector $\vec{\tau} = \vec{r} \times \vec{F}$.

3. A ball is thrawn downward from a height of 30m with a velocity of $10ms^{-1}$. Determine the velocity with which the ball strikes the ground by using law of conservation of energy.

4. At what height, the value of g is same as at a depth of $\dfrac{R}{2}$?

5. Write any three applications of viscosity.

6. An object is in uniform motion along a straight line, what will

be position time graph for the motion of object, if

(i) both x_0 positive v negative $\left|\vec{v}\right|$ is constant

(ii) x_0 = negative v negative is $\left|\vec{v}\right|$ constant

(iii) x_0 = negative , v = positive $\left|\vec{v}\right|$ is constant

(iv) both x_0 and v are positive |v| is constant .

7. A sphere contracts in volume by 0.01 % when taken to the

bottom of sea 1 km deep. Find the bulk modulus of the material

of the sphere.

8. State the second law of thermodynamics in therms of entropy.

9. what is an epoch ?

Part Iii

1. What is the relation between torque and angular momentum ?

2. Discuss the properties of scalar and vector

3. A block of mass m slides down the plane inclined at an angle $60°$ with an acceleration g/2. Find the co-efficient of kinetic friction.

4. Write a note on work done by a variable force.

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5. Why do we have seasons on Earth?

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6. Obtain an expression for the excess of pressure inside a liquid drop

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7. Consider the Earth as a homogenous sphere of radius R and a straight hole is bored in it through its centre. Show that a

particle dropped into the hole will execute a simple harmonic motion such that its time period is $T = 2\pi\sqrt{\dfrac{R}{g}}$

8. Which of the following functions represent SHM :

$\sin \omega t + 2\cos \omega t$

9. Obtain an expression for the excess of pressure inside a (i) liquid drop (ii) liquid bubble (iii) air bubble.

Part Iv

1. Explain in detail the idea of weightlessness using lift as an example.

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2. How will you determine the velocity of sound using resonance air column apparatus ?

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3. Briefly explain the origin of friction show that in an inclined plane angle of friction is equal to angle of repose

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4. Show that the minimum speed at dle lowest point as $\sqrt{5gr}$ in a vertical circle executed by the object.

A.

B.

C.

D.

Answer:

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5. What are the characteristics of stationery waves? Give the laws of transverse vibrations in a stretched string.

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6. Give an expression for work done in an isothermal process.

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7. Convert a velocity of 72 km h^{1-} into ms^{-1} with the help of dimensional analysis.

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8. Convert

3 ms^{-2} to $\mathrm{km}h^{-2}$ (ii) G $=$ 6.67×10^{-11} N $m^2 kg^{-2}$ to $cm^3 g^{-1} s^{-2}$

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9. (i) A uniform sphere of mass 200 g rotates on a horizontal surface without shipping. If centre of the sphere moves with a velocity 2.00 cm/s then its kinetic energy is?

(ii) Derive the expression for kinetic energy in rotating object and also derive the relation between rotational kinetic energy and angular momentum.

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10. What is a sonometer? Give its construction and working. Explain how to determine the frequency of tuning fork using sonometer.

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