ROLL NUMBER				

SET	A

INDIAN SCHOOL MUSCAT
FINAL EXAMINATION 2023
PHYSICS (SUB CODE: 042)

CLASS: XI　　　　　　　　　　　　TIME ALLOTED: 3 HRS.

DATE: 21-02-2023　　　　　　　　　MAXIMUM MARKS: 70

GENERAL INSTRUCTIONS:

(1) There are 35 questions in all. All questions are compulsory

(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.

(3) Section A contains eighteen MCQ of 1 mark each, Section B contains seven questions of two marks each, Section C contains five questions of three marks each, Section D contains three long questions of five marks each and Section E contains two case study based questions of 4 marks each.

(4) There is no overall choice. However, an internal choice has been provided in section B, C, D and E. You have to attempt only one of the choices in such questions.

(5) Use of calculators is not allowed.

SECTION A

1. Parsec is the unit of　1

   (a) Time　(b) distance　(c) frequency　(d) angular acceleration.

2. Area under speed-time graph represents　1

   (a) Distance　(b) acceleration　(c) average acceleration　(d) force.

3. A car moving along a straight highway with a speed of 126 Kmph is brought to a stop within a distance of 200m. Find the retardation of the car?　1

   (a) 3.06 m/s　(b) 39.98 m/s　(c) 30.06 m/s　(d) 3.98 m/s

4. The physical quantity which is equal to the change in momentum of a body is known as　1

   (a) Force　(b) acceleration　(c) impulse　(d) work.

5. A shell of mass of 0.02 Kg is fired by a gun of mass 10Kg. If the muzzle speed of the shell is 80m/s, what is the recoil speed of the gun?　1

   (a) 1.6 m/s　(b) 16 m/s　(c) 0.16m/s　(d) 40 m/s.

6. For inelastic collision between two spherical rigid bodies 1

(a)kinetic energy is conserved (b) linear momentum is conserved

(c)linear momentum is not conserved (d) both kinetic energy and linear momentum are conserved

7. Which physical quantity is represented by the product of moment of inertia and the angular acceleration? 1

(a) Centre of mass (b) Torque (c) Angular momentum (d) Linear momentum.

8. If the earth shrinks to half of its radius without change in mass, the duration of the day will be: 1

(a) 24 hr (b) 48 hr (c) 13 hr (d) 6hr

9. If V_0 be the orbital velocity of a satellite in a circular orbit close to the earth's surface and V_e is the escape velocity from the earth, then the relation between them the two is: 1

(a) $V_O = V_e$ (b) $V_e = \sqrt{2}\, V_O$ (c) $V_e = \sqrt{3}\, V_O$ (d) $V_e = 2V_O$

10. The ratio of the lateral strain to the longitudinal strain in a stretched wire is called 1

(a) Young's modulus (b) Poisson's ratio (c) Shear modulus (d) Bulk modulus

11. SI unit of thermal conductivity is 1

(a) $Wm^{-1}K^{-1}$ (b) Wm K (c) $Jsm^{-1}K^{-1}$ (d) $Js^{-1}mK$

12. Which are the modes of heat transfer that cannot operate between bodies separated by a distance in vacuum? 1

(a) Radiation and convection (b) Radiation and conduction

(c) Conduction and convection (d) Radiation

13. First law of thermodynamics is the law of conservation of 1

(a) Mass (b) Linear momentum (c) Energy (d) Angular momentum

14. Moon has no atmosphere because 1

(a) RMS velocity of all gases is more than the escape velocity on moon's surface
(b) its surface is not smooth
(c) it is quite far away from the earth.
(d) it does not have population and plants.

15. In a S.H.M. acceleration of a particle is 1

(a) Directly proportional to its displacement and the direction of acceleration and displacement are same.
(b) Directly proportional to its displacement and opposite to the direction of the displacement.
(c) Directly proportional to the square of its displacement.
(d) Independent of the displacement of the particle.

16. Two statements are given – one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below. 1

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true and R is NOT the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

ASSERTION (A): More the mass of a body, more is its inertia.

REASON (R): Mass of a body is the measure of its inertia.

17. Two statements are given – one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below. 1

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(c) A is true but R is false.

(d) A is false but R is true.

ASSERTION (A): Moment of inertia of a body is same whatever be the axis of rotation.

REASON (R): Moment of inertia depends on the distribution of mass of the body.

