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VOLUME

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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-I) 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](mailto:engineers.academy.india@gmail.com)

All the Best!



Engineers Academy Editorial Board



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# UNIT-I

## FLUID MECHANICS

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# PROPERTIES OF FLUIDS

## OBJECTIVE QUESTIONS

### CHAPTER

# 1

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/m<sup>2</sup>. Its kinematic viscosity, in m<sup>2</sup>/s, is
  - (a)  $2.6 \times 10^{-6}$
  - (b)  $4.4 \times 10^{-6}$
  - (c)  $5.8 \times 10^{-6}$
  - (d)  $7.2 \times 10^{-6}$
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]

11. One poise is equivalent to  
 (a) 360 kg/m-hr (b) 1 dyne sec/cm<sup>2</sup>  
 (c) 10<sup>-1</sup> 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 2m<sup>3</sup> of liquid results in a volume change of 0.004 m<sup>3</sup>. 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/m<sup>2</sup> (b) m<sup>2</sup>/s  
 (c) N/m (d) N.s/m  
**[RPSC-VPITI, Haryana JE, ISRO - 2018]**
16. A fluid, which satisfies the relations ' $\tau = \mu (du/dy)$ ', where ' $\tau$ ' is shear stress,  $\mu$  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]**
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) 10<sup>6</sup>cm<sup>3</sup>/s (b) 10<sup>-2</sup>m<sup>2</sup>  
 (c) 10<sup>4</sup>cm<sup>3</sup>/s (d) 10<sup>-4</sup>m<sup>2</sup>/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 ( $\mu$ ) has the dimension as :  
 (a) MLT<sup>-2</sup> (b) ML<sup>-1</sup>T<sup>-1</sup>  
 (c) ML<sup>-1</sup>T<sup>-2</sup> (d) M<sup>-1</sup>L<sup>-1</sup>T<sup>-1</sup>  
**[MPSC - 2012, AEC - 2017]**
24. A fluid in equilibrium cannot sustain:  
 (a) tensile stress (b) compressive stress  
 (c) shear stress (d) bending stress  
**[ISRO - 2015, NHPC - 2013]**
25. One kilo Pascal is equivalent to :  
 (a) 10 N/mm<sup>2</sup> (b) 1000 N/m<sup>2</sup>  
 (c) 100 N/mm<sup>2</sup> (d) 1000 N/cm<sup>2</sup>  
**[NBCC - 2017]**



26. Fluids undergo volume change under external pressure due to  
(a) Plasticity (b) Viscosity  
(c) Tenacity (d) Compressibility  
[ISRO - 2018]
27. 1 centipoise = \_\_\_\_\_ poise.  
(a) 1/10 (b) 1/100  
(c) 1/50 (d) 1/25  
[Haryana JE - 2018]
28. 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]
29. A vessel of 4 m<sup>3</sup> contains oil which weight 30 kN. The specific weight of the oil is  
(a) 4.5 kN/m<sup>3</sup> (b) 6 kN/m<sup>3</sup>  
(c) 7.5 kN/m<sup>3</sup> (d) 10 kN/m<sup>3</sup>  
[ISRO - 2017]
30. 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]
31. 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]
32. Pascal-sec is the unit of  
(a) Pressure (b) Kinematic viscosity  
(c) Dynamic viscosity (d) Surface tension  
[PMB JE - 2018]
33. If the volume of a liquid weighing 3000 kg is 4 cubic meters, 0.75 is its  
(a) Specific weight (b) Specific mass  
(c) Specific gravity (d) Specific volume  
[ISRO - 2013]
34. 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]
35. When a matter resists applied shear stress by static deformation, it is :  
(a) Liquid (b) Gas  
(c) Fluid (d) Solid  
[DDA JE - 2018]
36. Surface tension has the dimensions  
(a) FL<sup>-1</sup> (b) F  
(c) FL<sup>-2</sup> (d) FL<sup>-3</sup>  
[UK Combined AE - 2012, SSC JE - 2011]
37. 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]
38. 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]
39. 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]
40. 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]

