

Model Question Paper
Term -II Session : 2021-22
Subject : Physics Class: XI

Time : 3 hours

Max. Marks : 50

General Instructions:

1. The question paper has 31 questions. All the questions are compulsory. The internal choice is given where applicable.
2. Questions number 1 to 20 are multiple choice questions carrying one mark each. Questions number 21 to 25 are very short answer type questions carrying 2 marks each. Questions number 26 to 29 are short answer type questions carrying 3 marks each and questions number 30 to 31 carry four marks each.
3. There is no negative marking

Section A (MCQ)

1. At what altitude (h), above the earth's surface, would the acceleration due to gravity be one fourth of its value at the earth's surface?
A) $h = R$ B) $h = 2 R$ C) $h = 4 R$ D) $h = 16 R$
2. For a satellite, the escape velocity is 11.2 km/s. If the satellite is launched at an angle of 60° with the vertical, then the escape velocity in km/ s will be
a) 11.2 B) $11.2 \sqrt{3}$ C) $\frac{11.2}{\sqrt{3}}$ D) 5.6
3. If the radius of earth shrinks by one percent, keeping the mass same then the acceleration due to gravity on earth's surface will
A) Decrease B) Increase C) Remains same D) Cannot be predicted
4. A satellite is orbiting around earth with orbital radius R and time period T. The quantity which remains constant is
A) $\frac{T}{R}$ B) $\frac{T^2}{R}$ C) $\frac{T^2}{R^2}$ D) $\frac{T^2}{R^3}$
5. Viscosity of gases _____ with the increase in temperature, whereas that of the liquids _____ with the increase in temperature.
A) Decreases, increases B) Increases, decreases C) Both increase D) Both decreases

In question number 6 and 7, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct option out of the options five below

- A) If both assertion and reason are correct and R is true explanation of A.
- B) If both assertion and reason are correct and R is not the correct explanation of A.
- C) If assertion is true but reason is false.
- D) If both assertion and reason are false.

6. Assertion: An astronaut orbiting around earth in International Space Station experiences weightlessness.
Reason: An object orbits around earth under the influence of earth's gravitational field is in a state of free fall.
7. Assertion: Water waves in a river are not polarised.
Reason: Water waves are longitudinal as well as transverse in nature.
8. Bulk modulus is relevant for
A) Solids B) Liquids C) Gases D) All of the above
9. What is the pressure on a swimmer 10 m below the surface of lake?
A) 1 atm B) 2 atm C) 3 atm D) 1.5 atm

Answer question 10 and 11 based on this case study.

Your mother places hot milk on your study table which if not consumed immediately will begin to cool gradually. Finally it attains the temperature of the surrounding. Place a thermometer in the milk cup and stir it constantly using a wooden stick. Meanwhile take a stopwatch and note the thermometer readings after a fixed time intervals say after one minute. Continue till you get the temperature reading nearly 5°C above the room temperature. A graph is plotted between the change in temperature and time.

10. Which law best describes this experiment?
A) Wien's displacement law B) Stefan- Boltzman law
C) Newton's law of cooling D) All of the above laws
11. Which of the following statements is false?
A) Rate of loss of heat depends upon the difference in temperature of body and its surrounding.
B) Initially the rate of cooling is less which gradually increases as the temperature of the body falls.
C) Initially the rate of cooling is higher which gradually decreases as the temperature of the body falls.
D) The graph between change in temperature between two successive intervals and time is parabolic.

12. Match the following

- | | |
|-------------------------|-----------------------|
| 1. Isothermal expansion | a) $\Delta W = 0$ |
| 2. Isobaric expansion | b) $\Delta U = -ve$ |
| 3. Adiabatic expansion | c) $\Delta U = +ve$ |
| 4. Isochoric expansion | d) $\Delta U = 0$ |
| A) 1-d, 2-c, 3-b, 4-a | B) 1-c, 2-d, 3-b, 4-a |
| C) 1-d, 2-c, 3-a, 4-b | D) 1-c, 2-b, 3-a, 4-d |

13. The equation of state for an adiabatic process is

- A) $P V = K$ B) $P^{\gamma} = K$ C) $T V^{\gamma-1} = K$ D) $P T^{\gamma} = K$

14. No process is possible whose sole result is the transfer of heat from a colder object to a hotter object. This is the statement by

- A) Kelvin - Planck B) Clausius C) First law of thermodynamics D) Zeroth law of thermodynamics

15. For a linear triatomic gas, the value of γ is

- A) 1.28 B) 1.33 C) 1.4 D) 1.67

16. The ratio of vapour densities of two gases at the same temperature is 8 : 9. The rms velocity of these molecules will be

- A) 2:3 B) $3:2\sqrt{2}$ C) $2\sqrt{2} : 2$ D) 3 : 2

17. On an average a human heart is found to beat 75 times in a minute. The heart beat frequency is

- A) 75 Hz B) 1.25 Hz C) 72 Hz D) 98.4 Hz

18. A body oscillates with SHM according to the equation

$x = (5.0 \text{ m}) \cos [(2\pi \text{ rad/s}) t + \pi/4]$. At $t = 1.5 \text{ s}$, speed of the body in m/s is

- A) 22.22 B) 3.535 C) 2.22 D) 35.35

19. If the incident wave is represented by $y(x,t) = A \sin(\omega t - kx)$. For reflection at rigid boundary the reflected wave is represented as

- A) $-A \sin(\omega t - kx)$ B) $-A \sin(\omega t + kx)$ C) $A \sin(\omega t - kx)$ D) $A \sin(\omega t + kx)$

20. When sound wave travels from air to water, which parameter does not change?

- A) Wavelength B) Frequency C) Velocity D) All of these

Section B

21. What are the conditions for a satellite to be geostationary?
22. State zeroth law of thermodynamics.
23. What is isothermal process? What are the essential conditions for a process to be isothermal?
24. The length of a simple pendulum executing SHM is increased by 21%, what is the percentage increase in time period of the pendulum of increased length?

OR

At what temperature will the speed of sound be double of its value at 273 K?

25. Differentiate between transverse and longitudinal waves.
26. State briefly Kepler's laws of planetary motion with the help of labelled diagrams.
27. On the basis of kinetic theory, derive an expression for the pressure exerted by an ideal gas.
28. Load on a metal wire suspended from a rigid support is gradually increased. Plot the stress – strain curve and hence define elastic limit and permanent set.
29. Applying first law of thermodynamics derive relation between C_p and C_v .

OR

Explain four steps involved in the operation of a Carnot's engine.

30. What is SHM? Show that for small oscillations, the motion of a simple pendulum is simple harmonic. Hence obtain an expression for its time period. How the time period varies when mass is doubled?
31. What is velocity head? Prove that the sum of pressure head, velocity head and gravitational head remains constant in the streamline flow of an ideal fluid.

OR

Derive an expression for the rise of liquid in a capillary tube and show that the height of the liquid column supported is inversely proportional to the radius of the tube. State one example of capillarity from daily life.