

I - YEAR PHYSICS**TOP 10 LAQ**

TOTAL MARKS: 2 x 8 = 16

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1. State and prove law of conservation of energy in case of freely falling body
 2. Develop the notions of work and kinetic energy and show that it leads to work - energy theorem Theorem.
 3. What are collisions? Explain the possible types of collisions? Develop the theory of one dimensional elastic collision.
 4. Show that the motion of a simple pendulum is simple harmonic and hence derive an equation for its time period. what is seconds pendulum?
 5. Define simple harmonic motion. show that the motion of (point) projection of a particles performing uniform circular motion, on any diameter, is simple harmonic.
 6. Derive the equation for the kinetic energy and potential energy of a simple harmonic oscillator and show that the total energy of a particle in simple harmonic motion is constant at any point on its path.
 7. Obtain an equation for the frequency of oscillation of spring of force constant k to which a mass m is attached.
 8. Explain reversible and irreversible process. describe the working of carnot engine. obtain as expression for the efficiency.
 9. State 2nd law of thermodynamics. How is heat engine different from a refrigerator.
 10. State the explain Newton's law of cooling. state the conditions under which Newton's law of cooling is applicable.

TOP SAQ**TOTAL MARKS: 6 x 4 = 24**

1. Show that the trajectory of an object thrown at a certain angle with the horizontal is a parabola.
2. State parallelogram law of vectors. derive an expression for the magnitude and direction of the resultant vector.

3. Explain the advantages and disadvantages of friction.
4. Mention the methods used to decrease friction.
5. State Newton's IInd law of motion. Hence derive equation of motion $F=ma$
6. Define the terms momentum and impulse. state and explain the law of conservation of momentum. Give example.

7. Distinguish between centre of mass and centre of gravity.
8. Define vector product. Explain the properties of a vector product with 2 examples.
9. Define angular velocity (ω). Derive $v=r\omega$

10. What is orbital velocity? Obtain an expression for it.
11. What is escape velocity? Obtain an expression for it.
12. What is a geostationary satellite ? State its uses.

13. Explain conduction, convection and radiation with examples.
14. In what way is the anomalous behaviour of water advantageous to aquatic animals?

15. Define strain energy and derive the equation for the same.
16. Describe the behaviour of a wire under gradually increasing load.

17. Write short notes on triple point of water ?
18. Explain qualitatively the working of a heat engine.

19. What is the ratio of r.m.s speed of Oxygen and Hydrogen molecules at the same temperature?
20. How specific heat capacity of mono atomic, diatomic and poly atomic gases can be explained on the basis of law of equipartition of energy?

TOP VSAQ

TOTAL MARKS: 8 x 2 = 16

1. What is the discovery of C.V. Raman?
2. What is the contribution of S. Chandra Sekhar to physics?
3. What are the fundamental forces in nature?
4. What is physics?

5. Distinguish between Accuracy and precision.
6. Distinguish between Fundamental units and derived units.
7. How can systematic errors be minimised or eliminated?
8. Why do we have different units for the same physical quantity?

9. If $\vec{A} = \vec{i} + \vec{j}$ what is the angle between vector \vec{A} with x-axis?
10. When two right angled vectors of magnitude 7 units and 24 units combine, what is the magnitude of their resultant?
11. Two forces of magnitudes 3 units and 5 units act at 60° with each other, what is the magnitude of their resultant ?
12. If $\vec{P} = 2\vec{i} + 4\vec{j} + 14\vec{k}$ and $\vec{Q} = 4\vec{i} + 4\vec{j} + 10\vec{k}$ find the magnitude of $\vec{P} + \vec{Q}$

13. When a Bullet is fired from a Gun, the Gun gives a kick in the backward direction. Explain.
14. If a bomb at rest explodes into two pieces, the pieces must travel in opposite directions. Explains.
15. Why does the car with a flattened tyre stop sooner than the one with inflated tyres?
16. A horse has to exert a greater force during the start of the motion than later. Explain
17. What is inertia? What gives the measure of inertia?

18. Why are drops and Bubbles spherical?
19. What is the principle behind the carburetor of an automobile?
20. Define Viscosity. What are it's units and dimensions?
21. What is angle of contact?
22. Give the expression for the excess pressure in a liquid drop.

