ANNUAL INTENSIVE TEST SERIES
PHYSICS - UNIT 1 (A)

Answer any 4 questions from 1 to 5. Each carry 1 score.

1. The weakest force in nature is...............
2. The dimensions of torque is...............
3. Define instantaneous velocity.
4. Identify the scalar quantity from the following.
   a) momentum   b) work   c) torque   d) acceleration
5. Give an example of negative work.

Answer any 4 questions from 6 to 10. Each carry 2 score.

6. Is it possible for a body to have acceleration without velocity? Explain.
7. Find whether the given vectors 2i+3j+4k and 4i+6j+8k are parallel or not.
8. The error in the measurement of radius of a circle is 0.6% .Find the percentage error in the calculation of the area of the circle.
9. A stone is dropped from a height 'h'. Arrive at an expression for the velocity with which it hits the ground.
10. Why are passengers thrown forward when a speeding bus stops suddenly?

Answer any 3 questions from 11 to 14. Each carry 3 score.

11. The correctness of an equation can be checked using principle of homogeneity.
    a) State principle of homogeneity.
    b) Using this principle, check whether the following equation is dimensionally correct.
    $1/2 \, mv^2 = mgh$
12. a) The area under velocity – time graph gives ....
    b) Draw velocity – time graph of a body thrown vertically upwards.
13. a) State law of conservation of linear momentum.
    b) Arrive at an expression fore coil velocity of a gun.
14. a) What do you mean by centripetal acceleration?
    b) derive expression for centripetal acceleration.

Answer any 1 of the following (4 marks)..

15. A stone is thrown upwards from a moving train.

a) Name the path followed by the stone.
b) A particle is projected with an initial velocity u in the direction making an angle θ with the horizontal. Find
    i) time of flight   and   ii) Maximum height
16. a) A circular track of radius 400m is kept with outer edge raised to make 5 degrees with the horizontal.
    a) What do you call this this type of construction of tracks?
    b) Obtain an expression for the maximum permissible speed considering the force of friction.

ANNUAL INTENSIVE TEST SERIES
PHYSICS - UNIT 1 (B)

Answer any 4 questions from 1 to 5. Each carry 1 score.

1. Which is the strongest force in nature?
2. The dimensions of angular momentum is ....
3. The speedometer of a car gives ....
4. 1 light year = ...m
5. The slope of position-time graph of a particle gives ....

Answer any 4 questions from 6 to 10. Each carry 2 score.

6. Distinguish between average velocity and instantaneous velocity.
7. A car travels from A to B with a speed of 40 km/hr and returns to A with a speed of 60 km/hr. What is its average speed?
8. A ball trapped in a circular path of radius 10 cm moves steadily and completes 10 revolutions in 100 seconds. What is its angular velocity?
9. Write the reasons for the following.
   a) Action and reaction are equal and opposite. Yet they do not cancel each other.
   b) A cricketer moves his hands backwards while taking a catch.
10. Derive the expression for the optimum velocity of a car on a circular level road.

Answer any 3 questions from 11 to 14. Each carry 3 score.

11. a) State principle of homogeneity.
    b) Arrive at an expression for centripetal force f on a body of mass m moving along a circular path of radius r with speed v.
12. According to Newtons law of motion the force depends on the rate of change of momentum.
    a) Name the law that helps to measure force.
    b) Using the above law, deduce an expression for force.
13. A body of mass m is placed on a lift. Find its weight if the lift is
    a) moving up with an acceleration 'a'
    b) moving down with an acceleration 'a'
14. The figure shows the position – time graph of a body moving along a straight line.

    (1+2)
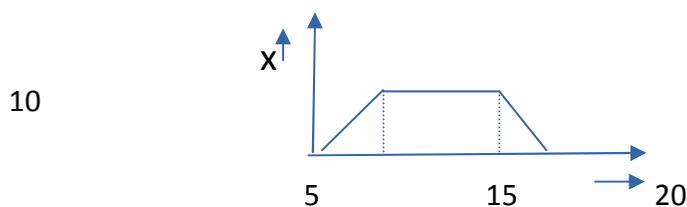
a) Draw the velocity- time graph of the body.
b) From the graph, find the displacement in 20 seconds.

