a.What is Viscosity? Discuss the significance of viscosity.

This question is often best answered by example. Imagine a styrofoam cup with a hole in the bottom. If I then pour honey into the cup I will find that the cup drains very slowly. That is because honey's viscosity is large compared to other liquids' viscosities. If I fill the same cup with water, for example, the cup will drain much more quickly.

Significance of Viscosity: It describes the internal friction of a moving fluid. A fluidwith large viscosity resists motion because its molecular makeup gives it a lot of internal friction. A fluid with low viscosity flows easily because its molecular makeup results in very little friction when it is in motion.

Gases also have viscosity, although it is a little harder to notice it in ordinary circumstances.

b. How is viscosity determined?

Heat Affects Viscosity
As viscosity is due to intermolecular interaction, so this property is affected by heat, given that heat is the result of the kinetic energy of molecules in a fluid. However, heat has a very different effect on liquids and gases. ...
Consequently the viscosity of a liquid decreases when it is heated.

c.What are the types of viscosity?

There are two kinds of viscosity commonly reported, kinematic and dynamic. Dynamic viscosity is the relationship between the shear stress and the shear rate in a fluid. The Kinematic viscosity is the relationship between viscous and inertial forces in a fluid.

d.What is viscosity and its formula?

Viscosity Formula
So, F/A, or force divided by area, is another way of defining viscosity. Dv divided dr represents the "sheer rate," or the speed the liquid is moving. The n is a constant unit equal to 0.00089 Pa s (Pascal-second), which is a dynamic viscosity measurement unit.

e.What is SI units of coefficient of viscosity?

SI unit of coefficient of viscosity of liquid is kg m^{-1} s^{-1} which is similar to the unit of viscosity.

f.What is Newton's law of viscosity?

NEWTON'S LAW OF VISCOSITY Newton's law of viscosity states that "shear stress is directly proportional to velocity gradient". The shear stress between the two adjacent

layers of fluid is directly proportional to the negative value of the velocity gradient between the same two adjacent fluid layers.

g.What factors affect viscosity?

Viscosity is resistance to flow. For liquids, typically the larger the intermolecular forces (IMF) the higher the viscosity. The other factors that affect viscosity are temperature and the shape of the molecule.

h.Is poise a SI unit?

The poise (symbol P; /pɔɪz, pwɑːz/) is the unit of dynamic viscosity (absolute viscosity) in the centimetre–gram–second system of units. ... A centipoise is one hundredth of a poise, or one millipascal-second (mPa·s) in SI units (1 cP = 10^{-3} Pa·s = 1 mPa·s).

i.Does viscosity increase with temperature?

With an increase in temperature, there is typically an increase in the molecular interchange as molecules move faster in higher temperatures. The gas viscosity will increase with temperature. ... With high temperatures, viscosity increases in gases and decreases in liquids, the drag force will do the same.

j. Discussion on Newton's law.

NEWTON'S LAW OF VISCOSITY

Newton's law of viscosity states that "shear stress is directly proportional to velocity gradient". The shear stress between the two adjacent layers of fluid is directly proportional to the negative value of the velocity gradient between the same two adjacent fluid layers.

Mathematically the law can be stated as:-

$$\tau yx = -\mu \, dVx / dy$$

Where μ is the constant of proportionality known as dynamic viscosity having units n.s / m2.

NEWTONIAN FLUIDS

The fluids that obey the newton's law of viscosity are known as Newtonian fluids.

NON NEWTONIAN FLUIDS

The fluids that do not obey newton's law of viscosity are called as Non-Newtonian fluids.

TYPES OF NON NEWTONIAN FLUIDS

Non-Newtonian fluids are divided into two broad categories on the basis of their shear stress/shear rate behavior as:-

- Those whose shear stress is dependent on time.
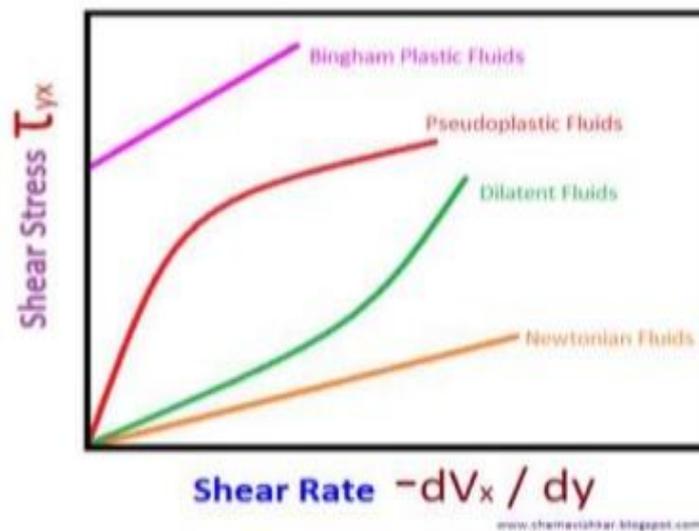- Those whose shear stress is independent of time.

FIGURE 1 SHEAR DIAGRAM FOR NEWTONIAN AND TIME-INDEPENDENT NON-NEWTONIAN FLUIDS

NON-NEWTONIAN FLUIDS (SHEAR STRESS IS INDEPENDENT OF TIME)

BINGHAM PLASTIC FLUIDS

These are the simplest types of Non-Newtonian fluids. They differ from Newtonian fluids only in the linear relationship that they do not pass through origin.

Examples:

k. How does Ostwald viscometer work?

Ostwald viscometer is a commonly used viscometer, which consists of a U-shaped glass tube held vertically. ... It is also known as a glass capillary viscometer. A liquid is allowed to flow through its capillary tube between two etched marks and the time of flow of the liquid is measured using a stopwatch.

l.What is the principle of viscometer?

Rotational viscometers use the idea that the torque required to turn an object in a fluid is a function of the viscosity of that fluid. They measure the torque required to rotate a disk or bob in a fluid at a known speed.

m.What is viscosity formula?

The viscosity formula is often expressed using Newton's equation for fluids: $F / A = n (dv / dr)$ where F represents force and A represents area. So, F/A, or force divided by area, is another way of defining viscosity. Dv divided dr represents the "sheer rate," or the speed the liquid is moving.

n. What factors affect viscosity?

Viscosity is resistance to flow. For liquids, typically the larger the intermolecular forces (IMF) the higher the viscosity. The other factors that affect viscosity are temperature and the shape of the molecule.

o.What is the use of Ostwald viscometer?

Ostwald viscometer, also known as U-tube viscometer or capillary viscometer is a device used to measure the viscosity of the liquid with a known density.

P. What are the types of viscosity?

There are two kinds of viscosity commonly reported, kinematic and dynamic. Dynamic viscosity is the relationship between the shear stress and the shear rate in a fluid. The Kinematic viscosity is the relationship between viscous and inertial forces in a fluid.