23. Distinguish between heat and temperature.
24. Why gaps are left between rails on a railway track?
25. Ventilators are provided in rooms just below the roof. why?
26. The roof of buildings are often painted white during summer. why?
27. What is greenhouse effect? Explain global warming.
28. State the conditions under which Newton's law of cooling is applicable.
29. Can a substance contract on heating? Give an example.
30. What is latent heat of vapourisation?

31. State Boyle's law and charles law.
32. State Dalton's law of partial pressure.
33. Define mean free path.
34. When does a real gas behave like an ideal gas?
35. What is the expression between pressure and kinetic energy of a gas molecule?

36. Is it necessary that is mass should be present at centre of mass of any system?
37. By spinning egg on a table top, how will you distinguish a hard boiled egg from a raw egg?
38. Why ae spokes provided in a bicycle wheel?

TOP PROBLEMS

1. A car travels the first third of a distance with a speed of 10kmph, the second third at 20kmph and the last third at 60 Kmph. what is its mean speed over the entire distance?
2. A bullet moving with a speed of 150 ms^{-1} strikes a tree and penetrates 3.5 cm before stopping what is the magnitude of its retardation in the tree and the time taken for it to stop after striking the tree?
3. A ball is thrown vertically upwards with a velocity of 20 ms^{-1} from the top of a multistorey building. The height of the point from where the ball is thrown is 25.0m from the ground (a) How high will the ball rise? (b) How long will it be before the ball hits the ground. Take $g=10 \text{ ms}^{-2}$. [Actual value of 'g' is 9.8 ms^{-2}]
4. Show that the maximum height reached by a projectile launched at an angle 45° is one quarter of the range.
5. Two balls are projected from the same point in directions 30° and 60° with respect to the horizontal. what is the ratio of their velocities if they (a) Attain the same height ? (b) Have the same range?
6. Calculate the time needed for a net force of 5N to change the velocity of a 10g mass by 2 m/s
7. A force $2\vec{i} + \vec{j} - \vec{k}$ newton acts on a body which is initially at rest. At the end of 20 seconds. the velocity of the body is $4\vec{i} + 2\vec{j} - 2\vec{k} \text{ ms}^{-1}$. what is the mass of the body?
8. A machine gun fires 360 bullets per minute and each bullet travels with a velocity of 600 ms^{-1} if the mass of each bullet is 5gm, find the power of the machine - gun.
9. A pump is required to lift 600 kg of water required to per minute from a well of 25 m deep and to eject it with speed of 50 ms^{-1} . calculate the power required to perform the above task. ($g=10 \text{ ms}^{-2}$)
10. Find the torque of a force $7\vec{i} + 3\vec{j} - 5\vec{k}$ about the origin. The force acts on a particle whose position vector is $\vec{i} - \vec{j} + \vec{k}$
11. Find the excess pressure inside a soap bubble of radius 5mm whose surface tension is 0.04 N/m
12. Four molecules of a gas have speeds 1,2,3 and 4 km/s. Find the rms speed of the gas molecule.

VSAQ

SECTION - A

1.
 - (i) What is the discovery of C.V. Raman ?
 - (ii) What is the contribution of S. Chandra Sekhar to Physics?
 - (iii) What are the fundamental forces in nature ?
 - (iv) What is Physics ?

2.
 - (i) Distinguish between Accuracy and Precision.
 - (ii) Distinguish between fundamental units and derived units.
 - (iii) How can systematic errors be minimised or eliminated?
 - (iv) Why do we have different units for the same physical quantity ?
 - (v) What is dimensional analysis?

3.
 - (i) If $\vec{A} = \vec{i} + \vec{j}$ what is the angle between vector \vec{A} with x-axis?
 - (ii) When two right angled vectors of magnitude 7 units and 24 units combine, what is the magnitude of their resultant?
 - (iii) Two forces of magnitudes 3 units and 5 units act at 60° with each other, what is the magnitude of their resultant ?
 - (iv) If $\vec{P} = 2\vec{i} + 4\vec{j} + 14\vec{k}$ and $\vec{Q} = 4\vec{i} + 4\vec{j} + 10\vec{k}$ find the magnitude of $\vec{P} + \vec{Q}$
 - (v) What is the acceleration of a projectile at the top of its trajectory?
 - (vi) Define unit vector, Null vector and position vector.
 - (vii) How is average velocity different from instantaneous velocity?
 - (viii) The vertical components of a vector is equal to its horizontal component. What is the angle made by the vector with X-axis?
 - (ix) Give an example of a case, where the velocity of an object is zero, but its acceleration is not zero.

