

GUJARAT TECHNOLOGICAL UNIVERSITY

DI -1 SEMESTER – OLD PAPER – S22 TO S25 – QUESTION BANK(English)

Subject Name & Code:

Applied Physics- 4300004

Unit 1: Units and Measurements

Repeated Questions:

1. **Explain the principle, construction and working of micrometer screw gauge.**
 - Appeared in: S22 (Q1c OR, 07 marks), W22 (Q1c OR, 04+03 marks), S24 (Q2c, 07 marks), W24 (Q1c OR, 07 marks), S25 (Q1c, 07 marks)
2. **Explain the principle, construction and working of vernier calipers.**
 - Appeared in: S23 (Q1b, 04 marks), W22 (Q1c, 04+03 marks), S24 (Q1c, 07 marks), S25 (Q1c OR, 07 marks)
3. **Define Least Count (L.C.). Calculate the L.C. for a given vernier caliper or micrometer.**
 - Appeared in: S23 (Q1c(1)&(2), 03+04 marks), W22 (Q1c(ii), 03 marks), W23 (Q2a, 03 marks), S24 (Q2a, 03 marks), S25 (Q1c OR(2), part of 07 marks)
4. **Find the absolute error, relative error, and percentage error for a set of readings.**
 - Appeared in: S22 (Q1c OR, 07 marks), S23 (Q1c OR, 07 marks)

Other Important Questions:

5. Explain the construction of the Platinum Resistance Thermometer with the figure. (S22 - Q1a, 03 marks)
6. Explain Physical and derived quantities with example. (S22 - Q2a, 03 marks)
7. Explain positive errors with figure. Let length of two cylinders are (6.52 ± 0.01) cm and (4.48 ± 0.02) cm respectively. Find the difference of their length with percentage error. (S22 - Q2c, 07 marks)
8. Write a short note on linear momentum. (S24 - Q1a, 03 marks)
9. Define momentum & explain law of conservation of momentum with example. (S24 - Q1b, 04 marks)
10. Write short note on molecular phenomenon in surface tension. (S24 - Q1c OR, 07 marks)
11. Define Young's Modules, Elasticity & Restoring force. (S24 - Q2a, 03 marks)
12. Write difference between scalar & vector quantity. (S24 - Q2b, 04 marks)
13. A micrometer screw has L.C. 5×10^{-6} m. If there are 100 divisions on its circular scale, find pitch of micrometer screw. (S24 - Q2a OR, 03 marks)

14. Explain S.I units. (S23 - Q1a, 03 marks)
15. Give the S.I Unit of Force, Momentum and Velocity. (S23 - Q2a, 03 marks)
16. (1) $1 \text{ N} = \underline{\hspace{2cm}} \text{ Dyne}$ (2) $1 \text{ Degree} = \underline{\hspace{2cm}} \text{ Radian}$ (3) $1 \text{ Degree} = \underline{\hspace{2cm}} \text{ Minute}$
(S23 - Q2a OR, 03 marks)
17. For a Simple Pendulum equation $g = 4\pi^2 L/T^2$, if percentage error in length L is 2% and periodic time T is 3% then find percentage error in gravitational acceleration 'g'. (W22 - Q1a, 03 marks)
18. List Fundamental physical quantities with its SI units. (W22 - Q1b, 04 marks)
19. Define (i) Angular Displacement (ii) Angular velocity (iii) Angular acceleration. (W22 - Q2a OR, 03 marks)
20. Define: (1) Meter (2) Ampere. (S25 - Q1a, 03 marks)
21. Write names, unit and symbol of Physical fundamental quantities. (S25 - Q1b, 04 marks)
22. Define a vertical element of a vertical element. (W24 - Q1d, 07 marks) *[Note: This question appears to be a scanning error/placeholder and is likely not a real question.]*
23. Define a horizontal element of a vertical element. (W24 - Q1f, 03 marks)

Unit 2: Circular Motion

Repeated Questions:

1. **State and explain the law of conservation of linear momentum.**
 - Appeared in: S22 (Q3a, 03 marks), S23 (Q2c(1), 03 marks), S24 (Q1b, 04 marks), W23 (Q1b, 04 marks)
2. **Define impulse of a force and explain it with examples.**
 - Appeared in: S24 (Q2b, 04 marks), W22 (Q2c(i), 03 marks), S25 (Q2c, 07 marks)
3. **Explain banking of roads.**
 - Appeared in: W22 (Q2c(i), 03 marks), S25 (Q2a OR, 03 marks)

Other Important Questions:

4. Explain Rocket propulsion. (S22 - Q2a OR, 03 marks)
5. If an object with a mass of 50 Kg is rotated in a circle with a radius of 2m at a constant speed of 60 m/s, find the centripetal acceleration and the centripetal force. (S22 - Q2b, 04 marks)
6. A cannon ball of 40 kg mass travels at a speed of 54 km/h. It explodes in two pieces. If one piece is of mass 15 kg is at rest, find the velocity of the other piece. (S22 - Q5c OR, 07 marks)
7. Give examples of centripetal force and centrifugal force. (W23 - Q2a, 03 marks)
8. A car having weight 2000 kg running on the straight road, if driver applied break on the car with the force of 4KN , then find out deceleration of the car. (S23 - Q2b, 04 marks)
9. A cannon ball of 40 kg mass travels with the velocity of 54 km/h. It explodes in two pieces. If one piece is of mass 15 kg is at rest, Find the velocity of the other piece. (S23 - Q2b OR, 04 marks)
10. Give the difference between linear velocity and angular velocity. (S23 - Q2c(1) OR, 03 marks)
11. The tied stone with a string is rotating in a circular path of radius 0.5 m and completes 20 rotations in 2 second. Find angular and linear velocity of the stone. (W22 - Q2b, 04 marks)
12. A circular racing track has a radius of curvature 600 m. What should be the banking angle of this track to maintain a maximum safe speed of 180 km/hr? (W22 - Q2b OR, 04 marks)
13. Define (i) Angular Displacement (ii) Angular velocity (iii) Angular acceleration. (W22 - Q2a OR, 03 marks)
14. Explain circular motion. (W24 - Q3c, 07 marks)
15. State Newton's second law of motion and prove $F=ma$. (S25 - Q2a, 03 marks)
16. Write the law of conservation of momentum. Explain impulse of force with example. (S25 - Q2c, 07 marks)
17. Derive relation between linear acceleration and angular acceleration. (S25 - Q2b OR, 04 marks)
18. A curve has a radius of 50 m with a banking angle 15° , What will be the ideal or critical velocity for a car on this curve using banking road formula? (take $\tan 15^\circ = 0.27$) (W23 - Q5a OR, 03 marks)

Unit 3: General Properties of Matter

Repeated Questions:

1. **Define Surface Tension and explain it with examples.**
 - Appeared in: S23 (Q2c(2) OR, 04 marks), S25 (Q2c, 07 marks)
2. **Explain Stokes' law for viscosity.**
 - Appeared in: S24 (Q3a, 03 marks), S25 (Q3c(2) OR, part of 07 marks)
3. **Explain cohesive and adhesive forces with examples.**
 - Appeared in: W23 (Q3a OR, 03 marks), S25 (Q3c(1) OR, part of 07 marks), S24 (Q3a OR, 03 marks), W24 (Q5a, 03 marks)
4. **Define and explain Terminal Velocity.**
 - Appeared in: S22 (Q3b OR, 04 marks), W22 (Q3c(i), 04 marks)
5. **What is Reynolds number? Give its significance.**
 - Appeared in: S23 (Q2c(2), 04 marks), S24 (Q3b OR, 04 marks), W23 (Q4b OR, 04 marks)

Other Important Questions:

