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CIVIL ENGINEERING

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**Fluid Mechanics • Hydrology & Irrigation
Environmental Engineering • Transportation Engineering**

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Also Useful for State-AE/JE, PSUs and PSCs Exams**



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Preface

This book has been written to meet the growing requirements of candidates appearing for State Engineering Service Examination, Junior Engineer, Public Sector Units, RRB-JE and Metro Exams. Though every candidate has ability to succeed but competitive environment, in-depth knowledge, quality guidance, time management and good source of study is required to achieve goals.

This book includes Multiple Choice Questions (MCQ Volume-III) which works as a mock exam practice for the reader. Questions of all the subject have been organized in systematic, concepts oriented and error less manner so that it become easy and interesting for even a beginner to understand. It is a very convenient book and must be solved by candidate aiming for competitive exams.

After solving this booklet students can feel encouraged and develop confidence to attempt each and every type of numerical as well as theoretical problems. Each problems explains solving approach so that at the end, so the reader is well equipped to be able to apply any type of problem solving requirement and distinctly choose one strategy or type from the other.

We hope this book will be proved an important tool to succeed in State Engineering Service Examination, Junior Engineer, Public Sector Units, RRB-JE and Metro Exams.

It is earnestly hoped that with the extensive additions and revisions, the present edition will facilitate the students not only in preparing themselves for competitive examinations but also in preparing for their regular examinations and prove more useful to the students than the earlier editions.

Even though, enough readings were given for correcting the error and printing mistakes, due to human tendency there could be some minor typos in the book. If any such typos found, they will be highly appreciated and incorporated in the next edition. Also, please provide your valuable suggestions at :engineers.academy.india@gmail.com

All the Best!



Engineers Academy Editorial Board

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UNIT-I

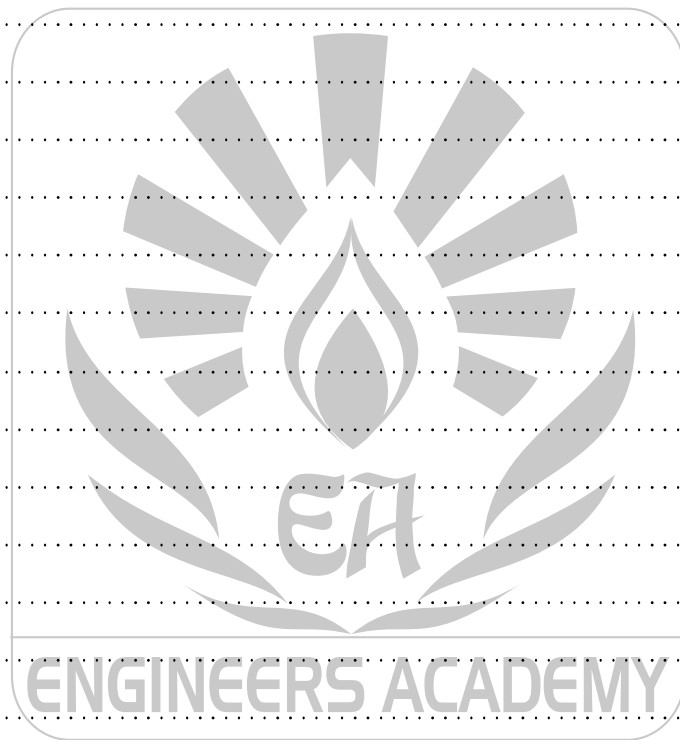
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NOTES



PROPERTIES OF FLUIDS

CHAPTER**1****OBJECTIVE QUESTIONS**

1. An ideal fluid
 - (a) Is very viscous
 - (b) Obeys newton's law of viscosity
 - (c) Is assumed in conduit flow
 - (d) Frictionless and incompressible
2. The density of air at 10°C is 1 MPa abs. in SI units is
 - (a) 12.31
 - (b) 1.231
 - (c) 118.4
 - (d) 65.0
3. The viscosity of a fluid varies with
 - (a) Temperature
 - (b) Temperature and pressure
 - (c) Pressure
 - (d) Density
4. A fluid is a substance that
 - (a) Is essentially incompressible
 - (b) Always moves when subjected to a shearing stress
 - (c) Has a viscosity that always increases with temperature
 - (d) Has a viscosity that always decreases with temperature
5. With decrease in temperature, the viscosity in gases generally
 - (a) Increases linearly
 - (b) Increases exponentially
 - (c) Remain unaffected
 - (d) Decreases
6. Viscosity of a fluid with specific gravity 1.3 is measured to be 0.0034 Ns/m². Its kinematic viscosity, in m²/s, is
 - (a) 2.6×10^{-6}
 - (b) 4.4×10^{-6}
 - (c) 5.8×10^{-6}
 - (d) 7.2×10^{-6}
7. Viscosity is the most important property in the
 - (a) Travel of a bullet through air
 - (b) Water jet issuing from a fire air
 - (c) Formation of soap bubbles
 - (d) Flow of castor oil through a tube
8. If the mass density of a liquid is 1000 kg/cum and its dynamic viscosity is 1 Ns/sq.m, then its kinematic viscosity (sq.m/s) will be :
 - (a) 0.1
 - (b) 1
 - (c) 0.001
 - (d) 0.01
9. A fluid in which resistance to deformation is linerly dependent of the shear stress, is known as
 - (a) Bingham plastic fluid
 - (b) Pseudo plastic fluid
 - (c) Dilatant fluid
 - (d) Newtonian fluid
10. Which of the following is not dimensionless quantity?
 - (a) Specific gravity
 - (b) Pressure coefficient
 - (c) Darcy weisbach friction factor
 - (d) Kinematic viscosity

[RPSC]

[DDA JE - 2018]

[UKPSC-JE - 2020]

[CGPSC - 2018]

11. One poise is equivalent to
(a) 3600 kg/m-hr (b) 1 dyne sec/cm²
(c) 10⁻¹ kg./m-sec (d) All the above
12. In a flowing fluid, a particles may posses
(a) Inertial energy
(b) Pressure energy
(c) Kinetic energy
(d) All of the above
13. When the rheogram for a fluid at any temperature and pressure is a straight line passing through origin, the fluid is said to be
(a) Ideal plastic (b) Bingham
(c) Newtonian (d) Non-newtonian
14. A pressure of 500 kPa applied to 2m³ of liquid results in a volume change of 0.004 m³. The bulk modulus, in MPa, is
(a) 2.5 (b) 25
(c) 250 (d) 2500
15. SI unit of kinematic viscosity is : –
(a) N.s/m² (b) m²/s
(c) N/m (d) N.s/m
[RPSC-VPITI, Haryana JE, ISRO - 2018]
16. A fluid, which satisfies the relations ' τ ' = μ (du/dy), where ' τ ' is shear stress, μ constant of proportionality and (du/dy) is the rate of deformation, is known as : –
(a) Newtonian fluid
(b) Non – Newtonian fluid
(c) Thixotropic fluid/ substance
(d) Plastic
[RPSC-VPITI, CGPSC-2018, DSSB-2019]
17. Which of the following fluids can be classified as non-newtonian ?
(a) Kerosene oil and Diesel oil
(b) Human blood and Toothpaste
(c) Diesel oil and water
(d) Kerosene oil and water
[LMRC-JE]
18. Which of the following fluid is incompressible and is having no viscosity?
(a) Real fluid
(b) Non-Newtonian fluid
(c) Ideal fluid
(d) Newtonian fluid
[PEB-SUB ER. - 2017, Haryana JE - 2018]
19. Poise is a unit for which of the following?
(a) Specific volume
(b) Viscosity
(c) Kinematic viscosity
(d) Mass density
[PEB-SUB ER. - 2017]
20. Specific gravity is also called as ____.
(a) Relative density (b) Mass density
(c) Specific weight (d) Weight density
[PEB-SUB ER. - 2017]
21. In CGS system, the unit of kinematic viscosity is stoke, where 1 stoke = ____.
(a) 10⁶cm³/s (b) 10⁻²m²
(c) 10⁴cm³/s (d) 10⁻⁴m²/s
[PEB-SUB ER. - 2017]
22. The ratio of the mass of a fluid to its volume is known as ____.
(a) Mass density (b) Viscosity
(c) Specific weight (d) Weight density
[PEB-SUB ER. - 2017]
23. Dynamic viscosity (μ) has the dimension as :
(a) MLT⁻² (b) ML⁻¹T⁻¹
(c) ML⁻¹T⁻² (d) M⁻¹L⁻¹T⁻¹
[MPSC - 2012, AEC - 2017, MPSC - 2018, RSSB JE - 2020]
24. The drag on a very small sphere falling in a highly viscous fluid varies
(a) Inversely with the velocity
(b) Directly with the velocity
(c) As the square root of the velocity
(d) As the square of the velocity
[LBS-ASST.PROF. - 2017]

