Day 2

1. What is the correct meaning of the term "Secondary Well Control"?

A. Preventing flow of formation fluid into the wellbore by maintaining drilling fluid hydrostatic equal to or greater than formation pressure

B. Preventing the flow of formation fluid into the well by maintaining a sum of drilling fluid hydrostatic and dynamic pressure loss

C. Preventing the flow of formation fluids into the well by maintaining the dynamic pressure loss in the annulus equal to formation pressure

D. Preventing flow of formation fluids into the well by using BOP equipment in combination with the hydrostatic pressure of the mud to balance formation pressure

2. Company policy states: "…while killing a well you will always attempt to kill the well using a method that minimizes the pressure on the stack and upper casing." Which method would you choose?

A. Wait and Weight

B. Driller's

C. Lubricate and Bleed

D. Volumetric

3. You are circulating out a gas kick using the Wait & Weight Method. What will happen to BHP in each of the following situations?

A. If drill pipe pressure is held constant while kill mud is being pumped to the bit.

a. Increase b. Decrease c. Stay the same

B. If drill pipe pressure is held constant while kill weight mud is pumped up the annulus.

a. Increase b. Decrease ***c. Stay the same***

C. If SPM is increased and drill pipe pressure is held constant.

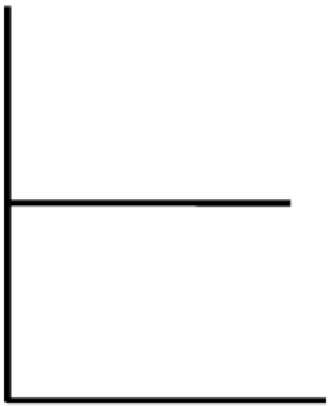
a. Increase ***b. Decrease*** c. Stay the same

D. If the gas bubble is not allowed to expand.

a. Increase b. Decrease c. Stay the same

4. Match the following names to the correct graphs – write the appropriate number in the answer boxes provided.

1. Drill Pipe Pressure
2. Bottom Hole Pressure
3. Casing Shoe Pressure
4. Surface Casing Pressure



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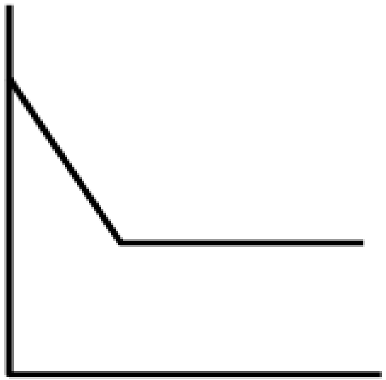

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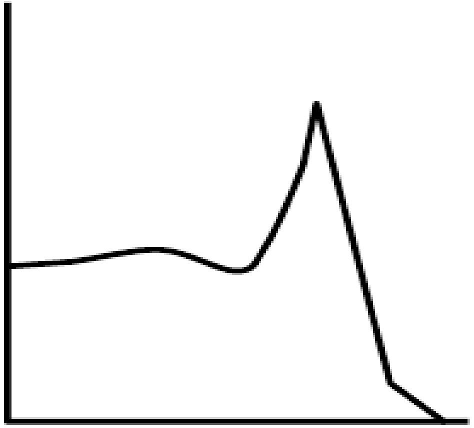

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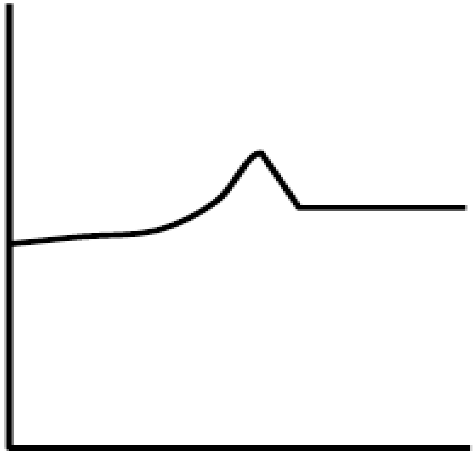

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5. When starting a kill operation with a surface BOP, the choke pressure is held constant while bringing the pump up to speed. The drill pipe pressure gauge now reads 250 psi higher than the calculated initial circulating pressure. To maintain constant BHP, what is the best action to take?

A. Open the choke and let the standpipe pressure drop to the calculated initial circulating pressure.

B. Continue to circulate with the new initial circulating pressure and adjust the drill pipe graph accordingly

C. There will now be a 250 pi overbalance on the bottom which is acceptable. Nothing needs to be done.

6. A well is being killed correctly using a constant BHP method. At what stage during the kill operation can the choke pressure reading exceed the MAASP without breaking down at the shoe?

A. Kill mud circulated to the bit

B. Influx in the casing annulus

C. Influx around the BHA.

D. Influx in the open hole annulus

7. On the second circulation of the Driller's Method if the casing pressure was held constant until KWM reached the surface what would happen to BHP?

A. ***Increase***

B. Decrease

C. Stay the same

8. A well is being killed using the Driller's Method.

Original SIDPP = 500 psi

Original SICP = 900 psi

After the first circulation the well is shut in and pressures allowed to stabilize. They then read:

SIDPP = 500 psi

SICP = 650 psi

It is decided not to spend any more time circulating original mud. Which one of the following actions should be taken first?

