



PHYSICS – Part I



NOTE: HIGHLIGHTED QUESTIONS ARE THE MOST IMPORTANT

PAIRING SCHEME – 2024

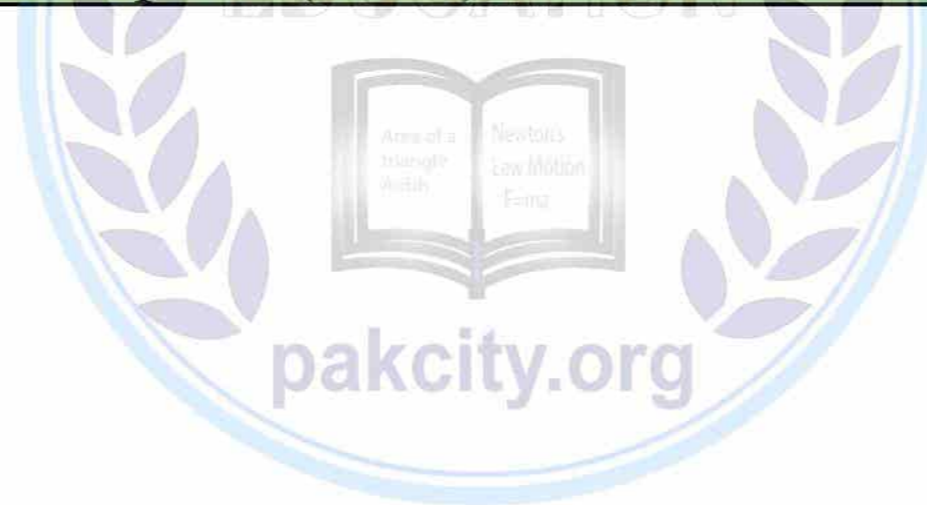
Chapter	MCQ's Q.1	Short Questions Q.2,3,4	Long Questions Q.5,6,7,8,9
1	2	4	-
2	2	3	Theory or Numerical
3	2	3	Theory or Numerical
4	1	2	Theory or Numerical
5	2	4	Theory or Numerical
6	1	2	Theory or Numerical
7	1	3	Theory or Numerical
8	2	3	Theory or Numerical
9	1	3	Theory or Numerical
10	1	3	Theory or Numerical
11	2	3	Theory or Numerical
Total	17/17 = 17	22/33 = 44	3/5 = 24

Short Questions portion is divided into 3 questions as follows

- Q. 2 Chapters (1+2+3+4) Attempt any 08 from 12 questions.
 Q. 3 Chapters (5+6+7+8) Attempt any 08 from 12 questions.
 Q. 4 Chapters (9+10+11) Attempt any 06 from 09 questions.

Pairing of Long Questions (Attempt any 03 questions from 05)

- Q.5 Chapters (2+3) Q.6 Chapters (4+8) Q.7 Chapters (5+7)
 Q.8 Chapters (6+11) Q.9 Chapters (9+10)



Regards:

Engr. Rana Zeeshan Maqsood

Chapter 01



Most Important Short Questions

1. What are the main frontiers of the fundamental sciences?
2. Differentiate between radian and steradian.
3. Differentiate between random and systematic error.
4. What is the difference between precision and accuracy?
5. Define dimensional analysis. Write its uses.

Exercise Short Questions

6. Name several repetitive phenomena occurring in nature which could serve as responsible time standards.
7. Give the draw backs to use the period of pendulum as a time standard?
8. Why do we find it useful to have two units for amount of substance, the kilogram and mole?
9. The period of a simple pendulum is measured by a stop watch. What types of error are possible?
10. Does dimensional analysis give any information about a constant of proportionality that may appear in an algebraic expression?
11. Write the dimension of (a) Pressure (b) density

Numerical Problem

Example: 1.4, 1.6

Numerical: 1.1, 1.2, 1.6, 1.7, 1.9



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Chapter 02

Most Important Short Questions

1. **What is head to tail rule?**
2. Define null vector and equal vector.
3. Write three characteristics of scalar product and dot product.
4. Define equilibrium. Discuss its types.