6. Write applications of Viscosity in hydraulic systems. (S22 - Q1c, 07 marks)
7. The radius of air bubble is 0.5 mm. Calculate its terminal velocity in water. Density of air=0.0012093 gm/cm³. Density of water= 10³ kg/m³, viscosity of water= 10⁻³ Ns/m². (S22 - Q3c, 07 marks)
8. Derive relation between surface tension and surface energy. (S22 - Q4a, 03 marks)
9. Explain Laplace's molecular theory of surface tension. (S22 - Q4a OR, 03 marks), (W22 - Q3a OR, 03 marks)
10. Derive the formula for capillary rise: $h = \frac{2T\cos\theta}{r\rho g}$. (S22 - Q5c, 07 marks)
11. Explain Newton's Law for viscosity. (S23 - Q3a, 03 marks)
12. Explain Hook's Law. (S23 - Q3b, 04 marks)
13. When a capillary tube of radius 0.5 mm is dipped vertically in water so that height of water rises in tube upto 2.8 cm, if density of water is 10³ kg/m³ then calculate the surface tension of water. (Take $g = 9.8 \text{ m/s}^2$ and $\theta = 0^\circ$) (S23 - Q3c, 07 marks)
14. Explain types of stress. (S23 - Q3b OR, 04 marks)
15. Derived the relation between surface energy and surface tension. (S23 - Q3c OR, 07 marks)
16. Explain Longitudinal Stress-Strain Curve. (W22 - Q3a, 03 marks)
17. State applications of Surface tension. (W22 - Q3b, 04 marks)
18. State applications of Viscosity. (W22 - Q3b OR, 04 marks)

19. A metal sphere with a radius of 2 mm and a density of 10.5 gm/cm^3 falls freely into glycerine having density 1.5 gm/cm^3 and coefficient of viscosity 9.8 poise. Find the terminal velocity of the sphere. (W22 - Q3c(ii), 03 marks)
20. Explain the principle of young's modulus. (S25 - Q3a, 03 marks)
21. Explain strain and stress with its types. (S25 - Q3b, 04 marks)
22. State Bernoulli's Theorem and write its applications. (S25 - Q3a OR, 03 marks)
23. Write short note on Reynold Number. (S25 - Q3b OR, 04 marks)
24. Define Viscosity, Viscosity coefficient, & Viscosity gradient. (W24 - Q2e, 04 marks)
25. A steel bar having radius R of $8.7 \times 10^{-3} \text{ m}$ and length L of 0.95m. A 72KN force F stretches it long its length. What are the stress on the rod, the elongation and the strain of the rod? Given that Young's modules Y for steel is $2 \times 10^{11} \text{ N/m}^2$. (W24 - Q2b, 04 marks)
26. Explain stress-strain diagram. (W24 - Q4c, 07 marks)
27. Explain Young's Modulus, Bulk Modulus and Shearing Modulus in detail. (W23 - Q1c, 07 marks)
28. The side length of the soap solution film is 3 cm and its width is increased by 2 cm. Find the work to be done on it. The surface tension of the soap solution is $28 \times 10^{-3} \text{ N/m}$. (W23 - Q3a, 03 marks)
29. State and explain Hooke's law. (W23 - Q3a OR, 03 marks)
30. Explain Longitudinal stress - Longitudinal Strain curve with proper graph. (W23 - Q4c, 07 marks)
31. A 5 cm cube has its upper face displaced by 0.2 cm by tangential force of 8 N. Calculate the shearing strain, shearing stress and modulus of rigidity of the material of the cube. (W23 - Q5b, 04 marks)
32. Determine the formula of terminal velocity of a sphere in viscous medium. (W23 - Q5c OR, 07 marks)

Unit 4: Heat and Thermometry

Repeated Questions:

1. **Explain the construction and working of a Mercury Thermometer.**
 - Appeared in: S22 (Q5a, 03 marks), W22 (Q4c(i), 04 marks), W23 (Q3c OR, 07 marks), S25 (Q4c, 07 marks)
2. **Explain the construction and working of a Bimetallic Thermometer.**
 - Appeared in: S22 (Q4c OR, 07 marks), W22 (Q4c(i) OR, 04 marks)
3. **Explain the construction and working of a Platinum Resistance Thermometer.**
 - Appeared in: S22 (Q1a, 03 marks), S23 (Q4a OR, 03 marks), W24 (Q5c, 07 marks)
4. **Give the difference between Heat and Temperature.**
 - Appeared in: S23 (Q4b, 04 marks), S25 (Q4a, 03 marks)
5. **Convert temperatures between Celsius, Fahrenheit, and Kelvin scales.**
 - Appeared in: S23 (Q4a, 03 marks), W22 (Q4b OR, 04 marks), S25 (Q4b, 04 marks)

Other Important Questions:

6. Explain Mode of Heat Transfer. (S22 - Q5a OR, 03 marks)
7. A metal bar measures 60 cm at 10°C . what would be its length at 110°C. $\alpha = 1.5 \times 10^{-5} / ^\circ\text{C}$. (S22 - Q3a OR, 03 marks)
8. Give merits and demerits of Bimetallic thermometer. (S22 - Q4c OR, 07 marks)
9. Explain the law of thermal conductivity and application of thermal conductivity. (S23 - Q4c, 07 marks)
10. Write the principle of Bimetallic and Platinum resistance thermometer. (S23 - Q4a OR, 03 marks)
11. Explain Heat capacity and Specific Heat. (S23 - Q4b OR, 04 marks)
12. Give the principle, construction and working of Mercury thermometer. (S23 - Q4c OR, 07 marks)
13. Define (i) Conduction (ii) Convection (iii) Radiation. (W22 - Q4a, 03 marks)
14. The total area of the glass window plate is 0.5 m². Calculate how much heat is conducted per hour through the glass window plate if thickness of the glass is 6.0 mm. The temperature of the inside is 23 °C and of the outside surface is 2 °C. Thermal conductivity of glass is 1.0 W/m K. (W22 - Q4b, 04 marks)
15. State applications of thermal conductivity. (W22 - Q4a OR, 03 marks)
16. (i) Explain construction and working of Bimetallic thermometer. (ii) A Copper rod of 19 cm long and 0.785 cm² area of cross section thermally insulated is heated at one end through 100 °C while another end is kept at 30 °C Calculate the amount of heat which will flow in 10 minutes along the way. Thermal conductivity of copper is 380 W/m K. (W22 - Q4c OR, 04+03 marks)

17. Define thermometer & Explain the types of thermometer. (W24 - Q3c, 07 marks)
18. State advantages and disadvantages of platinum resistance thermometer. (W24 - Q4a, 03 marks)
19. Define Heat, Calorie & Kilo Calorie. (W24 - Q4a OR, 03 marks)
20. Define : Specific heat, thermal conductivity. (S25 - Q4a, 03 marks)
21. A person is having fever of 101. Which unit of temperature is used here? Convert this temperature in other two units. (S25 - Q4b, 04 marks)
22. What is Thermometer? Explain Mercury thermometer and bimetallic thermometer. (S25 - Q4c, 07 marks)
23. For which value of temperature, °C and °F units are equal? (S25 - Q4a OR, 03 marks)
24. Write down the equations showing relation between Kelvin, Fahrenheit and Celsius scale. (S25 - Q4b OR, 04 marks)
25. Define Thermal Conductivity and state its applications. (S25 - Q4c OR, 07 marks)
26. Explain different methods (Celsius Scale, Fahrenheit Scale, and Kelvin Scale) to measure temperature. (W23 - Q1c OR, 07 marks)
27. A copper rod of 19 cm long and 0.785 cm^2 area of cross section thermally insulated is heated at one end through 100°C while the other end is kept at 30°C . Calculate the amount of heat which will flow in 10 minutes along the way. Thermal Conductivity of copper is 380 W / m. K . (W23 - Q2b, 04 marks)
28. Define heat capacity and specific heat of material. (W23 - Q3b OR, 04 marks)
29. Define: Periodic time, Frequency, Phase, echo, absorption coefficient, Nodes, Anti Nodes. (W23 - Q4c OR, 07 marks)