41. Rheology is the study of

- (a) Newtonian fluids
- (b) Ideal fluids
- (c) Non-Newtonian fluids
- (d) None of these

[H.P. SSC - 2015]

42. If the mass density of a fluid is  $789 \text{ kg/m}^3$  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]

43. 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]

44. What shall be the pressure intensity inside a soap bubble of radius 4 cm? (Surface tension of water is  $0.0736 \text{ N/m}$ ) :

- (a)  $7.36 \text{ N/m}^2$
- (b)  $1.84 \text{ N/m}^2$
- (c)  $3.68 \text{ N/m}^2$
- (d) None of these

[UPSSSC JE - 2016]

45. Which of the following is not the unit of pressure?

- (a)  $\text{Kg/cm}^2$
- (b) Psi
- (c) Atmosphere
- (d) Newton

[UP Jal Nigam JE - 2016]

46. 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]

47. Which of the following is dimensionless?

- (a) Specific volume
- (b) Specific weight
- (c) Specific gravity
- (d) Specific speed

[DMRC JE - 2017]

48. 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]

49. 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]

50. 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.  $\text{L}^2\text{T}^{-1}$
- b.  $\text{T}^{-1}$
- c.  $\text{T}^{-2}$
- d.  $\text{L}^3\text{T}^{-1}$

- (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]

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

**List-I (Fluid property)**

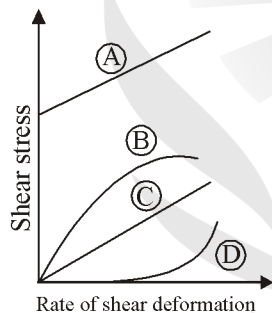
- A. Compressibility
- B. Gravity
- C. Viscosity
- D. Vapour pressure

**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]

52. 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]

53. 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]

54. 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]

55. 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/mm<sup>2</sup> to maintain this speed. What would be the fluid viscosity between the plates?

- (a) 10<sup>-3</sup> poise
- (b) 10<sup>-4</sup> poise
- (c) 2 × 10<sup>-3</sup> poise
- (d) None of these

[HPSSSB JE - 2017]

56. 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]

57. 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]

58. Spherical shape of droplets of mercury is due to-

- (a) High density
- (b) High surface tension
- (c) High adhesion
- (d) Water

[RRB JE - 2015]

59. 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]

60. 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]**
61. Cavitation is primarily associated with of the following fluid properties  
 (a) Specific gravity (b) Surface tension  
 (c) Viscosity (d) Vapour pressure  
**[RRB SSE - 2015]**
62. 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/cm<sup>2</sup> (b) 0.6 N/cm<sup>2</sup>  
 (c) 0.4 N/cm<sup>2</sup> (d) 400 N/cm<sup>2</sup>  
**[RRB JE - 2015]**
63. 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]**
64. The density of water is :  
 (a) 10<sup>-3</sup> kg/m<sup>3</sup> (b) 1 kg/m<sup>3</sup>  
 (c) 10<sup>2</sup> kg/m<sup>3</sup> (d) 10<sup>3</sup> kg/m<sup>3</sup>  
**[RRB JE - 2014]**
65. Water has its maximum density at :  
 (a) 0°C (b) 100°C  
 (c) 50°C (d) 4°C  
**[RRB JE - 2014]**
66. 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
67. Dynamic viscosity of the liquids with rise in temperature  
 (a) Does not show any change  
 (b) Increases  
 (c) Decreases (d) None of these
68. Property of a fluid because of which its own molecules attract each other is  
 (a) Adhesion (b) Compressibility  
 (c) Cohesion (d) Capillarity
69. Viscosity of water in comparison to mercury is  
 (a) Variable and unstable  
 (b) Higher  
 (c) Lower (d) Same
70. 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
71. 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)  $\frac{4wd}{\sigma}$
72. 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
73. 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

74. Mercury doesn't wet glass. This is due to property known as  
 (a) Surface tension (b) Adhesion  
 (c) Viscosity (d) Cohesion
75. The viscosity of water with respect to air is about  
 (a) 50 times (b) 55 times  
 (c) 60 times (d) 65 times
76. 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]