Exercise Short Questions

5. Define the terms (i) Unit vector (ii) Position Vector and (iii) Component of a Vector.
6. **The vector sum of three vectors gives zero resultant. What can be the possible orientation of the vectors?**
7. **If one of the rectangular components of a vector is not zero. Can its magnitude be zero? Explain.**
8. **Can a vector have components greater than the vector's magnitude?**
9. **Can a vector have components greater than the vector's magnitude?**
10. **If $\vec{A} + \vec{B} = \vec{0}$, What can you say about the components of two vectors?**
11. **Under what circumstances would a vector have components that are equal in magnitude?**
12. **Is it possible to add a scalar quantity into a vector quantity? Explain**
13. **Can you add zero to a null vector?**
14. Two vectors have unequal magnitude. Can their sum be equal to zero? Explain.
15. Suppose the sides of closed polygon represent vector arranged head to tail rule. What is the sum of these vectors?
16. **If all the components of the vectors \vec{A}_1 and \vec{A}_2 were reversed, how would this alter $\vec{A}_1 \times \vec{A}_2$**
17. **Name the three different conditions that could make $\vec{A}_1 \times \vec{A}_2 = \vec{0}$**
18. Can a body rotate about its centre of gravity under the action of its weight?

Long Questions

1. **Vector addition by rectangular components**
2. **Dot or scalar product**
3. **Cross or vector product**
4. Torque acting on a rigid body

Numerical Problem

Example: 2.5

Numerical: 2.3, 2.7, 2.8, 2.9, 2.10, 2.14, 2.15

Chapter 03

Most Important Short Questions

1. Show that the area between the velocity time graph is equal to the distance covered by the object.
2. When a bullet is fired from a rifle. Why does the rifle move backward?
3. Define ballistic missile and ballistic trajectory.

Exercise Short Questions

4. What is the difference between uniform and variable velocity? From the explanation of variable velocity, define acceleration. Give SI units of velocity and acceleration.
5. An object is thrown vertically upward. Discuss the sign of acceleration due to gravity, relative to velocity, while the object is in air?
6. Can the velocity of an object reverse direction when acceleration is constant? If so, given an example?
7. Explain the circumstances in which the velocity and acceleration of car are;
 - (i) Parallel
 - (ii) Anti-Parallel
 - (iii) Perpendicular to one another
8. Motion with constant velocity is a special case of motion with constant acceleration. Is this statement true? Discuss.
9. Find the change in momentum for an object subjected to a given force for a given time and state law of motion in terms of momentum?
10. Define impulse and show that how it is related to linear momentum?
11. Explain the difference between elastic and inelastic collision.
12. Explain what is meant by projectile motion? Derive the expression for
 - (a) The time of flight
 - (b) The range of projectile
 Show that the range of projectile is maximum when projectile is thrown at an angle of 45° with horizontal.
13. At what point or points in its path does a projectile have its minimum speed, its maximum speed?

Long Questions

1. Elastic Collision in one dimension
2. Projectile Motion

Numerical Problem

Example: 3.2, 3.5, 3.7

Numerical: 3.8, 3.10, 3.11, 3.12, 3.13

Chapter 04

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Most Important Short Questions

1. Prove that $P = F.V$
2. Define work energy principle, Write its mathematical form.
3. Define absolute P.E. Write its formula.
4. What is escape velocity? Write its value and mathematical form.
5. How electrical energy can be obtained by using tides?

Exercise Short Questions

6. Calculate the work done in kilo joules in lifting a mass of 10 kg (at a steady velocity) through a vertical height of 10m.
7. A Force F acts through a distance L . the force is then increased to $3F$, and then acts through a further distance of $2L$. Draw the work diagram to scale.
8. In which case is work done? When a 50kg of books is lifted through 50cm, or when a 50kg crate is pushed through 2m across the floor with a force of 50N?
9. An object has 1J of potential energy. Explain what does it mean?
10. When a rocket re-enters the atmosphere, its nose cone becomes very hot. Where does this heat energy come from?
11. A girl drops a cup from a certain height, which breaks into pieces. What energy changes are involved?
12. A body uses a catapult to throw a stone which accidentally smashes a green-house window. List the possible energy changes?