25. A fluid in equilibrium can't sustain
(a) Shear stress (b) Compressive stress
(c) Tensile stress (d) Bending stress
[ISRO - 2015]
26. One kilo Pascal is equivalent to :
(a) 10 N/mm² (b) 1000 N/m²
(c) 100 N/mm² (d) 1000 N/cm²
[NBCC - 2017]
27. Fluids undergo volume change under external pressure due to
(a) Plasticity (b) Viscosity
(c) Tenacity (d) Compressibility
[ISRO - 2018]
28. 1 centipoise = _____ poise.
(a) 1/10 (b) 1/100
(c) 1/50 (d) 1/25
[Haryana JE - 2018]
29. The viscosity of water at 20°C is
(a) 0.05 poise (b) 0.1 poise
(c) 0.01 poise (d) 0.1 centipoise
[Haryana JE - 2018]
30. A vessel of 4 m³ contains oil which weight 30 kN. The specific weight of the oil is
(a) 4.5 kN/m³ (b) 6 kN/m³
(c) 7.5 kN/m³ (d) 10 kN/m³
[ISRO - 2017]
31. The variation in the volume of a liquid with the variation of pressure is called its
(a) Surface tension (b) Compressibility
(c) Capillarity (d) Viscosity
[ISRO - 2017]
32. Newton's law of viscosity is a relationship between
(a) Pressure, velocity and temperature
(b) Shear stress and rate of shear strain
(c) Shear stress and velocity
(d) Rate of shear strain and temperature
[ISRO - 2017]
33. Pascal-sec is the unit of
(a) Pressure
(b) Kinematic viscosity
(c) Dynamic viscosity
(d) Surface tension
[PMB JE - 2018]
34. If the volume of a liquid weighing 3000 kg is 4 cubic metres, 0.75 is its
(a) Specific weight (b) Specific mass
(c) Specific gravity (d) Specific volume
[ISRO - 2013]
35. The property of a fluid which offers resistance to the movement of one layer to another adjacent layer is called ____.
(a) Viscosity (b) Slip
(c) Opacity (d) Velocity
[DMRC - 2018, JSSC - JE]
36. "Eddy Viscosity" means that it is
(a) Physical property of the fluid
(b) Same as the kinematic viscosity
(c) Always associated with laminar flow
(d) An apparent viscosity due to turbulent flow
[HPSC - 2014]
37. When a matter resists applied shear stress by static deformation, it is :
(a) Liquid (b) Gas
(c) Fluid (d) Solid
[DDA JE - 2018]
38. Surface tension has the dimensions
(a) FL⁻¹ (b) F
(c) FL⁻² (d) FL⁻³
[UK Combined AE - 2012, SSC JE - 2011, CGPSC - 2018]
39. If salt is added in water, the surface tension of water will :
(a) Increase (b) Decrease
(c) Will not change (d) None of the above
[UPSSSC JE - 2015]

40. The weight per unit volume of a liquid at standard temperature and pressure is called :
(a) Specific weight (b) Specific mass
(c) Mass density (d) Specific gravity
[F.C.I. JE - 2015]
41. Surface tension of water
(a) Increases with decreases in temperature
(b) Decreases with decreases in temperature
(c) Independent of temperature
(d) None of these
[MP SUB Eng. - 2016, GMB-AEn - 2021]
42. The stress, which is responsible for retaining water in a capillary tube above the free water surface of the water body in which the capillary tube is inserted, is called the
(a) Capillary compression
(b) Capillary tension
(c) Capillary pore pressure
(d) None of these
[MP SUB Eng. - 2016]
43. Rheology is the study of
(a) Newtonian fluids
(b) Ideal fluids
(c) Non-Newtonian fluids
(d) None of these
[H.P. SSC - 2015]
44. If the mass density of a fluid is 789 kg/m^3 Taking $g = 9.806 \text{ m/sec}^2$. Specific volume will be
(a) $0.126 \text{ m}^3/\text{kN}$ (b) $0.122 \text{ m}^3/\text{kN}$
(c) $0.129 \text{ m}^3/\text{kN}$ (d) $0.132 \text{ m}^3/\text{kN}$
[UK Combined AE - 2012]
45. With an increase in the radius of the tube, the rise of liquid in the tube due to surface tension will ____
(a) Decrease
(b) Increase
(c) Remains unchanged
(d) Cannot be said
[UK Combined AE - 2012]
46. If pipes of too small diameter are used, the power required may _____.
(a) Considerably increased
(b) Considerably decreased
(c) Be constant
(d) Be null
[MP Draftman JE - 2017]
47. What shall be the pressure intensity inside a soap bubble of radius 4 cm? (Surface tension of water is 0.0736 N/m) :
(a) 7.36 N/m^2
(b) 1.84 N/m^2
(c) 3.68 N/m^2
(d) None of these
[UPSSSC JE - 2016]
48. Which of the following is not the unit of pressure?
(a) Kg/cm^2 (b) Psi
(c) Atmosphere (d) Newton
[UP Jal Nigam JE - 2016]
49. The expression for kinematic viscosity of a fluid is-
(a) Dynamic viscosity $\times$ density
(b) Dynamic viscosity / density
(c) Dynamic viscosity $\times$ pressure
(d) None of the above
[Uttarakhand AE - 2013]
50. Which of the following is dimensionless?
(a) Specific volume (b) Specific weight
(c) Specific gravity (d) Specific speed
[DMRC JE - 2017]
51. The region within which the effect of viscosity is confined, is known as
(a) Cavitation (b) Stagnation layer
(c) Boundary layer (d) Free layer
[UPRVUNL JE - 2015]
52. A fluid whose viscosity changes with the rate of deformation is known as :
(a) Newtonian fluid (b) Laminar flow
(c) Turbulent flow (d) Non-newtonian fluid
[MP SUB. Eng. - 2016]

53. Match List I with List II and choose the correct answer from the options given below :

List-I

(Physical quantity)

- A. Angular velocity
- B. Angular acceleration
- C. Discharge
- D. Kinematic viscosity

List-II

(Dimension)

- a. L^2T^{-1}
- b. T^{-1}
- c. T^{-2}
- d. L^3T^{-1}
- (a) A-a, B-b, C-d, D-a
- (b) A-b, B-c, C-d, D-a
- (c) A-c, B-d, C-a, D-b
- (d) A-b, B-d, C-a, D-c

[LMRC JE - 2015]

54. Match List-I with List-II and the correct answer from the options below.

List-I (Fluid property)

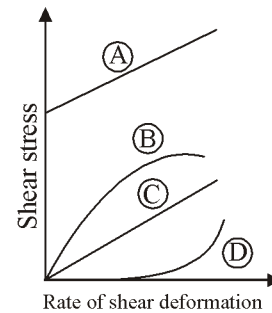
- A. Compressibility
- B. Gravity
- C. Viscosity
- D. Vapour pressure

List-II (Flow Phenomenon)

- a. Flow of real fluid past a tiny sphere
- b. Cavitation
- c. Hydraulic jump
- d. Flight of supersonic aircraft
- (a) A-c, B-d, C-b, D-a
- (b) A-c, B-d, C-b, D-a
- (c) A-d, B-c, C-a, D-b
- (d) A-d, B-c, C-b, D-a

[UPPCL JE - 2015]

55. In the given figure which nature of fluid is represented by curve A?



- (a) Newtonian
- (b) Pseudo-plastic
- (c) Dilatant
- (d) Ideal Bingham plastic

[UPPCL JE - 2015]

56. Which of the following statements is correct?

- (a) For water at 100°C at sea level, the vapour pressure is equal to the atmospheric pressure
- (b) Air is 50,000 times more compressible than water
- (c) Viscosity of the molecules is the property exhibited by them in both static and dynamic conditions
- (d) Surface energy is caused by the force of adhesion between liquid molecules

[UPPCL JE - 2015]

57. From the options given below, in which situations, the viscous force is unimportant?

- (a) Incompressible fluids in closed pipes
- (b) Motion of aeroplanes
- (c) Capillary waves in channels
- (d) Resistance to motion of ship

[MP SUB Eng. - 2016]

58. When a ship moving on sea water enters river and moves inland, it is expected to

- (a) Rise a little
- (b) Sink a little
- (c) Maintain the same level of draft
- (d) Rise or fall depending on whether it is made of wood or steel

[MP SUB ENG - 2016]

59. A plate of thickness 0.010 mm, distant from a fixed plate, moves at 10 cm/s and requires a force of 1 N per unit area i.e. 1 N/mm² to maintain this speed. What would be the fluid viscosity between the plates?
(a) 10⁻³ poise (b) 10⁻⁴ poise
(c) 2 × 10⁻³ poise (d) None of these
[HPSSSB JE - 2017]
60. Milk mixes with water due to
(a) Very good cohesion
(b) Very good adhesion
(c) Very good surface tension
(d) Very good vapour pressure
[RRB JE - 2015]
61. A liquid forms an interface with another liquid or gas; the surface energy per unit area of the interface is known as :
(a) Surface tension (b) Specific energy
(c) Specific heat (d) Suction energy
[RRB SSE - 2015]
62. Spherical shape of droplets of mercury is due to-
(a) High density (b) High surface tension
(c) High adhesion (d) Water
[RRB JE - 2015]
63. Falling drops of water become spheres due to the property of :
(a) Compressibility of water
(b) Surface tension of water
(c) Capillarity of water
(d) Viscosity of water
[RRB JE - 2014]
64. The capillary rise at 20°C in clean glass tube of 1 mm diameter, containing water is :
(a) 15 mm (b) 50 mm
(c) 20 mm (d) 30 mm
[RRB JE - 2015]
65. Cavitation is primarily associated with of the following fluid properties
(a) Specific gravity (b) Surface tension
(c) Viscosity (d) Vapour pressure
[RRB SSE - 2015]
66. The intensity of pressure developed by surface tension of 0.075 N/m in a droplet of water of 0.075 mm diameter is-
(a) 0.8 N/cm² (b) 0.6 N/cm²
(c) 0.4 N/cm² (d) 400 N/cm²
[RRB JE - 2015, Punjab Phed - 2015]
67. Capillarity of liquid in small-diameter tubes is due to molecular attraction. In case of Mercury, the following occurs in terms of capillarity
(a) Capillary rise (b) Capillary depression
(c) Capillary flattening (d) Compressibility
[RRB SSE - 2015]
68. The density of water is :
(a) 10⁻³ kg/m³ (b) 1 kg/m³
(c) 10² kg/m³ (d) 10³ kg/m³
[RRB JE - 2014]
69. Water has its maximum density at :
(a) 0°C (b) 100°C
(c) 50°C (d) 4°C
[RRB JE - 2014]
70. If cohesion between molecules of fluid is greater than adhesion between fluid and glass, then the free level of fluid in a dipped glass tube will be
(a) Higher than the surface of liquid
(b) The same as the surface of liquid
(c) Lower than the surface of liquid
(d) Unpredictable
71. Dynamic viscosity of the liquids with rise in temperature
(a) Does not show any change
(b) Increases
(c) Decreases
(d) None of these