4.
 - (i) When a Bullet is fired from a Gun, the Gun gives a kick in the backward direction. Explain.
 - (ii) If a bomb at rest explodes into two pieces, the pieces must travel in opposite directions. Explain
 - (iii) Why does the car with a flattened tyre stop sooner than the one with inflated tyres?
 - (iv) A horse has to exert a greater force during the start of the motion than later. Explain.
 - (v) What happens to the coefficient of friction if weight of the body is doubled.
 - (vi) Why does a heavy rifle not recoil as strongly as a light rifle using the same cartridge?
 - (vii) Can the coefficient of friction be greater than one?
 - (viii) What is inertia ? What gives the measure of inertia?
 - (ix) Define force. What are the basic forces in nature?
 - (x) According to Newton's third law, every force is accompanied by an equal and opposite force. How can a movement ever take place ?

5.
 - (i) Is it necessary that a mass should be present at centre of mass of any system?
 - (ii) Why should a helicopter necessarily have two propellers?
 - (iii) We cannot open or close the door by applying force at hinges. why ?
 - (iv) By spinning eggs on a table top, How will you distinguish a hard boiled egg from a raw egg?
 - (v) Why are spokes provided in a bicycle wheel ?
 - (vi) Two rigid bodies have same moment of inertia about their axes of symmetry. Of the two,

which body will have greater kinetic energy?

(vii) Find the torque of a force $7\vec{i} + 3\vec{j} - 5\vec{k}$ about the origin. The force acts on a particle whose position vector is $\vec{i} - \vec{j} + \vec{k}$

6.
 - (i) Why drops and bubbles are spherical ?
 - (ii) Mention any two examples that obey Bernoulli's theorem and justify them.
 - (iii) When water flows through a pipe, which of the layers moves fastest and slowest ?
 - (iv) What are water proofing agent and water wetting agents ? What do they do?
 - (v) What is the principle behind the carburetor of an automobile?
 - (vi) Define Viscosity. What are its units and dimensions?
 - (vii) What is angle of contact?
 - (viii) What is Magnus effect?
 - (ix) Give the expression for the excess pressure in a liquid drop.
 - (x) Give the expression for the excess pressure in the soap bubble in air.
 - (xi) Give the expression for the excess pressure in an air bubble inside the liquid.

7.
 - (i) Distinguish between heat and temperature.
 - (ii) Why gaps are left between rails on a railway track?
 - (iii) Ventilators are provided in rooms just below the roof. why?
 - (iv) The roof of buildings are often painted white during summer. why?
 - (v) What is greenhouse effect? Explain global warming.
 - (vi) What are the lower and upper fixing points in Celsius and Fahrenheit scales?
 - (vii) State the conditions under which Newton's law of cooling is applicable.

8.
 - (i) What is specific gas constant? Is it same for all gases?
 - (ii) What are the units and dimensions of specific gas constant?
 - (iii) Can substance contract on heating? Give an example.
 - (iv) What is latent heat of vapourisation?
 - (v) Why do liquids have no linear and areal expansions?
 - (vi) Define absorptive power of a body. What is the absorptive power of a perfect blackbody.
 - (vii) Define Coefficient of thermal conductivity and temperature gradient.
 - (viii) Why utensils are coated black? Why the bottom of the utensils are made of copper?

9.
 - (i) Define specific heat capacity of the substance. On what factors does it depend?
 - (ii) Define molar specific heat capacity.
 - (iii) Why a heat engine with 100% efficiency can never be realised in practice?
 - (iv) How much will be the internal energy change in (a) Isothermal process (b) adiabatic process
 - (v) Can a room be cooled by leaving the door of an electric refrigerator open?
 - (vi) A thermos flask containing a liquid is shaken vigorously, what happens to its temperature?
 - (vii) In summer, when the valve of a bicycle tube is opened, the escaping air appears cold.
 - (viii) What thermodynamic variables can be defined by (a) Zeroth law (b) First law?
 - (viii) Define thermal equilibrium. How does it lead to Zeroth law of thermodynamics?

