

Subject – Physics

Paper Title – Gravitation and properties of Matter

Paper Code – BPT201

Question Bank

Q.1 Define following terms/ Answer in one sentence (2 marks each)

1. Who did give the helio-centric theory and geo-centric theory?
2. The gravitational force of attraction between two bodies separated by a distance r is proportional to
3. What is SI unit of gravitational constant?
4. State Kepler's first law of planetary motion.
5. Kepler's second law of planetary motion is referred as
6. If the particle moves in central force field, itsremains constant.
7. If particle moves in a central force field, then its is conserved.
8. What is shape of planetary orbits around the sun?
9. Which fundamental force which holds the planets in their orbits around the sun?
10. What is central force?
11. Define viscosity.
12. What is the profile of the advancing liquid in the capillary tube?
13. What is type of flow of water flowing through horizontal canal calmly?
14. Give two examples of highly viscous and less viscous fluid.
15. Which physical factors affect viscosity of fluid.
16. If C is torsional couple, then work done in twisting the wire is
17. The quantity Yak^2 is called.....
18. Define neutral axis of bar.
19. Define neutral surface of bar.
20. Define plane of bending.
21. Define surface tension.
22. What is SI unit of surface tension?
23. Define angle of contact.

24. If T is surface tension of a liquid, then the excess pressure inside the liquid drop of radius ' r ' is
25. What is the angle of contact between glass and mercury?

Q.2 Long answer questions(10 marks each)

1. State and explain Newton's law of gravitation. Define the universal constant of gravitation and derive its dimension.
2. Show that for a motion of particle in central force field, angular momentum is conserved and areal velocity is constant.
3. Explain any five applications of satellite
4. Derive an expression for period of satellite moving in circular orbit around the earth.
5. Derive the Poiseuille's equation to determine the coefficient of viscosity of liquids.
6. Describe in brief the experimental determination of coefficient of viscosity of liquid by capillary flow method
7. What is a cantilever? Derive an expression for the depression of the free end of a cantilever due to a load.
8. What is meant by (i) torsion, (ii) torsional oscillations? Derive an expression for the torsional couple per unit angular twist in case of a wire.
9. Describe the method to determine Young's modulus of material of bar by bending of bar?
10. Derive an expression for modulus of rigidity of material of wire by dynamical method (torsional oscillation)
11. Describe the Jaeger's method to determine surface tension of a liquid.
12. Derive the relation between surface tension, excess pressure and radius of curvature. Hence derive the expression for excess pressure inside a soap bubble.

Q.3 Short answer questions(5 marks each)

1. State and explain Newton's law of gravitation.
2. State Kepler's laws of planetary motion.
3. Explain geosynchronous orbits and geostationary satellite.
4. Explain why an astronaut in an orbiting satellite experiences a feeling of weightlessness.

5. Calculate mass of earth if distance of the moon from centre of earth is 3.84×10^8 m and the time period of moon's revolution is 27.3 days, radius of the earth is 6400 km. (Given $G = 6.667 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$)
6. What would be duration of the year if distance between the earth and the sun gets doubled?
7. Discuss the effect of temperature and pressure on viscosity of liquids.
8. What is viscosity of fluid? Define coefficient of viscosity and give its unit.
9. What are the streamline and turbulent flows?
10. Write short note on equation of continuity.
11. Give general concept of fluid flow.
12. Describe the equation of continuity as applicable to linear flow of fluid in pipe.
13. Obtain an expression for work done in twisting a wire.
14. Derive an expression for the depressions of centrally loaded beams supported at the both ends.
15. A bar 80 cm long, having breadth and depth 0.5 cm each is supported at its ends. The depression produced at the middle by a load of 200 gm is 2 mm. Calculate Young's modulus of the material of the bar.
16. What is surface tension? Explain it on the basis of molecular forces.
17. Define adhesive force, cohesive force, molecular range and sphere of influence.
18. What is angle of contact? Derive the condition for the angle of contact to be acute or obtuse.
19. Explain various applications of surface tension.
20. In a Jaeger's experiment, the capillary tube of internal radius 0.25 mm dips 3cm inside water, the difference in level of the manometer with liquid of density 0.82 gm/cm^3 is found to be 11 cm, when the bubble just bursts. Calculate the surface tension of water.
21. The pressure of air in a soap bubble of diameter 0.7 cm is 8 mm of water above the atmospheric pressure. Calculate the surface tension of the soap solution.