77. Determine the bulk modulus of elasticity of liquid, if the pressure of liquid is increased from 60 N/cm<sup>2</sup> to 120 N/cm<sup>2</sup>. The volume of liquid was found to decrease by 0.20%.  
 (a)  $1 \times 10^4$  N/cm<sup>2</sup> (b)  $2 \times 10^4$  N/cm<sup>2</sup>  
 (c)  $3 \times 10^4$  N/cm<sup>2</sup> (d)  $4 \times 10^4$  N/cm<sup>2</sup>

[CGPSC]

78. 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]

79. 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]

80. The mass density of one litre of diesel of relative density 0.6 is :  
 (a) 1000 kg/m<sup>3</sup> (b) 6000 kg/m<sup>3</sup>  
 (c) 60 kg/m<sup>3</sup> (d) 600 kg/m<sup>3</sup>

[WRD B. Tech - 2013]

81. 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)  $4\pi$  (d)  $0.00004\pi$

[AEM - 2017]

82. 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
83. 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]

84. 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]

85. Which one of the following is defined as force per unit length –  
 (a) Surface tension (b) Compressibility  
 (c) Capillarity (d) Viscosity  
**[RRB JE - 2015]**
86. 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  $45^\circ$  to the horizontal  
 (d) The shear stress depends upon the coefficient of viscosity  
**[UPSSC JE - 2015]**
87. 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  
**[UPRVNL JE - 2015]**
88. A liquid compressed in a cylinder has initially a volume of  $20 \text{ m}^3$  at a pressure of 100 pa. If the new volume is  $40 \text{ m}^3$  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  
**[UPRVNL AE - 2014]**
89. A glass tube of 3 mm diameter is immersed in water which is at  $20^\circ\text{C}$ . The surface tension for water is  $0.0736 \text{ N/m}$ . The contact angle for water is  $0^\circ$ . 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]**
90. 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]**
91. 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]**
92. 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]**
93. Specific volume is ratio of  
 (a) Mass and volume  
 (b) Volume and mass  
 (c) Weight and volume  
 (d) Volume and weight  
**[RWRD JE - 2014]**
94. Which one of the following is correct unit of surface tension  
 (a)  $\text{N/m}^2$  (b) J/m  
 (c)  $\text{J/m}^2$  (d) W/m  
**[UPRVNL JE - 2016]**
95. 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]**

96. 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, HP - 2018]
97. 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]
98. 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]
99. 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]
100. One liter of water occupies a volume of :  
(a)  $100 \text{ m}^3$   
(b)  $1000 \text{ cm}^3$   
(c)  $10000 \text{ cm}^3$   
(d)  $100000 \text{ m}^3$   
[MP SE - 2016]
101. 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]
102. The surface tension at the soap-air interface is  $0.1 \text{ N/m}$ . The internal pressure in the soap bubble of  $32 \text{ mm}$  diameter is \_\_\_\_\_  $\text{N/m}^2$ .  
(a) 12.5  
(b) 25  
(c) 37.5  
(d) 50  
[MT-24.01.2021]
103. For an incompressible fluid, the density  
(a) varies with temperature only  
(b) varies with pressure only  
(c) varies with both pressure and temperature  
(d) remain constant  
[JPSC]
104. Which fluid does not experience stress during flow?  
(a) Dilatant  
(b) Bingham  
(c) Viscoplastic  
(d) Inviscid  
[JPSC]
105. Which of the following is a non-Newtonian fluid?  
(a) Air  
(b) Water  
(c) Gasoline  
(d) None of the above  
[ISRO - 2020]
106. If temperature increases, viscosity of the gases \_\_\_\_\_ and the viscosity of liquids \_\_\_\_\_.  
(a) decreases, increases  
(b) increases, decreases  
(c) increases, increases  
(d) decreases, decreases  
[Vizag Steel - 2020]
107. What happens to the liquid level. When a small diameter tube is inserted into a liquid whose contact angle is  $125^\circ$ ?  
(a) Liquid level in the tube falls  
(b) Liquid level in the tube remains constant  
(c) Liquid level in the tube will fall first and then rise.  
(d) Liquid level in the tube rises.  
[CIL (MT) - 26.03.2017]

