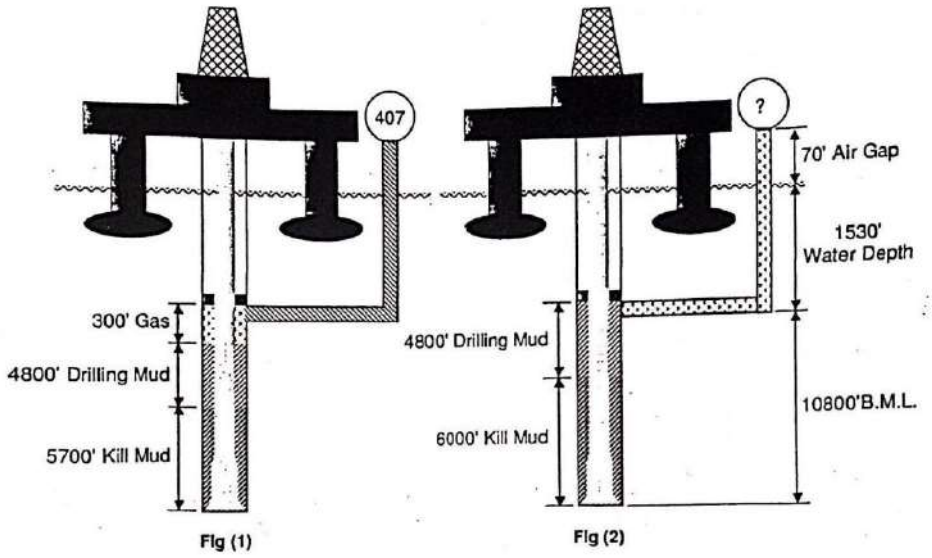
IWCF Combined P & P Exercises

1. **From the data provided below answer the following questions.**



Well Data Figure 1		**Well Data Figure 2**	
Kill mud weight	11.4 ppg	Kill mud weight	11.4 ppg
Drilling mud weight	10.6 ppg	Drilling mud weight	10.6 ppg
Choke line friction	80 psi	Choke line friction	20 psi
APL	40 psi	APL	60 psi
Gas gradient	0.12 psi/ft	Gas gradient	0.12 psi/ft
SCR at 30 SPM	350 psi	SCR at 30 SPM	350 psi

a. Calculate the BHCP in Figure 1

…… psi.

b. Based on your answer in question a, calculate the new dynamic casing pressure in Figure 2. …….. psi.

c. As gas begins to flow through the remote choke at surface how should the operator be manipulating the choke to maintain BHP pressure constant?

a. Opening the choke.
b. Closing the choke.
c. Keeping the choke in the same position.

2. **Well Data:**

Sea water depth	**1800 feet**
Sea water gradient	**0.445 psi/ft**
Air gap	**80 feet**
Mud density	**10 ppg**
Riser collapse pressure	**450 psi**

Calculate the riser collapse depth from RKP, due to drop in the mud level in the riser?

…… feet

3. **A floating rig is drilling below the 30 inch conductor pipe with returns to surface via the marine riser.**

Vertical depth of well from flow line	**2100 feet**
Water depth	**1200 feet**
Air gap	**80 feet**
Density of sea water	**8.5 ppg**
Density of mud	**9.5 ppg**

At a vertical depth of 2100 feet, the 9.5 ppg mud in the well exactly balances the formation pressure.

What is the minimum mud density required to keep the well in balance with the riser disconnected?

a. 10.6 ppg.
b. 9.6 ppg.
c. 11.9 ppg.
d. 9.8 ppg.

4. **While drilling from a floating rig the top hole section is being drilled with the riser in place.**

Well Data

Mud weight	**9.6 ppg**
Sea water	**8.6 ppg**
Well depth from RKB	**1700 ft**
Water depth	**1000 ft**
Riser length	**1100 ft**

During drilling at this depth the exerts an over balance on the formation of 50 psi.

What is the minimum required mud weight in the well when disconnecting the riser?

..... ppg

5. **A floating rig is drilling below the 30 inch conductor pipe with returns to surface via the marine riser.**

Water depth	**1200 feet**
Vertical depth of well from flow line	**2000 feet**
Air gap	**80 feet**
Density of sea water	**8.5 ppg**
Density of mud	**10 ppg**

What is the reduction in bottom hole pressure if the riser is disconnected at the subsea wellhead housing?

a. 210 psi.
b. 300 psi.
c. 135 psi.
d. 90 psi.

6. **What does the term "Riser Margin" mean?**
   a. The difference between the weight of the riser in air and the weight in water.
   b. The difference between the hydrostatic of the mud in the riser and the hydrostatic of the sea water, in its relation to BHP.
   c. The collapse pressure of the riser in relation to the sea water gradient.
   d. The difference between the riser full of mud and if it was evacuated and filled with gas.
7. **Which of the following methods can be used to measure choke line friction on a floating rig? (Three Answers)**
   a. Take slow circulation rates up the riser and then up the choke line through a fully open choke. The diffenence in pressures is the choke line friction.
   b. Circulate, at the slow circulating rate, down the choke line and up the riser. The pump pressure is the choke line friction.
   c. Circulate, at the slow circulating rate, down the kill line and up the choke line through a fully open choke. The pump pressure is twice the choke line friction.
   d. Circulate, at the slow circulating rate, down the choke line and up the kill line. The pump pressure is approximately half the choke line friction.
   e. Choke line friction can only be caclulated once the well has been shut in.

8. **On a floating rig, kill rate circulating pressures are usually taken with mud returns up the riser and then up the choke line.**

   What is the practical reason for this practice?

   a. To determin the choke line friction loss.
   b. To make it possible to select an Intial Circulating Pressure from a wider range of kill rate circulating pressures.
   c. To flush out the choke line and remove settled barite.