72. Property of a fluid because of which its own molecules attract each other is
 (a) Adhesion (b) Compressibility
 (c) Cohesion (d) Capillarity
- [UKPSC JE - 2020 (II)]
73. Viscosity of water in comparison to mercury is
 (a) Variable and unstable
 (b) Higher
 (c) Lower
 (d) Same
74. Angle of contact in case of a liquid depends upon
 (a) The material existing above the free surface of the liquid
 (b) The nature of the liquid and solid
 (c) Both of the above
 (d) Depends upon temperature
75. The rise or fall of head 'h' in a capillary tube of diameter 'd' and liquid surface tension ' σ ' and specific weight 'w' is equal to
 (a) $\frac{2d}{w\sigma}$ (b) $\frac{4\sigma}{wd}$
 (c) $\frac{3w\sigma}{d}$ (d) $\frac{4wd}{\sigma}$
76. The bulk modulus of elasticity of a
 (a) Fluid decreases with the increase in pressure
 (b) Liquid decreases with increase of temperature
 (c) Liquid increases with increase in temperature
 (d) None of the above
77. For a soap bubble, the surface tension σ and difference of pressure (ΔP) are related as
 (a) $\Delta P = \frac{4\sigma}{d}$ (b) $\Delta P = \frac{\sigma}{4d}$
 (c) $\Delta P = \frac{\sigma}{2d}$ (d) $\Delta P = \frac{8\sigma}{d}$
 where d is diameter of bubble
78. Mercury doesn't wet glass. This is due to property known as
 (a) Surface tension (b) Adhesion
 (c) Viscosity (d) Cohesion
79. The viscosity of water with respect to air is about
 (a) 50 times (b) 55 times
 (c) 60 times (d) 65 times
80. Match List I with List II and select the correct answer :
- | List I | | List II | |
|--------|---------------------|---------|--|
| A | Ideal fluid | 1 | Shear stress does not vary linearly with the rate of strain |
| B | Newtonian fluid | 2 | Tensile stress varies linearly with the rate of strain |
| C | Non-Newtonian fluid | 3 | Shear stress is zero |
| D | Bingham plastic | 4 | Viscosity decreases with increase in temperature |
| | | 5 | Shear stress varies linearly with the rate of strain |
| | | 6 | Fluid behaves like a solid until a minimum yield stress beyond which it exhibits a linear relationship between shear stress and the rate of strain |
- (a) A-3, B-5, C-6, D-1
 (b) A-3, B-5, C-1, D-6
 (c) A-5, B-3, C-4, D-2,
 (d) A-5, B-4, C-3, D-2
- [CGPSC]
81. Determine the bulk modulus of elasticity of liquid, if the pressure of liquid is increased from 60 N/cm² to 120 N/cm². The volume of liquid was found to decrease by 0.20%.
 (a) 1×10^4 N/cm²
 (b) 2×10^4 N/cm²
 (c) 3×10^4 N/cm²
 (d) 4×10^4 N/cm²
- [CGPSC]
82. A clean glass tube of 2 mm diameter contains water at 40°C. The capillary rise is approximately
 (a) 5 mm (b) 10 mm
 (c) 15 mm (d) 20 mm
- [CGPSC]

83. Which of the following statements is INCORRECT about thixotropic fluids?
 (a) Apparent viscosity depends on the time of shearing
 (b) Thixotropy is an irreversible process
 (c) Thixotropic fluid shows shear thinning behavior
 (d) Thixotropic fluids are in general non-Newtonian fluids
[CEPTM - 2009]
84. The mass density of one litre of diesel of relative density 0.6 is :
 (a) 1000 kg/m³ (b) 6000 kg/m³
 (c) 60 kg/m³ (d) 600 kg/m³
[WRD B. Tech - 2013]
85. The excess pressure in a droplet of 0.002 m diameter a fluid with surface tension of 0.01 N/m is
 (a) 10 (b) 20
 (c) 4 π (d) 0.00004 π
[AEM - 2017]
86. Surface tension is a phenomenon due to
 (a) Cohesion only
 (b) Viscous force only
 (c) Adhesion between liquid and solid molecules
 (d) Difference in magnitude between the forces due to adhesion and cohesion
[MPSC - 2018]
87. Newton's law of viscosity is given by the relation
 (a) $\tau = \mu^2 \frac{du}{dy}$ (b) $\tau = \mu \frac{du}{dy}$
 (c) $\tau = \mu \frac{dy}{du}$ (d) $\tau = \mu^2 \frac{dy}{du}$
[CEMPM - 2018]
88. Compressibility is the reciprocal of
 (a) Bulk modulus of elasticity
 (b) Shear modulus of elasticity
 (c) Young's modulus of elasticity
 (d) Viscosity
[CEMPM - 2018]
89. Which one of the following is defined as force per unit length –
 (a) Surface tension (b) Compressibility
 (c) Capillarity (d) Viscosity
[RRB JE - 2015]
90. For a fluid at rest–
 (a) The shear stress is zero only on the horizontal plane
 (b) The shear stress is zero
 (c) The shear stress is maximum on a plane inclined at 45° to the horizontal
 (d) The shear stress depends upon the co-efficient of viscosity
[UPSSC JE - 2015]
91. Match List-I (fluid properties) with List-II (related terms) and select the correct answer using the given lists:
- | List-I | List-II |
|---------------------|---------------------|
| A. Capillarity | a. Cavitation |
| B. Vapour pressure | b. Density of water |
| C. Viscosity | c. Shear forces |
| D. Specific gravity | d. Surface tension |
- (a) A-a, B-d, C-b, D-c
 (b) A-a, B-d, C-c, D-b
 (c) A-d, B-a, C-b, D-c
 (d) A-d, B-a, C-c, D-b
[UPRVUNL JE - 2015]
92. A liquid compressed in a cylinder has initially a volume of 20 m³ at a pressure of 100 pa. If the new volume is 40 m³ at a pressure of 50 Pa, the bulk modulus of elasticity would be :
 (a) 20 Pa (b) -20 Pa
 (c) 50 Pa (d) -50 Pa
[UPRVUNL AE - 2014]
93. A glass tube of 3 mm diameter is immersed in water which is at 20°C. The surface tension for water is 0.0736 N/m. The contact angle for water is 0°C. How much will be the capillary rise or depression ?
 (a) 20 mm (b) 10 mm
 (c) 0.492 cm (d) 0.56 cm
[MP SE - 2016]

94. The coefficient of viscosity may be observed by
(a) Capillary tube method
(b) Orifice type viscometer
(c) Rotating cylinder method
(d) All of these
[MP SE - 2016]
95. Free surface of a liquid tends to contract to the smallest possible area due to force of
(a) Adhesion (b) Viscosity
(c) Gravity (d) Surface tension
[MP SE - 2016]
96. Compressibility is equal to
(a) $\frac{-(dV / V)}{dp}$ (b) $\frac{dp}{-(dV/V)}$
(c) $\frac{dp}{dp}$ (d) $\sqrt{\frac{dp}{dp}}$
[Uttarakhand JE - 2008]
97. Specific volume is ratio of
(a) Mass and volume
(b) Volume and mass
(c) Weight and volume
(d) Volume and weight
[RWRD JE - 2014, DSSSB - 2021 Shift]
98. Which one of the following is correct dimension of surface tension
(a) N/m^2 (b) J/m
(c) J/m^2 (d) W/m
[UPRVNL JE - 2016]
99. The dynamic viscosity of fluid is 0.7 poise and specific gravity is 0.8, then the kinematic viscosity of fluid in stokes is :
(a) 1.14 (b) 0.87
(c) 0.22 (d) 0.34
[UPRVNL JE - 2016]
100. What is the ratio of specific weight of a liquid of the specific weight of pure water at a standard temperature called as?
(a) Density of liquid
(b) Specific gravity of liquid
(c) Compressibility of liquid
(d) Surface tension of liquid
[Vizag Steel M.T. - 2011]
101. The mass per unit volume of a liquid at a standard temperature and pressure is called
(a) Specific weight
(b) Mass density
(c) Specific gravity
(d) None of these
[Vizag Steel (J.T.) - 2017]
102. Viscosity is considered as property in model analysis.
(a) Geometric
(b) Dimensionless
(c) Dynamic
(d) Kinematic
[M.P. Vyapam - 2017]
103. The height to which a liquid will rise in an open capillary tube is inversely proportional to :
(a) Temperature of liquid
(b) Density of liquid
(c) Air pressure
(d) Surface tension
[ISRO Vikram Sarabhai - 2017]
104. Which property of mercury is the main reason for use in barometers?
(a) Low density
(b) Negligible capillary effect
(c) Very low vapour pressure
(d) Low compressibility
[UPPSC AE - 2016]

