DEHRADUN PUBLIC SCHOOL
ASSIGNMENT (2023-24)
SUBJECT - PHYSICS (042)
CLASS - XI

CHAPTER – 2 (UNITS AND MEASUREMENTS)

Multiple choice questions:

Q1. Which one of the following has the same dimensions in length as Planck's constant?

a. Coefficient of viscosity b. Rate of flow c. Pressure gradient d. Torque

Q2. Which two of the following quantities are dimensionally equivalent:

a. Force b. Pressure c. Young's Modulus d. Energy

Q3. Which among the following quantity has unit but no dimension:

a. angle b. stress c. relative velocity d. relative density

Assertion - Reason type questions:

Directions: In each of the following questions, a statement of **Assertion (A)** is followed by a statement of **Reason (R).** While answering a question, choose the correct one and mark it as

a. If both **Assertion (A)** and **Reason (R)** are true and Reason (R) is the correct explanation of Assertion.

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c. If **Assertion (A)** is true and **Reason (R)** is false.

d. If both **Assertion (A)** and **Reason (R)** are false.

Q4. **Assertion :** Specific gravity of a fluid is a dimensionless quantity.

Reason : It is the ratio of density of the fluid to the density of water.

Q5. **Assertion :** When we change the unit of measurement of quantity, its numerical value changes.

Reason : Smaller the unit of measurement smaller is its numerical value

Subjective type questions.

Q6. Check the correctness of the equation FS = $\frac{1}{2}mv^2 - \frac{1}{2}mu^2$ where F is the force acting on body, m is mass of the body, S is the distance travelled when velocity changes from u to v.

Q7. Assuming that the mass m of the largest stone that can be moved by a flowing river depends on velocity v, the density d and acceleration due to gravity g, show that m varies directly as the sixth power of velocity of flow.

Q8. Check the dimensional consistency of the equation escape velocity v = $\sqrt{\frac{2GM}{R}}$ where G is Gravitational constant, M is mass of satellite and R is radius of circular orbit.

Q9. Write four limitations of dimensional analysis.

Q10. Read the following passage and answer the questions that follow:

CASE STUDY

A physical equation must be dimensionally homogeneous. This is called as principle of homogeneity of dimensions. According to this principle, only that formula is correct, in which the dimensions of various terms on one side of the relation are equal in the respective dimensions of these terms on the other side of the relation. The principle of homogeneity of dimensions is used to check the correctness of a physical equation and to obtain the relationship among various physical quantities involved in a physical relation.This principle can also be employed to find the dimensions of an unknown quantity in a given relation if the dimensions of all other quantities are known.

i. The distance travelled by a body in nth second is given by $S_{nth} = u + \frac{a}{2}(2n - 1)$ where u is the initial velocity and a is acceleration. The dimensions of S_{nth} are

a. L b. LT^{-1} c. LT^{-2} d. L^{-1} T.

ii. Power P is related to distance x and time t as

$V = \frac{b - x^2}{at}$

The dimensional formula of b is

a. $[M^0LT^{-2}]$ b. $[M^0L^2T^2]$ c. $[M^0L^2T^{-2}]$ d. $[M^0L^2T^0]$

iii. The wavelength associated with a particle of mass m and moving with velocity *v* given by $\lambda = \frac{h}{mv}$, where h is Plank's constant. The dimensional formula for h is

a. $[ML^2T]$ b. $[ML^{-1}T^{-1}]$ c. $[ML^2T^{-1}]$ d. $[MLT^{-1}]$

iv. Force (F), distance (x) and time (t) are related as F = $a\sqrt{x}$ + bt^2. The dimensions of (a/b) are

a. $[M^0L^{1/2}T^{1/2}]$ b. $[M^0L^{-1/2}T^2]$ c. $[M^0L^2T^{-1}]$ d. $[MLT^{-1/2}]$

CHAPTER - 3 (MOTION IN A STRAIGHT LINE)

Multiple choice questions:

Q1. A body moves with uniform velocity, its acceleration is:

a. Zero b. Finite c. Infinite d. Negative

Q2. An automobile traveling with a speed of 60 km / hr can brake to stop within a distance Of 20 m. If the car is going twice as fast, i.e., 120 km / hr, the stopping distance will be:

a. 20m b. 40m c. 60m d. 80m

Q3. If the displacement of a body is proportional to square of time then:

a. The body moves with uniform velocity.
b. The body moves with uniform acceleration.
c. The body moves with increasing acceleration.
d. The body moves with decreasing acceleration.

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d. If both **Assertion (A)** and **Reason (R)** are false.

Q4. Assertion : The average velocity of the object over an interval of time is either smaller than or equal to the average speed of the object over the same interval.

Reason : Velocity is a vector quantity and speed is a scalar quantity.

Q5. Assertion : A body can have acceleration even if the velocity is zero at that instant of time.

Reason : The body will be momentarily at rest when it reverses its direction of motion.

Subjective type questions.

Q6. A ball is thrown vertically upwards. Draw the velocity –time curve.

Q7. If the instantaneous velocity of a particle is zero, will its instantaneous acceleration be necessarily zero?

Q8. Derive the relation analytically for uniformly accelerated motion along a straight line $S = ut + 1/2\ at^2$ where symbols have their usual meaning.

Q9. A car moving along a straight highway with a speed of 72 km/h is brought to a stop within the distance of 100 m. What is the retardation of the car and how long does it take for the car to stop?

