

**M.Sc. PHYSICS
FOURTH SEMESTER
CONCEPTS OF PHYSICS ,
MSP – 405 MDC
[USE OMR FOR OBJECTIVE PART]**

**SET
A**

Duration: 3 hrs.

Full Marks: 70

(Objective)

Time: 30 min.

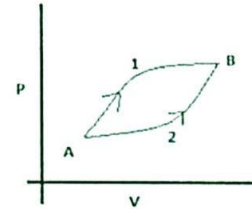
Marks: 20

Choose the correct answer from the following:

1X20=20

- What causes the motion of a body which is initially in the state of rest?
a. Force
b. Displacement
c. Speed
d. Velocity
- What is the force applied on a body with 5 kg of mass and an acceleration of 7 m/s^2 ?
a. 0 N
b. 7 N
c. 5 N
d. 35 N
- A batsman hits a ball with a force of 5 N. What force does the bat experience?
a. 5 N
b. 10 N
c. 15 N
d. 20 N
- From Kepler's law of orbit, we can infer that the sun is located _____ of the planet's orbit.
a. at the centre
b. at both foci
c. at one of the foci
d. anywhere along the semi-minor axis
- Kepler's laws of planetary motion replaced circular orbits with _____.
a. elliptical orbit
b. parabolic orbit
c. conical orbit
d. hyperbolic orbit
- Electromagnetic waves are considered to be which of the following types?
a. Transverse
b. Longitudinal
c. Both Transverse & Longitudinal
d. Neither longitudinal nor transverse
- The equation of a wave is given by $y = 3\sin(4x-2t)$. What is the time period and wavelength of the wave?
a. $T = 2\pi, \lambda = 2\pi$
b. $T = \pi, \lambda = 2\pi$
c. $T = \pi, \lambda = \pi/2$
d. $T = \pi/2, \lambda = \pi$
- Laplace correction makes use of which of the following processes?
a. Isothermal
b. Adiabatic
c. Isochoric
d. Isobaric

9. In a wave motion, for what value of w , will the magnitude of maximum acceleration be greater than the magnitude of maximum velocity? Here, w is angular frequency.
- a. $w > 1$ b. $w < 1$
 c. $w = 0$ d. Not possible for any value of w
10. The displacement y of a particle in a medium can be expressed as $y = 10^{-6} \sin\left(100t + 20x + \frac{\pi}{4}\right)$, where t is in second and x is in meter. What is the speed of the wave?
- a. 10 m/s b. 20 m/s
 c. 15 m/s d. 5 m/s
11. Which of the following represents viscosity?
- a. Potential energy stored in fluid b. Resistance to fluid motion
 c. Roughness of the surface d. The pressure difference between the two fluids
12. What is the relation between the internal energy (U) and heat supplied (Q) in the process 1 & 2 shown in the diagram? Both paths start at A and end at B.



- a. $U_1 > U_2, Q_1 > Q_2$ b. $U_1 < U_2, Q_1 > Q_2$
 c. $U_1 = U_2, Q_1 = Q_2$ d. $U_1 = U_2, Q_2 > Q_1$
13. On which factor does the average kinetic energy of gas molecules depend?
- a. Nature of the gas b. Temperature
 c. Volume d. Mass
14. Which key term describes the random movement of particles?
- a. Diffusion b. Osmosis
 c. Brownian Motion d. Absolute Zero
15. Identify the state of matter where Brownian motion can occur.
- a. Solid, Liquid, Gas b. Liquid, Gas
 c. Solid, Gas d. Solid, Liquid
16. Resistance of a wire is $y\Omega$. The wire is stretched to triple its length, then the resistance becomes _____
- a. $y/3$ b. $3y$
 c. $6y$ d. $y/6$

17. The algebraic sum of voltages around any closed path in a network is equal to _____
- a. Infinity
 - b. 1
 - c. 0
 - d. Negative polarity
18. What is the angle between the incident ray and the emergent ray in a prism called?
- a. Angle of deviation
 - b. Angle of refraction
 - c. Angle of reflection
 - d. Angle of dispersion
19. According to the thin lens formula, which one of the following is true regarding the focal length of the lens?
- a. f is positive for concave lens
 - b. f is negative for convex lens
 - c. f is positive for a diverging lens
 - d. f is negative for concave lens
20. As the wavelength of the radiation decreases, the intensity of the black body radiations _____
- a. Increases
 - b. Decreases
 - c. First increases then decrease
 - d. First decreases then increase

(Descriptive)

Time : 2 hrs. 30 mins.

Marks : 50

[Answer question no.1 & any four (4) from the rest]

1. a. Define internal resistance, electromotive force (emf) and terminal potential difference of a cell. 3+4+3
=10
b. Draw the circuit diagram and derive the expression for the internal resistance of a cell in terms of its emf and terminal potential difference.
c. Calculate the resistivity of the material of a wire 1.0 m long, 0.4 mm in diameter and having a resistance of 2Ω .
2. a. Explain Kirchoff's junction law and loop law. 5+5=10
b. Define magnetic field in a current carrying conductor and explain Biot Savart's Law.
3. a. With the help of neat and labeled ray diagram, show the image formation by a Concave mirror when the object is (i) at infinity (ii) beyond C, (iii) at C, (iv) between C and F, (v) at F and (vi) between F and P 6+4=10
b. An object 4 cm in size is placed at 25 cm in front of a concave mirror of focal length 15 cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image? Find the nature and size of the image.
4. a. Write any four points on the theory of heat exchange. 4+6=10
b. State and explain Newton's law of cooling.
5. a. Draw the ray diagram and derive the expression of magnifying power of a simple microscope. 7+3=10
b. A prism of refractive index 1.53 is placed in water of refractive index 1.33. If the angle of prism is 60° , calculate the angle of minimum deviation in water.
6. a. Define gravitational potential energy and derive the expression of gravitational potential energy between earth and a body. 5+5=10
b. What is escape velocity of an object? Derive the expression for escape velocity of an object when it is projected vertically upwards from the earth.
7. a. Derive the Newton's formula for the speed of sound. What is its limitation? 5+5=10
b. Explain the Laplace correction for Newton's formula.
8. a. Explain the kinetic interpretation of temperature and derive the expression for the root mean square velocity of the molecules. 7+3=10
b. Define Brownian motion and explain the cause of such motion.

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