105. The increase in pressure of a liquid
- (a) Lowers the boiling point of a liquid
 - (b) Raises the boiling point of a liquid
 - (c) Does not effect the boiling point of a liquid
 - (d) Reduces its volume

[MP SE - 2016]

106. One liter of water occupies a volume of :
- (a) 100 m³
 - (b) 1000 cm³
 - (c) 10000 cm³
 - (d) 100000 m³

[MP SE - 2016]

107. The desirable properties for an practical fluids :
- (a) Should be viscous
 - (b) Should posses surface tension
 - (c) Should be compressible
 - (d) All of the above

[MP SE - 2016]

108. Find the surface tension in soap bubble of 40 mm diameter when the inside pressure is 2.5 N/m² above atmospheric pressure.
- (a) 0.860 N/m
 - (b) 1.265 N/m
 - (c) 0.0125 N/m
 - (d) 0.0064 N/m

[RSMSSB-JE - 2020]

109. Pressure inside a water droplet is given by relation

- (a) $P = \frac{3\sigma}{d}$
- (b) $P = \frac{8\sigma}{d}$
- (c) $P = \frac{16\sigma}{d}$
- (d) $P = \frac{4\sigma}{d}$

[RSMSSB-JE - 2020]

110. Newton's Law of Viscosity is a relationship between
- (a) Shear stress and velocity
 - (b) Rate of shear strain and velocity
 - (c) Pressure, velocity and temperature
 - (d) Shear stress and rate of shear strain

[RSMSSB-JE - 2020]

111. With rise in pressure, the bulk modulus of liquid
- (a) Remains constant
 - (b) Increases
 - (c) Decreases
 - (d) None of the above

[UPPSC-AE - 2020]

112. Calculate the kinematic viscosity (stoke) of the fluid, if the dynamic viscosity of fluid is 0.5 poise and specific gravity is 0.4 ?
- (a) 0.95
 - (b) 1
 - (c) 1.25
 - (d) 1.5

[NCL - 2020]

113. The dimensional constant for discharge is :
- (a) T⁻¹
 - (b) L²T⁻¹
 - (c) L³T⁻¹
 - (d) ML⁻³
 - (e) ML⁻⁴

[CE : 25.02.2018 (Shift-2)]

114. What is the specific gravity of one litre of a liquid that weighs 5 N?
- (a) 0.71
 - (b) 0.41
 - (c) 0.61
 - (d) 0.51

115. What is the specific weight of one litre of oil whose specific gravity is 0.7?

- (a) 6.867 N
- (b) 6867 N/m³
- (c) 700 kg/m³
- (d) 13.868 kg

116. A fluid in which the shear stress is more than the yield value and the shear stress is proportional to the rate of shear strain is called a/an:

- (a) real fluid
- (b) non-Newtonian fluid
- (c) Newtonian fluid
- (d) ideal plastic fluid

117. What is the viscosity of water having the kinematic viscosity of 6 stokes and specific gravity of 1.9?

- (a) 13.04 poise
- (b) 14.8 poise
- (c) 12.40 poise
- (d) 11.40 poise

118. $ML^{-2}T^{-2}$ is the dimension for which physical Quantity ?
(a) Dynamic Viscosity
(b) Surface Tension
(c) Energy
(d) Specific Weight
119. A Newtonian fluid is one which
(a) Obeys Newton's law of viscosity
(b) Is highly viscous
(c) Is compressible and non-viscous
(d) Is incompressible and Non-viscous
120. Which of the following is the unit of Poise?
(a) Mass density
(b) Dynamic Viscosity
(c) Velocity gradient
(d) Kinematic viscosity
121. A real fluid in which the shear stress is directly proportional to the rate of shear strain is known as:
(a) Newtonian fluid. (b) Ideal plastic fluid
(c) Ideal fluid (d) Non Newtonian fluid
122. Calculate the density of one litre of petrol of specific gravity = 0.7
(a) 7000 kg/m^3 (b) 70 kg/m^3
(c) 7 kg/m^3 (d) 700 kg/m^3
123. Which below expression satisfies 'surface tension on hollow bubble'?
- (a) $p = \frac{4\sigma}{d}$ (b) $p = \frac{\sigma}{d}$
(c) $p = \frac{2\sigma}{d}$ (d) $p = \frac{8\sigma}{d}$
124. If 900 kg liquid occupies volume of one cubic meter, then 0.90 represents it's
(a) Specific gravity (b) Specific volume
(c) Density (d) Unit weight
125. Centi poise is the unit of
(a) Unit weight
(b) Dynamic viscosity
(c) Kinematic viscosity
(d) Velocity
126. Shear stress develops on a fluid element, if
(a) The fluid container is subject to uniform linear acceleration
(b) The fluid is in- viscous
(c) The fluid is at rest
(d) The fluid is viscous and the flow is non-uniform
127. The ratio of specific weight of a liquid to specific weight of pure water at standard temperature is called:
(a) density of a liquid
(b) surface tension of a liquid
(c) specific gravity of a liquid
(d) compressibility of a liquid
128. The variation in the volume of a liquid with the variation of pressure is called:
(a) capillarity
(b) compressibility
(c) surface tension
(d) viscosity
129. What is the specific gravity of a liquid having the viscosity 0.006 Ns/m^2 and kinematic viscosity $0.025 \times 10^{-4} \text{ m}^2/\text{s}$.
(a) 2.4 (b) 0.5
(c) 2 (d) 1.2
130. All imaginary fluids are _____.
(a) ideal plastic fluid (b) real fluids
(c) ideal fluids (d) plastic fluids
131. Specific Gravity of Mercury is _____.
(a) 1.6 (b) 10.6
(c) 13.6 (d) 15.6

132. The Value of Density of water is _____.
(a) 5gm/cm^3 (b) 0.5gm/cm^3
(c) 1gm/cm^3 (d) 10gm/cm^3
133. CGS unit of Viscosity is _____.
(a) $(\text{Dyne-sec})/(\text{cm}^3)$
(b) $(\text{Dyne-sec})/(\text{cm})$
(c) $(\text{Dyne-sec})/(\text{cm}^2)$
(d) $(\text{Dyne-sec}^3)/(\text{cm}^2)$
134. Surface tension can be defined as _____.
(a) The force acting on the surface of a liquid in contact with ground
(b) The compressive force acting on the surface of a liquid in contact with a gas
(c) The tensile force acting on the surface of a liquid in contact with a gas
(d) The shear force acting on the surface of a liquid in contact with a gas
135. The volume of a fluid occupied by a unit mass is called as _____.
(a) Specific Volume
(b) Specific Weight
(c) Viscosity
(d) Specific Gravity
136. CGS unit of Kinematic Viscosity is _____.
(a) Cm^3/s (b) Cm^2/s
(c) Cm^2/s^2 (d) Cm^2/s^3
137. As per Newton's Law of viscosity the shear stress acting between two layers of fluid is :
(a) Directly proportional to the distance between them.
(b) Inversely proportional to the square of the distance between them
(c) Directly proportional to the square of the distance between them.
(d) Inversely proportional to the distance between them.
138. Bulk modulus is defined as :
(a) Sum of direct stress and volumetric strain
(b) Product of direct stress and volumetric strain
(c) Ratio of direct stress and volumetric strain
(d) Difference of direct stress and volumetric strain
139. A tank is filled with 1L liquid & weight of the same was found to be 6 N. What is the specific weight of the liquid ?
(a) $0.6 * 10^{-3} \text{ N/m}^3$
(b) $6 * 10^{-3} \text{ N/m}^3$
(c) $0.6 * 10^3 \text{ N/m}^3$
(d) $6 * 10^3 \text{ N/m}^3$
140. 1 Newton (N) is equal to _____.
(a) 10 kg m/s^2 (b) 0.1 kg m/s^2
(c) 1 kg m/s^2 (d) 100 kg m/s^2
141. An object weight 100 N in air and 75 N in water when fully submerged unit. The specific gravity of the object is
(a) 4.0 (b) 4.5
(c) 2.5 (d) 1.25
142. Printer's ink is an example of
(a) Newtonian fluid
(b) Non-Newtonian fluid
(c) Thixotropic substance
(d) Elastic solid
143. Dynamic Viscosity of a gas
(a) Increases s temperature decreases
(b) Increases as temperature increases
(c) Is independent of temperature
(d) May increase or decrease with increase in temperature, depending on the nature of gas

[JPSC]