A. Prepare to use the Wait and Weight Method

B. Bullhead annulus until the SICP is reduced to 500 psi

C. Reverse circulate until the SICP is reduced to 500 psi

D. ***Continue with the second circulation of the Driller's Method***

9. For each of the following statements note whether it relates to the Driller's Method or the Wait and Weight method. Circle the correct method.

A. Minimizes pressures experienced on surface.

Driller’s ***Wait and Weight***

B. Removes influx from the hole before pumping KWM

Driller’s Wait and Weight

C. Pump KWM while circulating the influx up the annulus

Driller’s ***Wait and Weight***

D. Maintain a constant drill pipe pressure for the first circulation

Driller’s Wait and Weight

10. Under which circumstances would the Wait and Weight Method provide lower equivalent pressure at the casing shoe than the Driller's Method?

A. When the drill string volume is greater than the open hole annular volume

B. When the drill string volume is less than the open hole annular volume

C. The pressure at the casing shoe will be the same regardless of the method used

11. Which statement is correct when comparing the Driller's Method and the Wait and Weight Method?

A. The Driller's Method will give the lowest casing shoe pressure when the open hole annular volume is larger than the drill string volume

B. The Wait and Weight Method will give the lowest casing shoe pressure when the open hole annular volume is smaller than the drill string volume

C. The Wait and Weight Method will give the lowest casing shoe pressure when the open hole volume minus the gain is larger than the drill string volume

D. The Wait and Weight Method will always give a lower maximum pressure at the casing shoe than the Driller's Method

12. An influx is being circulated out using the Driller's Method and using 1,100 psi at 30 spm. The operator decreases the pump speed to 25 spm but holds the PUMP PRESSURE constant. Does this have any effect on bottom hole pressure?

A. ***Increases BHP***

B. Decreases BHP

C. BHP remains approximately the same

Formula #9 - $New\ PP = Old\ PP\ x \left(\frac{New\ SPM}{Old\ SPM}\right)^2$

$$1100\ x \left(\frac{25}{30}\right)^2 = 764\ psi$$

1100 psi – 764 psi = 336 psi

13. An influx is being circulated out using the Driller's Method and using 1,100 psi @ 30 spm. The operator increases the pump rate to 35 spm but holds the pump pressure constant. Does this have any impact on bottom hole pressure?

A. Increases BHP

B. ***Decreases BHP***

C. BHP remains approximately the same

Formula #9 - $New\ PP = Old\ PP\ x \left(\frac{New\ SPM}{Old\ SPM}\right)^2$

$$1100\ x \left(\frac{35}{30}\right)^2 = 1497\ psi$$

1100 psi – 1497 psi = -397 psi

14. While in the process of killing a well partial loss of return occurs. What can be done to reduce the pressure at the loss zone?

A. Reduce the pump speed thus reducing annular friction pressure

B. Keep the drill pipe pressure as close to the actual pressure that is supposed to be on the drill pipe gauge with no safety factor

C. Used the exact mud density to kill the well with no additional weight as a safety factor

D. All of the above

15. It is decided to use the volumetric procedure. That is, bleed enough mud to keep the drill pipe pressure constant at 450 psi, (SIDPP = 350 psi plus 100 psi safety margin). What would the pressure in the gas bubble do as the gas rises?

A. Increase

B. Decrease

C. Remain approximately the same

16. What would happen to bottom hole pressure?

A. Increase

B. Decrease

C. Remain approximately the same

17. What would happen to the SICP?

A. Increase

B. Decrease

C. Remain approximately the same

18. What would happen to pressure at the casing seat with the bubble below the casing seat?

A. Increase

B. Decrease

C. Remain approximately the same

19. What would happen to pressure at the casing seat as the bubble is passing the casing seat (some of the influx is in the casing and some is still in the open hole)?

A. Increase

B. Decrease

C. Remain the same

20. What would happen to pressure at the casing seat while the bubble is above the casing seat?

A. Increase

B. Decrease

C. Remain approximately the same

21. Which of the following statements are good operating practices in top hole (surface hole) that have a risk of gas bearing formations.
(TWO ANSWERS)

A. Use a high density mud (minimum of 15 ppg) to create a maximum overbalance

B. Pump out of the hole on trips

C. Control drill

D. Regularly pump a fresh water pill to clean cuttings from the hole

E. Maintain a high rate of penetration to ensure mud viscosity level is as high as possible

22. During top hole drilling from a jack-up rig the well suddenly starts to flow due to a shallow gas kick. What would be the safest actions to take for the rig and personnel? *(TWO ANSWERS)*

A. Activate the blind/shear rams to shut in the well

B. Activate the diverter system and remove all non-essential personnel from the rig floor and hazardous areas

C. Shut in the well and prepare for conventional kill operations immediately

D. Start pumping fluid into the well at the highest possible rate

E. First line up the flow to the mud/gas separator, activate the diverter system, and then remove personnel from the rig floor

23. The main purpose of the diverter system is to:

A. Shut in the well

B. Divert shallow gas away from the rig

C. To prevent gas from entering the wellbore

24. Kicks taken while drilling shallow formations should be:

A. Closed in with the annular preventer

B. Closed in with the rams

C. Ignored because the pressure is minimal

D. Diverted

25. The pressure build up due to the rising of gas which cannot expand could be called the second build up. The first build up occurs in 5 to 10 minutes after the well is closed in and sometimes takes 30 minutes. What causes the first build up?