Unit 5: Wave Motion and its Applications

Repeated Questions:

1. **Distinguish between transverse waves and longitudinal waves.**
 - Appeared in: S22 (Q1b, 04 marks), W22 (Q5b, 04 marks), S25 (Q5a, 03 marks)
2. **Explain Reverberation time and state Sabine's formula.**
 - Appeared in: S22 (Q2b, 04 marks), S23 (Q5c OR, 07 marks), S25 (Q5b OR, 04 marks)
3. **Give the characteristics of an acoustically good auditorium.**
 - Appeared in: W22 (Q5b OR, 04 marks), S24 (Q5b OR, 04 marks)
4. **Give applications of ultrasonic waves.**
 - Appeared in: S22 (Q5a OR, 03 marks), S23 (Q5c, 07 marks), W23 (Q5b OR, 04 marks)

Other Important Questions:

5. Write ten properties of ultrasonic waves. (S22 - Q3b, 04 marks)
6. The size of an auditorium is 8000 m^3 and its total sound absorption is 2500 O.W.U. Find the reverberation time. (S22 - Q2b, 04 marks)
7. Explain effect of temperature on velocity of sound in air medium. (W22 - Q5a, 03 marks)
8. (i) Explain Reverberation time. (ii) Find Reverberation time. If the volume of an Auditorium is 8000 m^3 and its total sound absorption is 2500 O.W.U. (W22 - Q5c, 02+05 marks)
9. (i) Explain Echelon effect. (ii) Obtain relation between Velocity, frequency and wavelength of a sound wave. Find velocity of a sound wave having frequency 20KHz and wavelength of 0.017m. (W22 - Q5c OR, 02+05 marks)
10. Give the definition of frequency and wavelength. (S23 - Q5a, 03 marks)
11. Calculate the frequency of sound wave having velocity of 350 m/s and wave length of 0.017 m. (S23 - Q5b, 04 marks)
12. What is Ultrasonic wave ? Give the application of it. (S23 - Q5c, 07 marks)
13. What is mechanical wave and non-mechanical wave.? (S23 - Q5a OR, 03 marks)
14. Calculate the wavelength of sound wave having velocity of 340 m/s and frequency of 2400 Hz. (S23 - Q5b OR, 04 marks)
15. Define frequency, Phase, Wave length & Period time. (S24 - Q3b, 04 marks)
16. Explain reflection of light and polarization. (S24 - Q2c, 07 marks)
17. Write short properties of light. (S24 - Q4b OR, 04 marks)
18. State the relation between θ , V , r and g . (S24 - Q4c OR, 07 marks)
19. Define capillarity with example. (S24 - Q5a OR, 03 marks)
20. Define Temperature, Power, Energy,& Time. (S24 - Q5b OR, 04 marks)
21. State Hook's law. Write determination of young's modules in laboratory. (S24 - Q5c OR, 07 marks)
22. Give main differences between Transverse (Non Mechanical) waves and Longitudinal (Mechanical) waves. (W23 - Q3b, 04 marks)
23. Radio wave has a wavelength 1200 cm and its frequency is $25 \times 10^3 \text{ KHz}$. Find the velocity of the wave. (W23 - Q4a, 03 marks)
24. Differentiate: Transverse wave and Longitudinal wave. (S25 - Q5a, 03 marks)
25. Explain dispersion of light in short. (S25 - Q5b, 04 marks)
26. Write properties of alpha, beta and gamma rays. (S25 - Q5c, 07 marks)
27. If a wave having wavelength of 1200cm and frequency of $25 \times 10^3 \text{ KHz}$, then find out the velocity of wave. (S25 - Q5a OR, 03 marks)
28. Define reverberation and state Sabine's formula for reverberation of sound and labelled each term. (S25 - Q5b OR, 04 marks)
29. Give applications of nanotechnology. (S25 - Q5c OR, 07 marks)
