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# PHYSICS

# **BOOKS - S CHAND PHYSICS (ENGLISH)**

# **SAMPLE QUESTION PAPER 5**

Section A

**1.** The angle between the vectors  $4\hat{i} + 3\hat{j} - 4\hat{k}$ 

and  $3\hat{i}+4\hat{j}+6\hat{k}$  is :

A.  $0^{\circ}$ 

B.  $45^{\,\circ}$ 

 $\mathsf{C.}\,60^\circ$ 

D.  $90^{\circ}$ 

Answer: D



2. Two particles of equal masses are revolving in circular paths of radii  $r_1$  and  $r_2$  respectively

centripetal foces is

A. 
$$r_2 / r_1$$
  
B.  $\sqrt{r_2 / r_1}$   
C.  $(r_1 / r_2)^2$ 

D. 
$$(r_2/r_1)^2$$

#### Answer: A



#### 3. The dimensional formula for surface tension

is

A. 
$$\left[ MLT^{\,-2} 
ight]$$

B. 
$$\left[ML^2T^{-2}
ight]$$

C. 
$$\left[MT^{-2}\right]$$

D. 
$$\left[ MLT^{\,-1} 
ight]$$

#### Answer: C

4. The energy equivalent to 1 kg of matter is :

A.  $9 imes 10^{16}J$ 

 $\text{B.9}\times 10^{16}~\text{erg}$ 

C. 1 J

D. 100 J

Answer: A

- **5.** Bernoulli's theorem is based on conservation of
  - A. Linear momentum
  - B. energy
  - C. Mass
  - D. Angular momentum

#### Answer: B

1. A satellite revolves around earth under the

gravitational force exerted upon it the earth.

Does it perform any work?

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2. Why is it difficult to walk on sand or ice ?

3. A person left on a frictionless surface wants

to get away from it. How can he do so ?

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**4.** A person standing downward on a tower throws a stone vertically upward with a velocity u and drops another stone downward with same initial velocity. Which stone will strike the earth with a larger velocity ?



5. A metal disc has a hole in it. Does the size of

hole change when the disc is heated ?

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6. Does gravity play any part in any mode of

heat transmission ?

**7.** A man with a wrist watch on his hand falls from the top of a tower. Does the watch give correct time during the free fall ?



#### Section B Answer All Questions

1. Explain the reason of separation of cream

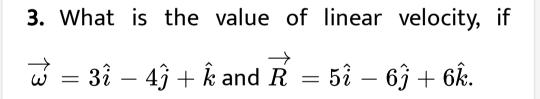
from milk.



2. Is a large brake on a bicycle more effective

than a small one ?

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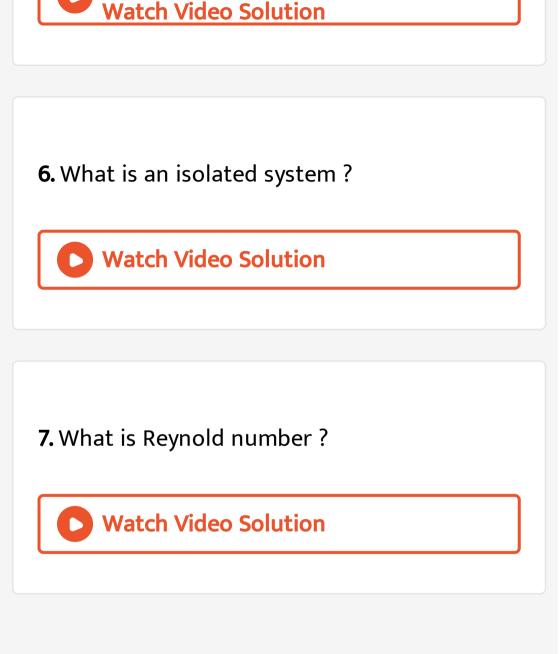


**4.** A car of mass 1000 kg moving with a speed  $18kmh^{-1}$  on a smooth road and colliding with a horizontally mounted spring of spring constant  $6.25 \times 10^3 Nm^{-1}$ . The maximum compression of the spring is

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**5.** A light body and a heavy body have the same kinetic energy which one has a greater momentum ?



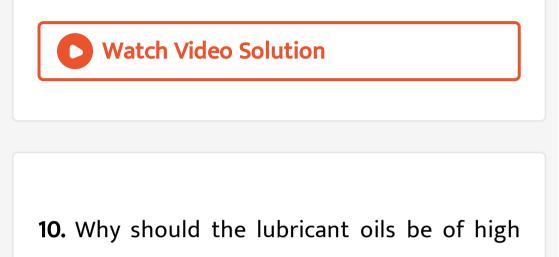


**8.** A steel cable with a radius of 1.5 cm support a chairlift at ski area. If the maximum stress is not to exeed  $10^8$  N m<sup>-2</sup>, what is the maximum load the cable can support?