A. Gas migration

B. Friction losses

C. Permeability

D. Type of influx

26. While drilling ahead the well kicks and is shut in. Drill pipe and casing pressures start to rise before stabilization and then both drop quite rapidly. What has probably happened?

A. The drill pipe has parted

B. The BHA has packed off

C. A formation has broken down

D. The pressure gauges need to be changed

27. While drilling, a gas kick is taken and the well shut in. The driller reported a 17 bbl pit gain. SIDPP = 525 psi; SICP = 0 psi

The choke was opened and there was no flow from the annulus and the drill pipe pressure remained constant. What is the probable cause?

A. The casing gauge is malfunctioning

B. The drill string has twisted off

C. The well is swabbed in

D. The hole has packed off around the BHA

E. The formation at the casing shoe has fractured

28. The reason the casing pressure is usually higher than the SIDPP is:

A. The cuttings in the annulus are lighter therefore creating a lighter hydrostatic in the annulus

B. The influx fluid is usually less dense than the existing mud weight

C. The casing pressure is not necessarily higher, it depends on whether it is an offshore or land operation

D. The only difference is the type of gauges used to measure pressures

29. Which of the following parameters primarily affect the value of the SICP when a well is shut in on a kick? (*THREE ANSWERS)*

A. Pore pressure
B. Bottom hole temperature
C. Hole or annulus capacity
D. Drill string capacity
E. Kick volume
F. Length of the choke line

30. Fast drilling in large diameter holes may cause errors in shut in pressures. If a well is shut in on a kick, just after a period of fast drilling, would you expect the SICP to be:

A. Higher than if drilling had been slow
B. Lower than if drilling had been slow
C. The same whether the annulus was clean or loaded with cuttings

31. When tripping out of a vertical well with a surface BOP stack, the well is shut in after a gas kick has been taken. The bit is 950 feet off bottom and the influx is estimated to fill the bottom 300 feet of the hole. The SICP is 450 psi.

What will the *most likely* SIDPP be?

A. The same as SICP
B. Higher than SICP
C. Lower than SICP because of the ECD
D. Impossible to say if the exact location of the kick is not known

32. Mud weight increase required to kill a kick should be based upon:

A. SIDPP
B. SICP
C. OMW plus slow circulating rate pressure
D. SICP minus the SIDPP

Formula #13 – Kill Mud Density ppg = (**SIDPP** ÷ TVD ft ÷ 0.052) + OMW ppg

33. The correct gauge to use to calculate KWM is:

A. The gauge on the choke and kill manifold

B. The drill pipe pressure gauge on the driller's console

C. The casing gauge on the driller's console

D. The drill pipe pressure gauge on the remote choke panel

E. The casing gauge on the remote choke panel

34. A flowing well is closed in. Which pressure gauge is used to determine formation pressure?

A. BOP manifold gauge

B. Choke console drill pipe pressure gauge

C. Driller's console drill pipe pressure gauge

D. Choke console casing pressure gauge

35. A kick has been taken in a horizontal well. Use the following data to calculate the mud weight required to kill this well:

MW	12.8 ppg
Length of horizontal section	5990 feet
TVD at time of kick	5820 feet
TVD at start of horizontal	5790 feet
MD at start of horizontal	13,680 feet
SIDPP	230 psi
SICP	240 psi

KWM = __***13.6***___ ppg

Formula #13 – Kill Mud Density ppg = (SIDPP ÷ TVD ft ÷ 0.052) + OMW ppg

(230 ÷ 5820 ÷ 0.052) + 12.8 = 13.55 Round up **13.6 ppg**

36. A gas kick has been taken in a well with a large open hole section. After a short time the drill pipe becomes plugged by debris blocking the bit. Drill pipe pressure cannot be read and pumping is impossible down the drill pipe. There is evidence of gas migration taking place.

Which one of the following control procedures can be applied?

A. Driller's Method

B. Lubricate and Bleed

C. Wait and Weight Method

D. Volumetric method

37. A vertical well is shut in on a gas kick. The kill operation is delayed and the influx starts migrating. Both the drill pipe and casing pressures have increased by 100 psi as a result of migration.

WELL DATA

Well Depth	10,000 feet
Casing shoe depth	6000 feet
MW	11.7 ppg
DP/OH capacity	.06 bbl/ft
DP/Csg capacity	.065 bbl/ft

KICK DATA

SIDPP = 800 psi; SICP = 1000 psi; Kick Volume = 30 bbls

Assume only drill pipe is in the well. How many bbls of mud should be bled from the well in order to arrive at the original BHP prior to gas migration?

____***0.44***____ bbl

Formula #4 - Formation Pressure psi = HP in Drill String psi + SIDPP psi

(11.7 ppg x 0.052 x 10,000) + 800 = 6884 psi

Formula #26 – Volume to Bleed off bbls = $\frac{Incr\ in\ Surf\ Pressure\ psi\ x\ Influx\ Volume\ bbls}{Formation\ Pressure\ psi - Incr\ Surf\ Pressure\ psi}$

Volume to Bleed off bbls = $\frac{100\ psi\ x\ 30\ bbls}{6884\ psi - 100\ psi}$ = **0.44 bbl**

38. Which of the following best describes the Volumetric Method of well control?

A. Maintains a constant pressure in the influx as the influx migrates up the well
B. Maintains a constant BHP as the influx migrates up the well
C. Maintains a constant casing pressure as the influx migrates up the well
D. Maintains a constant pressure at the casing shoe as the influx migrates up the well

39. A vertical well is shut in on a gas kick. The kill operation is delayed and the influx starts migrating. Both the drill pipe and casing pressures have increased by 100 psi as a result of migration.