18. Two statements are given – one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below. 1

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true and R is NOT the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is true.

Assertion(A): Every simple harmonic motion is periodic motion, but every periodic motion need not be simple harmonic motion.

Reason(R): The motion of earth around the sun is periodic motion, but not simple harmonic motion.

SECTION B

19. Derive the relation $v^2 - u^2 = 2as$ graphically. 2

OR

(a) A ball is thrown straight up. What is its velocity and acceleration at the top?

(b) Is it possible for a body to be accelerated without speeding up or slowing down. If it is so, give an example.

20. In a ballistics demonstration a police officer fires a bullet of mass 50g with a speed 200m/s on soft 2

plywood of thickness 2cm. The bullet emerges with only 10% of its kinetic energy. What is the emergent speed of the bullet?

21. A body weighs 63N on the surface of the earth. What is the gravitational force on it due to the earth at a height equal to half the radius of the earth? 2

22. Represent graphically the variation of extension with load in an elastic body. 2

On the graph mark: (a) Hooke's law region (b) Elastic limit (c) Proportional limit (d) Breaking point

(OR)

A wire is cut to half its original length (a) How would it affect the increase in length under a given load? (b) How does it affect the maximum load it can support without exceeding the elastic limit?

23. (a) State Wein's displacement law 2

(b)Water is used as a coolant in automobile radiators, as well as, a heater in hot water bags. Why?

24. (a)Name the thermodynamical variables defined by (i) Zeroth law, and (ii) first law of thermodynamics. 2

(b) State second law of thermodynamics.

25. State the postulates of kinetic theory of gases. 2

SECTION C

26. Assuming that the mass M of the largest stone that can be moved by a flowing river depends upon the velocity v, the density of water ρ and the acceleration due to gravity g. Show that M varies with the sixth power of the velocity flow. 3

(OR)

A planet moves around the sun in nearly circular orbit. Its period of revolution T depends upon:

(i) radius r of orbit (ii) mass M of the sun and (iii) the gravitational constant G.

Show dimensionally that $T^2 \alpha r^3$.

27. Obtain an expression for the maximum speed with a vehicle can safely negotiate a curved road banked at an angle θ. 3

28. Define elastic collision. Derive the final velocities after one dimensional elastic collision. 3

29. (a) Define centre of mass. Calculate the centre of mass of a system of two particles. 3

(OR)

Define angular momentum. Derive the relationship between angular momentum and torque.

30. (a) List any two characteristics of simple harmonic motion. 3

(b) The displacement equation for a particle executing **SHM** is **y = 5 Sin (20t + 0.5).** Where y is in centimeter and time in seconds Find amplitude, frequency and initial phase.

SECTION D

31. (a) What is a projectile? Obtain an expression for a maximum height when a projectile is fired at an angle θ with the horizontal. 5

(b) A body is projected with a velocity of 30m/s at an angle of 30^o with the horizontal. Find the time of flight and the horizontal range.

(OR)

(a) Show that the path followed by a projectile is a parabolic, when it is projected at an angle θ with the horizontal.

(b) An aeroplane takes off at an angle of 30^0 to the horizontal. If component of its velocity along the horizontal is 250 kmph, what is the actual velocity of plane? Find also the vertical component of the velocity.

32. (a) Define orbital velocity. Derive an expression for the orbital velocity of satellite. 5

(b) Assuming the earth to be a sphere of uniform mass density, how much would a body weigh half way down to the centre of the earth if it weighed 250N on the surface?

(OR)

(a) Define escape velocity. Derive an expression for the escape velocity of a body from the surface of the earth.

(b) Find the percentage decrease in weight of a body when taken to a height of 32km above the surface of earth, R = 6400km

33. (a) State and prove Bernoulli's theorem for fluids. 5

(b) The cylindrical tube of a spray pump has a cross-section of 8.0 cm^2, one end of which has 40 fine holes each of diameter 1.0 mm. If the liquid flow inside the tube is 1.5 m/min. What is the speed of ejection of the liquid through the holes?

(OR)

(a) Define terminal velocity. Derive an expression for terminal velocity

(b) Eight rain drops of radius 1mm each falling down with terminal velocity of 5m/s coalesce to form a bigger drop. Find the terminal velocity of the bigger drop.