Q10. Read the following passage and answer the questions that follows:

CASE STUDY

The average velocity tells us how fast an object has been moving over a given time interval but does not tell us how fast it moves at different instants of time during that interval. For this, we define instantaneous speed. It is the rate of change of distance with respect to time v=ds/dt .Instantaneous speed is always greater than or equal to zero and is a scalar quantity.

i. Displacement of an object depends upon time as $x = 4t^2 - 3t + 1$, its velocity at time 2 second is

a. 17m/s b. 13m/s c. 20m/s d. 30m/s

ii. If an object is moving in a uniform motion then

a. Its average velocity is constant but its instantaneous velocity is variable.
b. Its average velocity as well as instantaneous velocity is constant
c. Its average velocity and instantaneous velocity both are variable.
d. Its average velocity is variable but its instantaneous velocity is constant.

iii. An object starts from rest moving with an acceleration a = 2t, then its instantaneous velocity is

a. $V = 4t^2$ b. $V = 4t^2 + 2$ c. $V = 2t^2$ d. $V = t^2$

iv. The distance travelled by a particle moving along a straight line is given by $x = 4t + 5t^2 + 6t^3$ meter. The initial velocity of the particle is

a. 4 m/s b. 10 m/s c. 18 m/s d. 14 m/s

CHAPTER – 4 (MOTION IN A PLANE)

Multiple choice questions:

Q1. A boat moves from a point $A(4\hat{i}+5\hat{j})$ to another point across the river. The new position of the boat is given by $B(-7\hat{i}-9\hat{j})$. The displacement vector is given by.

a. $11\hat{i} + 14\hat{j}$ b. $-11\hat{i} - 14\hat{j}$ c. $-11\hat{i} + 14\hat{j}$ d. $11\hat{i} - 14\hat{j}$

Q2. A body is projected horizontally from a point above the ground. The motion of the body is given by the equations $x = 2t$ and $y = 5t^2$ where x and y are horizontal and vertical displacements in m at time t. The trajectory of the body is.

a. a straight line b. a circle c. an ellipse d. a parabola

Q3. Scalar is specified by number and units. Here the number represents its

a. Direction b. Magnitude c. Quantity d. Location

Assertion - Reason type questions:

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d. If both **Assertion (A)** and **Reason (R)** are false

Q4. Assertion : The dot product of one vector with another vector may be a scalar or a vector.
Reason : If the product of two vectors is a vector, then product is called a dot product.

Q5. Assertion : A physical quantity can be regarded as a vector quantity, if magnitude as well as direction is associated with it.
Reason : A physical quantity can be regarded as a scalar quantity, if it is associated with magnitude only.

Subjective type questions.

Q6. At what angle a ball must be thrown to get maximum horizontal range?

Q7. A boy stands at 78.4 m from a building and throws a ball which just enters a window 39.2m above the ground. Calculate the velocity of the projection of the ball.

Q8. The greatest and the least resultant of two forces acting at a point are 29 N and 5 N respectively. If each force is increased by 3 N, find the resultant of two new forces when acting at a point at an angle of 90° with each other.

Q9. A projectile is fired horizontally with a velocity of 98 ms^{-1} from the top of a hill 490 m high. Find:

i. the velocity with which it strikes the ground.

ii. the time is taken to reach the ground.

Q10. Read the following passage and answer the questions that follow:

CASE STUDY

The physical quantities which have both magnitude as well as direction are known as vector quantities. The vectors may be equal, negative, collinear, coplanar, unit vector or orthogonal vectors. The vectors which act in different directions can be added either by triangle or parallelogram or by polygon law of vectors. Whereas the product of vectors can be scalar product (dot) or the vector product (cross). The resultant vector is scalar product of two vectors is always a scalar, on the other hand vector product of two vectors is always a vector quantity. The resultant vector when two vectors are in different directions is given by $R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$. Here A and B are two vectors and θ is angle between vectors. The scalar product of two vectors A and B is $\vec{A}.\vec{B} = AB\cos\theta$ and vector product of two vectors A and B is $\vec{A} \times \vec{B} = AB\sin\theta$

i. Angle between negative vectors is

a. 0° b. 90° c. 180° d. 260°

ii. If **A** = n î - ĵ + 2 î and **B** = 2 î +2 ĵ - k are perpendicular to each other then value of n is

a. 1 b. 2 c. 3 d. 4

iii. If **A** x **B** = 0 then

a. **A** is perpendicular to **B**
b. **A** is parallel to **B**
c. **A** is equal to **B**
d. **A** is neither perpendicular nor parallel to **B**

iv. If the magnitude of sum of two vectors is equal to magnitude of difference of two vectors, the angle between vectors is

(a) 0° (b) 180° (c) 45° (d) 90°

CHAPTER – 5 (LAWS OF MOTION)

Multiple choice questions:

Q1. Which of the following is known as law of inertia?

a. Newton's first law of motion
b. Newton's second law of motion
c. Newton's third law of motion
d. Law of conservation of momentum

Q2. A body of mass 50 g is moving with a constant velocity of 5 m s^{-1} on a horizontal Smooth surface. The force acting on the body is

e. 1 N b. 2 N c. 5 N d. zero

Q3. Change in momentum is given by

f. Force x time b. Force x mass
c. Force x velocity d. Force x Distance

Assertion - Reason type questions:

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Q4. Assertion : It is difficult to move a cycle along the road with brakes on.
Reason : Sliding friction is greater than rolling friction.

Q5. Assertion : The driver in a vehicle moving with a constant speed on a straight road is a non-inertial frame of reference.
Reason : A reference frame in which Newton's laws of motion are applicable is non-inertial.

Subjective type questions.

Q6. Define coefficient of static and kinetic friction.

Q7. What do you mean by angle of friction? Obtain the relation between angle of friction and coefficient of friction.

