



# PHYSICS

## BOOKS - FULL MARKS PHYSICS (TAMIL ENGLISH)

### SAMPLE PAPER-5 (SOLVED)

#### Part I

1. The direction of angular velocity vector is  
along:

A. the tangent to the circular path

B. the inward radius

C. the outward radius

D. the axis of rotation

**Answer: D**



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2. The angle between two vectors

$-3\hat{i} + 6\hat{k}$  and  $2\hat{i} + 3\hat{j} + \hat{k}$  is

A.  $0^\circ$

B.  $30^\circ$

C.  $60^\circ$

D.  $90^\circ$

**Answer: D**



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**3. The breaking stress of a wire depends upon**

..... .

A. length of a wire

B. nature of the wire

C. diameter of the wire

D. shape of the cross section

**Answer: B**



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**4.** State the factors on which the moment of inertia of a body depends.

A. distribution of mass from axis of rotation

B. angular velocity of the body

C. angular acceleration of the body

D. mass of the body

**Answer: A**



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## 5. Complete the chart

	F (N)	$m_1$ (kg)	$m_2$ (kg)	d (m)
(1)	.....	500	84	02
(2)	$30 \times 10^{27}$	$15 \times 10^5$	.....	03
(3)	$16 \times 10^9$	.....	17	34
(4)	$250 \times 10^{-7}$	45	47	.....

A.  $Y_B = 2Y_A$

B.  $Y_A = Y_B$

C.  $Y_B = 3Y_A$

D.  $Y_A = 3Y_B$

**Answer: D**



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6. The ratio of the velocities of two particles as shown in figure is 

A.  $1 : \sqrt{3}$

B.  $\sqrt{3} : 1$

C.  $1 : 3$

D.  $3 : 1$

**Answer: C**



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7. The load - elongation graph of three wires of the same material are shown in figure. Which of the following wire is the thickest?



A. wire 1

B. wire 2

C. wires

D. all of them have same thickness

**Answer: A**





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8. The waves produced by a motor boat sailing in water are

A. transverse

B. longitudinal

C. longitudinal and transverse

D. stationary

**Answer: C**



9. A sound wave whose frequency is 5000 Hz travels in air and then hits the water surface. The ratio of its wavelength in water and air is

A. 4.30

B. 0.23

C. 5.30

D. 1.23

**Answer: A**



10. The wavelength of two sine waves are  $\lambda_1 = 1\text{m}$  and  $\lambda_2 = 6\text{ m}$  . Calculate the corresponding wave numbers .

A.  $1.05\text{radm}^{-1}$  and  $6.28\text{radm}^{-1}$

B.  $6.28\text{radm}^{-1}$  and  $1.05\text{radm}^{-1}$

C.  $1\text{radm}^{-1}$  and  $0.1666\text{radm}^{-1}$

D.  $0.166\text{radm}^{-1}$  and  $\text{radm}^{-1}$

**Answer: B**



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11. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature the ratio  $\frac{C_p}{C_v}$  for the gas is

A.  $\frac{3}{5}$

B.  $\frac{4}{5}$

C.  $\frac{5}{3}$

D.  $\frac{3}{2}$

**Answer: B**



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**12.** If the rms speed of the molecules of a gas is  $1000 \text{ ms}^{-1}$  the average speed of the molecule is

A.  $1000 \text{ms}^{-1}$

B.  $922 \text{ms}^{-1}$

C.  $780 \text{ms}^{-1}$

D.  $849 \text{ms}^{-1}$

**Answer: B**



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**13.** The net work done by the system \_\_\_\_

A. zero

B. more than the heat given to the system

C. equal to heat given to the system

D. independent of heat given to system

**Answer: C**



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14. A closed tube partly filled with water lies in a horizontal plane. If the tube is rotated about a perpendicular bisector, the moment of inertia of the system. ....

