

WBSCTE DIPLOMA QUESTION PAPER
FIRST YEAR COMMON FOR ALL BRANCHES
BASIC PHYSICS DEC 2016

1. Choose the correct answer from the given alternatives (any twenty):

i) The SI unit of surface tension is

- (a) N/m^3 (b) N/m^2 (c) N/m (d) none of these

ii) Which of the following is unit of a basic physical quantity?

- (a) Pascal (b) Newton (c) Radian (d) Joule

iii) Dimension of angular velocity is

- (a) zero (b) $[\text{L}^1]$ (c) $[\text{L}^1\text{T}^{-1}]$ (d) $[\text{T}^{-1}]$

iv) The dimensional formula of stress is the same as that of

- (a) energy (b) pressure (c) force (d) none of these

Explanation: dimensional formula $\text{ML}^{-1}\text{T}^{-2}$

v) The measured value of a capacitor is $205.3 \mu\text{F}$, whereas the value is $201.4 \mu\text{F}$. The percentage error is

- (a) 1.94 (b) 2.94 (c) 0.94 (d) 0.094

Explanation: % Error = $\left| \frac{205.3 - 201.4}{201.4} \right| \times 100 = \frac{3.9}{201.4} \times 100 = 1.936 = 1.94$

vi) The length of wire is increased by 0.02% and its radius is decreased by 0.005%. The percentage change in resistance is

- (a) 0.03% (b) 0.01% (c) 0.02% (d) zero

Explanation : $l_2 = l_1 + \frac{l_1 \times 0.02}{100} = l_1 + 0.0002l_1 = 1.0002l_1$;

$r_2 = r_1 - \frac{r_1 \times 0.005}{100} = 1.00005 r_1$

$$R_1 = \rho \frac{l_1}{A_1} = \rho \frac{l_1}{\pi r_1^2};$$

$$R_2 = \rho \frac{l_2}{A_2} = \rho \frac{l_2}{\pi r_2^2};$$

$$\frac{R_2}{R_1} = \frac{l_2}{l_1} \times \frac{r_1^2}{r_2^2} = \frac{1.0002l_1}{l_1} \times \frac{r_1^2}{(1.00005)^2 r_1^2} = \frac{1.0002}{1.0001}$$

$$\frac{R_2 - R_1}{R_1} = \frac{1.0002 - 1.0001}{1.0001} = \frac{0.0001}{1.0001}$$

% increase of resistance = $\frac{0.0001}{1.0001} \times 100 = \frac{0.01}{1.0001} = 0.009 = 0.01$ (Round off)

vii) Young modulus of perfectly rigid body is

- (a) non-zero (b) one (c) zero (d) infinity

Explanation: $Y = \frac{\text{stress}}{\text{strain}}$

Since perfectly rigid body would not yield irrespective of amount of stress, its young modulus is infinite.

viii) Isothermal bulk modulus of gas at a pressure p is

- (a) p/γ (b) p (c) $p\gamma$ (d) none of these

ix) Surface tension is measured by

- (a) force/mass (b) force/area (c) force/volume (d) force/length

x) If a liquid wet a solid then the angle of contact is

- (a) $>90^\circ$ (b) $<90^\circ$ (c) $=90^\circ$ (d) none of these

xi) Bar is the unit of

- (a) thrust (b) force (c) pressure (d) none of these

xii) A body is immersed in water and then again in kerosene. Buoyancy will be

- (a) same (b) greater in water (c) greater in kerosene (d) none of these

xiii) The difference of temperature of two bodies in Celsius scale is 15° . In Kelvin scale this difference will be

- (a) 20 (b) 27 (c) 30 (d) 15

xiv) At what temperature, do the Celsius and Fahrenheit scale gives the same reading?

- (a) 0°C (b) 40°C (c) 72°C (d) -40°C

xv) Heat from sun reaches the earth by

- (a) conduction (b) convection (c) radiation (d) none of these

xvi) Which of the following processes of heat transfer depends on gravity?