Q8. What do you mean by angle of repose? Deduce its relation with coefficient of friction.

Q9. Show the Newton's second law of motion is real law of motion.

Q10. Read the following passage and answer the questions that follows:

CASE STUDY

According to Newton's second law of motion F = ma, where F is the force required to produce acceleration *a* in the body of mass m. When *a* = 0 i.e. the object is moving with uniform velocity then F = 0, it means no force is required to move the body with a uniformvelocity along a straight line. If a force F acts on the body for time t seconds, the effect of forces is given by impulse (I) = F x t = change in linear momentum of body.

i. A cricketer catches the ball of mass 150 g in 0.3s moving with velocity 20 ms^{-1} then forceexperienced is
a.10 N b. 30 N c. 3 N d. 0.3 N

ii. An impulsive force of 100 N acts on a body for 1 s. What is the change in its linearmomentum?
a. 1Ns b. 10 Ns c. 100Ns d. 1000 Ns

iii. The units of impulse are same as that of
a. linear momentum b. energy c. velocity d. power

iv. A 30g bullet travelling initially at 500 m/s penetrates 12 cm into wooden block. Theaverage force exerted will be
a. 41250 N b. 31750 N c. 30400 N d. 31250 N

CHAPTER – 6 (WORK, ENERGY AND POWER)

Multiple choice questions:

Q1. When a body is thrown up work done by gravity on the body is
a. Positive b. zero c. negative d. can't say

Q2. Which of the following is non conservative force?
a. Gravitational Force b. Electrostatic Force
c. Magnetic Force d. Force of friction

Q3. If the momentum of body is increased by 0.01%, then its K.E. will be increasedby
a. 0.01% b. 0.02% c. 0.03% d. 0.04%

Assertion - Reason type questions:

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Q4. Assertion : Centripetal force does no work.

Reason : Force and displacement are perpendicular to each other.

Q5. Assertion : Work done in uniform circular motion is zero.

Reason : Force is always directed along the displacement.

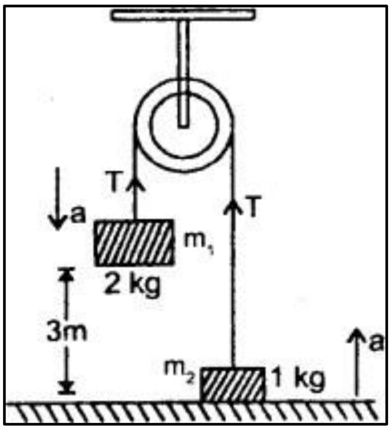
Subjective type questions.

Q6. The momentum of an object is doubled. How does its kinetic energy changes?

Q7. Discuss elastic collision in one dimension.

Q8. A ball falls under gravity from a height of 10m with an initial downward velocity of u. It collides with the ground, loses 50% of its energy in the collision, and then rises back to the same height. Find the initial velocity u.

Q9. A 1 kg mass on a floor is connected to a 2 kg mass by a string passing over a pulley as shown in the figure. Obtain the speed of the masses (after they are released) when the 2 kg mass just touches the floor. Show that the gain in kinetic energy of the system equals the loss in its potential energy. The 2 kg mass is initially at a height 3 m above the ground.



Q10. Read the following passage and answer the questions that follows:

CASE STUDY

Kinetic energy of a body is the energy possessed by body by virtue of its motion. K.E. of abody of mass m moving with velocity v is given by, $K = \frac{1}{2} mv^2$.

Potential energy of a body is the energy possessed by the body by virtue of its position. P.E. = mgh where symbols have their usual meanings. Energy can neither be created nor bedestroyed, however the energy can be changed from one form of energy to the other, such that energy appearing in one form is equal to the energy disappearing in other form.

i. A light and heavy body have equal K.E. Which has greater momentum?

a. A heavy body   b. A light body

c. Both have equal momentum   d. Data given is incomplete

ii. If the velocity of a body is doubled its K.E. becomes

a. twice   b. half

c. four times   d. one fourth

iii. If the momentum of a body is increased by 0.01% then its K.E. will be increased by

a. 0.01%   b. 0.02%

c. 0.03%   d.0.04%

iv. Two bodies of unequal masses have same linear momentum, which one has greater K.E.?

a. lighter body   b. heavy body

c. both bodies have equal   d. Data given is incomplete

CHAPTER – 7 (SYSTEM OF PARTICLES AND ROTATIONAL MOTION)

Multiple choice questions:

Q1. Which is the wrong relation from the following?

a. t = I a b. F = ma c. L = I w d. I = t a

Q2. The product of the moment of inertia and the angular acceleration is:

a. force b. torque c. work d. angular moment

Q3. If the moment of inertia of a rotating body is increased then what will be the effect on the angular velocity?

a. It will increase b. It will decrease

c. There will be no effect d. First increases then decreases

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d. If both **Assertion (A)** and **Reason (R)** are false

Q4. Assertion : If polar ice melts, days will be longer.

Reason : Moment of inertia increases and thus angular velocity decreases.

Q5. Assertion : The earth is slowing down and as a result the moon is coming nearer to it.

Reason : The angular momentum of the earth moon system is not conserved.

Subjective type questions.

Q6. If one of the particles is heavier than the other, to which side will their C.M. shift?

Q7. Why do we prefer to use a wrench with a long arm?

Q8. Two solid spheres of the same mass are made of metals of different densities. Which of them has a larger M.I. about a diameter?

Q9. The moment of inertia of a body about a given axis is 1.2 kg m^2. Initially, the body is at rest. In order to produce a rotational K.E. of 1500J, for how much duration, an acceleration of 25 $rads^{-2}$ must be applied about that axis.