SECTION E

34. **Case study:** Read the following paragraph and answer the questions. 4

Friction between any two surfaces in contact is the force that opposes the relative motion between them. The force of limiting friction is directly proportional to the normal reaction (R) between them i.e., F α R (or) F = μR, where μ is coefficient of limiting friction. If θ is angle of friction, then μ = tan θ.

(i) A force of 49N is just able to move a block of wood weighing 10Kg on a rough horizontal surface. Calculate the coefficient of limiting friction.

(ii) What would be the coefficient of friction, if angle of friction is 30^0?

(iii) Define angle of friction.

OR

State laws of limiting friction. (any two)

35. **Case study:** 4

Read the following paragraph and answer the questions.

The pressure of the atmosphere at any point is equal to the weight of a column of air of unit cross-sectional area extending from that point to the top of the atmosphere. At sea level, it is 1.013×10^5 Pa (1 atm). Italian scientist Evangelista Torricelli (1608–1647) devised for the first time a method for measuring atmospheric pressure.

$$\mathbf{P = P_a + \rho gh}$$

Where ρ is the density of mercury and h is the of the mercury column in the tube in the experiment it is found that the mercury column in the barometer has a height of about 76 cm at sea level equivalent to one atmosphere (1 atm). This can also be obtained using the value of ρ. A common way of stating pressure is in terms of cm or mm of mercury (Hg). A pressure equivalent of 1 mm is called a torr (after Torricelli). 1 torr = 133 Pa. The mm of Hg and torr are used in medicine and physiology. In meteorology, a common unit is the bar and millibar.1 bar = 10^5 Pa. An open tube manometer is a useful instrument for measuring pressure differences.

(i) Is pressure a scalar or a vector quantity? Give reason.

(ii) Name the factors on which the atmospheric pressure at a place depends.

(iii) Why are passengers advised to remove the ink from their pens while going up in aeroplane?

OR

Why is it difficult to stop bleeding from a cut in human body at high altitudes?

******END OF THE QUESTION PAPER******

ROLL NUMBER				

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INDIAN SCHOOL MUSCAT
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PHYSICS (SUB CODE: 042)

CLASS: XI — TIME ALLOTED: 3 HRS.
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(4) There is no overall choice. However, an internal choice has been provided in section B, C, D and E. You have to attempt only one of the choices in such questions.

(5) Use of calculators is not allowed.

SECTION A

1. G = 6.67 X 10^{-11} Nm^2kg^{-2}= ---------$g^{-1}cm^3s^{-2}$ 1

   (a) 6.67 X 10^{-8} (b) 6.67 X 10^{-10} (c) 6.67 X 10^{-12} (d) 6.67 X 10^{8}.

2. Area under speed-time graph represents 1

   (a) Distance (b) acceleration (c) average acceleration (d) force.

3. A car moving along a straight road covers one third of the distance with 20kmph and the rest with 60kmph. What is the average speed of the car? 1

   (a) 40kmph (b) 36kmph (c) 72kmph (d) 20kmph

4. The physical quantity which is equal to the change in momentum of a body is known as 1

   (a) Force (b) acceleration (c) impulse (d) work.

5. A shell of mass of 0.02 Kg is fired by a gun of mass 10Kg. If the muzzle speed of the shell is 80m/s, what is the recoil speed of the gun? 1

   (a) 1.6 m/s (b) 16 m/s (c) 0.16m/s (d) 40 m/s.

6. For inelastic collision between two spherical rigid bodies 1

(a)kinetic energy is conserved (b) linear momentum is conserved

(c)linear momentum is not conserved (d) both kinetic energy and linear momentum are conserved

7. A solid sphere is rotating in free space. If the radius of sphere is increased keeping mass same, which one of the following will not be affected? 1

(a) Angular velocity (b) Torque (c) Angular momentum (d) Linear momentum.