144. The following results are obtained on shear stress (τ) and rate of deformation at constant temperature for a fluid.

(du/dy) (radians/sec)	0	0	1	2	3
τ (kPa)	0	10	20	30	40

The above fluid is classified as

- (a) Newtonian (b) Non-Newtonian
(c) Ideal plastic (d) Thixotropic

[MPSC - 2018]

145. The units of kinematic viscosity are

- (a) $\text{kg/m}^2 \cdot \text{sec}$ (b) kg/sec/m^2
(c) $\text{m/kg} \cdot \text{sec}$ (d) m^2/sec

[UKPSC]

146. The flow in a pipe is laminar if the Reynolds number is

- (a) Less than 2000
(b) Between 2000 and 4000
(c) Between 4000 and 6000
(d) Equal to 6300

147. The unit of kinematic viscosity is :

- (a) $\text{gm/cm} \cdot \text{sec}^2$ (b) $\text{dyne} \cdot \text{sec/cm}^2$
(c) $\text{gm/cm}^2 \cdot \text{sec}$ (d) cm^2/sec

148. Two horizontal plates are placed in parallel keeping 2.0 cm apart. If the space between the plates is filled with an oil of viscosity 10 poise, then what would be the shear stress in oil if upper plate is moved with velocity of 3.0 m/s

- (a) 50 N/m^2 (b) 100 N/m^2
(c) 150 N/m^2 (d) 200 N/m^2

[Punjab - SSSB]

149. At room temperature, the dynamic and kinematic viscosity of water are

- (a) Both greater than that of air.
(b) Both lesser than that of air
(c) Respectively greater than and lesser than that of air.
(d) Respectively less er than and greater than that of air.

[Punjab SDO - 2021]

150. Which of the following is the least incompressible fluid ?

- (a) Gasoline (b) Kerosene oil
(c) Helium (d) Water

[OPSC AE - 2015]

151. What is the specific weight of water in S.I. units ?

- (a) 9.81 gm (b) 981 gm
(c) 9.81 kN/m^3 (d) $9.81 \times 10^3 \text{ kN/m}^2$

[OPSC AE - 2015]

152. An ideal flow of a liquid obeys :

- (a) Continuity equation
(b) Newton's law of viscosity
(c) Newton's second law of motion
(d) Dynamic viscosity law

[JPSC - AE]

153. Which one of the following pressure units represents the maximum pressure ?

- (a) Millibar (b) mm of Hg
(c) N/mm^2 (d) kg(f) cm^2

[JPSC - AE]

154. Which of the following statements is correct ?

- (a) Dynamic viscosity of water is nearly 50 times that of air
(b) Kinematic viscosity of water is 30 times that of air
(c) Water in soil is able to rise a considerable distance above the ground water table due to viscosity
(d) Vapor pressure of a liquid is inversely proportional to the temperature

[JPSC - AE]

155. Which one of the following expresses the height of rise or fall of a liquid in a capillary tube ?

Where , w = Specific weight of the liquid, α = Angle of contact of the liquid surface, s = Surface tension, d = diameter of capillary tube.

- (a) $\frac{4wd}{\sigma \cos \alpha}$ (b) $\frac{\sigma \cos \alpha}{4wd}$
(c) $\frac{4\sigma \cos \alpha}{wd}$ (d) $\frac{wd}{4\sigma \cos \alpha}$

[JPSC - AE]

156. Poise is the unit of :

- (a) Dyne-cm/s² (b) Dyne-cm/s
(c) Dyne-s/cm (d) Dyne-s/cm²

[JPSC - AE]

157. The surface tensional a soap bubble of 50 mm diameter with its inside pressure being 2.5 N/m² above the atmospheric pressure is :

- (a) 0.0125 N/m (b) 0.0156 N/m
(c) 0.2000 N/m (d) 0.0312 N/m

[JPSC - AE]

158. If the kinematic viscosity of a fluid is 6 stokes and specific gravity is 1.9, then dynamic viscosity of the liquid in poise is :

- (a) 11.40 (b) 1.40
(c) 10.80 (d) 3.16

[DFCCIL - 2016]

159. The atmospheric pressure at sea level is called

- (a) Normal pressure
(b) Standard atmospheric pressure
(c) Barometric pressure
(d) Absolute pressure

[MPSC]

160. The property of a fluid which determines its resistance to shearing stress, is called_____.

- (a) Permeability (b) Viscosity
(c) Capillarity (d) Density

[MPSC - 2019]

161. At what standard temperature, the specific gravity of water is equal to 1

- (a) 2 °C (b) 4 °C
(c) 10 °C (d) 20 °C

[MPSC - 2017]

162. The pressure at a point 4 m below the free surface of water is :

- (a) 19.24 kPa (b) 29.24 kPa
(c) 39.24 kPa (d) 49.24 kPa

[MPSC - 2016]

163. The kinematic viscosity of oil of specific gravity 0.8 and dynamic viscosity 2 poise is -

- (a) 2.5 centistoke (b) 2500 cm²/sec
(c) 2.5×10^{-4} cm²/sec (d) 2.5 stokes

[TNPSC - 1998, APPSC - 2013]

164. In MLT system, the dimensions of angular momentum would be

- (a) MLT⁻¹ (b) ML²T
(c) ML²T⁻¹ (d) ML²T⁻²

165. If the surface tension of a soap air interface is 0.09 N/m, the difference between the internal and external pressure in the soap bubble of 3 cm diameter is-

- (a) 22 (b) 20
(c) 24 (d) 30

[CGSES - 2015]

166. Capillarity is due to

- i. Surface tension
ii. Cohesion
iii. Viscosity
iv. Weight density of fluid

- (a) (ii),(iii) (b) (iii)
(c) (i) (d) (ii),(iii),(v)

[SSC-JE - 2014]

167. The bulk modulus of elasticity of a compressible fluid for isothermal process is equal to

- (a) p (b) kp
(c) k (d) none of these

[APPSC - 1984]

168. If the diameter of a capillary tube is doubled, the capillary rise will be—

- (a) Unaffected
(b) Doubled
(c) Halved
(d) None of the above.

169. The region within which the effect of viscosity is confined, is known as—

- (a) Cavitation
- (b) Stagnation layer
- (c) Boundary layer
- (d) Free layer

[UP RVUNL JE - 2015]

170. A fluid whose viscosity changes with the rate of deformation is known as—

- (a) Newtonian fluid
- (b) Laminar flow
- (c) Turbulent flow
- (d) Non-Newtonian fluid

[MP SUB. ENG. 2016 Morning]

171. It is the product of elastic stress and the area of a flowing liquid—

- (a) Pressure force (b) Elastic force
- (c) Gravity force (d) Viscous force

[UP Jal Nigam JE 2013, MP SUB ENG. (Morning) 2016]

172. Match list-I with List-II and choose the correct answer from the options given below

List-I

Physical Quantity

- (A) Angular velocity
- (B) Angular acceleration
- (C) Discharge
- (D) Kinematic viscosity

List-II

Dimension

- (i) L^2T^{-1} (ii) T^{-1}
- (iii) T^{-2} (iv) L^3T^{-1}
- (a) (A)–(i), (B)–(ii), (C)–(iii), (D)–(iv)
- (b) (A)–(ii), (B)–(iii), (C)–(iv), (D)–(i)
- (c) (A)–(iii), (B)–(iv), (C)–(i), (D)–(ii)
- (d) (A)–(ii), (B)–(iv), (C)–(i), (D)–(iii)

[LMRC JE - 2015]

173. Match list-I with List-II and choose the correct answer from the options given below—

List-I (Fluid property)

- (A) Compressibility
- (B) Gravity
- (C) Viscosity
- (D) Vapour pressure

List-II (Flow Phenomenon)

- (i) Flow of real fluid past a tiny sphere
- (ii) Cavitation
- (iii) Hydraulic Jump
- (iv) Flight of supersonic aircraft
- (a) (A)–(iii), (B)–(iv), (C)–(ii), (D)–(i)
- (b) (A)–(iii), (B)–(iv), (C)–(i), (D)–(ii)
- (c) (A)–(iv), (B)–(iii), (C)–(i), (D)–(ii)
- (d) (A)–(iv), (B)–(iii), (C)–(ii), (D)–(i)

[UP PCL JE - 2015]

174. With increase in temperature the viscosity of air and water varies as

- (a) Viscosity of air increases and viscosity of water increases
- (b) Viscosity of air decreases and viscosity of water decreases
- (c) Viscosity of air decreases and viscosity water increases
- (d) Viscosity of air increases and viscosity water decreases

[SSC JE - 2016]

175. The ratio of specific weight of a liquid to the specific weight of pure water at a standard temperature is called

- (a) Density of liquid
- (b) Specific gravity of liquid
- (c) Compressibility of liquid
- (d) Surface tension of liquid

ANSWERS SHEET1. **Ans. (d)**

Ideal fluid is non viscous, frictionless and incompressible.

2. **Ans. (a)**3. **Ans. (a)**

Viscosity is a function of temperature.

4. **Ans. (b)**

Fluid has zero or very less shear strength and always moves when subjected to shearing stress.

5. **Ans. (d)**

With increase in temperature viscosity of liquid decreases while for gases it increases.