Q10. Read the following passage and answer the questions that follow:

CASE STUDY

The centre of mass of a body is a point at which the centre mass of the body is supposed to be concentrated. The C.M. of a body may or may not be within the body. The position vector of C.M. of the system of two particles of masses m_1 and m_2 having position vectors $\vec{r_1}$ and $\vec{r_2}$ is given by

$$\vec{r} = \frac{m_1\vec{r_1} + m_2\vec{r_2}}{m_1 + m_2}$$

For an isolated system, the C.M. moves with constant velocity when an external force actson it.

$\vec{r}_{CM}$ = constant

i. For which of the following does the centre of mass lie outside the body?

a. solid sphere b. solid cylinder

c. a disc d. a ring

ii. If two particles of masses m_1 and m_2 move with velocities v_1 and v_2 towards each other on a smooth horizontal table. What will be the velocity of their C.M.?

a. $V = \frac{m_1v_1 + m_2v_2}{m_1 + m_2}$ b. $V = \frac{m_1v_1 - m_2v_2}{m_1 + m_2}$

c. $V = \dfrac{m_1v_1 + m_2v_2}{m_1 - m_2}$ d. $V = \dfrac{m_1v_1 - m_2v_2}{m_1 - m_2}$

iii. A solid sphere of radius R is placed on a smooth horizontal surface. A horizontal force Fis applied at a height *h* from the lowest point. For the maximum acceleration of C.M.

a. h = R b. h = 2 R

c. h = 0 d. the acceleration will be same whatever *h* may be.

iv. An electron and a proton move towards each other with velocities *v1* and *v2* respectively.

The velocity of their centre of mass is

a. zero b. v_1 c. v_2 d. $\dfrac{v_1 + v_2}{2}$

CHAPTER – 8 (GRAVITATION)

Multiple choice questions:

Q1. There is no atmosphere on the surface of the moon because

a. Moon is bigger than the earth.

b. Moon is closer to earth.

c. Root mean square velocity of the molecules at moon is greater than escape velocity.

d. Moon is a satellite.

Q2. The value of acceleration due to gravity at centre of the earth is

a. $9.8 m/s^2$ b. $8 m/s^2$ c. $2 m/s^2$ d. 0

Q3. At what depth below the surface of earth, the value of g is the same as that at a height of 5 km?

a. 10 km b. 7.5 km c. 5 km d. 2.5 km

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d. If both **Assertion (A)** and **Reason (R)** are false.

i. **Assertion:** The value of 'g' varies from place to place.
Reason: 'g' is a scalar quantity.

ii. **Assertion:** The escape velocity of a body from earth's surface is 11.2km/s
Reason: The escape velocity is independent of the mass of the body.

Subjective type questions.

Q6. What does negative sign in gravitational potential energy signifies?

Q7. State Kepler's law of planetary motion? Which law is based on angular momentum conservation?

Q8. Derive an expression for the variation of acceleration due to gravity 'g' with height 'h' from the surface of the earth.

Q9. With what velocity must a body be thrown upward from the surface of the earth so thatit reaches at a height of $10R_E$?

(Radius of earth, R_E= 6.4×10^6 m & G = 6.67×10^{-11} Nm^2kg^{-2}).

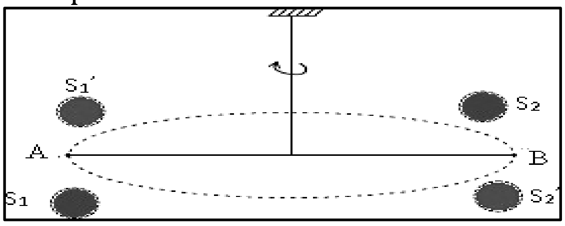
Q10. Read the following passage and answer the questions that follow:

CASE STUDY

Cavendish's Experiment

The figure shows the schematic drawing of Cavendish's experiment to determine the value of the gravitational constant. The bar AB has two small lead spheres attached at its

ends. The bar is suspended from a rigid support by a fine wire.
Two large lead spheres are brought close to the small ones but on opposite sides as shown.
The name of G from this experiment came to be 6.67×10^{-11} N-m^2 / kg^2



i. The big spheres attract the nearby small ones try a force which is small ones by a force which is
   a. Equal and opposite
   b. Equal but in same direction
   c. Unequal and opposite
   d. Unequal but in same direction

ii. The net force on the bar is
   a. non-zero
   b. zero
   c. data insufficient
   d. none of the above

iii. The net torque on the bar is
   a. zero
   b. non-zero
   c. F times the length of the bar, where F is the force of attraction between a big sphere and its neighbouring
   d. Both (b) and (c)

iv. The torque produces twist in the suspended wire. The twisting stops when
   a. restoring torque of the wire equals the gravitational torque
   b. restoring torque of the wire exceeds the gravitational torque
   c. the gravitational torque exceeds the restoring torque of the wire
   d. gravity stops

CHAPTER – 9 (MECHANICAL PROPERTIES OF SOLIDS)

Multiple choice questions:

Q1. A stretched rubber has
   a. increased kinetic energy
   b. increased potential energy
   c. decreased kinetic energy
   d. decreased potential energy

Q2. Stress is directly proportional to strain
   a. Within elastic limit
   b. Within plastic limit
   c. Within stretched limit
   d. All of the above

Q3. Young's modulus of a substance depends on
   a. Its length
   b. Its area
   c. Acceleration due to gravity
   d. None of the above

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Q4. Assertion: The value of Young's Modulus 'Y' is different for all materials.
   Reason: 'Y' is a constant for all materials.