Long Questions

1. Work done by gravitational force
2. Absolute P.E
3. Interconversion of K.E and P.E

Numerical Problem

Example: 4.2

Numerical: 4.1, 4.4, 4.5, 4.6, 4.7, 4.8,

Chapter 05

Most Important Short Questions

1. Prove that $v = r\omega$
2. Prove that $a = r\alpha$
3. What is difference between real and apparent weight?

Exercise Short Questions

4. Explain the difference between tangential velocity and the angular velocity, if one of these given for a wheel of known radius, how will you find the other?
5. Explain what is meant by centripetal force and why it must be furnished to an object if the object is to follow a circular path?
6. What is meant by moment of inertia? Explain its significance.
7. What is meant by angular momentum? Explain the law of conservation of angular momentum?
8. Show that orbital angular momentum $L_o = mvr$
9. Describe what should be the minimum velocity, for a satellite, to orbit close to the earth around it.
10. When mud flies off the tyre of a moving bicycle, in what direction does it fly? Explain it.
11. A disc and a hoop start moving down from the top of an inclined plane at the same time. Which one will be moving faster on reaching the bottom?
12. Why does a diver change its positions before and after diving in the pool?
13. Explain how many minimum number of geo-stationary satellites are required for global coverage of T.V transmission.

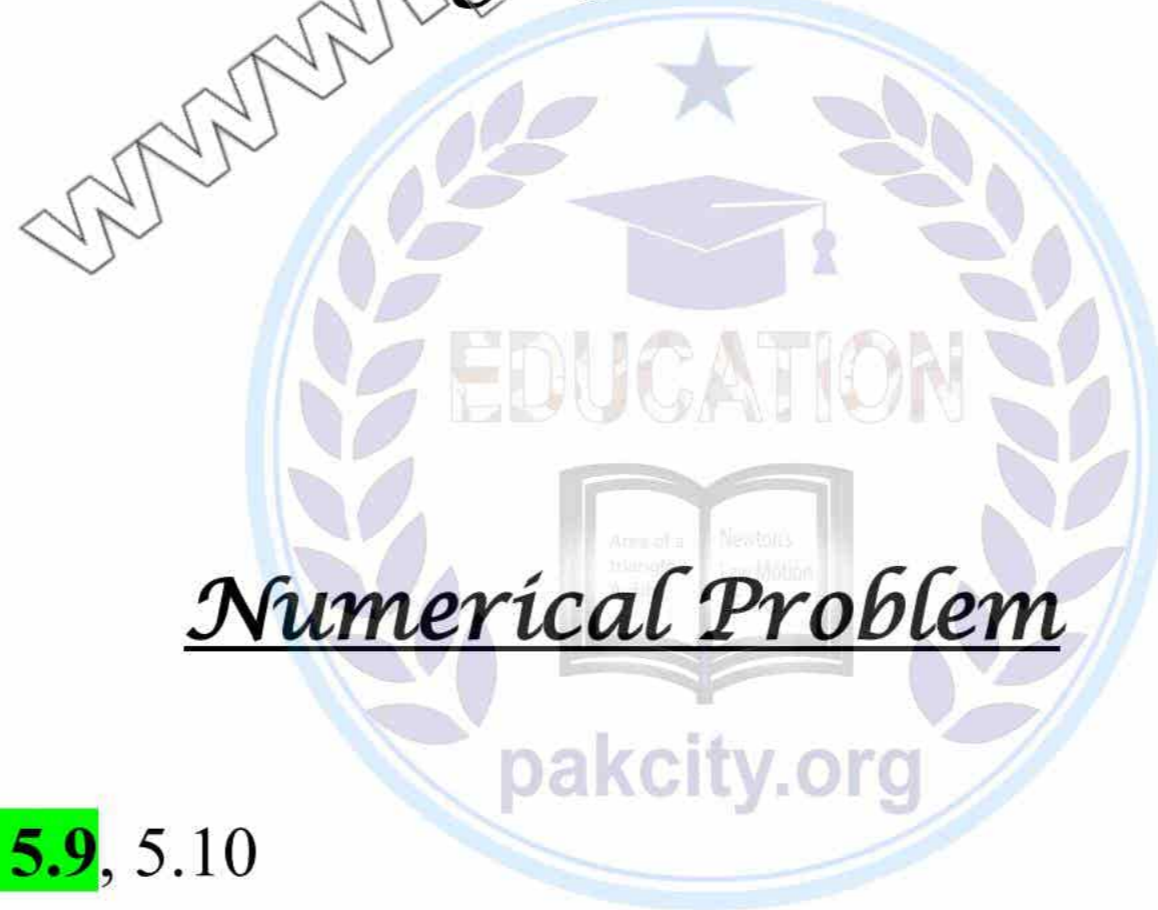
Long Questions

1. Centripetal Force
2. Rotational K.E
3. Artificial Gravity
4. Geostationary Orbits

Numerical Problem

Example: 5.1

Numerical: 5.1, 5.3, 5.6, 5.7, 5.9, 5.10



Chapter 06

Most Important Short Questions

1. What is Stoke's law? Write its formula and limitation.
2. What are the conditions for ideal fluid?
3. State Torricelli's theorem. Write its equation.

Exercise Short Questions

4. Explain what do you mean by terminal velocity?
5. What is meant by drag force? What are the factors upon which drag force acting upon a small sphere of radius r moving down through a liquid, depend?
6. Why fog droplets appear to be suspended in air?
7. Explain the difference between laminar flow and turbulent flow?
8. A person is standing near a fast-moving train. Is there any danger that he will fall towards it?
9. Two row boats moving parallel in the same direction are pulled towards each other. Explain?
10. Explain, how the swing is produced in a fast-moving cricket ball?
11. Explain the working of a carburettor of a motorcar using Bernoulli's principle.

Long Questions

1. Equation of Continuity
2. Bernoulli's Equation
3. Torricelli's Theorem

Numerical Problem

Examples: 6.1

Numerical: 6.1, 6.2, 6.4, 6.5, 6.7, 6.9