Answer any 1 of the following . (4 marks).

15. a) Draw the velocity- time graph of a body moving with a uniform acceleration and initial velocity v_0.
    b) Using the above graph obtain the equation for displacement in time t.
16. Parallelogram law helps to find magnitude and direction of the resultant of two forces: a) State the law.
    b) Arrive at an expression for the magnitude of resultant of two vectors.

ANNUAL INTENSIVE TEST SERIES
PHYSICS - UNIT II (A)

Answer any 4 questions from 1 to 5. Each carry 1 score.

1. Give an example of negative work.
2. State work-energy theorem.
3. The turning effect of force is.........
4. State Kepler's law of areas.
5. Define angle of contact.

Answer any 4 questions from 6 to 10. Each carry 2 score.

6. A body is lifted from ground to a height h. Name the energy possessed by the body at maximum height and write the expression for it.
7. State and prove law of conservation of angular momentum.
8. Show that escape velocity = $\sqrt{2}$ x orbital velocity.
9. Calculate the stress developed in a metal wire when it is strained by 30%. Given Young's modulus of the material is 200 Gpa.
10. The excess pressure inside a liquid drop is 60 N/m^2. What will be the excess pressure inside a liquid bubble of the same radius formed by the same liquid.

Answer any 3 questions from 11 to 14. Each carry 3 score.

11. a) What is escape velocity.
    b) The moon doesn't have an atmosphere around it. Give reason.
12. a) A stone is tied on a string and whirled round a circular path. What is its moment of inertia.
    b) If L is the angular momentum and 'τ' is the torque, show that τ = dL/dt
13. a) What is stokes law?
    b) Obtain an expression for the terminal velocity attained by a body falling through a viscous medium.
14. a) State the law associated with liquid pressure.
    b) Explain the working of hydraulic lift.

Answer any 1 of the following .

15. a) State law of conservation of mechanical energy.
    b) Prove law of conservation of mechanical energy for a freely falling body.
16. a) State Bernoullis principle.
    b) By using the above principle arrive at Torricellis equation.

ANNUAL INTENSIVE TEST SERIES
PHYSICS - UNIT II (B)

Answer any 4 questions from 1 to 5. Each carry 1 score.

1. A man brings down a body from a height to the ground. The work done by him is......

2. The quantity which is conserved in both elastic and inelastic collision is............

3. What is radius of gyration?

4. The ratio of shear stress to shear strain is ....

5. Pick the odd one out of the following.

    a) Aerofoil   b) Atomiser   c) Hydraulic lift   d) Venturimeter

Answer any 4 questions from 6 to 10. Each carry 2 score.

6. A car is moving with a constant velocity on a straight line.
    a) What is the net work done by the external force on the car.
    b) State work-energy theorem.

7. How will you distinguish a hardboiled egg and a raw egg by spinning each on a table top?

8. What will happen to acceleration due to gravity
    i) if the earth stops rotating.
    ii) if the rotational speed is increased.

9. If the Young's moduli of iron and glass are 190×10^9 Nm^{-2} and 60×10^9 Nm^{-2} respectively. Which is more elastic. Justify your answer.

10. Define angle of contact. What is its value for pure water with glass.

Answer any 3 questions from 11 to 14. Each carry 3 score.

11. a) Define acceleration due to gravity.
    b) Derive an expression for the variation of 'g' with height 'h' above the surface of the earth.

12. a) What is rolling motion?
    b) Arrive at an expression for rolling kinetic energy.

13. Draw the stress-strain graph of a loading wire and mark the following points.
    i) Elastic limit   ii) Elastic region   iii) Plastic region iv) Fracture point

14. State and prove Bernoullis principle.

Answer any 1 of the following. (4 marks).

