

**Yashwantrao Chavan College of Science Karad**

**B.Sc. – I**

**Paper II: Mechanics II**

**Question Bank - 2023-2024**

**Q.1 Select the most correct alternative.**

- Which of the following is not the unit of surface tension?  
a) dyne/cm      b) dyne/cm<sup>2</sup>      c) erg/cm<sup>2</sup>      d) newton/m
- If T is surface tension of a liquid then the excess pressure inside the liquid drop of radius r is  
a)  $\frac{T}{r}$       b)  $\frac{2T}{r}$       c)  $\frac{4T}{r}$       d)  $\frac{6T}{r}$
- The period of geostationary satellite is.....  
a) 6 hours      b) 12 hours      c) 24 hours      d) 48 hours
- The weight of an object of mass 10kg on the earth is.....  
a) 9.8 N      b) 9.8 kg      c) 9.8 N      d) 98 kg
- Kepler's third law of planetary motion is referred to as.....  
a) law of elliptical orbits      b) law of equal area  
c) harmonic law      d) law of equal periods
- Kepler's second law of planetary motion is referred to as.....  
a) law of elliptical orbits      b) law of equal area  
c) harmonic law      d) law of equal periods
- Kepler's third law of planetary motion is given as.....  
a)  $T^2 \propto r^3$       b)  $T^3 \propto r^2$       c)  $T \propto r^2$       d)  $T^2 \propto r$
- The planetary orbits around the sun are.....  
a) Circular      b) elliptical      c) parabolic      d) hyperbolic
- A plane perpendicular to neutral surface is called.....  
a) Plane of bending      b) axis of bending      c) neutral bending      d) neutral axis
- The section of the neutral surface by the plane of bending is called.....  
a) bending axis      b) neutral axis      c) free axis      d) plane of axis
- A beam supported at both the ends and loaded at the center is equivalent to.....  
a) A cantilever      b) two cantilever      c) three cantilever      d) four cantilevers
- The angle of contact between glass and mercury is.....  
a) A right-angle      b) an acute angle      c) an obtuse angle      d) zero
- A liquid wets a solid surface if the angle of contact between them is.....  
a) A right angle      b) an acute angle      c) an obtuse angle      d)  $\pi^c$

14. If  $T$  is surface tension of a soap solution then the excess pressure inside its bubble of radius  $r$  is.....
- a)  $T/r$                       b)  $2T/r$                       c)  $4T/r$                       d)  $6T/r$
15. A small amount of liquid, set free in the air, takes spherical shape because of its.....
- a) High density   b) elasticity   c) viscosity   d) surface tension
16. S.I unit of gravitational constant is.....
- a)  $\text{Nm}^2 \text{kg}^2$     b)  $\text{Nm}^2 \text{kg}^{-2}$     c)  $\text{Nm}^2 \text{s}^{-2}$     d)  $\text{Nm kg}^{-2}$
17. The gravitational force of attraction between two bodies separated by a distance  $r$  is proportional to.....
- a)  $r^2$    b)  $1/r^2$    c)  $r^3$    d)  $1/r^3$
18. The total energy of a body performing SHM is  $E$ . Then average kinetic energy of the body, is .....
- a)  $E$    b)  $E/4$    c)  $E/2$    d)  $2E$
19. The fundamental force which holds the planets in their orbits around the sun is force of attraction.
- a) Electromagnetic    b) nuclear    c) electrostatic   d) gravitational
20. Period of the satellite does not depend on.....
- a) Radius of the earth                      b) mass of the earth    c) height of the satellite  
d) mass of the satellite

**Q.2 Answer the following questions in brief.**

1. State and explain the Jaeger's method for determination of surface tension.
2. What are damped oscillations? Set up differential equation for a damped oscillator and obtain the solution for the same. Explain how the amplitude and frequency of oscillator are affected.
3. Derive the relation between surface tension, pressure and curvature. Hence, show that the excess pressure inside a soap bubble of radius  $r$  is  $\frac{4T}{r}$
4. Set up differential equation for SHM and hence obtain expression for displacement ( $x$ ), velocity ( $v$ ) and acceleration of the particle executing SHM.
5. What are forced oscillations? Set up differential equation for the same and obtain its solution.

**Q.3 Answer the following questions in short.**

1. Derive expressions for P.E.(U), K.E.(K) and total energy (E) of a particle performing SHM.
2. State and explain application of surface tension.
3. Give the application of the satellites.
4. State Kepler's laws of planetary motion.
5. Explain wettability on the basis of angle of contact and also on the basis of cohesive and adhesive forces.
6. Derive an expression for bending moment of a horizontal beam fixed at one end and loaded at the other.
7. What is cantilever? Derive an expression for the depression of the free end of a cantilever due to load.
8. State the Newton's law of gravitation and define the universal constant of gravitation. Derive its dimensions.
9. Show that the square of the period of revolution of a satellite is directly proportional to the cube of the orbital radius.
10. Show that for a motion of particle in central force field, angular momentum is conserved and areal velocity remains constant.