WELL DATA

Well Depth	12,000 feet
Casing shoe depth	9000 feet
MW	12.2 ppg
DP/OH capacity	.065 bbl/ft
DP/Csg capacity	.070 bbl/ft

KICK DATA

SIDPP = 850 psi; SICP = 1100 psi; Kick Volume = 50 bbls

Assume only drill pipe is in the well. How many bbls of mud should be bled from the well in order to arrive at the original BHP prior to gas migration?

___***0.59***___ bbl

Formula #4 - Formation Pressure psi = HP in Drill String psi + SIDPP psi

(12.2 ppg x 0.052 x 12,000) + 850 = 8463 psi

Formula #26 – Volume to bleed off bbls = $\frac{\text{Incr in Surf Pressure psi x Influx Volume bbls}}{\text{Formation Pressure psi} - \text{Incr Surf Pressure psi}}$

Volume to Bleed off bbls = $\frac{\text{100 psi x 50 bbls}}{\text{8463 psi} - \text{100 psi}}$ = **0.59 bbl**

40. The well has been shut in on a swabbed in kick. The SIDPP and SICP both read 350 psi. The bit is 30 stands off bottom. Which of the following would be the safest course of action to take in order to bring the well back under primary well control?

A. Calculate KWM using 350 psi and circulate the well out from that depth using the Wait and Weight Method

B. Bring the well on choke while holding the casing pressure constant as the pump is brought up to the kill rate. Then circulate the influx out using the Driller's Method

C. Strip back to bottom using proper stripping techniques then circulate the influx out using the Driller's Method

41. Which one of the following actions taken while stripping into the hole will help maintain an acceptable bottom hole pressure?

A. Pumping a volume into the well equal to the drill pipe closed end displacement at regular intervals

B. Bleeding off the drill pipe displacement at regular intervals

C. Pumping a volume of mud into the well equal to the drill pipe displacement at regular intervals

D. Bleeding off the drill pipe closed end displacement of the pipe stripped in at regular intervals

42. When stripping pipe into the hole which valves should be installed?

A. Full opening safety valve in closed position

B. Full opening safety valve in open position

C. Inside BOP with Full opening safety valve in open position

D. Inside BOP with Full opening safety valve in closed position

43. A well is closed in on a 30 bbl gas kick while drilling 8 ½" hole at 11,000 feet TVD with 5", 19.5lb/ft drill pipe and 750 feet of 6 ½" drill collars.

Annular Capacities:		
	5" DP in 8 ½" Hole	.0459 bbl/ft
	6 ½" DC in 8 ½" hole	.0292 bbl/ft

The mud weight is 12.3 ppg and the SIDPP is 350 psi. Assuming a gas gradient of .115 psi/ft. what will the casing gauge read?

A. 480 psi

B. 650 psi

C. 975 psi

D. 837 psi

Volume of gas around Drill Collars bbls = 0.0292 x 750 = 21.9 bbls

Volume of gas around Drill Pipe bbls = 30 – 21.9 = 8.1 bbls

Height of Influx ft = (21.9 ÷ 0.0292) + (8.1 ÷ 0.0459) = 926 ft

SIDPP psi + Height of Influx ft x (mud gradient psi/ft – gas gradient psi/ft)

350 + { 926 x (.6396 - .115)} = ***835.7 psi***

Questions 44 through 48 are based on the following information:

A deviated hole has a MD of 12320 feet and a TVD of 10,492 feet. 9 5/8" casing is set at a measured depth of 9750 feet and 9200 feet TVD. 11.4 ppg mud is in use when the well kicks and is closed in.

SIDPP	750 psi
SICP	1150 psi
Pit Gain	15 bbl
Fracture Mud Weight	14.4 ppg
DP Capacity	.01776 bbl/ft
Casing Capacity	.0732 bbl/ft
Slow Circulating Rate Pressure	850 psi

44. The maximum allowable annular surface pressure is rounded off to:

A. 1370 psi

B. 1480 psi

C. 1435 psi

D. 1415 psi

Formula #12 - MAASP psi = (MAMW ppg – MW ppg) x 0.052 x Casing Shoe TVD ft

(14.4 – 11.4) x 0.052 x 9200 = ***1435 psi***

45. The kill weight mud required to balance the formation pressure is:

A. 13.1 ppg

B. 12.6 ppg

C. 12.8 ppg

D. 12.2 ppg

Formula #13 – Kill Mud Density ppg = (SIDPP psi ÷ 0.052 ÷ TVD ft) + OMW ppg

(750 ÷ 0.052 ÷ 10,492) + 11.4 = 12.77ppg = ***12.8ppg***

46. What drilling mud weight would give a safety margin of 100 psi after the well was killed?

A. 13.4 ppg

B. 13.0 ppg

C. 12.4 ppg

D. 11.8 ppg

Formula #8 Mud Density = (Safety Margin psi ÷ 0.052 ÷ TVD ft) + Kill Mud Density ppg