108. The viscosity of liquids decreases with increase in temperature due to :

- (a) decreased cohesive forces
- (b) decreased molecular momentum transfer
- (c) increased molecular momentum transfer
- (d) increased cohesive forces

[CIL (MT) - 26.03.2017]

109. The specific gravity of water is

- (a) 0.001
- (b) 0.01
- (c) 0.1
- (d) 1

[HP - 2018]

110. One cubic meter of water weighs

- (a) 100 litre
- (b) 250 litre
- (c) 500 litre
- (d) 1000 litre

[HP - 2018]

111. A liquid compressed in cylinder has a volume of  $0.04 \text{ m}^3$  at  $50 \text{ kg/cm}^2$  and a volume of  $0.039 \text{ m}^3$  at  $150 \text{ kg/cm}^2$ . The bulk modulus of liquid is

- (a)  $400 \text{ kg/cm}^2$
- (b)  $4000 \text{ kg/cm}^2$
- (c)  $40 \times 10^5 \text{ kg/cm}^2$
- (d)  $40 \times 10^6 \text{ kg/cm}^2$

[ISRO - 2007]

112. The diameter of a soap bubble which has an inside pressure of  $2.5 \text{ N/m}^2$  over the atmospheric pressure and a surface tension of  $0.0125 \text{ N/m}$  is

- (a) 40 mm
- (b) 4 mm
- (c) 16 mm
- (d) 60 mm

[ISRO - 2012]

113. An increase in pressure of a liquid from  $7.5 \text{ MPa}$  to  $15 \text{ MPa}$  results into 0.2 percent decrease in its volume. The coefficient of compressibility of the liquid in  $\text{m}^2/\text{N}$  is

- (a)  $0.267 \times 10^{-9}$
- (b)  $2.67 \times 10^{-9}$
- (c)  $1 \times 10^{-9}$
- (d) None of the above

[ISRO - 2012]

114. A reservoir of capacity  $0.01 \text{ m}^3$  is completely filled with a fluid of coefficient of compressibility  $0.75 \times 10^{-9} \text{ m}^2/\text{N}$ . The amount of fluid that will spill over (in  $\text{m}^3$ ), if pressure in the reservoir is reduced by  $2 \times 10^7 \text{ N/m}^2$  is

- (a)  $1 \times 10^{-4}$
- (b)  $1.5 \times 10^{-4}$
- (c)  $0.15 \times 10^{-4}$
- (d) None of the above

[ISRO - 2012]

115. Poise can also be expressed as

- (a) Dyne-cm/s<sup>2</sup>
- (b) Dyne-cm/s
- (c) Dyne-s/cm
- (d) Dyne-s/cm<sup>2</sup>

[RRB-JE - 2015 (III)]

116. Which one of the following is defined as force per unit length

- (a) Surface tension
- (b) Compressibility
- (c) Capillarity
- (d) Viscosity

[RRB-JE - 2015 (I)]

117. Kinematic viscosity of gases on increase of temperature

- (a) Decreases
- (b) Increases
- (c) Remains the same
- (d) First decreases then increases

[RRB-JE - 2015 (I)]

118. The intensity of pressure developed by surface of  $0.075 \text{ N/m}$  in a droplet of water of  $0.075 \text{ mm}$  diameter is

- (a)  $0.8 \text{ N/cm}^2$
- (b)  $0.6 \text{ N/cm}^2$
- (c)  $0.4 \text{ N/cm}^2$
- (d)  $400 \text{ N/cm}^2$

[RRB-JE - 2015 (III)]

119. In the equation for capillary rise or fall of a liquid  $h = \frac{4\sigma \cos \theta}{\rho g d}$ , the value of  $\theta$  for water is

- (a)  $0^\circ$
- (b)  $10^\circ$
- (c)  $45^\circ$
- (d)  $180^\circ$

[TSPSC - 2015]