10.
 - (i) State Boyle's law and Charles law.
 - (ii) State Dalton's law of partial pressures.
 - (iii) Define mean free path.
 - (iv) When does a real gas behave like an ideal gas?
 - (v) What is the expression between pressure and kinetic energy of a gas molecule?
 - (vi) Pressure of an ideal gas in container is independent of shape of the container- explain
 - (vii) The absolute temperature of a gas is increased 3 times. what will be the increase in rms velocity of the gas molecule?

S A Q

SECTION - B

11. (i) Show that the trajectory of an object at a certain angle with the horizontal is a parabola.
 (ii) State parallelogram law of vectors. Derive an expression for the magnitude and direction of the resultant vector.
 (iii) Show that maximum height and range of projectile are $\frac{u^2 \sin^2 \theta}{2g}$, $\frac{u^2 \sin 2\theta}{g}$ respectively when the terms have their regular meaning.
 (iv) If θ is angle of projection, R the range, h the maximum height, T the time of flight then show that (a) $\tan \theta = \frac{4h}{R}$ (b) $h = \frac{gT^2}{8}$
 (v) A force $2\vec{i} + \vec{j} - \vec{k}$ newton acts on a body which is initially at rest. At the end of 20 seconds, the velocity of the body is $4\vec{i} + 2\vec{j} - 2\vec{k}$ ms⁻¹. What is the mass of the body ?
12. (i) Show that the maximum height reached by a projectile launched at an angle 45° is one quarter of the range.
 (ii) A car travels the first third of a distance with a speed of 10kmph, the second third at 20kmph and the last third at 60 kmph. What is the mean speed over the entire distance?
 (iii) A ball is thrown vertically upwards with a velocity of 20 ms⁻¹ from the top of a multistorey building. The height of the point from where the ball is thrown is 25.0m from the ground.
 (a) How high will the ball rise? (b) How long will it be before the ball hits the ground.
 Take $g = 10 \text{ ms}^{-2}$ [Actual value of 'g' is 9.8 ms⁻²]
 (iv) Two balls are projected from the same point in directions 30° and 60° with respect to the horizontal. What is the ratio of their initial velocities if they (a) attain the same height ?
 (b) have the same range?
 (v) A bullet moving with a speed of 150 ms⁻¹ strikes a tree and penetrates 3.5 cm before stopping. What is the magnitude of its retardation in the tree and the time taken for it to stop after striking the tree ?
13. (i) Explain the advantages and disadvantages of friction
 (ii) Mention the methods used to decrease friction.
 (iii) State the laws of rolling friction.
 (iv) Why is pulling the lawn roller preferred to pushing it?
 (v) Why are shock absorbers used in motor - cycles and cars?
 (vi) State Newton's IInd law of motion. Hence derive equation of motion $F=ma$.
 (vii) Define the terms momentum and impulse. State and explain the law of conservation of momentum. Give example.
14. (i) Distinguish between centre of mass and centre of gravity.
 (ii) Define vector product. Explain the properties of a vector product with 2 examples.
 (iii) Define angular velocity (ω), Derive $v = r\omega$
 (iv) State and prove parallel axes theorem.
 (v) State and prove perpendicular axes theorem
 (vi) State and prove of conservation of angular momentum with examples.
 (vii) Define Angular acceleration and Torque. Establish the relation between angular acceleration and Torque.

15. (i) What is orbital velocity? Obtain an expression for it.
(ii) What is escape velocity? Obtain an expression for it.
(iii) What is a geostationary satellite? State its uses.
(iv) State Kepler's Laws of Planetary motion.
(v) Derive the relation between acceleration due to gravity (g) at the surface of a planet and gravitational constant (G).
(vi) Derive an expression for the variation of acceleration due to gravity (a) above and (b) below the surface of the Earth.
16. (i) Define strain energy and derive the equation for the same.
(ii) Explain the concept of Elastic potential energy in a stretched wire and hence obtain the expression for it.
(iii) Define modulus of elasticity, stress strain and poisson's ratio.
(iv) Describe the behaviour of a wire under gradually increasing load.
(v) Define Hooke's Law of elasticity, proportionality limit, permanent set and breaking stress.
(vi) Define hydraulic lift and hydraulic brakes.
(vii) Explain dynamic lift with example.
(viii) Explain surface tension and surface energy
(ix) What is Venturimeter ? Explain how it is used.
17. (i) Explain conduction, convection and radiation with examples.
(ii) In what way is the anomalous behaviour of water advantageous to aquatic animals?
(iii) Explain Celsius and Fahrenheit scales of temperature. Obtain the relation between Celsius and Fahrenheit scales of temperature.
(iv) State Boyle's law and Charles's law. Hence derive ideal gas equation. Which of the two laws is better for the purpose of thermometry and why?
(v) Explain thermal conductivity and Coefficient of thermal conductivity.
18. (i) Write short notes on triple point of water ?
(ii) Explain qualitatively the working of a heat engine.
(iii) Compare isothermal and an adiabatic process.
(iv) 4 molecules of a gas have speeds 1,2,3 & 4 km/s. Find rms speed of the gas molecule.
(v) How specific heat capacity of mono atomic, diatomic and poly atomic gases can be explained on the basis of law of equipartition of energy ?
(vi) Derive a relation between the two specific heat capacities of gas on the basis of first law of thermodynamics.
(vii) What is the ratio of r.m.s speed of Oxygen & hydrogen molecules at the same temperature?