(100 ÷ 0.052 ÷ 10,492) + 12.8 = 12.98 = ***13.0 ppg***

47. The Initial Circulating Pressure is:

A. 1400 psi

B. 1600 psi

C. 1900 psi

Formula #14 –ICP = Kill Rate Circulating psi +SIDPP psi

850 + 750 = ***1600 psi***

48. The Final Circulating Pressure is:

A. 850 psi

B. 955 psi

C. 920 psi

D. 1050 psi

Formula #15 – FCP = $\frac{Kill\ Mud\ ppg}{Original\ Mud\ ppg}\ x\ Kill\ Rate\ Circulating\ psi$

$$\frac{12.8}{11.4}\ x\ 850 = \mathbf{955\ psi}$$

49. On a surface stack, what would happen when bringing the pumps up to the kill speed if the casing pressure was allowed to fall below the SICP?

A. Formation would probably break down

B. More influx would be let into the wellbore

C. It would have no affect on anything

50. A kicking well has been shut in. SIDPP = 0 psi and there is a float in the drill string. To establish the SIDPP what action should be taken?

A. Pump very slowly into the drill pipe with the well shut in. When the drill pipe pressure gauge fluctuates, the float has opened. This pressure is the SIDPP.

B. Bring the pump up to the kill rate holding the casing pressure constant by opening the choke. The pressure shown when the pump is at the kill rate is the SIDPP.

C. Pump at the kill rate into the drill string with the well shut in. When casing pressure starts to rise, read the pump pressure. This is the SIDPP.

D. Shearing the pipe and reading the SIDPP directly off of the casing pressure gauge.

51. Calculate the slow circulating rate pressure. The initial circulating pressure (ICP) is determined by bringing the pump rate to a pre-determined 30 spm by holding the SICP constant. The shut in drill pipe pressure SIDPP is 220psi. At 30 spm the ICP is 1060 psi.

A. 700 psi
B. 770 psi
C. 800 psi
D. 840 psi

Slow Circulating Rate Pressure = Initial Circulating Pressure (ICP) – SIDPP psi

1060 – 220 = ***840 psi***

52. To find the initial circulating pressure on a surface BOP stack when the slow pump rate circulating pressure is not known and a kick has been taken:

A. Circulate at the desired SPM to circulate out the kick, but hold 200 psi back pressure on the drill pipe side with the choke.
B. Add 400 psi to the casing pressure and bring the pump up to the selected kill rate while using the choke to maintain an additional 400 psi on the casing.
C. Bring the pump up to the kill rate while holding the casing pressure constant at the SICP by choke manipulation. After the hydraulic delay, the pressure shown on the drill pipe gauge is the initial circulating pressure.
D. Add 1000 psi to the SIDPP and circulate out the kick.

53. While killing the well, as the pump speed is increased, what should happen to the casing pressure in order to keep BHP constant?

A. Casing pressure should be held steady during a SPM change

B. Casing pressure should be allowed to rise during a SPM change

C. Casing pressure should be allowed to fall during a SPM change

54. A *saltwater* kick is circulated out using the Driller's Method. The drill string consists of drill collars plus drill pipe and a surface BOP stack is in use. When will the surface casing pressure be at its maximum value?

A. When KWM enters the drill pipe

B. When the kick has been circulated to the surface

C. Only when the kick reaches the casing shoe

D. Just after KWM reaches the bit

E. Immediately after the well has been shut in and stabilized

55. The following slow circulating rate pressures (SCRP) were recorded. Which one does not seem to be correct?

A. 30 spm @ 100 psi

B. 40 spm @ 180 psi

C. 50 spm @ 400 psi

56. A hydraulic delay exists between the time the choke is adjusted to the time the drill pipe pressure reacts. This hydraulic delay is:

A. Equal to the speed of sound

B. About 1 second per 300 meters (1000 feet) of distance traveled.

C. About equal to 20 seconds

D. This is a myth –no hydraulic delay exists

57. WELL DATA

Hole Size = 12 ¼"; DP = 5" OD; DC = 8" X 3" (215 feet);
DC/OH capacity = .0836 bbl/ft; DP/OH capacity = .1215 bbl/ft

While drilling at 12,000 feet a gas kick is taken and the well shut in. The influx volume is measured as 35 bbl. Calculate the length of the influx assuming it is on bottom and does not migrate.

___***355***___ feet

Volume around Drill Collars = 215 x .0836 = 18 bbls

Volume around Drill Pipe = 35 bbls – 18 bbls = 17 bbls

Height of Influx around Drill Pipe = 17 bbls ÷ .1215 =140 ft

Height of Influx = 215 + 140 = ***355 ft***

58. While tripping out of the hole from 12,000 feet TVD the hole does not take the proper amount of fill. With the bit at 9000 feet TVD the well flows and is shut in with 215 psi SICP. A float is in the drill string. Drill collar length is 1200 feet and the average length of each stand is 93 feet. *Assume the gas is on bottom and does not migrate*.

Drill pipe capacity	.01776 bbl/ft
Drill pipe displacement	.0076 bbl/ft
Open hole capacity	.0702 bbl/ft
DC/Open hole capacity	.0291 bbl/ft
DP/Open hole capacity	.046 bbl/ft
Pit gain	30 bbl
Gas gradient	.12 psi/ft
MW	12.0 ppg

58a. How much volume is required to fill the drill pipe after stripping one stand into the hole?