Question Bank

B.Sc. I (Semester II) End Semester Examination, June 2022 Electricity and Magnetism (BPT-202)

Q.1: Definition / Answer in one sentence.

- 1) Define quality factor for an ac circuit.
- 2) Define impedance and state its unit.
- 3) What is phasor?
- 4) Define admittance and state its unit.
- 5) Define susceptance and state its unit.
- 6) Define reactance and state its unit.
- 7) What is relation between impedance and admittance?
- 8) Define resonance frequency in series LCR ac circuit.
- 9) What is diamagnetic material?
- 11) Define magnetic flux and state its unit.
- 12) State Ampere's law.
- 13) State Biot –Savart's law.
- 14) Define magnetic permeability.
- 15) Define magnetic susceptibility.
- 16) Define the term magnetic intensity and state its unit.
- 17) Define Faraday's law of electromagnetic induction.
- 18) Define Lenz's law.
- 19) Define self induction and state its unit.
- 20) Define mutual induction and state its unit.
- 21) Define Figure of merit in ballistic galvanometer.
- 22) Define current sensitivity in ballistic galvanometer.
- 23) Define Poynting's vector and state its unit.
- 24) Define current density and state its unit.
- 25) What is displacement current?

Q.2: Long Answer Questions.

- 1) Describe Owen's bridge. How the self inductance of a coil is determined by this bridge?

- 2) Discuss series LCR circuit. Derive impedance for it. Draw the phasor diagram.
- 3) Derive an expression for magnetic induction due to circular coil at a point along its axis.
- 4) Derive an expression for magnetic induction at a point on a axis of straight solenoid and hence obtain induction at a point on the axis of an infinite straight solenoid.
- 5) Explain self inductance and obtain an expression for self inductance of a solenoid.
- 6) What is ballistic galvanometer? Derive an expression for charge passing through the coil of B.G.
- 7) State Maxwell's equations in vacuum and also obtain wave equations for propagation of electromagnetic wave in vacuum.
- 8) Obtain an expression for energy density in an electromagnetic field.

Q.3: Short Answer Questions.

- 1) A circuit has an inductance of $(1/\pi)$ Henry and resistance 2000 ohm also ac supply of 50 Hz is applied to it. Calculate the reactance and impedance offered by the circuit.
- 2) A resistor of 50 ohm connected in series with an inductance of 400 mH and capacitor of 5 micro farad .What is the resonant frequency and current in the circuit when it is supplied to a 150 V ac source operating at resonant frequency.
- 3) Obtain an expression for resonant frequency of series LCR circuit.
- 4) Explain complex number and how 'j' works as an operator.
- 5) A long solenoid of 2000 turns has a length 200 cm carries a current of 3 amperes, Calculate magnetic induction at the center along the axis of solenoid.
- 6) State and explain Biot –Savart's law.
- 7) State and explain Ampere's circuital law.
- 8) Show that divergence of magnetic field is zero.
- 9) Show that curl of magnetic field is non zero.
- 10) Write a note on different types of magnetic materials.
- 11) Write a note on different properties of magnetic materials.
- 12) Explain electromagnetic induction and Faraday's, Lenz's law.

- 13) Explain mutual induction and derive Newmann's formula.
- 14) Derive an expression for self inductance of a solenoid.
- 15) Write a note on energy stored in magnetic field.
- 16) Define characteristic constants of B.G. and give their units.
- 17) What is damping? Why correction for damping is necessary and how it is applied?
- 18) Write a note on equation of current continuity.
- 19) Write a note on electric displacement current.
- 20) Explain Maxwell's correction for Ampere's circuital law .Why correction was needed?
- 21) Explain physical significance of Maxwell's equations.