- (a) conduction (b) convection (c) radiation (d) none of these

xvii) In isothermal process the constant quantity is

- (a) pressure (b) volume (c) temperature (d) none of these

xviii) For a mono atomic gas the value of γ is

- (a) 1.33 (b) 1.40 (c) 1.67 (d) 1.00

xix) Luminous intensity of a source depends upon its

- (a) area (b) distance (c) volume (d) none of these

xx) Mirages are due to

- (a) reflection (b) refraction (c) total internal reflection (d) polarization

xxi) The power of two lenses are $+5\text{D}$ and -2.5D , the focal length of these two lenses in contact will be

- (a) $+40\text{cm}$ (b) -40cm (c) $+40$ (d) none of these

xxii) Optical path difference corresponding to the geometrical path difference of 3m is ($\mu = 1.5$)

- (a) 4.5m (b) 3m (c) 2m (d) 1.2m

xxiii) 1 eV is equivalent to

- (a) 1.6×10^{-12} J (b) 1.6×10^{-19} J (c) 1.6 J (d) none of these

xxiv) The energy of a photon associated with a radiation of frequency γ is

- (a) h/γ (b) $h\gamma$ (c) γ (d) none of these

Group-A

2. a) What do you mean by fundamental and derived quantities? What do you mean by proportional error and absolute error?

b) The time period (T) of a pendulum may depend on mass of the bob (m), effective length of the pendulum (l) and acceleration due to gravity (g). By the principle of dimensional homogeneity,

prove that $T = K \sqrt{\frac{l}{g}}$ where K is a dimensionless constant.

4. a) Define surface tension. What are the effects of temperature and impurity on surface tension?

b) If a capillary tube of radius 0.1 mm is dipped in water of surface tension 7.2×10^{-2} N/m then find the rise of water through the capillary tube. Assume the angle of contact is 0° .

c) What is the dimension of surface tension? Define cohesive and adhesive force.

5. a) State Pascals law for transmission of fluid pressure. What is critical velocity? How does the coefficient of viscosity of fluid depends on temperature?

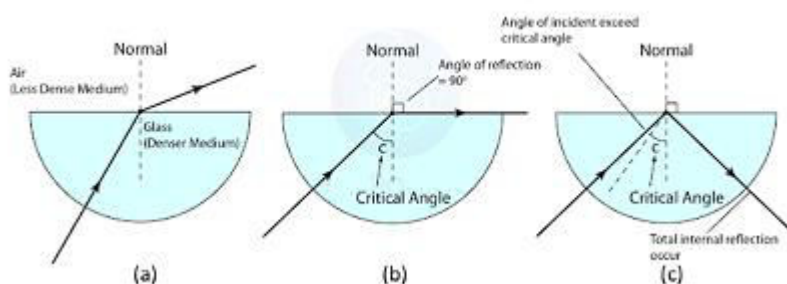
b) What do you mean by thermal expansion of a solid? Establish the relationship between, α , β and γ .

6. a) Distinguish between conduction, convection and radiation. Give examples of two good and bad conductors of heat.

b) State Zeroth law of thermodynamics. Establish, P-T, V-T relationship for adiabatic process.

Group-B

7. a) Write down the principle of photometry. State laws of refraction of light. What do you mean by critical angle? Explain with diagram.



b) What will be the speed of light in glass ($\mu = 1.5$) if the speed of light in air is 3×10^8 m/sec?

8. a) What do you mean by power of a lens? What are the units of power of a lens? The power of lens is +4D. What is the focal length of the lens and what is the type?

b) The focal length of plano-convex lens is 20cm ($\mu=1.5$). Calculate the radius of curvature of the curved surface using lens makers formula.

9. a) What do you mean by coherent source? State Huygens principle of propagation of wave. What are the conditions for constructive and destructive interference?

b) Describe briefly Young's double slit experiment and find out an expression for fringe width.

10. a) What are photons? Write down their characteristics.

b) Work function of potassium is 2.2eV. What is the threshold frequency of photoelectron?

c) What is the ratio of intensities of bright and dark fringes if the slit width changes in the ratio 4:1 in Young's double slit experiment?