

# TSBIE - MODEL PAPER

## PHYSICS - I

*Time: 3 Hours*

*Max.Marks: 60*

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### SECTION - A

10 x 2 = 20

**Note:** (i) Answer ALL Questions

(ii) Each Question carries TWO marks

(iii) ALL are very short answer type questions.

1. What are the fundamental forces in nature?
2. How can systematic errors be minimised or eliminated ?
3.  $A = \vec{i} + \vec{j}$ . What is the angle between the vector and x-axis?
4. Why does the car with a flattened tyre stop sooner than the one with inflated tyres “?
5. Why are spokes provided in a bicycle wheel?
6. By spinning eggs on a table top, how will you distinguish a hard boiled egg from a raw egg?
7. Why are drops and bubbles spherical?
8. “Terminal velocity is more if surface area of the body is more”. Give reasons in support of your answer.
9. When does a real gas behave like an ideal gas?
10. Pressure of an ideal gas in container is independent of shape of the container– explain

## SECTION - B

6 x 4 = 24

- Note:** (i) Answer any SIX Questions  
(ii) Each Question carries FOUR marks  
(iii) ALL are short answer type questions.
11. A particle moves in a straight line with uniform acceleration. Its velocity at time  $t=0$  is  $v_1$  and at time  $t=t$  is  $v_2$ . The average velocity of the particle in this time interval is  $(v_1+v_2)/2$ . Is this correct? Substantiate your answer.
  12. A ball is dropped from the roof of a tall building and simultaneously another ball is thrown horizontally with some velocity from the same roof. Which ball lands first? Explain your answer.
  13. If  $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$  prove that the angle between  $\vec{a}$  and  $\vec{b}$  is  $90^\circ$ .
  14. Show that the trajectory of an object thrown at certain angle with the horizontal is a parabola.
  15. Explain advantages and disadvantages of friction.
  16. Distinguish between centre of mass and centre of gravity.
  17. What is escape velocity? Obtain an expression for it.
  18. What is a geostationary satellite? State its uses.
  19. Explain why steel is preferred to copper, brass, aluminium in heavy-duty machines and in structural designs.
  20. Pendulum clocks generally go fast in winter and slow in summer. Why?
  21. Obtain an expression for the work done by an ideal gas during isothermal change.
  22. Explain the following processes
    - i) Cyclic process with example
    - ii) Non cyclic process with example

## SECTION - C

2 x 8 = 16

- Note:** (i) Answer any TWO Questions  
(ii) Each Question carries EIGHT marks  
(iii) ALL are Long answer type questions.

23. Develop the notions of work and kinetic energy and show that it leads to work-energy theorem.

A machine gun fires 360 bullets per minute and each bullet travels with a velocity of  $600 \text{ ms}^{-1}$ . If the mass of each bullet is 5 gm, find the power of the machine gun?

24. State and prove law of conservation of energy in case of a freely falling body.

A pump is required to lift 600 kg of water per minute from a well 25 m deep and to eject it with a speed of  $50 \text{ ms}^{-1}$ . Calculate the power required to perform the above task?

25. Show that the motion of a simple pendulum is simple harmonic and hence derive an equation for its time period. What is seconds pendulum?

26. State and explain Newton's law of cooling. State the conditions under which Newton's law of cooling is applicable. A body cools down from  $60^\circ\text{C}$  to  $50^\circ\text{C}$  in 5 minutes and to  $40^\circ\text{C}$  in another 8 minutes. Find the temperature of the surroundings.