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| 28 | Flow geometry. Give examples of cases where spherical and hemispherical flow geometries are used. Flow rate equation for hemispherical flow geometry. | №2 |
| 29 | Formation volume factor. Why the volume of produced fluid at surface conditions is different than the volume entering the wellbore at reservoir conditions? | №2 |
| 30 | Give general equation of pollutant’s propagation in porous media. Explain each term: diffusive, convective propagation and source.  | №2 |
| 31 | A core plug has a radius of 1.25\*10-2[m] and a length of 5.0\*10-2[m]. It is completely saturated with brine having a density of 1200 [kg/m3]. The dry core plug weighted 5.1\*10-3[kg], and 10.4\*10-3[kg] when it was saturated with brine. Calculate the effective porosity of the core plug. | №3 |
| 32 | A cylindrical core having a radius 2.54\*10-2[m] and a lenth of 0.3 [m], was flooded with brine at a steady rate of 1\*10-6[m3s-1], the differential pressure across the core was 10[bar]. Calculate the absolute permeability of the core. Assume brine viscosity 0.001 [Pa s].   | №3 |
| 33 | Determine whether the filtration flow in the productive layer is subject to Darcy's law using the following data:-    The flow rate of the oil   Q=200 m3/day;-    Coefficient of porosity of the productive layer  m=16 %;-    Productive layer thickness  h=10 m;-    Coefficient of permeability  k=0.2 darcy;-    Oil density 0.8 g/cm3;-    Viscosity mju=5 ∙ 10-3 Pa∙s ;-    Wellbore radius  rw=0.1 m; the well is hydraulically perfect. | №3 |
| 34 | For the case of plane radial filtration movement of gas to the well, determine the distance/radius from the production well at which the filtration through productive layer violates to Darcy law. It is known:-    The flow rate converted to STP conditions is Q=2\*106 m3/day;-    Productive layer thickness h= 10 m;-    Permeability k=0.6 darcy;-    Porosity m=19 %;-    Dynamic viscosity of the gas at reservoir conditions is mju = 1,4 ∙ 10-5 kg/m∙s ;-    Density of the gas at atmospheric pressure and temperature rhoatm =  0.7 kg/m3.Use Millionschikoff's formula with critical Reynolds number of Recr=0.022. | №3 |
| 35 | Find the change in well production rate if the borehole radius is doubled for the following two cases:1. Filtration is subject to Darcy’s law;
2. Filtration law is defined by the expression:

                   https://univer.kaznu.kz/Content/test/i/59259_vpt34e46r6cbyh.png      (Krasnopolsky equation) The initial radius of the borehole rw = 0.1 m, the radius of the external reservoir boundary Re = 5 km.  | №3 |
| 36 | What should be the size of the well  rw’ to double the flow rate Q? Other parameters of the well and the reservoir remain unchanged.Consider two cases:1. Flow occurs by Darcy’s law;
2. The filtration law is defined by the expression:

  https://univer.kaznu.kz/Content/test/i/59259_vpt34e46r6cbyh.png (The formula of Krasnopolsky)The initial radius of the wellbore rw = 0.1 m, the radius of the external reservoir boundary Re = 1 km. | №3 |
| 37 | In homogeneous porous medium occurs rectilinear parallel filtration of oil with the Darcy law. Determine the coefficient of permeability of rock in cm2,m2 and D.Given:* the hydraulic gradient i=0.03;
* the width of the productive layer a=500 m  and thickness h=6 m ;
* density of oil 850 kg/m3;
* coefficient of dynamic viscosity mju=5 cPs ;
* flow rate Q=30 m3/hr.
 | №3 |
| 38 | The gas flow rate at the welbore converted to STP conditions is Q=2\*106m3/day; the pressure in the bottom of the borehole  pw=80 atm; the thickness of the productive layer h=10m; porosity of the rock m=18%, permeability k=1.2 darcy, the molecular weight of gas is 18, dynamic viscosity of gas in the productive layer mju=0.015 cPs at the temperature of 450C.Determine whether the filtration law near welbore is subject to Darcy law?radius of the well rw=10 cm.  | №3 |
| 39 | Assuming that Darcy's law is valid for the given case, construct an indicator diagram (in coordinates *Q, ∆p = pc – pw*) for the case of a radial axisymmetric filtration flow of oil for the following numerical parameters:* Diameter of the well *dw* = 24,765 cm;
* Productive layer thickness *h* = 10 m;
* Radius of external boundary *Rc*= 10km;
* Pressure at the external boundary *Pc*= 90 atm;
* Viscosity of the oil *µ* = 5cPs;
* Coefficient of permeability *k*= 0.6 darcy.
 | №3 |
| 40 | Knowing the index of productivity *J* = 18 tons/(day·atm) by means of a sounding of the productive layer of the oil field, find the coefficient of the hydroconductivity of the layer (*Kh/µ*). It is supposed that Darcy's filtration law is valid. The average distance between the wells 2σ = 1400 m, the specific mass (density) of oil *ρ* = 925 kg/m2, the radius of the well *rw =*0.1 m. | №3 |