8. If the earth shrinks to half of its radius without change in mass, the duration of the day will be: 1

(a) 24 hr (b) 48 hr (c) 13 hr (d) 6hr

9. If V_0 be the orbital velocity of a satellite in a circular orbit close to the earth's surface and V_e is the escape velocity from the earth, then the relation between them the two is: 1

(a) $V_O = V_e$ (b) $V_e = \sqrt{2}\, V_O$ (c) $V_e = \sqrt{3}\, V_O$ (d) $V_e = 2V_O$

10. The ratio of the lateral strain to the longitudinal strain in a stretched wire is called 1

(a) Young's modulus (b) Poisson's ratio (c) Shear modulus (d) Bulk modulus

11. SI unit of thermal conductivity is 1

(a) $Wm^{-1}K^{-1}$ (b) Wm K (c) $Jsm^{-1}K^{-1}$ (d) $Js^{-1}mK$

12. Which are the modes of heat transfer that cannot operate between bodies separated by a distance in vacuum? 1

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13. First law of thermodynamics is the law of conservation of 1

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Assertion(A): Every simple harmonic motion is periodic motion, but every periodic motion need not be simple harmonic motion.

Reason(R): The motion of earth around the sun is periodic motion, but not simple harmonic motion.

SECTION B

19. Derive the relation $v^2 - u^2 = 2as$ graphically. 2

20. In a ballistics demonstration a police officer fires a bullet of mass 50g with a speed 200m/s on soft plywood of thickness 2cm. The bullet emerges with only 10% of its kinetic energy. What is the emergent speed of the bullet? 2

21. A body weighs 63N on the surface of the earth. What is the gravitational force on it due to the earth at a height equal to half the radius of the earth? 2

22. Represent graphically the variation of extension with load in an elastic body. 2

On the graph mark: (a) Hooke's law region (b) Elastic limit (c) Proportional limit (d) Breaking point

(OR)

A wire is cut to half its original length (a) How would it affect the increase in length under a given load? (b) How does it affect the maximum load it can support without exceeding the elastic limit?

23. (a) State Wein's displacement law 2

(b)Water is used as a coolant in automobile radiators, as well as, a heater in hot water bags. Why?

24. State the first law of thermodynamics and also write its limitations. 2

(OR)

Write any four differences between isothermal and adiabatic processes.

25. State the postulates of kinetic theory of gases. 2

SECTION C

26. Assuming that the mass M of the largest stone that can be moved by a flowing river depends upon the velocity v, the density of water ρ and the acceleration due to gravity g. Show that M varies with the sixth power of the velocity flow. 3

(OR)

A planet moves around the sun in nearly circular orbit. Its period of revolution T depends upon: (i) radius r of orbit (ii) mass M of the sun and (iii) the gravitational constant G. Show dimensionally that $T^2 \alpha r^3$.

27. Obtain an expression for the speed with which a vehicle can safely negotiate a flat curved road. 3

28. Define elastic collision. Derive the final velocities after one dimensional elastic collision. 3

29. Define centre of mass. Determine position of the centre of mass of a system of two particles. 3

(OR)

Define angular momentum. Derive the relationship between angular momentum and torque.

30. (a) List any two characteristics of simple harmonic motion. 3

(b) The displacement equation for a particle executing simple harmonic motion is **y = 12Sin (10t + 0.5).** Where y is in centimeter and time in seconds Find amplitude, frequency and initial phase.

SECTION D

31. (a) What is a projectile? Obtain an expression for a maximum height when a projectile is fired at an angle θ with the horizontal. 5

(b) A body is projected with a velocity of 30m/s at an angle of 30° with the horizontal. Find the time of flight and the horizontal range.

(OR)

(a) Show that the path followed by a projectile is a parabolic, when it is projected at an angle θ with the horizontal.

(b) An airplane takes off at an angle of 30^0 to the horizontal. If component of its velocity along the horizontal is 250 kmph, what is the actual velocity of plane? Find also the vertical component of the velocity.

32. (a) Define orbital velocity. Derive an expression for the orbital velocity of satellite. 5

(b) Assuming the earth to be a sphere of uniform mass density, how much would a body weigh half way down to the centre of the earth if it weighed 250 N on the surface?

(OR)

(a) Define escape velocity. Derive an expression for the escape velocity of a body from the surface of the earth.

(b) Find the percentage decrease in weight of a body when taken to a height of 32 km above the surface of earth, R = 6400km

33. (a) State and prove Bernoulli's theorem for fluids. 5

(b) The cylindrical tube of a spray pump has a cross-section of 8.0 cm^2, one end of which has 40 fine holes each of diameter 1.0 mm. If the liquid flow inside the tube is 1.5 m/min. What is the speed of ejection of the liquid through the holes?

(OR)

(a) Define terminal velocity. Derive an expression for terminal velocity

(b) Eight rain drops of radius 1mm each falling down with terminal velocity of 5m/s coalesce to form a bigger drop. Find the terminal velocity of the bigger drop.