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Chapter 07



Most Important Short Questions

1. What is second pendulum? Calculate its frequency and length.
2. What is the difference between free oscillations and forced oscillation?
3. What is difference between damped oscillations and un-damped oscillations?

Exercise Short Questions

4. Name two characteristics of simple harmonic motion.
5. Does frequency depend on amplitude for harmonic oscillations?
6. Can we realize an ideal simple pendulum?
7. What is the total distance travelled by an object moving with SHM in a time equal to its period, if its amplitude is A ?
8. What happens to the time period of the simple pendulum if its length is doubled? What happens if the suspended mass is doubled?
9. Does the acceleration of a simple harmonic oscillator remain constant during its motion? Is the acceleration ever zero? Explain?
10. Under what conditions does the addition of two simple harmonic motions produce a resultant, which is also simple harmonic?
11. Explain the relation between total energy, potential energy for a body oscillating with SHM?
12. Describe some common phenomenon in which the resonance plays an important role?
13. If a mass spring system is hung vertically and set into oscillation, why does motion eventually stop?

Long Questions

1. Derivation of (a) Instantaneous Velocity (ii) Instantaneous Acceleration
2. Simple Pendulum
3. Energy Conservation in SHM

Numerical Problem

Example: 7.2

Numerical: 7.3, 7.4, 7.5, 7.8

Chapter 08

Most Important Short Questions

1. What are the effects of pressure and density on speed of sound?
2. State the principle of super position. What are its different cases?
3. What are beats? Write its formula and uses.
4. Which is richer in harmonics? An open organ pipe or a closed organ pipe?
5. What do you mean by red shift and blue shift?

Exercise Short Questions

6. What features do longitudinal waves have common with transverse waves?
7. Is it possible for two identical waves travelling in the same direction along a string to give rise to a stationary wave?
8. A wave is produced along the stretched string but some of its particles permanently show zero displacement. What type of wave is it?
9. Explain the terms, crest, node and antinode.
10. Why does sound travel faster in solids than in gases?
11. How are beats useful in tuning musical instrument?
12. As a result of a distant explosion, an observer senses a ground tremor and then hears the explosion. Explain the time difference.
13. Explain why sound travels faster in warm air than in cold air.
14. How should a sound move with respect to an observer so that frequency of its sound does not change?