Q5. Assertion: The work done in stretching a rubber is stored in form of elastic potential energy.

Reason: Work is done against restoring forces.

Subjective type questions.

Q6. Which is more elastic- steel or rubber. Justify your answer?

Q7. Among solids, liquids and gases, which possess greatest bulk modulus?

Q8. What force is required to stretch a steel wire $1cm^2$ in cross section to double its length? $Y_{steel} = 2 \times 10^{11} Nm^{-2}$.

Q9. The elastic limit of a steel cable and a copper wire of equal length and equal cross sectional area are joined end to end and the combination is subjected to a tension. Find the ratio of (a) the stress developed in the two wires (b) the strain developed in the two wires. Given $Y_{steel} = 2.0 \times 10^{11}$ N/m^2&$Y_{copper} = 1.1 \times 10^{11}$ N/m^2.

Q10. Read the following passage and answer the questions that follow:

CASE STUDY

Stress-Strain Curve: Elastic limit is the upper limit of deforming force up to which, if deforming force is removed, the body regains its original form completely and beyond which if deforming force is increased, the body loses its property of elasticity and gets permanently deformed. Elastic limit is the property of a body whereas elasticity is the property of material of a body.

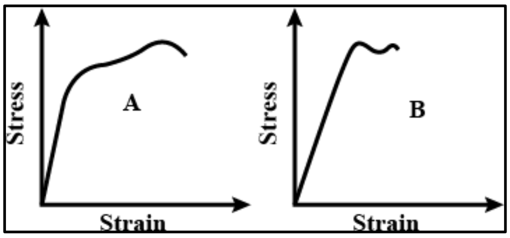
i. Elasticity is shown by materials because inter-atomic or inter-molecular forces

a. increases when a body is deformed
b. decreases when a body is deformed
c. remains same when a body is deformed
d. becomes non-zero when a body is deformed

ii. The maximum load a wire can withstand without breaking, when its length is reduced to half of its original length, will

a. be double b. be halved
c. be four times d. remain same

iii. Stress-strain curves for the materials A and B are shown below.



a. A is brittle material b. B is ductile material
c. B is brittle material d. Both a. and b.

iv. A and B are two wires. The radius of A is twice that of B. That are stretched by the same load, then the stress on B is

a. equal to that on A b. four times that on A
c. Two times that on A d. half that on A

CHAPTER – 10 (MECHANICAL PROPERTIES OF FLUIDS)

Multiple choice questions:

Q1. The radii of two drops are in the ratio oof3:2, their terminal velocities are in the ratio

a. 9:4 b. 2:3
c. 3:2 d. 2:9

Q2. If the liquid does not wet the glass, the angle of contact is

a. zero b. acute
c. obtuse d. right angle

Q3. Stirred liquid comes to rest after sometime due to

a. Viscosity
b. Surface tension
c. Pressure
d. Capillarity

Assertion - Reason type questions:

Directions: In each of the following questions, a statement of **Assertion (A)** is followed by a statement of **Reason (R).** While answering a question, choose the correct one and mark it as

a. If both **Assertion (A)** and **Reason (R)** are true and Reason (R) is the correct explanation ofAssertion.
b. If both **Assertion (A)** and **Reason (R)** are true but Reason is not the correct explanation ofthe **assertion (A)**.
c. If **Assertion (A)** is true and **Reason (R)** is false.
d. If both **Assertion (A)** and **Reason (R)** are false.

Q4. Assertion: The surface tension of oil and paints is kept low.
Reason: The oil and paint can acquire maximum surface area.

Q5. Assertion: Bernoulli's theorem is based on energy conservation.
Reason: Bernoulli's theorem is applicable to ideal liquids in streamline motion only.

Subjective type questions.

Q6. Why paints and lubricating oils have low surface tension?

Q7. What is the effect of temperature on the viscosity of liquids and gases?

Q8. Compute the terminal velocity with which an air bubble of diameter 0.8mm will rise in a liquid of viscosity 0.18 Pa-s and relative density 0.8. Neglect the weight of air bubble.

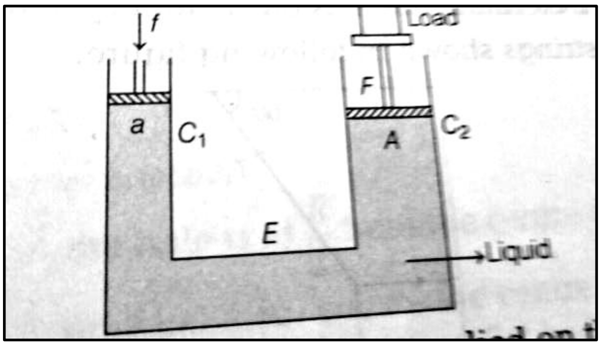
Q9. State and prove Bernoulli's theorem.

Q10. Read the following passage and answer the questions that follow:

CASE STUDY

Hydraulic Lift

Hydraulic lift is an application of Pascal's law. It is used to lift heavy loads. It is a force multiplier.



