PHYSICS

Class XI

Sample Paper—2

Max. Marks: 50   **Time Allowed: 90 minutes**

General Instructions:
  (i) This question paper consists of 40 questions in 4 sections.
 (ii) Section A consists of 10 Objective type questions carrying 1 mark each.
(iii) Section B consists of 10 Fill in the blanks type questions carrying 1 mark each.
 (iv) Section C consists of 10 True or False statement type questions carrying 1 mark each.
  (v) Section D consists of 10 Short answer type questions carrying 2 marks each.

Section A

Select and write one most appropriate option out of the four options given for each of the questions 1–10.

1. The density of water at 4°C is 1000.0 kg/m^3 and at 100°C it is 958.4 kg/m^3. The cubic expansivity of water between these temperatures is
(*a*) 4.5×10^{-3} K^{-1} (*b*) 5.4×10^{-5} K^{-1}
(*c*) 4.5×10^{-4} K^{-1} (*d*) 5.4×10^{-6} K^{-1}.

2. If C_p and C_v denote the specific heats of nitrogen per unit mass at constant pressure and constant volume respectively, then
(*a*) $C_p - C_v = 28R$ (*b*) $C_p - C_v = R/14$
(*c*) $C_p - C_v = R/28$ (*d*) $C_p - C_v = R$.

3. An ideal gas is expanding such that PT^2 = constant. The coefficient of volume expansion of the gas is

(a) $\dfrac{1}{T}$ (b) $\dfrac{2}{T}$

(c) $\dfrac{3}{T}$ (d) $\dfrac{4}{T}$.

4. A resonance pipe is open at both ends and 30 cm of its length is in resonance with an external frequency 1.1 kHz. If the speed of sound is 330 m s^{-1} which harmonic is in resonance ?

(a) first   (b) second

(c) third   (d) fourth.

5. When two progressive waves y_1 = 4 sin $(2x - 6t)$ and y_2 = 3 sin $\left(2x - 6t - \dfrac{\pi}{2}\right)$ are superimposed, the amplitude of the resultant wave is

(a) 2   (b) 3

(c) 4   (d) 5.

6. A wave motion is described by $y(x, t) = a$ sin $(kx - \omega t)$. Then the ratio of the maximum particle velocity to the wave velocity is

(a) ωa (b) $\dfrac{1}{ka}$

(c) $\dfrac{\omega}{k}$ (d) ka.

7. Angle of reflection is the angle between

(a) incident ray and normal to the surface

(b) incident ray and surface of the mirror

(c) reflected ray and surface of mirror

(d) reflected ray and normal to the surface.

8. In case of reflection from a spherical mirror, the image formed is

(a) always real   (b) always virtual

(c) real as well as virtual   (d) neither real nor virtual.

9. In sign convention to be followed, the mirror is kept with its reflecting face towards

(a) left   (b) right

(c) upward   (d) downward.

10. Image of the face has an enlarged size when seen in a mirror from a close distance. The mirror is

(*a*) plane   (*b*) concave

(*c*) convex   (*d*) parabolic

Section B

Fill in the blanks with a suitable word for each of the questions 11–20.

11. A metal rod of Young's modulus Y and coefficient of thermal expansion α is held at its two ends such that its length remains invariant. If its temperature is raised by $t°$C, the linear stress developed in it is _____ .

12. An aluminium sphere of 20 cm diameter is heated from 0°C to 100°C. Its volume changes by _____ . (Given that coefficient of linear expansion for aluminium $\alpha_{Al} = 23 \times 10^{-6}/°$C)

13. A lead bullet strikes against a steel plate with a velocity 200 m s^{-1}. If the impact is perfectly inelastic and the heat produced is equally shared between the bullet and the target, then the rise in temperature of the bullet is _____ .

14. Two temperature scales A and B are related by $\dfrac{A - 42}{110} = \dfrac{B - 72}{220}$. At _____ temperature two scales have the same reading?

15. Two identical piano wires, kept under the same tension T have a fundamental frequency of 600 Hz. The fractional increase in the tension of one of the wires which will lead to occurrence of 6 beats/s when both the wires oscillate together would be _____.

16. Sound waves travel at 350 m s^{-1} through warm air and at 3500 m s^{-1} through brass. The wavelength of a 700 Hz acoustic wave as it enters brass from warm air _____ .

17. Tube A has both ends open while tube B has one end closed. Otherwise they are identical. Their fundamental frequencies are in the ratio _____ .

18. For a convex mirror, magnification m is _____ one.

19. In refraction, a ray of light _____ when it enters obliquely in some other medium.

20. Image distance for the image on the right of the lens is _____ .

Section C

State whether the following statements are true or false for each of the questions 21–30.

21. 1 calorie = 4.2 joule
22. The specific heat of every liquid varies with temperature.
23. Non-metals like wood, glass are good conductors.
24. A perfectly black body cannot be realized in practice.
25. Electromagnetic waves require material medium for their production or propagation.
26. The wave velocity is very much different from the particle velocity.
27. The longitudinal wave can be transmitted through solids, liquids or gases.
28. Light has a dual nature, particle nature as well as wave nature.
29. Radio frequency waves have wavelengths ranging from a few kilometre down to 0.3 m.
30. X-rays are produced by the inner or more tightly bound electrons in atoms.

Section D

Answer each of the questions 31–40.

31. Calculate the temperature which has same numeral value on Celsius and Fahrenheit scale.
32. These days people use steel utensils with copper bottom. This is supposed to be good for uniform heating of food. Explain this effect using the fact that copper is the better conductor.
33. What kind of waves help the bats to find their way in the dark?
34. The velocity of sound in air is 332 m s^{-1}. Find the frequency of the fundamental note of an open pipe 50 cm long.
35. What determines the focal length of a spherical mirror?
36. 100 g of water is supercooled to – 10°C. At this point, due to some disturbance mechanised or otherwise some of it suddenly freezes to ice. What will be the temperature of the resultant mixture and how much mass would freeze?

    [S_w = 1 cal/g/°C and L^w_{Fusion} = 80 cal/g]
37. One day in the morning, Ramesh filled up 1/3 bucket of hot water from geyser, to take bath. Remaining 2/3 was to be filled by cold

water (at room temperature) to bring mixture to a comfortable temperature. Suddenly Ramesh had to attend to something which would take some time, say 5 – 10 minutes before he could take bath. Now he had two options: (*i*) fill the remaining bucket completely by cold water and then attend to the work, (*ii*) first attend to the work and fill the remaining bucket just before taking bath. Which option do you think would have kept water warmer? Explain.

38. The air column in a pipe closed at one end is made to vibrate in its second overtone by a tuning fork of frequency 440 Hz. The speed of sound in air is 330 ms^{-1}. Find the length of the air column. [End correction may be neglected]

39. In the following series of resonant frequencies, one frequency (lower than 400 Hz) is missing : 150, 225, 300, 375 Hz (a) What is the missing frequency? (b) What is the frequency of the seventh harmonic?

40. A ray of light falls on a plane mirror making an angle of 60° with the mirror. Find the angle through which the ray gets deviated after reflection from the mirror.