__***1.65***__ bbl

Capacity bbl = Stand Length ft x Drill pipe capacity bbl/ft

93 ft x .01776 = ***1.65 bbl***

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Drill pipe displacement	.0076 bbl/ft
Open hole capacity	.0702 bbl/ft
DC/Open hole capacity	.0291 bbl/ft
DP/Open hole capacity	.046 bbl/ft
Pit gain	30 bbl
Gas gradient	.12 psi/ft
MW	12.0 ppg

58 **b**. Calculate the height of the influx

__***427.3***__feet

Height of Influx in open hole ft = Pit Gain bbls ÷ Open Hole capacity

30 ÷ .0702 = ***427.3 ft***

58 **c**. Calculate the volume displaced per stand of drill pipe stripped into the hole

__***2.35***___bbl

Displacement per stand bbls = Std Length ft x (DP cap bbl/ft + DP displacement bbl/ft)

93 x (.01776 + .0076) = ***2.35 bbls***

58. While tripping out of the hole from 12,000 feet TVD the hole does not take the proper amount of fill. With the bit at 9000 feet TVD the well flows and is shut in with 215 psi SICP. A float is in the drill string. Drill collar length is 1200 feet and the average length of each stand is 93 feet. *Assume the gas is on bottom and does not migrate*.

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Drill pipe displacement	.0076 bbl/ft
Open hole capacity	.0702 bbl/ft
DC/Open hole capacity	.0291 bbl/ft
DP/Open hole capacity	.046 bbl/ft
Pit gain	30 bbl
Gas gradient	.12 psi/ft
MW	12.0 ppg

58 **d**. After stripping to bottom, what is the height of the influx across the BHA

__***1031***___feet

Height of Influx around Drill Collars = Pit Gain bbls ÷ Drill Collar capacity bbl/ft

30 ÷ .0291 = ***1031 ft***

58 **e**. Calculate the SICP once the bit is back on bottom

__***519***___psi

SICP = Height of Influx x (Mud Grad – Gas Grad)

1031 x (0.624 – 0.12) = ***519 psi***

59. WELL DATA FOR QUESTION

Well Depth	12,000 feet
DC length	1100 feet
9 5/8" Csg Shoe	8000 feet
DC capacity	.00768 bbl/ft
8 ½" OH capacity	.0702 bbl/ft
DC displacement	.033 bbl/ft
MW	12 ppg (.624 psi/ft)
DP capacity	.01776 bbl/ft
DP displacement	.0076 bbl/ft
DC/OH capacity	.0291 bbl/ft
DP/OH capacity	.0459 bbl/ft
DP/Csg capacity	.0515 bbl/ft

After pulling 33 stands the driller checks the hole fill. The well has not taken the correct amount of mud. A flow check is made and the well is flowing.

Bit depth	9000 feet
SICP	200 psi
Influx volume	30 bbl
Influx gradient (Gi)	.156 psi/ft

Assume that the influx occurred from the bottom of the hole and that no gas migration occurs.

59 a.Calculate the volume to bleed off per 98 feet of drill pipe stripped back into the hole.

__***2.48***__ bbl

Drill Pipe Displacement bbls = Length ft x (DP capacity bbl/ft + DP displacement bbl/ft)

*Volume to Bleed = 98 x (0.01776 + 0.0076) = **2.48 bbl***

59 b.What will be the effect on bottom hole pressure of bleeding off too much mud?

Increase ____ ***Decrease __↓__*** Stay the same _____

59 c. How would casing pressure most likely react as the drill string is stripped into the influx?

Increase __↑__ Decrease _____ Stay the same _____

60. Problems that occur during a killing operation may affect the parameters you are monitoring at the surface (drill pipe pressure and casing pressure). For each of the following problems state the *immediate* effect on each of the parameters listed.

For an increase use this symbol ↑
For a decrease use this symbol ↓
For no change use this symbol =

Problem	Drill Pipe Pressure	Casing Pressure	Bottom Hole Pressure
A. Choke washout	↓	↓	↓
B. Hole in string	↓	=	=
C. Nozzle blowout	↓	=	=
D. Choke plugging	↑	↑	↑
E. Nozzle plugging	↑	=	=

61. During the well kill operation, slowly but regularly you have to reduce the choke size because the drill pipe and casing pressures keep dropping with constant pump strokes.
What is the likely cause of this?

A. A bit nozzle is washing out

B. The choke is washing out

C. You have a washed out pump swab

62. Which of the following parameters *can be affected* by a string washout during a well killing operation *(TWO ANSWERS).*

A. Bottom hole pressure

B. Kick tolerance

C. Formation fracture pressure

D. Slow circulating pressure

63. The choke has to be closed gradually due to a string washout. What effect does the gradual closing of the choke have on bottom hole pressure?

A. Decrease

B. Increase

C. Stay the same

64. How is a choke washout recognized?

A. Rapid rise in casing pressure with no change in the drill pipe pressure

B. Increase in drill pipe pressure with no change in casing pressure

C. Continually having to open the choke to maintain drill pipe and casing pressures

D. Continually having to close the choke to maintain drill pipe pressure

65. A kick is being circulated from the well using the Driller's Method. Pumping pressure has been established as 1000 psi @ 30 SPM. During the operation pressure suddenly increases to 1350 psi. You are reasonably certain that a nozzle has plugged.
What should you do?