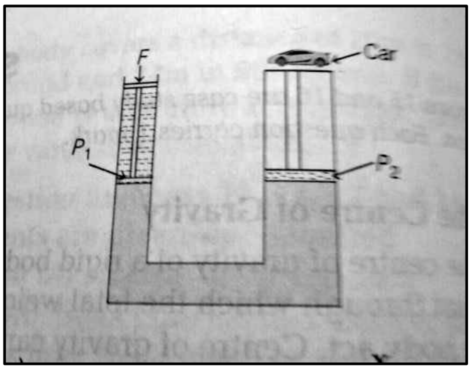
So, when small forces applied on the smaller piston (acting downward) will be appearing as a very large force (acting upward) on the larger piston. As a result of it, a heavy load placed on the larger piston is easily lifted upwards.

i. Pascal's law states that pressure in a fluid at rest is the same at all points, if
a. they are at the same height
b. they are along same plane
c. they are along same line
d. Both a. and b.

ii. Pressure is applied to an enclosed fluid as shown in the above figure. It is
a. increased and applied to every part of the fluid
b. diminished and transmitted to the walls of the container
c. increased in proportion to the mass of the fluid and then transmitted
d. transmitted unchanged to every on portion of the fluid and the walls of container

iii. Pressure at a point inside a liquid does not depend on
a. the depth of the point below the surface of the liquid
b. the nature of the liquid
c. the acceleration due to gravity at that point
d. total weight of fluid in the beaker

iv. A hydraulic lift has 2 limbs of areas A and 2 A. Force F is applied over limb of area A to lift a heavy car. If distance moved by piston P_1 is x, then distance moved by piston P_2 is



a. x b. 2x
c. x/2 d. 4x

CHAPTER – 11 (THERMAL PROPERTIES OF MATTER)

Multiple choice questions:

Q1. Specific heat of a substance is a function of
a. mass b. weight
c. volume d. molecular structure

Q2. The density of water is maximum at
a. 4^0C b. 0^0C
c. $10\ ^0C$ d. 5^0C

Q3. Stainless steel cooking pans are preferred with extra bottoms of
a. Copper b. Silver
c. Iron d. zinc

Assertion - Reason type questions:

Directions: In each of the following questions, a statement of **Assertion (A)** is followed by a statement of **Reason (R).** While answering a question, choose the correct one and mark it as

a. If both **Assertion (A)** and **Reason (R)** are true and Reason (R) is the correct explanation ofAssertion.
b. If both **Assertion (A)** and **Reason (R)** are true but Reason is not the correct explanation ofthe **assertion (A)**.
c. If **Assertion (A)** is true and **Reason (R)** is false.
d. If both **Assertion (A)** and **Reason (R)** are false.

Q4. Assertion: At absolute zero all molecular activity stops.
Reason: Absolute zero is unattainable.

Q5. Assertion: Radiation is the fastest mode of heat transfer.
Reason: Solar energy is radiation energy.

Subjective type questions.

Q6. Why invar is used to make a clock pendulum?

Q7. Define coefficient of thermal conductivity and on what factors does it depends?

Q8. The coefficient of volume expansion of glycerine is $49 \times 10^{-5}/^0C$. Find the fractional change in its density for 30^0C rise in temperature?

Q9. Calculate the difference in temperatures between two sides of an iron plate 20 mm thick, when heat is conducted at the rate of 6×10^5cal. $min^{-1}m^{-2}$.
K for metal is 0.2 cal $s^{-1}cm^{-1}\,^0C^{-1}$.

Q10. Read the following passage and answer the questions that follow:

CASE STUDY

Thermal conductivity - Three modes of heat transfer are conduction, convection and radiation. In conduction, heat is transferred from one part of body to another part at lower temperature through molecular collisions, without any actual flow of matter. When two opposite faces of slab of area of cross-section A and separated by distance x are maintained at temperatures T_1 and T_2 ($T_1 > T_2$), then rate of heat flow is

$$Q/t = KA\,(T_1 - T_2)/x,$$

Where K is called coefficient of thermal conductivity of the material of the slab. Thermal conductivities of metals are much greater than those for non metals. Gases are poor thermal conductors.

i. The unit of coefficient of thermal conductivity is

a. WmK | b. Wm^2 K
c. JK | d. W/mK

ii. A metal surface appears colder to touch than a wooden surface, because

a. metal have high specific heat
b. metal have low thermal conductivity
c. metal have high thermal conductivity
d. metals are sonorous

iii. A body of length 1m having cross- sectional area of 0.75 m^2 has heat flow through it atthe rate of 6000J/s. If K=200 J/smK, the temperature difference across the ends of thebody is

a. 20^0C | b. 40^0C
c. 80^0C | d. 100^0C

iv. Two rods having thermal conductivity in the ratio of 5:3 having equal lengths and equal cross sectional areas are joined end to end. If the temperature of the free end of the first rod is 100^0C and free end of the second rod is 20^0C, then the temperature of the junctionis

a. 50^0C | b. 70^0C
c. 60^0C | d. 90^0C

CHAPTER – 12 (THERMODYNAMICS)

Multiple choice questions:

Q1. Which of the following parameters does not characterize the thermodynamic state Of matter?

a. Temperature | b. Pressure
c. Work | d. Volume

Q2. During adiabatic change, specific heat of a gas is

a. zero | b. positive
c. negative | d. infinity

Q3. Internal energy of an ideal gas depends upon

a. volume only | b. temperature only
c. both volume and temperature | d. neither volume nor temperature

Assertion - Reason type questions:

Directions: In each of the following questions, a statement of **Assertion (A)** is followed by a statement of **Reason (R).** While answering a question, choose the correct one and mark it as

a. If both **Assertion (A)** and **Reason (R)** are true and Reason (R) is the correct explanation ofAssertion.
b. If both **Assertion (A)** and **Reason (R)** are true but Reason is not the correct explanation ofthe **assertion (A)**.
c. If **Assertion (A)** is true and **Reason (R)** is false.
d. If both **Assertion (A)** and **Reason (R)** are false.

Q4. Assertion: Internal energy is a state function.

Reason: Internal energy depends on the temperature of the system.

Q5. Assertion: In adiabatic process the specific heat of the gas is zero.