SECTION E

34. **Case study:** 4

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(ii) What would be the coefficient of friction, if angle of friction is 30^0?

(iii) Define angle of friction.

OR

State laws of limiting friction. (any two)

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$$\mathbf{P = P_a + \rho g h}$$

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(5) Use of calculators is not allowed.

SECTION A

1. Light year is the unit of: 1

   (a) distance (b) Time (c) frequency (d) angular acceleration.

2. What does slope of position – time graph represents? 1

   (a) Distance (b) acceleration (c) velocity (d) force.

3. A body is moving with a uniform acceleration of $10ms^{-2}$. If its initial velocity is zero, its displacement after 5seconds? 1

   (a) 25m (b) 125m (c) 250m (d) 100m

4. The physical quantity which is equal to the rate of change of momentum of a body is known as 1

   (a) Force (b) acceleration (c) impulse (d) work.

5. A shell of mass of 0.02 Kg is fired by a gun of mass 10Kg. If the muzzle speed of the shell is 80m/s, what is the recoil speed of the gun? 1

   (a) 1.6 m/s (b) 16 m/s (c) 0.16m/s (d) 40 m/s.

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(a) Young's modulus (b) Poisson's ratio (c) Shear modulus (d) Bulk modulus

11. SI unit of thermal conductivity is 1

(a) $Wm^{-1}K^{-1}$ (b) Wm K (c) $Jsm^{-1}K^{-1}$ (d) $Js^{-1}mK$

12. Which are the modes of heat transfer that cannot operate between bodies separated by a distance in vacuum? 1

(a) Radiation and convection (b) Radiation and conduction

(c) Conduction and convection (d) Radiation

13. A process in which pressure, volume and temperature of the system change, but there is no exchange of heat between the system and its surroundings is called. 1

(a) Isothermal (b) Adiabatic (c) Isochoric (d) Isobaric

14. Absolute zero is considered at which 1

(a) Gas becomes liquid (b) Molecular energy is zero

(c) Random motion of molecule occurs. (d) All molecular motion ceases.

15. In a S.H.M. acceleration of a particle is 1

(a) Directly proportional to its displacement and the direction of acceleration and displacement are same.

(b) Directly proportional to its displacement and opposite to the direction of the displacement.

(c) Directly proportional to the square of its displacement.

(d) Independent of the displacement of the particle.

16. Two statements are given – one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below. 1

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ASSERTION (A): More the mass of a body, more is its inertia.

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ASSERTION (A): Moment of inertia of a body is same whatever be the axis of rotation.

REASON (R): Moment of inertia depends on the distribution of mass of the body.

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Assertion(A): Every simple harmonic motion is periodic motion, but every periodic motion need not be simple harmonic motion.

Reason(R): The motion of earth around the sun is periodic motion, but not simple harmonic motion.

SECTION B

19. Derive the relation $S = ut + \frac{1}{2}at^2$ graphically. 2

20. In a ballistics demonstration a police officer fires a bullet of mass 50g with a speed 200m/s on soft plywood of thickness 2cm. The bullet emerges with only 10% of its kinetic energy. What is the emergent speed of the bullet? 2

21. How much below the surface of the earth does the acceleration due to gravity become 1% of its value at earth's surface? 2

22. Represent graphically the variation of extension with load in an elastic body. 2

On the graph mark: (a) Hooke's law region (b) Elastic limit (c) Proportional limit (d) Breaking point

(OR)

A wire is cut to half its original length (a) How would it affect the increase in length under a given load? (b) How does it affect the maximum load it can support without exceeding the elastic limit?

23. (a) State Wein's displacement law 2

(b)Water is used as a coolant in automobile radiators, as well as, a heater in hot water bags. Why?

24. State the first law of thermodynamics and also write its limitations. 2

(OR)

Give any four differences between Isothermal and adiabatic process.

25. State the postulates of kinetic theory of gases. 2

SECTION C

26. Assuming that the mass M of the largest stone that can be moved by a flowing river depends upon the velocity v, the density of water ρ and the acceleration due to gravity g. Show that M varies with the sixth power of the velocity flow. 3

(OR)

A planet moves around the sun in nearly circular orbit. Its period of revolution T depends upon: (i) radius r of orbit (ii) mass M of the sun and (iii) the gravitational constant G. Show dimensionally that $T^2 \alpha\, r^3$.