A. Reduce the pump pressure to 1000 psi by adjusting the choke
B. Shut the well in and re-establish the pumping pressure
C. Hold casing pressure constant at the value recorded just before the nozzle plugged
D. A & B are acceptable courses of action

66. A well is being killed using the Driller's Method. During the first circulation the drill pipe pressure is kept constant at 670 psi and the pump speed @ 30 SPM. Halfway through the first circulation the operator on the choke observes a sudden increase in drill pipe pressure. There is no significant change in choke pressure and the pump speed is still 30 SPM. What could have happened? (THREE ANSWERS)

A. The bit nozzles have partially plugged
B. The choke has partially plugged
C. The kick is about to enter the choke
D. A partial blockage in the kelly hose
E. Pressure has built up in the mud/gas separator
F. A partial blockage in the drill string has occurred

67. During a well killing operation using the Driller's Method, the choke pressure suddenly increases by 150 psi. Shortly thereafter the operator observes the same pressure increase on the drill pipe pressure gauge. What is the most likely cause of this pressure increase?

A. A second influx has entered the well

B. A restriction in the kelly hose

C. A plugged nozzle in the bit

D. The choke is partially plugged

E. A washout in the drill string

68. What would be the correct action to take for the problem in question #67

A. Reduce the pump rate to reduce the pressure by 150 psi

B. Open the choke a little until the drill pipe pressure returns to the calculated value

C. No action required as this pressure increase has no effect on bottom hole pressure

D. Stop the kill operation, remove the restriction in the kelly hose or change over to a spare kelly hose

69. While displacing the drill pipe with Kill Weight Mud a sudden loss in drill pipe pressure occurs, no change in the choke pressure is seen. The driller continued to pump at the same rate while the supervisor adjusted the choke to follow the drill pipe pressure graph as originally planned. What happens to BHP as a result of this?

A. BHP increases then decreases
B. BHP remains unchanged
C. BHP decreases
D. BHP decrease then increases
E. BHP increases with the choke adjustment

70. Which of the following would be applicable, if the pressures did not respond to opening the choke and the pumps were shut down and the well secured?

A. Bit nozzle plugged
B. Bit nozzle washout
C. Drill string washout
D. Pump failure
E. Plugged choke
F. Choke washed out

71. During a kill operation the choke operator notices the drill pipe pressure rises sharply though the casing pressure remains steady. He reacts by opening up the choke to maintain correct pumping pressure. This situation continues with increasing regularity. The choke operator notices that during this operation the choke has been adjusted from ½ to ¾ open. What is the most likely cause of this?

A. Choke plugging

B. Choke washing out

C. Pipe washed out

D. Bit nozzle plugging

72. In the above question, what effect has the gradual opening of the choke have on bottom hole pressure?

A. BHP has decreased

B. BHP has increased

C. BHP has remain unchanged

73. Lost circulation during a well control operation is usually detected by:

A. Monitoring the return flow with a flowshow

B. Monitoring the mud volume in the pits

C. Monitoring the pump speed

D. Monitoring the weight indicator

74. While circulating out a kick the choke operator has been continually closing the choke in order to maintain the correct circulating drill pipe pressure. The mud logger has reported that both drill pipe and casing pressures have been increasing.

NOTE: The choke operator's gauges operate from different sensor than the mud logger. A check of the gauges on the standpipe and choke manifold confirm the mud logger's report. What is the most likely explanation?

A. The choke is washing out

B. The choke operator's gauges are malfunctioning

C. The choke is plugging

D. The mud logger's gauges are malfunctioning

75. A kick has been taken and it is known that a potential lost circulation zone exists in the open hole. Select *TWO CORRECT ACTIONS* which can be taken to minimize pressure in the annulus during the kill operation.

A. Maintain extra back pressure on the choke for safety

B. Use the Wait and Weight Method

C. Choose a lower circulating rate

D. Choose a higher circulating rate

76. Does a kick always occur in the event of total loss of circulation?

A. Yes, losses always occur above any potential kick zone

B. No, it depends on the drill string weight reduction noted on the weight indicator

C. No, it depends on the mud level in the annulus and the formation pressure

77. If total losses occur while drilling with water based mud what would you do?

A. Continue drilling blind

B. Stop drilling and fill the annulus with water

C. Stop drilling, shut in the well and see what happens

78. While circulating out a kick the mud pump fails. What is the first thing to do?

A. Shut the well in

B. Fix the pump as soon as possible

C. Change over to Pump #2

D. Divert the well

79. If the drill string washed out during a kill operation, providing no action was taken, which of the following would remain constant? *(TWO ANSWERS)*

A. Bottom hole pressure

B. Casing pressure

C. Slow circulating pressure

D. Drill pipe pressure

80. Which *THREE* of the following are proper practices for drilling an anticipated H_2S environment?

A. Use S-135 drill pipe

B. Use X-95 drill pipe

C. Use H_2S scavenger

D. Use a high ph mud to neutralize the hydrogen sulfide

E. Use a low pH mud to neutralize the hydrogen sulfide

F. Always reverse out prior to round trips

81. How would you determine the Initial Circulating Pressure if no slow pump rate pressure were available? Assume the rig is on land, a kick has been taken and the well is shut in.

