(7 pages) **Reg. No. :** .....

Code No. : 5796 **Sub. Code : WPHSEC 21**

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2024.

Second Semester

Physics

Skill Enhancement Course – PHYSICS FOR COMPETITIVE EXAMINATIONS

(For those who joined in July 2023 onwards)

Time : Three hours Maximum : 75 marks

PART A — (15 × 1 = 15 marks)

Answer ALL questions.

Choose the correct answer :

1. The dimensional formula for force is

(a) $M^{-2}L^{-1}T^{2}$ (b) $M^{-1}L^{-2}T^{2}$

(c) $M^{-1}L^{-2}T^{2}$ (d) MLT^{-2}

2. The Escape velocity of Earth is

(a) 9.8 km/s (b) 11.2 km/s

(c) 10.3 km/s (d) 15.6 km/s

3. Potential energy of a particle undergoing simple harmonic motion is

(a) $\frac{1}{2}Kx^{2}$ (b) $\frac{1}{2}Kx$

(c) Kx (d) $-Kx$

4. Melting point of pure ice is

(a) $273\,K$ (b) $0\,K$

(c) $-273\,K$ (d) $373\,K$

5. Mayer's relation is

(a) $C_p - C_v = R$

(b) $C_p / C_v = R$

(c) $C_v - C_p = R$

(d) $C_v / C_p = R$

6. The density of water is maximum at ————

(a) 3°C (b) 4°C

(c) 5°C (d) 6°C

7. According to Brewster's law $\mu =$

(a) $\sin i_p$ (b) $\cos i_p$

(c) $\tan i_p$ (d) $\cot i_p$

8. The speed of light is maximum in which of the following medium?

(a) Quartz (b) Glass

(c) Vacuum (d) Water

9. The speed of sound is maximum in

(a) Vacuum (b) Glass

(c) Liquids (d) Solids

10. The unit of electric field is

(a) Vm (b) V/m

(c) V/m^2 (d) Vm^2

11. Which of the following quantity is a scalar?

(a) Displacement (b) Electric force

(c) Electric field (d) Electric potential

12. The value of permeability of vacuum is

(a) $4\pi \times 10^{-8}\ Hm^{-1}$ (b) $4\pi \times 10^{-7}\ Hm^{-1}$

(c) $4\pi \times 10^{-6}\ Hm^{-1}$ (d) $4\pi \times 10^{-5}\ Hm^{-1}$

13. The photoelectric effect demonstrates which nature of light?

(a) Wave nature (b) Particle nature

(c) Dual nature (d) Crystalline nature

14. According to the special theory of relativity which one is an absolute quantity?

(a) Only Space (b) Only Time

(c) Space and Time (d) Mass

15. If the binding energy per nucleon is more, then the nucleus will be

(a) More stable

(b) Less stable

(c) The binding energy per nucleon does not affect the nuclear stability

(d) Highly radioactive

PART B — ($5 \times 4 = 20$ marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

16. (a) Derive Newton's equations of motion.

Or

(b) Explain the laws of conservation of linear momentum.

17. (a) State and explain Boyle's law and Charle's law.

Or

(b) Write about specific heat.

18. (a) Explain total internal reflection.

Or

(b) Write short notes on open ended and closed end organ pipes.

19. (a) If two particles with equal and opposite charges of magnitude $1.37 \times 10^5 C$ is separated by 19 m, calculate the amount of force act on each particle.

Or

(b) Write about solenoids.

20. (a) Derive an expression for time dilation.

Or

(b) What are the uses of radioactive dating?

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 600 words.

21. (a) Explain simple harmonic motion and deduce an expression for its angular frequency.

Or

(b) A fly wheel of mass 50 kg and radius 2m makes 20 revolution per second. Find the following :

(i) Angular velocity

(ii) Moment of inertia and

(iii) The energy of fly wheel. (assume that the whole mass of the flying wheel is concentrated at the rim).

22. (a) State and explain Stefan-Boltzmann law. Derive an expression for Stefan's constant.

Or

(b) A quantity of air at 27°C and at atmospheric pressure is suddenly compressed to half of its original volume. Find the final pressure and temperature.

23. (a) Explain the concept of optical polarization.

Or

(b) Obtain the laws of vibrating strings.

24. (a) Find the electrostatic force between the proton and electron in a hydrogen atom radius of hydrogen atom $= 5.3 \times 10^{-1} m$, $\epsilon_0 = 8.85\ C^2 m^{-2} N^{-1}$ and the charge of electron = the charge of proton = $1.6 \times 10^{-19} C$.

Or

(b) Describe the magnetic field due to a current in a long, straight wire.

25. (a) Derive Lorentz transformation equations.

Or

(b) List out the properties of α, β, γ - rays.

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