Long Questions

1. Speed of sound in air (Newton + Laplace Correction)
2. Effect of temperature on speed of sound
3. Stationary waves in stretched string
4. Stationary waves in air column
5. Doppler effect

Numerical Problem

Example: 8.1

Numerical: 8.1, 8.3, 8.4, 8.5



Chapter 09



Most Important Short Questions

1. **State Huygens's Principle.**
2. What are the conditions for detectable interference?
3. **Why central spot of Newton's rings is dark?**
4. Define Michelson's experiment. Write its uses.

Exercise Short Questions

5. **Under what conditions, the two sources of light behave as coherent sources?**
6. How is the distance between interference fringes affected by the separation between the slits of Young's experiment? Can fringe disappear?
7. **Can the visible light produce interference fringes? Explain.**
8. **Explain whether Young's experiment is an experiment for studying interference or diffraction effects of light.**
9. **An oil film spreading over a wet footpath shows colours? Explain how does it happen?**
10. Could you obtain Newton's rings with transmitted light? If yes, would the pattern be different from that obtained with reflected light?
11. **How would you manage to get more orders of spectra using grating?**
12. **Why Polaroid sunglasses are better than ordinary sun glasses?**
13. How would you distinguish between unpolarized and plane polarized light?

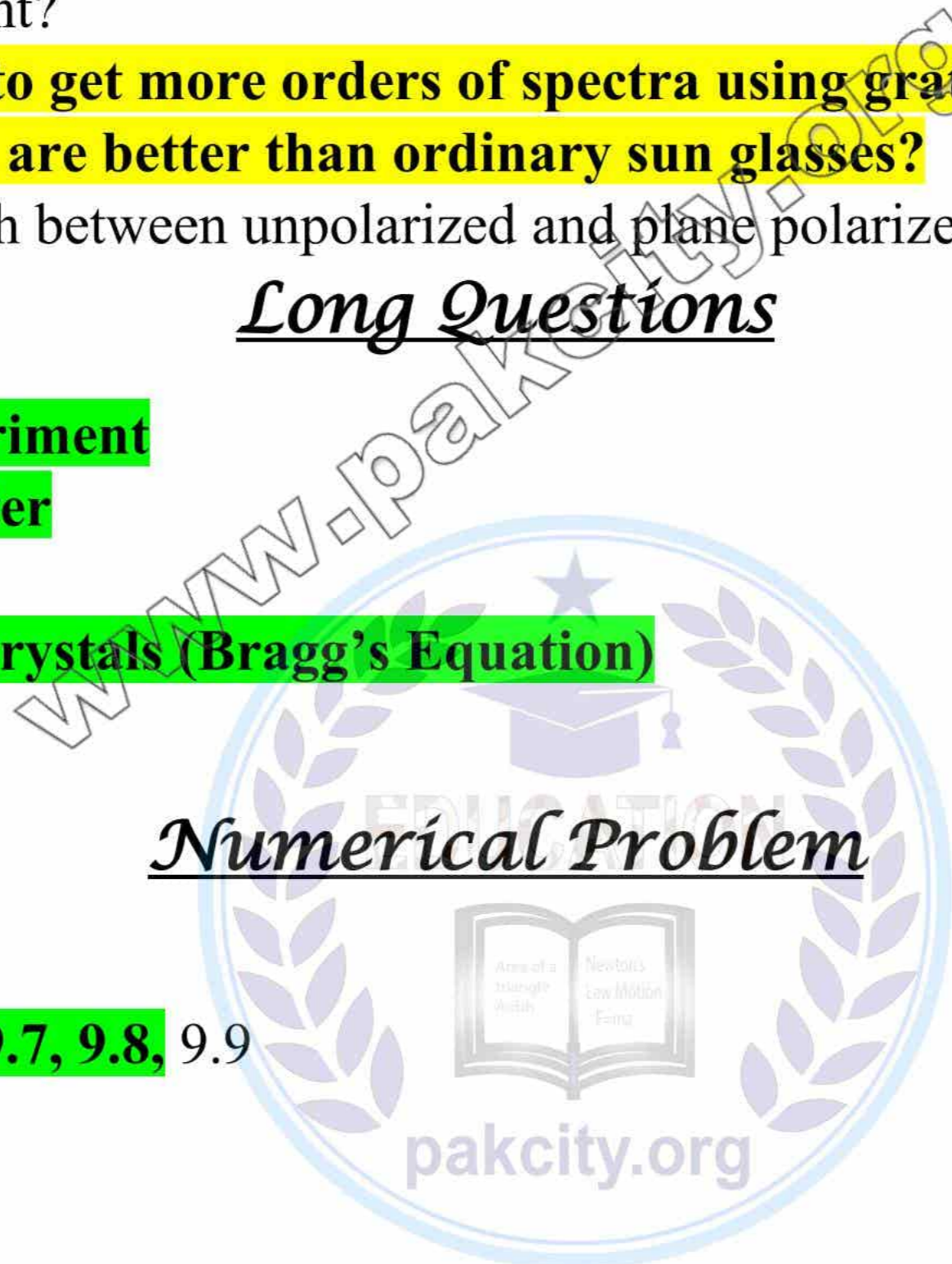
Long Questions

1. **Young's double slit experiment**
2. **Michelson's interferometer**
3. Diffraction grating
4. **Diffraction of x-rays by crystals (Bragg's Equation)**

Numerical Problem

Example: 9.3

Numerical: 9.3, 9.5, 9.6, 9.7, 9.8, 9.9



Chapter 10

Most Important Short Questions

1. What is least distance of distinct vision? Give its value.
2. Define spectrometer. Write its main path. Also write its uses.
3. Write function of collimator in spectrometer.
4. Define Total internal reflection. Write the conditions of total internal reflection.
5. What are the types of optical fibre? Explain.