120. The dynamic viscosity of fluid is 0.7 poise and specific gravity is 0.8, then the kinematics viscosity of fluid in stokes is

- (a) 0.22 (b) 1.14  
(c) 0.87 (d) 0.34

[UPRVUNL - 2016]

121. Viscosity of gases

- (a) Remains constant with temperature  
(b) Increases with increase in temperature  
(c) Decreases with increase in temperature  
(d) Increases with decrease in temperature

[JKSSB-JE]

122. The unit of dynamic viscosity is

- (a) N/m/sec (b) Nm/sec  
(c) Nm/sec (d)  $\frac{\text{N sec}}{\text{m}^2}$

[TNPSC 1998]

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

- (a) 2.5 centistoke (b) 2500 cm<sup>2</sup>/sec  
(c)  $2.5 \times 10^{-4}$  cm<sup>2</sup>/sec (d) 2.5 stokes

[TNPSC - 1998, APPSC-2013]

124. The stress-strain relation of the newtonian fluids is

- (a) Linear (b) Parabolic  
(c) Hyperbolic (d) Involutic

[TNPSC-1998, APPSC-2013,  
APPSC-(Observe 2013)]

125. The newton's law of viscosity relates

- (a) The stress and strain in the fluid  
(b) The shear stress, pressure and velocity  
(c) The shear stress and rate of shear strain  
(d) The viscosity and the shear stress

[TNPSC-APPSC-2013]

126. 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]

127. Capillary rise a phenomenon that is attributed to the following property of fluid.

- (a) Vapour pressure (b) Viscosity  
(c) Density (d) Surface tension

[SSC-JE-2014]

128. 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]

□□□

**ANSWERS SHEET**1. *Ans. (d)*2. *Ans. (a)*

$$P = \rho RT$$

$$\rho = \frac{P}{RT}$$

$$= \frac{1 \times 10^6}{0.287 \times 1000 \times 283}$$

$$= 12.31 \text{ kg/m}^3$$

3. *Ans. (a)*4. *Ans. (b)*5. *Ans. (d)*6. *Ans. (a)*

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

$$= \frac{0.0034}{1300}$$

$$= 2.6 \times 10^{-6} \text{ m}^2/\text{sec}$$

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

$$\nu = \frac{\mu}{\rho} = \frac{1}{1000} = 0.001 \text{ m}^2/\text{sec}$$

9. *Ans. (d)*10. *Ans. (d)*11. *Ans. (d)*12. *Ans. (d)*13. *Ans. (c)*14. *Ans. (c)*

$$K = \frac{dP}{\left(-\frac{dv}{V}\right)}$$

$$= \frac{500 \times 10^3}{-\left(-\frac{0.004}{2}\right)}$$

$$= 250 \times 10^6$$

$$= 250 \text{ MPa}$$

15. *Ans. (b)*

$$\nu = \frac{\mu}{\rho} = \frac{\text{kg}}{\text{m} \cdot \text{sec}} = \frac{\text{m}^2}{\text{sec}} \cdot \frac{\text{kg}}{\text{m}^3}$$

16. *Ans. (a)*17. *Ans. (b)*18. *Ans. (c)*19. *Ans. (b)*20. *Ans. (a)*21. *Ans. (d)*22. *Ans. (a)*23. *Ans. (b)*24. *Ans. (c)*25. *Ans. (b)*26. *Ans. (d)*27. *Ans. (b)*

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

28. *Ans. (c)*29. *Ans. (c)*

$$\text{specific weight} = \frac{\text{weight}}{\text{volume}}$$

$$\gamma = \frac{30}{4} \frac{\text{kN}}{\text{m}^3} ; \gamma = 7.5 \text{ kN/m}^3$$