15. a) State parallel axes theorem.
    b) The moment of inertia of a ring about its diameter is......
    c) Find the moment of inertia of a ring about a tangential axis parallel to its diameter.

16. a) What do you mean by surface tension.
    b) Draw a figure and derive an equation for capillary rise in a tube of radius 'r'.

ANNUAL INTENSIVE TEST SERIES
PHYSICS - UNIT III (A)

Answer any 4 questions from 1 to 5. Each carry 1 score.

1. Triple point of water is 0.01^0C.Express this temperature in Kelvin scale.
2. Define mean free path.
3. Define coefficient of thermal expansion.
4. The quantity which is constant in an adiabatic process is..........
5. What are damped oscillations?

Answer any 4 questions from 6 to 10. Each carry 2 score.

6. What is anomalous expansion of water?
7. A steel beam of lenth 5m is kept at a temperature of 20^0C. On a hot day, the temperature rises to 40^0C. What is the change in length due to thermal expansion. ($\alpha_l = 1.2 \times 10^{-5}/^0$C)
8. Explain isobaric process and isothermal process.
9. Write any four postulates of kinetic theory of gases.
10. Distinguish between longitudinal waves and transverse waves.

Answer any 3 questions from 11 to 14. Each carry 3 score.

11. Arrive at an expression for the work done in an isothermal process.
12. Derive an expression for pressure of an ideal gas.
13. a) What do you mean by simple harmonic motion?
    b) Derive an expression for period of oscillation of a loaded spring.
14. A transverse harmonic wave on a string is described by   (Score 1½ +1½
    $y = 3.0 \sin(36t+0.18x+\pi/4)$, where x and y are cm and t in seconds.
    a) Is it a travelling or stationary wave? Why?
    b) What are its amplitude and frequency?

Answer any 1 of the following. (4 marks).

15. a) Draw Carnot cycle and write the four processes in carnot engine.
    b) Derive an expression for the efficiency of a heat engine.
16. a) Show that for a pipe closed at one end , the frequencies are in the ratio v1:v2:v3 = 1:2:3.
    b) open pipes are preferred to closed pipes in musical instruments. Why?

HSE-I

TRIUMPH

Time : 1 Hour

Marks: 25

ANNUAL INTENSIVE TEST SERIES
PHYSICS - UNIT III (B)

Answer any 4 questions from 1 to 5. Each carry 1 score.

1. What is conduction?
2. Name the process in which PV^γ = constant.
3. Write the ideal gas equation.
4. Give an example of SHM.
5. What is thermal conductivity coefficient?

Answer any 4 questions from 6 to 10. Each carry 2 score.

6. Aquatic animals are protected in cold countries as ice is formed on the surface of river. How?
7. Invar is used for making pendulum clocks. Why?
8. A carnot engine is working between temperatures of 27^0C and 327^0C. Find its efficiency.
9. Show graphically the variation of potential energy and kinetic energy with displacement in SHM.
10. Mention four characteristics of transverse waves.

Answer any 3 questions from 11 to 14. Each carry 3 score.

11. What is adiabatic process. Derive an expression for the work done in an adiabatic process.
12. a) State law of equipartition of energy.
    b) Derive Newton-Laplace equation.
13. a) What happens to internal energy of a gas during
    i) isothermal expansion.
    ii) adiabatic expansion.
    b) Gases have two specific heat capacities Cp and Cv. Why?
14. A sound travelling along a string is described by y = 0.005 sin (80.0x-3.0 t). calculate i) amplitude ii) wavelength iii) velocity

Answer any 1 of the following (4 marks).

15. Heat engine is a device which converts heat energy in to mechanical energy.
    a)   Draw the schematic diagram of a heat engine.
    b)   Derive expression for the efficiency of a carnot engine.   (1+3)
16. A student plucks at the centre of a stretched string and observes the wave pattern produced.

    a) What type wave is produced in the string?
    b) Plot the different modes of vibration in a stretched string.