LAQ**SECTION - C**

19. (i) State and prove law of conservation of energy in case of freely falling body.
(ii) Develop the notions of work and kinetic energy and Show that it leads to work - energy theorem.
(iii) What are collisions? Explain the possible types of collision? Develop the theory of one dimensional elastic collision.
20. (i) Show that the motion of a simple pendulum is simple harmonic and hence derive an equation for its time period. What is seconds pendulum?
(ii) Define simple harmonic motion. Show that the motion of (point) projection of a particle performing uniform circular motion, on any diameter, is simple harmonic.
(iii) Derive the equation for the kinetic energy and potential energy of a simple harmonic oscillator and show that the total energy of a particle in simple harmonic motion is constant at any point on its path.
(iv) Obtain an equation for the frequency of oscillation of spring of force constant K to which a mass m is attached.
21. (i) Explain reversible and irreversible processes. describe the working of carnot engine. Obtain an expression for the efficiency.
(ii) State 2nd law of thermodynamics. How is heat engine different from a refrigerator.
(iii) State and explain Newton's law of cooling. State the conditions under which Newton's law of cooling is applicable.
A body cools down from 60°C to 50°C in 5 minutes and 40°C in another 8 minutes. Find the temperature of the surrounding.
(iv) Obtain an expression for the work done by an ideal gas during isothermal change.
(v) Obtain an expression for the work done by an ideal gas during adiabatic change and explain.

GUESS PAPER - 1

Junior. PHYSICS

SECTION - A

I. Answer ALL questions :

[10 x 2 = 20]

1. What is the discovery of C.V. Raman?
2. Distinguish between Fundamental units and derived units.
3. When two right angled vectors of magnitude 7 units and 24 units combine, what is the magnitude of their resultant?
4. If a bomb at rest explodes into two pieces, the pieces must travel in opposite directions. Explain.
5. Find the torque of a force $7\vec{i} + 3\vec{j} - 5\vec{k}$ about the origin. The force acts on a particle whose position vector is $\vec{i} - \vec{j} + \vec{k}$
6. What is angle of contact?
7. Can a substance contract on heating? Give an example.
8. The roof of buildings are often painted white during summer. why?
9. Define specific heat capacity of the substance. ON what factors does it depend?
10. State Dalton's law of partial pressures.

SECTION - B

II. Answer any SIX of the following Questions :

[6 x 4 = 24]

11. Show that the trajectory of an object at a certain angle with the horizontal is a parabola.
12. A car travels the first third of a distance with a speed of 10kmph, the second third at 20kmph and the last third at 60 kmph. What is the mean speed over the entire distance?
13. State Newton's IInd law of motion. Hence derive equation of motion $F=ma$.
14. Define vector product. Explain the properties of a vector product with 2 examples.
15. What is a geostationary satellite? State its uses.
16. Describe the behaviour of a wire under gradually increasing load.
17. Explain Celsius and Fahrenheit scales of temperature. Obtain the relation between Celsius and Fahrenheit scales of temperature.
18. 4 molecules of a gas have speeds 1,2,3 & 4 km/s. Find rms speed of the gas molecule.

SECTION - C

III. Answer any Two of the following Questions :

[2 x 8 = 16]

19. State and prove law of conservation of energy in case of freely falling body. A machine gun fires 360 bullets per minute and each bullet travels with a velocity of 600 ms^{-1} if the mass of each bullet is 5gm, find the power of the machine - gun.
20. Define simple harmonic motion. Show that the motion of (point) projection of a particle performing uniform circular motion, on any diameter, is simple harmonic.
21. Explain reversible and irreversible processes. describe the working of Carnot engine. Obtain an expression for the efficiency.