Exercise Short Questions

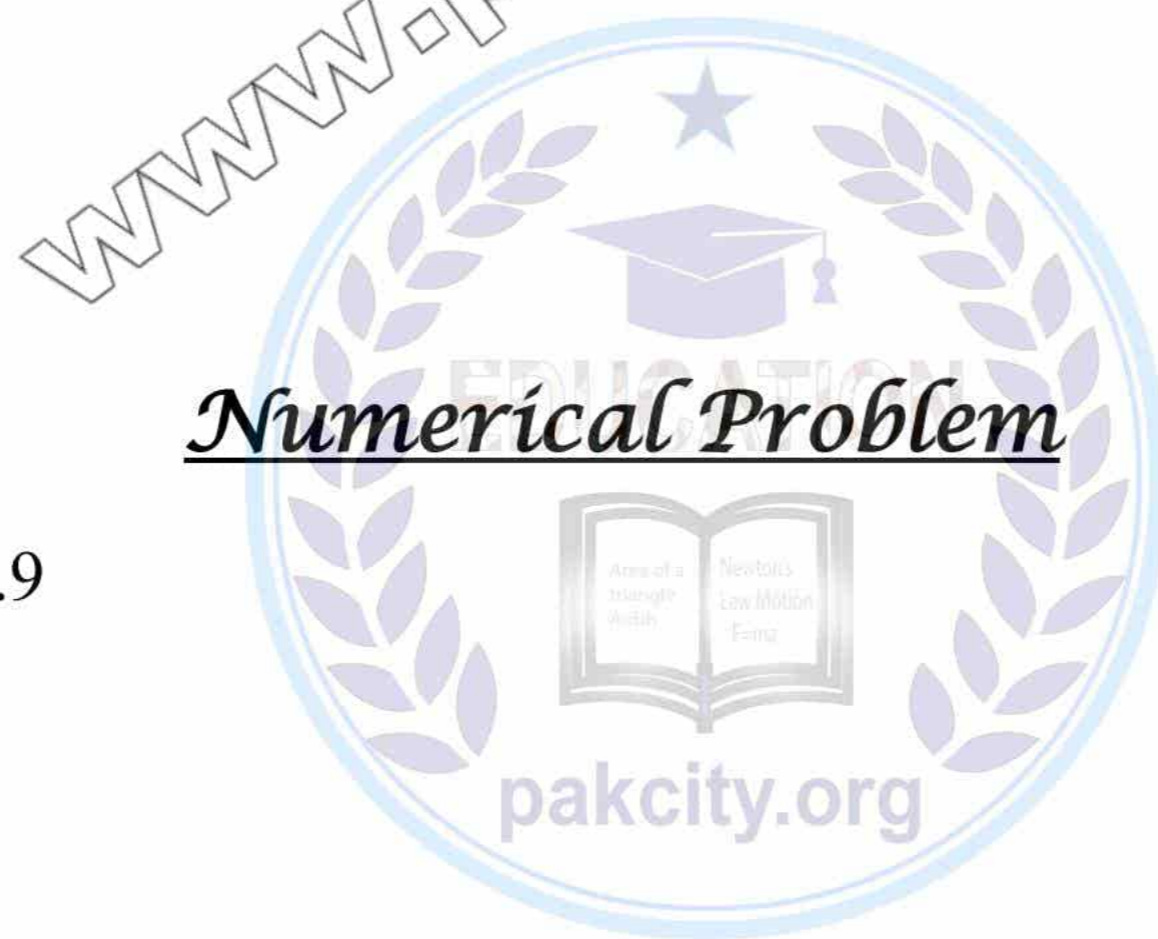
6. What do you understand by linear magnification and angular magnification? Explain how a convex lens is used as a magnifier?
7. Explain the difference between angular magnification and resolving power of an optical instrument. What limits the magnification of an optical instrument?
8. Why would it be advantage to use blue light with a compound microscope?
9. One can buy a cheap microscope for use by the children. The image seen in such a microscope have coloured edges, why is this so?
10. If a person were looking through a telescope at full moon, how would the appearance of the moon be changed by covering half of the objective lens.
11. A magnifying glass gives a five-times enlarged image at a distance of 25 cm from the lens. Find, by ray diagram, the focal length of the lens.
12. How the light signal is transmitted through the optical fibre?
13. How the power is lost in optical fibre through dispersion? Explain.

Long Questions

1. Simple microscope
2. Compound microscope
3. Telescope
4. Speed of light

Numerical Problem

Numerical: 10.3, 10.8, 10.9



Chapter 11



Most Important Short Questions

1. Define Boyle's law. How it can be derived the expression of gas.
2. Define Charles's law. How it can be derived the expression of gas.
3. State first law of thermodynamics and give its mathematical form.
4. What is difference between isothermal and adiabatic process?
5. Differentiate between reversible and irreversible process.
6. State second law of thermodynamics.