6. **Ans. (a)**

$$v = \frac{\mu}{\rho} = \frac{3.4 \times 10^{-3}}{1300} = 2.6 \times 10^{-6} \text{ m}^2/\text{s}$$

7. **Ans. (d)**8. **Ans. (c)**

$$\rho = 1000 \text{ kg/m}^3$$

$$\mu = 1 \frac{\text{N-s}}{\text{m}^2} \text{ then}$$

$$v = \frac{1}{10^3} = 10^{-3} \text{ m}^2/\text{s}$$

9. **Ans. (d)**

For newtonian fluid,

$$\tau = \frac{\mu du}{dy}$$

10. **Ans. (d)**

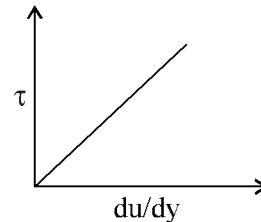
Kinematic viscosity is not a dimensionless quantity its unit is m^2/sec .

11. **Ans. (d)**12. **Ans. (d)**

Total energy consist of inertial energy, pressure energy and kinetic energy.

13. **Ans. (c)**

Rheogram for Newtonian fluid is a straight line passing through origin

14. **Ans. (c)**

$$K = \frac{\partial P}{\partial V} = \frac{500 \times 2}{4 \times 10^{-3}} = 250 \times 10^3 \text{ KPa} = 250 \text{ MPa}$$

15. **Ans. (b)**

$$v = \frac{\mu}{\rho} = \frac{\text{kg}}{\frac{\text{m} - \text{sec}}{\text{kg} / \text{m}^3}} = \frac{\text{m}^2}{\text{sec}}$$

16. **Ans. (a)**

For newtonian fluid, stress is directly proportional to velocity gradient.

$$\tau = \frac{\mu du}{dy}$$

17. **Ans. (b)**

Human blood $\rightarrow$ Pseudo plastic fluid

Toothpaste $\rightarrow$ Bingham plastic fluid

Air, water, petrol, Diesel, Kerosene, mercury $\rightarrow$ Newtonian fluids

18. **Ans. (c)**

Ideal fluid is the fluid which is incompressible and have no viscosity.

19. **Ans. (b)**

Poise is the unit of dynamic viscosity or viscosity

$$1 \text{ poise} = 0.1 \text{ N-s/m}^2$$

20. **Ans. (a)**

Specific gravity is also called as relative density.

21. *Ans. (d)*

Stoke's is the unit of kinematic viscosity in CGS

$$1 \text{ stoke} = 10^{-4} \text{ m}^2/\text{sec}$$

22. *Ans. (a)*

$$\rho = \frac{M}{V}$$

23. *Ans. (b)*

$$\begin{aligned} \text{Dimension of viscosity} &= \frac{\text{N-s}}{\text{m}^2} \\ &= \frac{(\text{MLT}^{-2})\text{T}}{\text{L}^2} = \text{ML}^{-1}\text{T}^{-1} \end{aligned}$$

24. *Ans. (d)*

$$\text{Drag force} = \frac{1}{2} C_D \rho A V^2$$

Clearly drag force is directly proportional to square of velocity.

25. *Ans. (a)*

Fluid has zero or very less shear resistance that's why can't sustain shear stress.

26. *Ans. (b)*

$$1 \text{ KPa} = 1 \times 10^3 \text{ Pa} = 10^3 \frac{\text{N}}{\text{m}^2}$$

27. *Ans. (d)*

Compressibility is property by virtue of which fluid undergo volume change under external pressure.

28. *Ans. (b)*

$$1 \text{ centipoise} = 10^{-2} \text{ poise}$$

29. *Ans. (c)*

Viscosity of water at 20°C is 10^{-2} poise.

30. *Ans. (c)*

$$\text{Volume} = 4\text{m}^3$$

$$\text{Total weight} = 30 \text{ kN}$$

$$\text{Weight} = mg = (V\rho)g = 30 \times 10^3 \text{ N}$$

$$(\rho g = \text{weight density})$$

$$4\rho g = 30$$

$$(\rho g) = 7.5 \text{ kN/m}^3$$

$$\text{Specific weight} = 7.5 = 7.5 \text{ kN/m}^3$$

31. *Ans. (b)*

The property by virtue of which fluid undergo volume under pressure is compressibility

32. *Ans. (b)*

Newton's law of viscosity

$$\tau = \frac{\mu du}{dy}$$

here

$$\tau = \text{shear stress}$$

$$\mu = \text{dynamic viscosity}$$

$$\frac{du}{dy} = \text{rate of shear strain}$$

33. *Ans. (c)*

Pascal-second = N-s/m^2 = unit of dynamic viscosity.

34. *Ans. (c)*

$$\text{Mass} = \text{Volume} \times \text{density}$$

$$3000 = 4 \times \rho$$

$$\text{Density } (\rho) = 750$$

$$\begin{aligned} \text{Specific gravity} &= \frac{750}{\text{density of water}} = \frac{750}{1000} \\ &= 0.75 \end{aligned}$$

35. *Ans. (a)*

Viscosity is the resistance to flow offered by one layer of fluid on another.

36. *Ans. (d)*

Eddy viscosity is due to turbulent flow.

37. *Ans. (d)*

Solid resist applied shear stress by static deformation neither liquid nor gases.

38. *Ans. (a)*

$$F = (\sigma)L$$

$$\sigma = \frac{F}{L} = FL^{-1} \left[\begin{array}{l} \sigma = \text{surface tension} \\ F = \text{Force} \\ L = \text{Length} \end{array} \right]$$

39. *Ans. (a)*

With increase in turbidity in water such as salt, surface tension of water will increase.

40. *Ans. (a)*

The weight per unit volume of a liquid at standard temperature and pressure is called specific weight.

41. *Ans. (a)*

Surface tension of water is inversely proportional to temperature.

42. *Ans. (b)*

Rise of capillary is due to surface tension and cohesion combinedly known as capillary tension.

43. *Ans. (c)*

Rheology is the study of non-newtonian fluid

44. *Ans. (c)*

For the given fluid

$$1\text{m}^3 \rightarrow 789\text{kg}$$

$$1\text{m}^3 \rightarrow 789 \times 9.81\text{N}$$

$$1\text{m}^3 \rightarrow 789 \times 9.81 \text{ kN} = 7.74 \text{ kN}$$

$$\text{So specific volume} = \frac{1}{7.74} \text{ m}^3/\text{kN}$$

$$= 0.129 \text{ m}^3/\text{kN}$$

45. *Ans. (a)*

$$\text{Height of rise in capillary} = \frac{2\sigma \cos \theta}{\rho g r} = h$$

so with increase in radius of tube, the rise of liquid decreases.

46. *Ans. (a)*47. *Ans. (a)*

$$P \text{ for soap bubble} = \frac{8\sigma}{d} = \frac{4\sigma}{r}$$

$$= \frac{4 \times 0.0736}{4 \times 10^{-2}} = 7.36 \text{ N/m}$$

48. *Ans. (d)*

Unit of pressure $\rightarrow$ Pa, Psi, kg/cm^2 , N/m^2 , atmosphere while newton is the unit of force.

49. *Ans. (b)*

$$\nu = \frac{\mu}{\rho}$$

50. *Ans. (c)*

Specific gravity is the ratio of density of a fluid and density of standard fluid at 27°C so it is dimensionless.

51. *Ans. (c)*

Flow inside boundary layer is viscous flow and outside is not viscous and thus irrotational.

52. *Ans. (d)*

For newtonian fluid viscosity remains constant with rate of deformation while for non-newtonian fluid viscosity changes with rate of deformation.

53. *Ans. (b)*

Physical quantity	Dimension
(a) Angular velocity	T^{-1}
(b) Angular acceleration	T^{-2}
(c) Discharge	L^3T^{-1}
(d) Kinematic viscosity	L^2T^{-1}

54. *Ans. (c)*

Fluid property	Flow phenomenon
Compressibility	Flight of supersonic aircraft
Gravity	Hydraulic jump
Viscosity	Flow of real fluid past a tiny sphere
Vapour pressure	Cavitation

55. *Ans. (d)*

Line A in rheograph is for Bingham plastic fluid, Ex – Tooth paste.

56. *Ans. (a)*

Surface energy is caused by force of cohesion between liquid molecules and for water at 100°C at sea level vapour pressure is equal to atmospheric pressure and that is why water start boiling at 100°C .

57. *Ans. (b)*58. *Ans. (b)*

Density of sea water is greater than density of river water, so when ship enters in river, its submerged volume has to increase to stay stable.

59. *Ans. (d)*

We know that,

$$\tau = \mu \frac{du}{dy}$$

$$\text{Force} = \mu A = \frac{du}{dy} \times \mu A$$

Here 1N is required for 1mm² area

$$\mu \times 1 \times \frac{100}{10^{-2}} = 1$$

$$\mu = 10^{-4} \text{ N-s/mm}^2$$

$$= \frac{10^{-4}}{10^{-6}} \text{ N-s/m}^2$$

$$= 100 \text{ N-s/m}^2$$

$$\mu = 10^3 \text{ poise}$$

60. *Ans. (b)*

Molecules of milk and water are different and bond between two different molecules is due to adhesion.

61. *Ans. (a)*

The surface energy per unit area of the interface of a liquid with another liquid or gas is surface tension.

62. *Ans. (b)*

Spherical shape of droplets of mercury is due to high surface tension.

