PHYSICS

BOOKS - FULL MARKS PHYSICS (TAMIL ENGLISH)

SAMPLE PAPER 15 (UNSOLVED)

Part I

1. The numebr of significant figures in $2.64 \times 10^4 kg$ is

A. 2

B. 4

C. 5

D. 3

Answer: D

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2. Two bullets are fired simultaneously, horizontally and with different speeds from

the same place. Which bullet will hit the ground first ?

A. the faster one

B. the slower one

C. depends on the mass

D. both will reach simultaneously

Answer: A

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3. A heavy iron rod of weight 'W' is having its one end on the ground and the other on the shoulder of a man. The rod makes an angle $'\theta'$ with the horizontal. What is the weight experienced by the man ?

A. W $\sin\theta$

B. W$\cos\theta$

C. W

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

Answer: D

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4. In uniform circular motion the centripetal force is perpendicular to the displacement. The work done by the force is .....

A. Minimum

B. Maximum

C. Zero

D. All of the above

Answer: C

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5. A liquid can easily change its shpae but a solid can not because

A. the density of a liquid is smaller than that of a solid

B. the force between the molecules is stronger in a solid than in liquids

C. the atoms combine to form bigger molecules is larger in solids

D. the average separation between the molecules is larger in solids

Answer: A

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6. When a cycle tyre suddenly bursts, the air inside the tyre expands. This process is.....

A. isothermal

B. adiabatic

C. isoberic

D. isochoric

Answer: B

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7. Two objects which are initally at rest, move towards each other under the action of their internal attraction. If their speeds are 4 v and 2 v at any instant, then the speed of centre of mass of the system will be

A. 2v

B. zero

C. v

D. 1.5v

Answer: B

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8. In an isochoric process we have

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9. Surface tension does not depends on ..... .

A. nature of the liquid

B. temperature of the liquid

C. atmospheric pressure

D. pressure of impurities

Answer: C

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10. Which of the following is not a scalar ?

A. Viscosity

B. Surface tension

C. Pressure

D. Stress

Answer: D

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11. Pressure of an ideal gas is increased by keeping temperature constant. What is the effect on the kinetic energy of molecules?

A. increases

B. no change

C. decreases

D. cannot be determined

Answer: B

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12. The efficiency of a heat engine working between the freezing point and boiling point of water is

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13. If the surface tension of water is $0.06Nm^{-1}$, then the capillary rise in a tube of diameter 1 mm is (angle of contact = 0°) ..... .

A. 1.22 cm

B. 2.44 cm

C. 3.12 cm

D. 3.86 cm

Answer: B

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14. A sample of ideal gas is at equilibrium. Which of the following quantity is zero?

A. rms speed

B. average speed

C. average velocity

D. most probable speed

Answer: C

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15. A spring is cut into 4 equal parts & 2 parts are connected in parallel. What is the effective in parallel. What is the effective spring constant.

A. 4 K

B. 16K

C. 8K

D. 6K

Answer: C

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Part Ii

1. Define - Astronomical unit?

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2. Write a short note on vector product between two vectors.

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3. What is the meaning by pseudo force ?

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4. A force of $\vec{F} = \left(4\hat{i} - 3\hat{j} + 5\hat{k}\right)N$ is applied at a point whose position vector is $\vec{r} = \left(7\hat{i} + 4\hat{j} - 2\hat{k}\right)m$. Find the torque of force about the origin.

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5. Why is the energy of a satellite negative?

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6. The ratio of the radii of gyration of a circular disc to that of circular ring, each of same mass and same radius about their axes is

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7. Define Poisson's ratio.

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8. A balloon is filled at $27^{\circ}C$ and 1 atm pressure by $500m^3$ He. Then find the volume of He at $-3^{\circ}C$ and 0.5 mm Hg pressure.

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9. Consider two springs with force constants $1Nm^{-1}$ and $2Nm^{-1}$ connected in parallel. Calculate the effective spring constant (k_p) and comment on k_p.

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Part Iii

1. Write short notes on the following:

a. Unit

b. Rounding -off

c. Dimensionless quantities

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2. A particle moves in a circle of radius 10 m. Its linear speed is given by v= 31 where is in

second and v is in ms^{-1}.

(a) Find the centripetal and tangential acceleration at 1 = 2 s.

(b) Calculate the angle between the resultant acceleration and the radius vector.

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3. A horizontal force of 3.2 N is applied on a 3.7kg block, which rests on a horizontal surface. If the co-efficient of friction is 0.6, find the acceleration produced in the block ?

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4. Write the differences between conservative and non-conservative forces. Give two examples each.

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5. Write the comparison of translational and rotational quantities.

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6. A cappilary of diameter d mm is dipped in water such that the water rises to a height of 30 mm. If the radius of the capillary is made $\left(\frac{2}{3}\right)$ of its previous value, then compute the height up to which water will rise in the new capillary ?

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7. A bullet of mass 50 g is fired from below into a suspended object of mass 450 g. The object

rises through a height of 1.8 m with bullet remaining inside the object. Find the speed of the bullet. Take $g = 10ms_{-2}$

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8. A particle of mass 2 kg experiences two forces

$verF = 5\hat{i} + 8\hat{j} + 7\hat{k}$ and $\overrightarrow{F}_2 = 3\hat{i} - 4\hat{j} + 3\hat{k}$

What is the acceleration of the particle?

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9. Whet is the ratio between the potential energy the total energy of a particle executing S.H.M, when it's displacement is half of its amplitude?

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Part Iv

1. What do you mean by propagation of errors? Explain the propagation of errors in addition and multiplication.

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2. Derive the kinematic equations of motion for constant acceleration.

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3. Briefly explain 'rolling friction'.

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4. What does the work - kinetic energy theorem imply ?

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5. State and prove perpendicular axis theorem.

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

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7. What is capillarity? Obtain an expression for the surface tension of a liquid by capillary rise method.

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8. Explain in detail newton's law of cooling .

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9. Derive the expression pressure exerted by the gas on the walls of the container.

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10. Consider a simple pendulum of length l = 0.9 m which is properly placed on a trolley rolling down on a inclined plane which is at $0 = 45^{\circ}$ with the horizontal. Assuming that the inclined plane is frictionless. Assuming

that the time period of oscillation of the simple pendulum is T. Find the value of T.

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