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**9.** In a test experiment on a model aeroplane in a wind tunnel, the flow speeds on the upper and lower surfaces of the wing are  $70ms^{-1}$  and  $63ms^{-1}$  respectively. What is the lift on the wing if its area is  $2.5m^2$ ? Take

the density of air to be $1.3kgm^{-3}$ 



viscosity?

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**11.** The temperature difference between the ends of a rod of aluminium of length 1.0 m

and area of cross section 5.0 cm<sup>2</sup> is  $200^{\circ}C$ . How much heat will flow through the rod in 5 minutes ? The coefficient of thermal conductivity of aluminium is  $0.2 \text{ kJ s}^{-1} \text{ m}^{-1} {}^{\circ}C^{-1}$ . Watch Video Solution

12. A person goes to post office slowly, purchases postcards and comes back speedily.Draw time - velocity and time - displacement graphs.





13. A simple harmonic oscillation is represented by the equation  $y = 5\sin(100\pi t + 0.8)$ , when y and t are in metre and second respectively. Write down its amplitude, angular frequency, frequency time period and initial phase.



Section C Answer All Questions

**1.** A body of mass m attached to one end of an ideal spring of force constant k is executing simple harmonic motion. Establish that the time - period of oscillation is  $T=2\pi\sqrt{m/k}$ .

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**2.** The acceleration due to gravity on the surface of moon is  $1.7ms^{-2}$ . What is the time period of a simple pendulum on the moon if

its time period on the earth is 3.5 s ? (g on earth =  $9.8ms^{-2}$ )

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**3.** What do you understandby centripetal acceleration ? Derive formula for the centripetal acceleration of a particle moving on a circular path.

**4.** Two vectors  $\overrightarrow{A}$  and  $\overrightarrow{B}$  are added. Prove that the magnitude of the resultant vector cannot be greater than (A + B) and smaller than (A - B) or (B - A).

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5. What is meant by gravitational potential ?

Extablish the formula for the same.

**6.** A cylinder of mass 5 kg and radius 30 cm, and free to rotate about its axis, receives an angular impulse of 3 kg  $m^2s^{-1}$  initially. Followed by a similar impulse after every 4 s. What is the angular speed of the cylinder 30 s after the initial impulse ? The sylinder is at rest initially.

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**7.** Write down the three equations of rotational motion and explain the meaning of

each symbol.

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8. Calculate the temperature at which the average kinetic energy of a molecule of a gas will be the same as that of an electron accelerated through, 1 volt.

Boltzmann constant  $k=1.4 imes 10^{-23} {
m JK}^{-1}$ ,

charge of an electron  $e = 1.6 \times 10^{-19} C$ .

**9.** Estimate the fraction of molecular volume to the actual volume occupied by oxygen gas at NTP. Take the diameter of an oxygen molecule to be  $3\text{\AA}$ .

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#### Section D Answer All Questions

**1.** Write first law of thermodynamic system and explain isochoric, isothermal and adiabatic process on its basis.

2. A gas is filled in a cylinder fitted with piston at a constant temperature and pressure.
Explain on the basis of kinetic theory :
(i) The pressure of the gas increases by raising its temperature.
(ii) On pulling the piston out, the pressure of

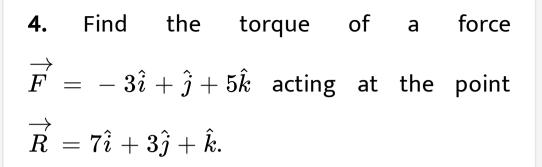
the gas decreases.

The pressure of an ideal gas filled in the bulb of a constant - volume gas thermomrter at  $7^{\circ}C$  is 60 cm of mercury. What will be the pressure of the same volume of gas at  $147^{\,\circ}\,C$ 

## ?



**3.** What do you understand by torque and moment of inertia ? Obtain the relation between torque and moment of inertia for a rigid body.





5. If the units of force, energy and velocity are 10 N, 100 J and  $5 \, {\rm m s}^{-1}$  respectively. Then

obtain the units of length, mass and time.



6. Write the limitations of dimensions and obtain the values of a,b and c in the equation  $T\propto P^a
ho^bE^c$ 

where, T is time, P is pressure E is energy and ho

is density.