

**DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO**

Subject Code :

2 4

Test Booklet No. :

00795

## TEST BOOKLET

### PHYSICS

Time Allowed : 2 (Two) Hours

Full Marks : 200

#### INSTRUCTIONS

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Subject Code shall be written legibly and correctly in the space provided on the Answer Sheet with black ball pen.
2. **Space provided for Series in the Answer Sheet is not applicable for Optional Subject. So the space shall be left blank.**
3. All questions carry equal marks. Your total marks will depend only on the number of correct responses marked by you in the Answer Sheet.
4. No candidate shall be admitted to the Examination Hall/Room 20 minutes after commencement of distribution of the paper. The Supervisor of the Examination Hall/Room will be the time-keeper and his/her decision in this regard is final.
5. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/Invigilator. No candidate shall be permitted to hand over his/her Answer Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
6. No Mobile Phone, Pager, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Pager, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
7. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected paper permitted by the Commission.
8. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
9. After you have completed filling in all your responses on the Answer Sheet and the Examination has concluded, you should hand over to the Invigilator *only the Answer Sheet*. You are permitted to take away with you the Test Booklet.
10. Violation of any of the above Rules will render the candidate liable to expulsion from the Examination Hall/Room and disqualification from the Examination, and according to the nature and gravity of his/her offence, he/she may be debarred from future Examinations and Interviews conducted by the Commission for appointment to Government Service.
11. Smoking inside the Examination Hall/Room is strictly prohibited.
12. **This Test Booklet contains one sheet (two pages) for Rough Work at the end.**

SEAL

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[ No. of Questions : 100 ]

1. The rotational kinetic energy of a body of moment of inertia  $I$  rotating about an axis with an angular velocity  $\omega$  is
- (A)  $I\omega$   
 (B)  $I\omega^2$   
 (C)  $\frac{1}{2}I\omega^2$   
 (D)  $\frac{1}{2}I^2\omega$
2. The relation between moment of inertia  $I$  of a body of mass  $M$  and radius of gyration  $K$  is
- (A)  $I = MK^2$   
 (B)  $I = \frac{M}{K}$   
 (C)  $I = M^2K$   
 (D)  $I = \frac{K}{M}$
3. For a circular disc of mass  $M$  and radius  $R$ , the moment of inertia about an axis passing through its centre and perpendicular to its plane is
- (A)  $I = MR^2$   
 (B)  $I = \frac{1}{4}MR^2$   
 (C)  $I = \frac{1}{2}MR^2$   
 (D)  $I = \frac{3}{4}MR^2$
4. In case of simple harmonic motion, the restoring force is proportional to
- (A) velocity  
 (B) acceleration  
 (C) displacement  
 (D) time
5. The time period  $T$  of a simple pendulum of length  $l$  is
- (A)  $T = 2\pi\sqrt{\frac{l}{g}}$   
 (B)  $T = 2\pi\frac{\sqrt{l}}{g}$   
 (C)  $T = 2\pi\sqrt{\frac{g}{l}}$   
 (D)  $T = 2\pi lg$
6. Hooke's law states that within the elastic limit, stress is proportional to
- (A) pressure  
 (B) force  
 (C) length  
 (D) strain
7. The unit of surface tension is
- (A) newton/meter  
 (B) joule/meter  
 (C) newton  
 (D) joule

8. According to Stokes' law, the force of viscosity  $F$  along on a spherical body of radius  $r$  moving with a velocity  $v$  through a fluid of viscosity  $\eta$  is

- (A)  $F = 2\pi\eta r v$
- (B)  $F = 6\pi\eta r v$
- (C)  $F = 4\pi\eta r v$
- (D)  $F = 9\pi\eta r v$

9. The dimension of coefficient of viscosity is

- (A)  $ML^{-1}T^{-1}$
- (B)  $MLT^{-1}$
- (C)  $ML^{-1}T$
- (D)  $ML^{-1}T^{-2}$

10. Change of momentum is also known as

- (A) torque
- (B) inertia
- (C) impulse
- (D) moment of inertia

11. The ratio of the velocity of escape  $v_e$  and velocity of projection  $v_0$  of a body to become a satellite of the earth is

- (A)  $v_e / v_0 = \sqrt{2}$
- (B)  $v_e / v_0 = 1/\sqrt{2}$
- (C)  $v_e / v_0 = 2$
- (D)  $v_e / v_0 = 1$

12. The working of a sprayer or atomizer is based on

- (A) fluid continuity equation
- (B) Bernoulli's theorem
- (C) Stokes' law
- (D) Poiseuille's formula

13. The relations between the coefficient of linear expansion  $\alpha$ , superficial expansion  $\beta$  and cubical expansion  $\gamma$  are

- (A)  $\alpha = 2\beta$  and  $\beta = 3\gamma$
- (B)  $\beta = 2\alpha$  and  $\gamma = 3\alpha$
- (C)  $\alpha = 2\beta$  and  $\gamma = 3\alpha$
- (D)  $\beta = 2\alpha$  and  $\alpha = 3\gamma$

14. Which one of the following is not a thermodynamic variable?

- (A) Pressure
- (B) Temperature
- (C) Volume
- (D) Work

15. Rusting of iron is an example of

- (A) irreversible process
- (B) reversible process
- (C) adiabatic process
- (D) isothermal process

16. If an ideal gas is compressed at constant temperature, its change of internal energy will
- increase
  - decrease
  - remain same
  - become zero
17. The coefficient of performance of a heat engine working between source temperature  $T_1$  and sink temperature  $T_2$  is
- $T_2 / (T_1 - T_2)$
  - $T_1 / (T_1 - T_2)$
  - $1 - T_2 / T_1$
  - $(T_1 - T_2) / T_2$
18. In a Carnot engine, the temperature of source is 1000 K and the efficiency of engine is 80%. The temperature of the sink is
- 700 K
  - 400 K
  - 600 K
  - 200 K
19. In an adiabatic process, the quantity which remains constant is
- volume
  - pressure
  - temperature
  - total heat of the system
20. "Heat cannot itself flow from a body at lower temperature to a body at higher temperature" is a statement of
- second law of thermodynamics
  - zeroth law of thermodynamics
  - conservation of mass
  - first law of thermodynamics
21. The quantity of heat required to change the state of unit mass of a substance at constant temperature is known as
- latent heat
  - water equivalent
  - specific heat
  - thermal capacity
22. At which temperature, the Celsius and Fahrenheit scales are equal?
- $40^\circ$
  - $36^\circ$
  - $-40^\circ$
  - $-80^\circ$
23. Two gases are at absolute temperature 300 K and 350 K respectively. The ratio of average kinetic energy of their molecules is
- 7 : 6
  - 6 : 7
  - 36 : 49
  - 49 : 36