30. *Ans. (b)*31. *Ans. (b)*32. *Ans. (c)*33. *Ans. (c)*

$$\rho = \frac{3000}{4} = 750 \text{ kg/m}^3$$

$$\text{Specific gravity} = \frac{750}{1000} = 0.75$$

34. *Ans. (a)*

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

35. *Ans. (d)*

36. *Ans. (a)*37. *Ans. (a)*38. *Ans. (a)*39. *Ans. (a)*40. *Ans. (b)*41. *Ans. (c)*42. *Ans. (c)*

$$v = \frac{1}{\rho} = \frac{1}{789} \text{ m}^3/\text{kg}$$

$$= \frac{1}{\frac{789 \times 9.81}{1000}} \text{ m}^3/\text{kN}$$

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

43. *Ans. (a)*44. *Ans. (a)*

$$P = \frac{8\sigma}{d} = \frac{4\sigma}{r}$$

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

45. *Ans. (d)*46. *Ans. (b)*47. *Ans. (c)*48. *Ans. (c)*49. *Ans. (d)*50. *Ans. (b)*51. *Ans. (c)*52. *Ans. (d)*53. *Ans. (b)*54. *Ans. (b)*55. *Ans. (d)*

$$\text{Shear stress } (\tau) = \mu \frac{du}{dy}$$

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

$$= \frac{1 \times 10^6 \times 0.010 \times 10^{-3}}{10 \times 10^{-2}}$$

$$= 100 \text{ poise}$$

56. *Ans. (b)*57. *Ans. (a)*58. *Ans. (b)*59. *Ans. (b)*60. *Ans. (d)*

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

$$= \frac{4 \times 0.073 \times \cos 0}{998 \times 9.81 \times 1 \times 10^{-3}}$$

$$= 30 \text{ mm}$$

61. *Ans. (d)*62. *Ans. (c)*

$$P = \frac{4\sigma}{d}$$

$$= \frac{4 \times 0.075}{0.075 \times 10^{-3}} \text{ N/m}^2$$

$$= 0.4 \text{ N/cm}^2$$

63. *Ans. (b)*64. *Ans. (d)*65. *Ans. (d)*66. *Ans. (c)*67. *Ans. (c)*

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

68. *Ans. (c)*69. *Ans. (c)*70. *Ans. (c)*71. *Ans. (b)*72. *Ans. (b)*73. *Ans. (d)*74. *Ans. (d)*