A. increases

B. decreases

C. remains constant

D. depends on sense of rotation

**Answer: C**



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**15.** Force acting on the particle moving with constant speed is

- A. always zero
- B. need not be zero
- C. always non zero
- D. cannot be concluded



**Answer: A**



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## Part II

1. What are the limitations of dimensional analysis?



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2. A particle of mass 2 kg experiences two forces

$$\vec{F}_1 = 5\hat{i} + 8\hat{j} + 7\hat{k} \text{ and } \vec{F}_2 = 3\hat{i} - 4\hat{j} + 3\hat{k}$$

What is the acceleration of the particle?



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3. An electron and proton are detected in a cosmic ray experiment, the first with kinetic energy 10 KeV and the second with 100 KeV.

Which is faster, the electron or the proton?

Obtain the ratio of their speeds

(electron mass :  $9.11 \times 10^{-31} \text{ kg}$  : proton mass  
:  $1.67 \times 10^{-27} \text{ kg}$  :  $1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$ )



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4. A bullet of mass 20 g strikes a pendulum of mass 5kg. The centre of mass of pendulum rises a vertical distance of 10 cm. If the bullet gets embedded into the pendulum, calculate its initial speed.



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5. Derive an expression for kinetic energy in rotation and establish the relation between rotational kinetic energy and angular momentum.



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6. Why is there no lunar eclipse and solar eclipse every month?



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7. Calculate the change in internal energy of a block of copper of mass 200 g when it is heated from  $25^{\circ}C$  to  $75^{\circ}C$ . Specific heat of copper =  $0.1 \text{ cal} \frac{\text{g}}{\text{g}} / ^{\circ}C$  and assume change in volume is negligible.



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8. The shortest distance travelled by a particle executing SHM from mean position in 2

seconds is equal to  $\frac{\sqrt{3}}{2}$  times of its amplitude . Determine its time period .



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9. What is the difference between sliding and slipping ?



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**Part Iii**

1. You are given a thread and a metre scale. How will you estimate the diameter of the thread?



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2. Consider two cylinders with same radius and same mass. Let one of the cylinders be solid and another one be hollow. When subjected to some torque, which one among them gets more angular acceleration than the other?





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3. The reading of pressure meter attached with a closed pipe is  $5 \times 10^5 Nm^{-2}$ . On opening the valve of the pipe, the reading of the pressure meter is  $4.5 \times 10^5 Nm^{-2}$ . Calculate the speed of the water flowing in the pipe.



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4. State and prove perpendicular axis theorem.





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5. Give some practical applications of Stoke's law.



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6. Define molar specific heat capacities.



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7. If 5 L of water at  $50^{\circ}C$  is mixed with 4L of water at  $30^{\circ}C$ , what will be the final temperature of water? Take the specific heat capacity of water as  $4184Jkg^{-1}K^{-1}$



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8. Smooth block is released at rest on a  $45^{\circ}$  incline and then slides a distance  $d$ . If the time taken of slide on rough incline is  $n$  times as large as that to slide than on a smooth incline.

Show that coefficient of friction.

$$\mu = \left(1 - \frac{1}{n^2}\right)$$



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9. How do you distinguish between stable and unstable equilibrium?



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1. Assuming that the frequency  $\gamma$  of a vibrating string may depend upon (i) applied force (F) (ii) length (l) (iii) mass per unit length (m), prove that  $\gamma \propto \frac{1}{l} \sqrt{\frac{F}{m}}$  using dimensional analysis.



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2. Prove the law of conservation of linear momentum use it to find the recoil velocity of a gun when a bullet is fired from it



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3. Explain the variation of 'g' with latitude.



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4. Explain why a cyclist bends while negotiating a curve road?



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5. Derive the expression for moment of inertia of a uniform ring about an axis passing through the centre and perpendicular to the plane.



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6. Explain how overtones are produced in a: (a) Closed organ pipe (b) Open organ pipe



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7. When a source of sound is in motion towards a stationary observer, the effect observed is .....



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8. Define specific heat capacity at constant volume.



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**9.** Explain the isobaric process and derive the work done in this process.



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**10.** What is meant by interference of waves?



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