Multiple Choice Questions on Rheology

1. Rheology is the scientific study of the deformation and flow of matter. Which of the following is an example of a Newtonian fluid?
a) Toothpaste
b) Ketchup
c) Water
d) Cornstarch and water mixture
2. What is the primary characteristic that distinguishes a Newtonian fluid from a non-Newtonian fluid?
a) A non-Newtonian fluid has a constant density.
b) A Newtonian fluid has a viscosity that changes with temperature.
c) A non-Newtonian fluid's viscosity depends on the applied shear rate.
d) A Newtonian fluid does not respond to shear stress.
3. A substance exhibits a decrease in viscosity with an increase in shear rate. This behavior is known as:
a) Dilatant flow
b) Newtonian flow
c) Plastic flow
d) Pseudoplastic flow
4. A rheogram (flow curve) is a plot of shear stress versus shear rate. For a Bingham plastic, the rheogram is a straight line that:
a) Passes through the origin with a positive slope.
b) Starts at the origin and then curves upwards.
c) Starts at the origin and then curves downwards.
d) Does not pass through the origin and has a positive slope.
5. What is the unit of dynamic viscosity in the SI system?
a) Stokes (St)
b) Poise (P)
c) Pascal-second (Pa·s)
d) Dyne-second/cm^2
6. Thixotropic behavior is observed when a fluid's viscosity decreases over time under constant shear. What happens to the fluid's structure when the shear is removed?
a) The viscosity decreases further and permanently.
b) The viscosity increases as the structure begins to rebuild.
c) The viscosity remains at the lowest point achieved under shear.
d) The fluid solidifies completely and permanently.

7. Which type of viscometer is most suitable for measuring the rheological properties of a non-Newtonian fluid, as it can apply a wide range of controlled shear rates?
a) Ostwald viscometer (capillary viscometer)
b) Falling sphere viscometer
c) Rotational viscometer (e.g., cone and plate)
d) Brookfield viscometer
8. The flow behavior of a concentrated suspension of solid particles, where viscosity increases with an increase in shear rate, is known as:
a) Pseudoplastic flow
b) Plastic flow
c) Dilatant flow
d) Rheopectic flow
9. What is the relationship between shear stress (τ) and shear rate ($\dot{\gamma}$) for a Newtonian fluid?
a) $\tau \propto \dot{\gamma}^n$ where $n<1$
b) $\tau = \eta\dot{\gamma}$ where η is a constant
c) $\tau = \tau_0 + \eta\dot{\gamma}$
d) $\tau = \eta\dot{\gamma}^n$ where $n>1$
10. In the context of rheology, what does the term 'yield stress' refer to?
a) The stress at which a fluid's viscosity becomes constant.
b) The maximum stress a fluid can withstand before breaking.
c) The minimum shear stress required to initiate flow in a fluid.
d) The stress at which a fluid begins to solidify.