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

75. *Ans. (a)*76. *Ans. (b)*

77. Ans. (c)

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

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

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

78. Ans. (c)

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

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

$$h = 0.01488$$

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

79. Ans. (c)

80. Ans. (d)

$$\frac{\rho}{\rho_{\text{steel}}} = \frac{\rho}{1000} = 0.6$$

$$\rho = 600 \text{ kg/m}^3$$

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

81. Ans. (b)

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

$$\Delta P = \frac{2 \times 0.01}{0.001} = 20 \text{ N/m}^2$$

82. Ans. (a)

83. Ans. (b)

84. Ans. (a)

85. Ans. (a)

86. Ans. (b)

87. Ans. (d)

88. Ans. (c)

89. Ans. (b)

90. Ans. (d)

91. Ans. (d)

92. Ans. (a)

93. Ans. (b)

94. Ans. (c)

95. Ans. (b)

96. Ans. (b)

97. Ans. (b)

98. Ans. (c)

99. Ans. (b)

100. Ans. (b)

$$1 \text{ Lit} = 10^{-3} \text{ m}^3 = 10^3 \text{ cm}^3$$

101. Ans. (d)

102. Ans. (b)

For soap bubble

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

 $\sigma$  = surface tension

$$\Delta P = \frac{8 \times 0.1}{32}$$

$$= \frac{8 \times 0.1 \times 1000}{32}$$

$$\Delta P = 25 \text{ N/m}^2$$

103. Ans. (a)

104. Ans. (d)

105. Ans. (d)

106. Ans. (b)

107. Ans. (a)

108. Ans. (a)

109. Ans. (d)

110. Ans. (d)

$$[1 \text{ m}^3 = 1000 \text{ lit}]$$

111. Ans. (b)

$$\text{Bulk modulus} = -\frac{\Delta P}{\left(\frac{\Delta V}{V}\right)}$$

$$= -\left[\frac{(150 - 50)}{\left(\frac{0.039 - 0.04}{0.04}\right)}\right]$$

$$= 4000 \text{ kg/cm}^2$$

112. Ans. (a)

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

$$= \frac{8 \times 0.0125}{2.5} \times 1000 \text{ mm}$$

$$d = 40 \text{ mm}$$

113. Ans. (a)

Coefficient of Compressibility

$$= \frac{1}{\text{Bulk Modulus}}$$

$$\text{Bulk Modulus (K)} = \frac{\Delta P}{\left(-\frac{\Delta V}{V}\right)}$$

$$= \frac{(15 - 7.5) \times 10^6}{-\left(-\frac{0.2}{100}\right)}$$

$$K = 3750 \times 10^6 \text{ N/m}^2$$

$$\beta = \frac{1}{K} = \frac{1}{3750 \times 10^6}$$

$$= \frac{1}{3.75} \times 10^{-9}$$

$$= 0.267 \times 10^{-9} \text{ m}^2/\text{N}$$

114. Ans. (b)

$$\beta = 0.75 \times 10^{-9} \text{ m}^2/\text{N}$$

$$V = 0.01 \text{ m}^3$$

$$\Delta P = 2 \times 10^7$$

$$\beta = -\frac{\frac{1}{\Delta P}}{\frac{\Delta V}{V}}$$

$$= -\frac{\Delta V}{V \Delta P}$$

$$\beta = +\frac{\Delta V}{V \Delta P}$$

$$0.75 \times 10^{-9} \times 0.01 \times 2 \times 10^7 = \Delta V$$

$$\Delta V = 1.5 \times 10^{-4} \text{ m}^3$$

115. Ans. (d)

116. Ans. (a)

117. Ans. (b)

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

$$= T \uparrow, \mu \uparrow, \rho \uparrow, \gamma \uparrow$$

118. Ans. (c)

$$\Delta P = \frac{4\sigma}{d}$$

$$= \frac{4 \times 0.075}{0.075 \times 10^{-3}}$$

$$= 4000 \text{ N/m}^2$$

$$= 4000 \times \frac{\text{N}}{10^4 \text{ cm}^2}$$

$$= 0.4 \text{ N/cm}^2$$

119. Ans. (a)

120. Ans. (c)

$$\gamma = \frac{\mu}{\rho} = \frac{0.7}{0.8} = 0.87 \text{ stoke}$$

121. Ans. (b)

122. Ans. (d)

Dynamic viscosity ( $\mu$ )SI unit is pascal-second or N-sec/m<sup>2</sup>CGS-unit is poise = Dyne-sec/cm<sup>2</sup>1 poise = 0.1 N-S/m<sup>2</sup>

123. Ans. (d)

Kinematic viscosity ( $\nu$ ) =  $\frac{\mu}{\rho}$ 

$$= \frac{2}{0.8 \times 1000 \times 10}$$

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

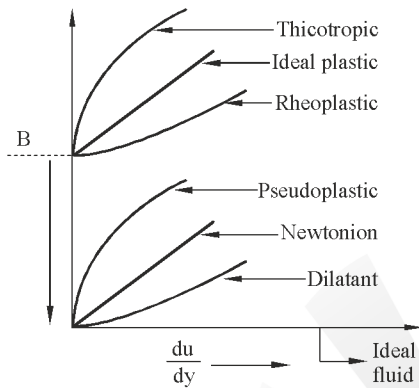
Its SI unit is m<sup>2</sup>/sec CGS unit is cm<sup>2</sup>/sec or stoke

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

124. Ans. (a)

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

For non newtonian fluids A & B are constants depending upon type of fluid and condition of flow



125. Ans. (c)

Shear stress  $\tau = \mu \left( \frac{dv}{dy} \right)$

Where  $\mu$  = dynamic viscosity

$\frac{dv}{dy}$  = rate of shear strain or velocity gradient or rate of angular deformation

126. Ans. (c)

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

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

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

127. Ans. (d)

128. Ans. (a)

$$Pv = \text{constant}$$

$$p = \frac{\partial p}{\left( -\frac{\partial \nabla}{\nabla} \right)}$$

$$K_{\text{isothermal}} = P$$



ENGINEERS ACADEMY

Properties of the Fluids

SCAN ME