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GUESS PAPER - 2

Junior. PHYSICS

SECTION - A

I. Answer ALL questions :

[10 x 2 = 20]

1. What are the fundamental forces in nature?
2. Distinguish between Accuracy and precision.
3. Two forces of magnitudes 3 units and 5 units act at 60° with each other, what is the magnitude of their resultant ?
4. A horse has to exert a greater force during the start of the motion than later. Explain
5. We cannot open and close the door by applying force at hinges. why
6. Define Viscosity. What are it's units and dimensions?
7. Why gaps are left between rails on a railway track?
8. What is greenhouse effect? Explain global warming.
9. Can a room be cooled by leaving the door of an electric refrigerator open?
10. When does a real gas behave like an ideal gas?

SECTION - B

II. Answer any SIX of the following Questions :

[6 x 4 = 24]

11. State parallelogram law of vectors. Derive an expression for the magnitude and direction of the resultant vector.
12. Show that the maximum height reached by a projectile launched at an angle 45° is one quarter of the range.
13. Why is pulling the lawn roller preferred to pushing it?
14. State and prove perpendicular axes theorem.
15. What is escape velocity? Obtain an expression for it.
16. Explain surface tension and surface energy
17. In what way is the anomalous behaviour of water advantageous to aquatic animals?
18. Write short notes on triple point of water ?

SECTION - C

III. Answer any Two of the following Questions :

[2 x 8 = 16]

19. Develop the notions of work and kinetic energy and Show that it leads to work - energy theorem. A pump is required to lift 600 kg of water required to per minute from a well of 25 m deep and to eject it with speed of 50 ms^{-1} . calculate the power required to perform the above task. ($g=10 \text{ ms}^{-2}$)
20. Show that the motion of a simple pendulum is simple harmonic and hence derive an equation for its time period. What is seconds pendulum?
21. State and explain Newtons' law of cooling. State the conditions under which Newton's law of cooling is applicable. A body cools down from 60°C to 50°C in 5 minutes and 40°C in another 8 minutes. Find the temperature of the surrounding.

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GUESS PAPER - 3

JUNIOR. PHYSICS

SECTION - A

I. Answer ALL questions :

[10 x 2 = 20]

1. What is the contribution of S. Chandra Sekhar to Physics?
2. How can systematic errors be minimised or eliminated?
3. If $\vec{A} = \vec{i} + \vec{j}$ what is the angle between vector \vec{A} with x-axis?
4. What happens to the coefficient of friction if weight of the body is doubled.
5. Is it necessary that a mass should be present at centre of mass of any system?
6. Why drops and bubbles are spherical ?
7. What is the principle behind the carburetor of an automobile?
8. What is greenhouse effect? Explain global warming.
9. State Newton's law of cooling.
10. State Boyle's law and Charles law.

SECTION - B

II. Answer any SIX of the following Questions :

[6 x 4 = 24]

11. A bullet moving with a speed of 150 ms^{-1} strikes a tree and penetrates 3.5 cm before stopping. What is the magnitude of its retardation in the tree and the time taken for it to stop after striking the tree ?
12. Show that maximum height and range of projectile are $\frac{u^2 \sin^2 \theta}{2g}$, $\frac{u^2 \sin 2\theta}{g}$ respectively when the terms have their regular meaning.
13. Mention the methods used to decrease friction.
14. Distinguish between centre of mass and centre of gravity.
15. What is orbital velocity? Obtain an expression for it.
16. In what way is the anomalous behaviour of water advantageous to aquatic animals?
17. Define strain energy and derive the equation for the same.
18. How specific heat capacity of mono atomic, diatomic and poly atomic gases can be explained on the basis of law of equipartition of energy?

SECTION - C

III. Answer any Two of the following Questions :

[2 x 8 = 16]

19. What are collisions? Explain the possible types of collision? Develop the theory of one dimensional elastic collision.
20. a) Show that the motion of a simple pendulum is simple harmonic and hence derive an equation for its time period. What is seconds pendulum?
b) What is the length of a simple pendulum, which ticks seconds?
21. State 2nd law of thermodynamics. How is heat engine different from a refrigerator.

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