Reason: In adiabatic process no heat exchange of heat takes place between systemand surrounding.

Subjective type questions.

Q6. What is the specific heat of a gas in an isothermal process?

Q7. Give one limitation of first law of thermodynamics.

Q8. State first law of thermodynamics. On what conservation principle it is based?

Q9. Give four basic difference between isothermal and adiabatic process

Q10. Read the following passage and answer the questions that follows:

CASE STUDY

First law of thermodynamics

The first law of thermodynamics is the general law of conservation of energy applied to any system in which energy transfer from or to the surroundings (through heat and work) is taken into account. It states that the energy supplied to the system goes in partly to increase the internal energy of the system and the rest in work on the environment. Mathematically, $\Delta Q = \Delta U + \Delta W$ where ΔQ is the heat supplied to the system, ΔW is the work done by the system and ΔU is the change in internal energy of the system. ΔQ and ΔW depend on the path taken to go from initial to final states, but the combination $\Delta Q - \Delta W$ is path independent.

i. The first law of thermodynamics is concerned with conservation of

a. number of molecules　　b. number of moles

c. energy　　d. temperature

ii. Which of the following is not the path function?

a. ΔQ　　b. $\Delta Q+\Delta W$

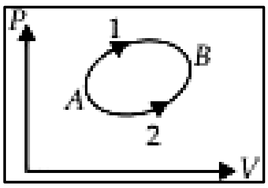
c. ΔW　　d. $\Delta Q- \Delta W$

iii. An electric heater supplies heat to a system at a rate of 120 W. If system performs work at a rate of 80J/s, the rate of increase in internal energy is

a. 30 J/s　　b. 40 J/s

c. 50 J/s　　d. 60 J/s

iv. A system goes from A to B by two different paths in the PV diagram as shown in the figure. Heat given to the system in path 1 is 1100J, The work done by the system along path1 is more than path 2 by 150 J. The heat exchanged by the system in path 2 is The heat exchanged by the system in path 2 is



a. 800 J　　b. 750 J

c. 950 J　　d. 1050 J

CHAPTER – 13 (KINETIC THEORY)

Multiple choice questions:

Q1. The number of degree of freedom for diatomic gas molecule is

a. 1　　b. 2

c. 3　　d. 6

Q2. The root mean square velocity of ideal gas varies with temperature as

b. directly　　b. inversely

c. unaffected

d. varies in complex manner

Q3. The mean kinetic energy per unit volume of a gas E is related to average pressure, exerted by the gas is

a. E=2/3 P

b. E=3/2 P

c. E=P

d. E=5/4 P

Assertion - Reason type questions:

Directions: In each of the following questions, a statement of **Assertion (A)** is followed by a statement of **Reason (R).** While answering a question, choose the correct one and mark it as

a. If both **Assertion (A)** and **Reason (R)** are true and Reason (R) is the correct explanation ofAssertion.

b. If both **Assertion (A)** and **Reason (R)** are true but Reason is not the correct explanation ofthe **assertion (A)**.

c. If **Assertion (A)** is true and **Reason (R)** is false.

d. If both **Assertion (A)** and **Reason (R)** are false.

Q4. Assertion: The ratio of Cp and Cv is more for helium gas than hydrogen gas.
Reason: Atomic mass of helium is more than hydrogen.

Q5. Assertion: For monoatomic gas R/Cv= 0.67.
Reason: For monoatomic gas Cv=3R/2

Subjective type questions.

Q6. On what factors average kinetic energy of gas molecules depends?

Q7. State the law of equipartition of energy. Prove that for an ideal gas = 1 + 2/f., where f is no. of degrees of freedom of gas molecules.

Q8. State the postulates of kinetic theory of gases.

Q9. Show average kinetic energy of a gas molecule is directly proportional to the temperature of the gas.

Q10. Read the following passage and answer the questions that follows:

CASE STUDY

Law of Equipartition of Energy

In equilibrium, the total energy is equally distributed in all possible energy modes, with each mode having average energy equal to (1/2) kBT. This is known as the law of equipartition energy. Each translational and rotational degree of freedom contributes (1/2) kBT to the energy. Each vibrational frequency contributes
$2 \times (1/2)\ k_BT = k_BT$ energy since vibration has both kinetic and potential modes of energy.

i. According to the law of equipartition energy, each particle in a system of particles have thermal energy E equal to

a. $3/2\ k_BT$

b. k_BT

c. $1/2\ k_BT$

d. $3k_BT$

ii. The average energy per molecule of a triatomic gas at room temperature is

a. $3/2\ k_BT$

b. $5/2\ k_BT$

c. $1/2\ k_BT$

d. $3k_BT$

iii. The gases carbon- monoxide CO. and nitrogen are kept at same temperature. If their kinetic energies are E1 and E2 respectively, then

a. E1=E2

b. E1>E2

c. E2>E1

d. E1 and E2 cannot be compared

iv. Which of the following molecules does not possess vibrational energy?

a. Oxygen

b. Nitrogen

c. Argon

d. CO2

CHAPTER -14 (OSCILLATIONS)

Multiple choice questions:

Q1. In a simple harmonic motion, when displacement is one half the amplitude, what fraction of total energy is kinetic?

a. ½ b. 3/4
c. zero d. 1/4

Q2. What is the time period of second's pendulum

a. 1 sec b. 2 sec
c. 3sec d. 4 sec

Q3. A particle executes SHM. Then the graph of the velocity as a function of displacement is

a. a straight line b. a circle
c. an ellipse d. a hyperbola

Assertion - Reason type questions:

Directions: In each of the following questions, a statement of **Assertion (A)** is followed by a statement of **Reason (R).** While answering a question, choose the correct one and mark it as

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c. If **Assertion (A)** is true and **Reason (R)** is false.
d. If both **Assertion (A)** and **Reason (R)** are false.