7. What is triple point of water?
8. Name the four strokes of petrol engine.
9. Why spark plug is not needed in a diesel engine?

Exercise Short Questions

10. Why the average velocity of the molecules in a gas container is zero but the average of the squares of velocities is not zero?
11. Why does the pressure of gas in a car tyre increases when it is driven through some distance?
12. Specific heat of a gas at constant pressure is greater than specific heat at constant volume. Why?
13. Give an example of a process in which no heat is transferred to or from the system but the temperature of the system changes.
14. Is it possible to convert internal energy into mechanical energy? Explain with an example.
15. Is it possible to construct a heat engine that will not expel heat into the atmosphere?
16. A thermos flask containing milk, as a system is shaken rapidly. Does the temperature of milk rise?
17. What happens to the temperature of the room? When an air conditioner is left running on a table in the middle of the room?
18. Can the mechanical energy be converted completely into heat energy? If so, give an example.
19. Does entropy of a system increase or decreases due to friction?
20. Give an example of a natural process that involves an increase in entropy?

Long Questions

1. Derivation of pressure of gas
2. Prove that $C_P - C_V = R$
3. Carnot Theorem and Carnot Engine
4. Petrol Engine

Numerical Problem

Example: 11.1, 11.4, 11.5

Numerical: 11.1, 11.7, 11.8, 11.9, 11.11

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