63. *Ans. (b)*

Falling drops of water becomes spheres due to the property of surface tension of water.

64. *Ans. (d)*

Surface tension of water at 20°C is 0.076 N/m

$$h = \frac{4\sigma \cos\theta}{\rho g d} = \frac{4 \times 0.076}{1000 \times 9.81 \times 10^{-3}} = 0.030 \text{ m}$$

65. *Ans. (d)*

Cavitation is primarily associated with the vapour pressure of fluid.

66. *Ans. (c)*

$$\text{For a water droplet, } P = \frac{4\sigma}{d}$$

$$P = \frac{4 \times 0.075}{0.0075 \times 100}$$

$$\Rightarrow \frac{4 \times 75 \times 10^{-3}}{75 \times 10^{-2}} = 0.4 \text{ N/cm}^2$$

67. *Ans. (b)*

Density of mercury is very high as compare to water i.e. 13.6 and so the weight of mercury column is also high so the rise of capillary in mercury is below free surface that is capillary depression.

68. *Ans. (d)*

Density of water = 1000 kg/m³.

69. *Ans. (d)*

Water has its maximum density at 4°C.

70. *Ans. (c)*

71. *Ans. (c)*

Because with increasing temperatures cohesive forces decreases which reduces the resistance between the layers .

72. *Ans. (c)*

Attraction between same type molecules is cohesion.

73. *Ans. (c)*

Mercury is more viscous than water.

74. *Ans. (c)*

75. *Ans. (b)*

$$\sigma(\pi d) = w \left(\frac{\pi d^2}{4} \right) h$$

$$h = \frac{4\sigma}{wd}$$

76. *Ans. (b)*

77. *Ans. (d)*

For soap bubble

$$2\sigma(\pi d) = P \times \pi d^2/4$$

$$P = \frac{8\sigma}{d}$$

$$h = \frac{4\sigma}{\rho g d}$$

$$h = 0.01488$$

$$h \approx 15 \text{ mm}$$

78. *Ans. (d)*

Because in mercury cohesion force is more, compare to adhesion force.

79. *Ans. (b)*

Water is 55 times more viscous than air.

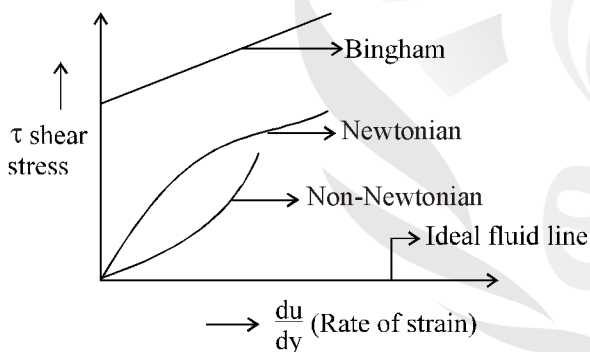
80. *Ans. (b)*

1. **Ideal fluid** : Shear stress is zero.

2. **Newtonian fluid** : Shear stress vary linearly with the rate of strain.

3. **Non-newtonian fluid** : Shear stress vary non linearly with the rate of strain.

4. **Bingham plastic** : Fluid behaves like a solid until a minimum yield stress beyond which it exhibits a linear relation between shear stress and rate of strain.



81. *Ans. (c)*

$$K = -\frac{dP}{\frac{dV}{V}}$$

$$K = -\frac{(120 - 60)}{\left(\frac{0.20}{100}\right)}$$

$$K = 30,000 \text{ N/cm}^2$$

82. *Ans. (c)*

Surface tension of water at 40°C is $6.96 \times 10^{-2} \text{ N/m}$

83. *Ans. (c)*

Thixotropic fluid do not show shear thinning behaviour

84. *Ans. (d)*

$$1000 \times 0.6 = 600 \text{ kg/m}^3.$$

85. *Ans. (b)*

$$P_i - P_o = \frac{2T}{R}$$

$$\Delta P = \frac{2 \times 0.01}{0.001} = 20$$

86. *Ans. (a)*

Surface tension is due to attractive forces between same type of molecule i.e. cohesion.

87. *Ans. (b)*

Newton's law of viscosity says shear stress is proportional to rate of strain.

$$\tau \propto \frac{du}{dy}$$

$$\tau = \mu \frac{du}{dy} \text{ [here } \mu \text{ is viscosity]}$$

88. *Ans. (a)*

Compressibility is reciprocal of bulk modulus of elasticity.

$$\beta = \frac{1}{K}$$

89. *Ans. (a)*

90. *Ans. (b)*

For a fluid at rest the relative velocity between its layers is zero and thus shear stress is zero.

91. *Ans. (d)*

Capillarity : Surface tension

Vapour pressure : Cavitation

Viscosity : Shear forces

Specific gravity : Density of water

92. *Ans. (c)*

$$K = \frac{\partial p}{-\frac{\partial V}{V}} = \frac{50-100}{-\left(\frac{20}{20}\right)} = \frac{-50}{-1} = 50 \text{ pa}$$

93. *Ans. (b)*

Diameter = 3mm.

Surface tension = 0.0736 N/m

$$\theta = 0^\circ \text{C}$$

$$h = \frac{4\sigma \cos \theta}{\rho g d}$$

$$= \frac{4 \times 0.0736 \times \cos 0^\circ}{1000 \times 9.81 \times 3 \times 10^{-3}} \times 1000 \text{ mm}$$

$$\Rightarrow 10 \text{ mm}$$

94. *Ans. (d)*

Coefficient of viscosity can be determined by

- (a) Capillary tube method
- (b) Orifice type viscometer
- (c) Rotating cylinder method

95. *Ans. (d)*

Free surface of a liquid tends to contract to the smallest possible area due to force of surface tension as in case of spherical droplets in rainfall.

96. *Ans. (a)*

Compressibility is inverse of bulk modulus

$$\beta = \frac{1}{K} = \left(-\frac{\partial V}{V \partial P} \right)$$

97. *Ans. (b)*

Specific volume is define as volume per unit mass.

98. *Ans. (c)*

Unit of surface tension is N/m it can also be written as J/m².

99. *Ans. (b)*

$$\mu = 0.7 \text{ poise} = 7 \times 10^{-2} \text{ N-s/m}^2$$

$$G = 0.8$$

$$\nu = \frac{\mu}{\rho} = \frac{7 \times 10^{-2}}{.8 \times 1000}$$

$$= .875 \times 10^{-4} \text{ m}^2/\text{sec}$$

$$= 0.875 \text{ stokes}$$

100. *Ans. (b)*

Specific gravity is define as the ratio of specific weight of a liquid to the specific weight of pure water at standard temperature.

101. *Ans. (b)*

Mass per unit volume of a liquid at a standard temperature and pressure is called mass density.

$$\rho = \frac{M}{V}$$

102. *Ans. (c)*

Viscosity is consider as dynamic property in model analysis.

103. *Ans. (b)*

Height of capillary rise is inversely proportional to density of fluid and diameter of capillary

$$h = \frac{4\sigma \cos \theta}{\rho g d}$$

104. *Ans. (c)*

Mercury has very low vapour pressure and high density.

105. *Ans. (b)*

The increase in pressure of a liquid, raises the boiling point of a liquid and vice-versa.

106. *Ans. (b)*

$$1 \text{ lt} = 10^{-3} \text{ m}^3 = 10^{-3} \times 10^6 \text{ cm}^3 = 1000 \text{ cm}^3$$

107. *Ans. (d)*

Practical fluids are real fluids and they posses

1. Viscosity
2. Surface tension
3. Compressibility

108. *Ans. (c)*109. *Ans. (d)*110. *Ans. (d)*111. *Ans. (b)*112. *Ans. (c)*

$$\nu = \frac{\mu}{\rho}$$

$$= \frac{0.5 \times 0.1}{0.4 \times 1000} \frac{\text{m}^2}{\text{sec}}$$

$$= 0.125 \times 10^{-3} \text{ m}^2/\text{sec}$$

$$= 1.25 \text{ stoke}$$

113. *Ans. (c)*

$$\text{Discharge (Q)} = \frac{V}{T} \left(\frac{\text{m}^3}{\text{sec}} \right)$$

$$= \text{L}^3 \text{T}^{-1}$$

114. *Ans. (d)*

Specific Weight of liquid

$$= \frac{5 \text{ N}}{1 \times 10^{-3} \text{ m}^3}$$

$$= 5 \times 10^3 \text{ N/m}^3$$

$$\text{S.G.} = \frac{5 \times 10^3}{9810} = 0.51$$

115. *Ans. (b)*

$$\text{S.G.} = \frac{\text{Specific Weight of Oil}}{\text{Specific Weight of Water}}$$

$$0.7 \times 9810 = \text{S.W. of oil}$$

$$6867 \text{ W/m}^3 = \text{S.W. of oil}$$

116. *Ans. (d)*

Ideal Plastic Fluid : When the shear stress is proportional to the velocity gradient and shear stress is more than the yield value, it is known as ideal plastic fluid.