Q4. Assertion: An oscillatory motion are periodic.
Reason: All motions are oscillatory.

Q5. Assertion: The time period of simple pendulum depend on acceleration due to gravity.
Reason: Time period is mass dependent

Subjective type questions.

Q6. List any two characteristics of simple harmonic motion.

Q7. A particle starts executing SHM from its positive extreme position. Draw graphs showing variation of its potential energy and total energy with time.

Q8. A body of mass 0.4 kg when suspended by an ideal spring increases the length of the spring by2 cm. What will the time period when a body of 2 kg is suspended by this spring?

Q9. The acceleration of a particle executing SHM is 20 cm/s^2 at a distance 5 cm from itsequilibrium position. Calculate its time period.

Q10. Read the following passage and answer the questions that follows:

CASE STUDY

Energy in SHM

A particle executing SHM posseses both kinetic energy and potential energy. When a body is displaced from its equilibrium position by doing work upon it, it acquires potential energy. When the body is released, it begins to move back with a velocity, thus acquiring kinetic energy. Both kinetic and potential energies of a particle in SHM vary between zero and their maximum values.

i. In SHM,

a. potential energy is stored due to elasticity of system
b. kinetic energy is stored due to inertia of system
c. Both KE and PE are stated by virtue of elasticity of system.
d. Both in a. and b.

ii. The expression for displacement of an object in SHM is X= A cos wt. The potential energy at t=T /4 is, where K is a constant,

a. 1/2 KA^2 b. 1/8 KA^2
c. 1/4KA^2 d. zero

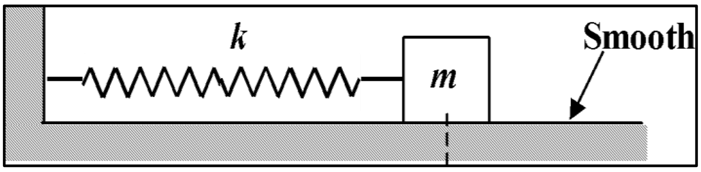
iii. For a SHM, if the maximum potential energy become double, choose the correct option

a. Maximum kinetic energy will become double

b. The total mechanical energy will remain constant
c. Both a. and b.
d. Neither a. nor b.

iv. A block is in simple harmonic motion as shown in the figure on a frictionless surface. i.e. $\mu = .0$

Choose the correct option



a. The kinetic energy varies between a maximum value and zero
b. The potential energy varies between a maximum value and zero
c. Total energy remains constant
d. All are correct

CHAPTER - 15 (WAVES)

Multiple choice questions:

Q1. Two waves are propagating with same amplitude and nearly same frequency in opposite direction, they result in

a. Beats
b. stationary waves
c. resonance
d. wave packet

Q2. In wave motion what is transferred

a. Energy
b. Momentum
c. both energy and momentum
d. Matter

Q3. The propagation constant of a wave is also called its

a. wave number
b. wavelength
c. frequency
d. angular wave number

Assertion - Reason type questions:

Directions: In each of the following questions, a statement of **Assertion (A)** is followed by a statement of **Reason (R).** While answering a question, choose the correct one and mark it as

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c. If **Assertion (A)** is true and **Reason (R)** is false.
d. If both **Assertion (A)** and **Reason (R)** are false.

Q4. Assertion: The medium should possess elasticity and inertia for wave propagation.
Reason: Wave is a periodic disturbance.

Q5. Assertion: A vibrating body always produces sound.
Reason: Sound is the characteristic property.

Subjective type questions.

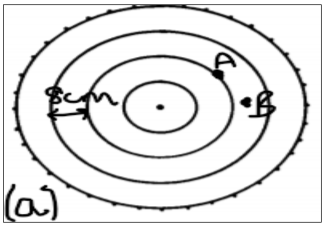
Q6. What are beats? Write the essential conditions for the formation of beats.
Q7. What are the characteristics of stationary waves?
Q8. Describe various modes of vibrations of an open organ pipe.
Q9. What should be minimum length of an open organ pipe for producing a note of 110Hz? The speed of sound is 330m/s.

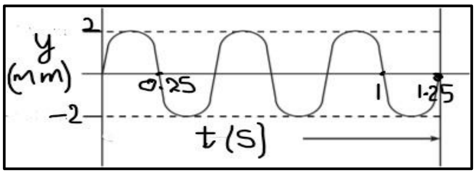
Q10. Read the following passage and answer the questions that follow:
CASE STUDY

Displacement of wave

A stone is dropped in a liquid at rest in a tank. The fig. (a) below show circular wave fronts. The waves produced at the centre of a circular ripple tank. Two corks A and B, floats on the water and moves up & down on the surface as the wave passes. The wavelength of wave is 8.0 cm.

The Fig.(b) shows how the displacement of A varies with time.

a. 

b. 

i. Name the type of waves produced on water surface?

a. Longitudinal wave b. Transverse wave

c. Sound wave d. EM wave

ii. What is the amplitude of the vibrations of A as wave passes?

a. 2mm b. 0.25 mm

c. 0.50 mm d. 8mm

iii. The horizontal distance between A and B is half the wavelength of the wave. Then, the displacement of B with time is

a. same as that of A with equal magnitude

b. opposite to that of A with equal magnitude

c. double in magnitude as that of A

d. half in magnitude as that of A

iv. What is the frequency of the wave?

a. 4 Hz b. 0.4 Hz

c. 2 Hz d. 0.2 Hz