27. Obtain an expression for the maximum speed with a vehicle can safely negotiate a curved road banked at an angle θ. 3

28. Define elastic collision. Derive the final velocities after one dimensional elastic collision. 3

29. Define centre of mass. Determine the position of centre of mass of a system of two particles. 3

(OR)

Define angular momentum. Derive the relationship between angular momentum and torque.

30. (a) List any two characteristics of simple harmonic motion. 3

(b) The displacement equation for a particle executing simple harmonic motion is **y = 10Sin (40t + 0.5).** Where y is in centimeter and time in seconds Find amplitude, frequency and initial phase.

SECTION D

31. (a) What is a projectile? Obtain an expression for a maximum height when a projectile is fired at an angle θ with the horizontal. 5

(b) A body is projected with a velocity of 30m/s at an angle of 30^o with the horizontal. Find the time of flight and the horizontal range.

(OR)

(a) Show that the path followed by a projectile is a parabolic, when it is projected at an angle θ with the horizontal.

(b) An aeroplane takes off at an angle of 30^0 to the horizontal. If component of its velocity along the horizontal is 250kmph, what is the actual velocity of plane? Find also the vertical component of the velocity.

32. (a) Define orbital velocity. Derive an expression for the orbital velocity of satellite. 5

(b) Assuming the earth to be a sphere of uniform mass density, how much would a body weigh half way down to the centre of the earth if it weighed 250N on the surface?

(OR)

(a) Define escape velocity. Derive an expression for the escape velocity of a body from the surface of the earth.

(b) Find the percentage decrease in weight of a body when taken to a height of 32km above the surface of earth, R = 6400km

33. (a) State and prove Bernoulli's theorem for fluids.

(b) The cylindrical tube of a spray pump has a cross-section of 8.0 cm^2, one end of which has 40 fine holes each of diameter 1.0 mm. If the liquid flow inside the tube is 1.5 m/min. What is the speed of ejection of the liquid through the holes? 5

(OR)

(a) Define terminal velocity. Derive an expression for terminal velocity

(b) Eight rain drops of radius 1mm each falling down with terminal velocity of 5m/s coalesce to form a bigger drop. Find the terminal velocity of the bigger drop.

SECTION E

34. **Case study:** Read the following paragraph and answer the questions.

Friction between any two surfaces in contact is the force that opposes the relative motion between them. The force of limiting friction is directly proportional to the normal reaction (R) between them i.e., $F \alpha R$ (or) $F = \mu R$, where μ is coefficient of limiting friction. If θ is angle of friction, then $\mu = \tan\theta$. 4

(i) A force of 49N is just able to move a block of wood weighing 10Kg on a rough horizontal surface. Calculate the coefficient of limiting friction.

(ii) What would be the coefficient of friction, if angle of friction is 30^0?

(iii) Define angle of friction.

OR

State laws of limiting friction. (any two)

35. **Case study:**

Read the following paragraph and answer the questions. 4

The pressure of the atmosphere at any point is equal to the weight of a column of air of unit cross-sectional area extending from that point to the top of the atmosphere. At sea level, it is 1.013×10^5 Pa (1 atm). Italian scientist Evangelista Torricelli (1608–1647) devised for the first time a method for measuring atmospheric pressure.

$$\mathbf{P = P_a + \rho g h}$$

Where ρ is the density of mercury and h is the of the mercury column in the tube In the experiment it is found that the mercury column in the barometer has a height of about 76 cm at sea level equivalent to one atmosphere (1 atm). This can also be obtained using the value of ρ. A common way of stating pressure is in terms of cm or mm of mercury (Hg). A pressure equivalent of 1 mm is called a torr (after Torricelli). 1 torr = 133 Pa. The mm of Hg and torr are used in medicine and physiology. In meteorology, a common unit is the bar and millibar.1 bar = 10^5 Pa. An open tube manometer is a useful instrument for measuring pressure differences.

(i) Is pressure a scalar or a vector quantity? Give reason.

(ii) Name the factors on which the atmospheric pressure at a place depends.

(iii) Why are passengers advised to remove the ink from their pens while going up in aeroplane?

OR

Why is it difficult to stop bleeding from a cut in human body at high altitudes?

******END OF THE QUESTION PAPER******