117. *Ans. (d)*

$$\nu = \frac{\mu}{\rho}$$

$$6 \times 10^{-4} = \frac{\mu}{1.9 \times 1000}$$

$$\mu = 1.14 \text{ NS/m}^2$$

$$1 \text{ poise} = 0.1 \text{ N.S/m}^2$$

$$\mu = 11.40 \text{ poise}$$

118. *Ans. (d)*

$$\text{Specific Weight} = \gamma = \rho g$$

$$= \frac{\text{kg}}{\text{m}^3} \times \frac{\text{m}}{\text{sec}^2}$$

$$= \text{ML}^{-2} \text{T}^{-2}$$

119. *Ans. (a)*

A newtonian fluid is one which obeys newton's law of viscosity.

120. *Ans. (b)*

Poise is the unit of dynamic viscosity.

121. *Ans. (a)*

Newtonian fluids are defined as fluids for which the shear stress is linearly proportional to the shear strain rate.

122. *Ans. (d)*

$$\text{Density of Petrol} = 0.7 \times 1000$$

$$= 700 \text{ kg/m}^3$$

123. *Ans. (d)*

For hollow bubble

$$P_i - P_o = \frac{4T}{r} = \frac{8\sigma}{d}$$

124. *Ans. (a)*

$$\text{Specific Gravity} = \frac{\text{Density of Fluid}}{\text{Density of Standard Fluid}}$$

125. *Ans. (b)*

Poise is the unit of dynamic viscosity.

126. *Ans. (d)*

Shear stress develops on a fluid element when a fluid is viscous and if it is in motion.

127. *Ans. (c)*

Specific Gravity of Liquid

$$= \frac{\text{Specific Weight of a Liquid}}{\text{Specific Weight of Water}}$$

128. *Ans. (b)*

Compressibility is defined as the ratio of volumetric strain to compressive stress.

$$\beta = - \frac{\partial V}{V \times \partial P}$$

129. *Ans. (a)*

$$\nu = \frac{\mu}{\rho}$$

$$\rho = \frac{0.006}{0.025 \times 10^{-4}}$$

$$= 2400 \text{ kg/m}^3$$

$$\text{S.G.} = \frac{2400}{1000} = 2.4$$

137. *Ans. (d)*

$$\tau = \mu \frac{du}{dy}$$

$$\tau \propto \frac{du}{dy}$$

138. *Ans. (c)*

$$\text{Bulk modulus} = \frac{\text{direct stress}}{\text{volumetric strain}}$$

130. *Ans. (c)*

Ideal fluid is only an imaginary fluid as all the fluids, which exist, have some viscosity.

$$= - \frac{dP}{\frac{dV}{V}}$$

131. *Ans. (c)*

Specific Gravity of Mercury = 13.6

139. *Ans. (d)*

Specific Weight = ρg

132. *Ans. (c)*

The density of water is 1 gm/cm^3 .

$$= \frac{W}{V}$$

133. *Ans. (c)*

$$\text{SI unit of dynamic viscosity} = \frac{\text{N} \cdot \text{sec}}{\text{m}^2}$$

140. *Ans. (c)*141. *Ans. (a)*

$$= 6 \times 10^3 \text{ N/m}^3$$

$$1 \text{ Poise} = \frac{\text{Dyne} \cdot \text{sec}}{\text{cm}^2}$$

$W = 100\text{N}$, Weight in water 75N

$$W - F_B = 75\text{N}$$

$$100 - F_B = 75\text{N}$$

$$F_B = 25\text{N}$$

134. *Ans. (c)*

Surface tension is defined as the tensile force acting on the surface of a liquid in contact with a gas or on the surface between two immiscible liquids.

$$\rho_w \times g \times V = 25$$

135. *Ans. (a)*

Specific Volume :

It is defined as the volume of the fluid occupied by a unit mass or volume per unit mass of a fluid is called a specific volume.

$$V = \frac{25}{\rho_w \times g}$$

$$\rho g V = 100$$

$$\rho g \left(\frac{25}{\rho_w g} \right) = 100$$

$$\text{Specific Volume} = \frac{1}{\text{density}}$$

$$\rho = 4\rho_w$$

136. *Ans. (b)*

C.G.S unit of kinematic viscosity = cm^2/sec

$$\text{Specific gravity} = \left(\frac{\rho}{\rho_w} \right) = 4$$

142. *Ans. (c)*

Fluid type	Examples
(Non Newtonian)	
Dilatants fluid	Butter, quick sand, sugar in water
Pseudoplastic fluids	Paints, lipstick, blood, milk
Thixotropic	Printer ink, enamels
Rheoplectic	Gypsum, solution in water, bentonite solution
Bingham plastic fluid	Sewage sludge, toothpaste, drilling mud gel

143. *Ans. (b)*144. *Ans. (c)*

$$\tau = A \left(\frac{du}{dy} \right)^n + B$$

By seeing second value

$$\frac{du}{dy} = 0$$

But τ has some value.145. *Ans. (b)*

Unit of dynamic viscosity

SI unit: Pa-s or $\text{Kgm}^{-1} \text{s}^{-1}$

CGS unit: Poise

Unit of kinematic viscosity

$$\text{SI unit: } \frac{\text{m}^2}{\text{s}}$$

CGS unit: Stokes

146. *Ans. (a)*

$$\text{Reynolds number} = \frac{\text{Inertial force}}{\text{Viscous force}}$$

$$R_e = \frac{\rho V D}{\mu}$$

V is the mean velocity of flow.

 ρ is the mass density. μ is the dynamic viscosity.

D is the known dia of the pipe.

The type of flow is based on the value of R_e If $R_e < 2000$, the flow is called laminar $R_e < 4000$, the flow is called turbulentIf $2000 < R_e < 4000$, the flow is called transition147. *Ans. (d)*

Kinematic viscosity: The ratio of dynamic viscosity to density appears frequently and this ratio is given by the name of kinematic viscosity. Its unit

$$\text{is stoke or } \left(\frac{\text{m}^2}{\text{s}} \right).$$

148. *Ans. (c)*

$$\tau = \mu \cdot \frac{dv}{dy}$$

$$= \left(1 \times \frac{3}{0.02} \right) = 150 \text{ N/m}^2$$

149. *Ans. (c)*150. *Ans. (d)*151. *Ans. (c)*152. *Ans. (a)*153. *Ans. (c)*

$$\text{N/mm}^2 = 10^6 \text{ Pa}$$

$$\text{kgf/cm}^2 = 9.81/10^{-4} \text{ Pa}$$

$$\text{millibar} = 10^2 \text{ Pa}$$

$$\text{mm of mercury} = 10^{-3} \times 13600 \times 9.81 \\ = 133.416 \text{ Pa}$$

154. *Ans. (a)*

1. Water is about 50 times more viscous than air.
2. Castor oil is about 1000 times more viscous than water.
3. Crude oil about 10 times more viscous than water.
4. Gasoline is about 1/3 time viscous than water.

Kinematic viscosity of air is more than that of water.

155. *Ans. (c)*156. *Ans. (d)*

157. *Ans. (b)*

$$P = \left(\frac{8\sigma}{d} \right)$$

$$\Rightarrow \sigma = \frac{\Delta P \times d}{8}$$

$$= \frac{2.5 \times 0.050}{8}$$

$$= 0.0156 \text{ N/m}$$

158. *Ans. (a)*

$$\nu = 6 \times 10^{-4} \frac{\text{m}^2}{\text{sec}}$$

$$\text{Density of fluid} = \text{s. gravity} \times 1000$$

$$= 1.9 \times 1000 = 1900 \text{ kg/m}^3$$

$$\nu = \frac{\text{Dynamic viscosity}}{\text{Density of fluid}}$$

$$6 \times 10^{-4} = \frac{\mu}{1900}$$

$$1.14 \frac{\text{NS}}{\text{m}^2} = \mu$$

$$11.40 \text{ Poise} = \mu$$

159. *Ans. (b)*160. *Ans. (b)*161. *Ans. (b)*

Water has a density of 1 at 4°C. When the s gravity is defined based on water at 4°C, then the specific gravity is equal to the density of liquid.

162. *Ans. (c)*

$$P = \rho g H$$

$$1000 \times 9.81 \times 4 = 39240 \text{ Pa, } 39.24 \text{ kPa}$$

163. *Ans. (d)*

Kinematic viscosity (ν) = $\frac{\mu}{\rho}$ (Dynamic viscosity, and density)

$$= \frac{2}{0.8}$$

$$\nu = 2.5 \text{ stokes}$$

Its SI unit is m^2/sec CGS unit is cm^2/sec or stoke
1 stoke = $10^{-4} \text{m}^2/\text{sec}$

164. *Ans. (c)*165. *Ans. (c)*

$$\Delta P = 8\sigma/d$$

$$\Delta P = 8 \times 0.09 / 0.03$$

$$= 24 \text{ N/m}^2$$

166. *Ans. (c)*

Capillarity is due to the adhesion of the liquid to the sides of the tube and due to the surface tension of the liquid.

167. *Ans. (a)*

$$PV = \text{constant}$$

$$P dV + V dP = 0$$

$$P = \frac{dP}{\left(-\frac{dV}{V} \right)} \quad \left[K_{\text{isothermal}} = P \right]$$

168. *Ans. (c)*169. *Ans. (c)*170. *Ans. (d)*171. *Ans. (b)*172. *Ans. (b)*173. *Ans. (c)*174. *Ans. (d)*175. *Ans. (b)*

ENGINEERS ACADEMY

Properties of the Fluids

SCAN ME