A. Add 300 psi to the casing pressure and bring the pump up to the kill speed while using the choke to keep casing pressure at (SICP + 300 psi)

B. Bring the pump up to the kill rate while keeping casing pressure constant by choke manipulation

C. Circulate at the kill rate holding 200 psi back pressure on the drill pipe side with the choke

82. During a kill operation a pump swab starts leaking. The choke operator knows nothing about the leak and is maintaining the standpipe pressure in accordance with the pressure schedule on the kill sheet. What will be the affect on BHP?

A. BHP stays constant

B. BHP decreases

C. BHP increases

KILL SHEET EXERCISES

Complete a SURFACE IWCF KILL SHEET using the data given below and answer the questions on the page following the data.

Well Data

Hole ID	12 ¼”
MD	10,975 feet
TVD	10,550 feet
Csg	Set @ 6250 feet; 12.515” ID

Internal Capacities

DP	.0174 bbl/ft
HW	.0088 bbl/ft (465 feet in length)
DC	.0087 bbl/ft (900 feet in length)

Volume from mud pumps to rig floor: 7.2 bbl

Annular Capacities

DC in Open Hole	.0836 bbl/ft
DP & HW in open hole	.1215 bbl/ft
DP & HW in cased hole	.1279 bbl/ft

Mud Pumps Output: .11 bbl/stk

Slow Circulating Pump Data

Pump #1	30 SPM @ 620 psi	40 SPM @ 1100 psi
Pump #2	30 SPM @ 610 psi	40 SPM @ 1080 psi

Active Surface Volume 525 bbl

Formation Strength Test Data

Fracture Gradient @ Casing Shoe (6250 feet) .75 psi/ft

Kick Data

SIDPP	525 psi
SICP	750 psi
Pit Gain	18 bbl
MW at the time of the kick	11.5 ppg

NOTE: The well will be killed with pump #2 at 40 SPM using the Wait and Weight Method

1. Calculate the MAASP using the mud weight of 11.5 ppg

_***942 - 950***_ psi

Formula #11 – MAMW ppg = LOT psi ÷ 0.052 ÷ Csg shoe TVD ft

(.75 x 6250) ÷ 0.052 ÷ 6250 = 14.42 ppg

Formula #12 - MAASP = (MAMW ppg – Current MW ppg) ÷ 0.052 x Csg Shoe TVD

*(14.42 – 11.5) x 0.052 x 6250 = **949 psi***

2. What mud weight is required to balance formation pressure (round off to 1 decimal)?

____***12.5***_____ ppg

Formula #13 - Kill Mud Density = (SIDPP ÷ 0.052 ÷ TVD ft) + OMW ppg

*(525 ÷ 0.052 ÷ 10550) + 11.5 = 12.45 = **12.5 ppg***

3. Calculate the Initial Circulating Pressure (ICP).

____***1605***____ psi

Formula #14 – ICP = Kill Rate Circulating psi + SIDPP psi

*1080 + 525 = **1605 psi***

4. Calculate the Final Circulating Pressure (FCP).

___***1174***____ psi *Formula #15 – FCP =* $\frac{Kill\ Mud\ ppg}{Original\ Mud\ ppg}\ x\ Kill\ Rate\ Circulating\ psi$

$$\frac{12.5}{11.5}\ x\ 1080 = \mathbf{1174\ psi}$$

5. Calculate the pump strokes from surface to bit.

_***1613 - 1645***_ strokes *Surface to Bit strokes = Drillstring Volume ÷ Pump Output*

179.1 ÷ .11 = ***1628 strokes***

6. Calculate the pump strokes from the mud pump to the bit.

_***1675 - 1707***_ strokes *(Drillstring Volume + Surface Lines Volume) ÷ Pump Output*

(179.1 + 7.2) ÷ .11 = ***1694 strokes***

7. Calculate the time in minutes from surface to the bit.

_***40 - 41***__ minutes *Circulating Time* = Strokes from surface to bit ÷ SPM

1628 ÷ 40 = **40.7 min**

8. Calculate in minutes to pump from the mud pump to the bit.

_***42 - 43***__ minutes *Circulating Time* = Strokes from mud pump to bit ÷ SPM

1694 ÷ 40 = **42.3 min**

9. Calculate the strokes required to pump from the bit to the shoe.

_***4860 - 4958***__ strokes

Bit to Shoe strokes = Open Hole Annular Volume ÷ Pump Output

540.2 ÷ .11 = ***4911 strokes***

10. How many minutes are required to circulate the total well system volume at 40 SPM?

_***345 - 346***__ minutes

Circulating Time = Surface to Surface strokes ÷ 40 SPM

13806 ÷ 40 = ***345.1 min***

11. Calculate the MAASP with KWM in the system.

_***617 - 624***__ psi

Formula #12 -New MAASP = (MAMW – KMW) x 0.052 x Casing Shoe TVD

(14.42 – 12.5) x 0.052 x 6250 = ***624 psi***

12. What is the pressure loss per 100 strokes as the KWM is pumped from surface to the bit?

_***26 - 27***___psi/100 stks

Pressure Loss = ICP – FCP = 431 psi

Pressure Loss ÷ (Surf to Bit strokes ÷ 100)

431 ÷ 16.28 = ***26.5 psi/ 100 stks***