9. **To find the choke line friction we require to know the slow circulating rate pressure while circulating. (Two Answers)**

   a. Uo the riser.
   b. Up the choke line.
   c. With kill mud weight.
   d. With fracture mud weight.
   e. With leak-off mud weight.
   f. With at least 3 difference SCR rates.

10. **While killing the choke line friction can be reduced by? (Two Answers)**

    a. Circulating through the choke and kill line at the same time.
    b. Reducing the pump rate.
    c. Increasing the pump rate.
    d. Circulating through the kill line only.

11. **On a floating rig, what will be the effect on bottom hole pressure if the choke line friction is not taken into account as the pump is brought to kill rate?**

    a. The bottom hole pressure will not change.
    b. The bottom hole pressure will increase by the amount of choke line friction.
    c. The bottom hole pressure will decrease by the amount of choke line friction, corrected for the effect of kill fluid density.
    d. The bottom hole pressure will decrease by the amount of choke line friction.

12. **On a subsea BOP installation a well is being killed using the Driller's Method. A piston swab on the pump has been washed out in the middle of the first circulation.**
What is the correct procedure to use to maintain bottom hole pressure constant while reducing the pump rate to zero?
    a. Allow the casing pressure to increase by the amount of choke line friction while reducing the pump rate to zero spm.
    b. Allow the casing pressure to decrease by the amount of choke line friction while reducing the pump rate to zero spm.
    c. Keep the drill pipe pressure constant while reducing the pump rate to zero spm.
    d. Keep the casing pressure constant while reducing the pump rate to zero spm.
13. **Which of the following conditions on a floating rig may affect the accuracy of mud volume readings and mud flow readings? (Three Answers)**
    a. Assignment of centrifugal pump.
    b. Riser tension.
    c. Rig pitch and roll.
    d. Rig heave.
    e. Crane operations.
    f. Depth of the well.
    g. Temprature of the sea water.
    h. Sea water depth.

14. A top-hole section is being drilled from a floating rig. A 8-1/2" pilot hole is being drilled below the 30" conductor pipe. Sea water is being used as the drilling fluid. No marine riser is yet installed.

Well Data

Well depth RKP	**1850 feet**
Conductor shoe	**1535 feet**
Water depth (MSL to Mud line)	**1175 feet**
Air gap	**80 feet**
Sea water density	**8.7 ppg**
Annular pressure loss (drilling)	**65 psi**

At 1850 feet a shallow gas formation with a pore pressure of 775 psi is encountered.

Which one of the following statements describes the situation?

a. The well is overbalanced as long as the pumps are running.

b. The gas will enter the well immediately, because the well is already under-balance.

c. The well is overbalanced even with the pumps off.

d. It is impossible to control the well without a marine riser installed.

15. A well has been shut in on a kick on a subsea BOP stack.

The well is to be killed with Wait and Weight Method.

The pump has been set at the required kill pump rate.

The selected kill mud density is 0.6 ppg higher than the mud density required to balance the formation pressure.

After the pump has been reached kill rate, at which point in the circulation might the surface casing pressure decrease?

a. When the kill mud is halfway down the drill string.

b. As kill mud enters the annulus.

c. Immediately before the kill mud reached the bit.

16. A well is being killed from a floating rig in deep water and the bottom hole pressure is being held constant. Mud in the choke line is now being displaced by gas. How should the choke be operated during this period?

a. The choke must be closed more.

b. The choke should be opened more.

c. The choke should remain the same.

17. **With deep water and a high shallow gas risk, it is normal to drill to hole riserless. What is the reason of this?**

    a. The riser may collapse if shallow gas kick is taken.

    b. The riser may burst from the excess pressure exerted by the gas inside it.

    c. Buoyancy forces acting on the riser may require riser tension forces greater than the density of the drilling mud inside the riser.

18. **Drilling takes place from a floating rig with a marine riser and a diverter in place.**

    Shallow gas is encountered and diverting mode selected.

    What is the most risk from?

    a. Collapsing.

    b. Bursting.

    c. Torsional failure.

19. **Well Data**

Vertical depth of casing shoe	**6000 feet**
Surface leak-off test pressure with 9.2 ppg fluid	**1300 psi**
Slow pump rate pressure at 30 spm through riser	**340 psi**
Slow pump rate pressure at 30 spm through choke-line	**580 psi**
Mud density	**10 ppg**

A kick is taken and the well is shut in:

SIDPP	**700 psi**
SICP	**900 psi**
Vertical depth	**10,000 feet**

Choke and kill lines are filled with 10 ppg mud.

What is the calculated Intial Circulating Pressure?

a. 1040 psi.

b. 1280 psi.

c. 1240 psi.

d. 700 psi.

20. Well Data

Vertical depth of casing shoe	**6000 feet**
Surface leak-off test pressure with 9.2 ppg fluid	**1300 psi**
Slow pump rate pressure at 30 spm through riser	**340 psi**
Slow pump rate pressure at 30 spm through choke-line	**580 psi**
Mud density	**10 ppg**

A kick is taken and the well is shut in:

SIDPP	**700 psi**
SICP	**900 psi**
Vertical depth	**10,000 feet**

Choke and kill lines are filled with 10 ppg mud.

What is the final circulating pressure when the density of the kill mud is 11.4 ppg?

a. 661 psi.

b. 326 psi.

c. 388 psi.

d. 1100 psi.

21. According to API RP 59 in deep offshore wells what is the recommended minimum number of different SCR rates and pressures that should be recorded both in the riser and up the choke line.

a. Four different rates and pressures.

b. Two but preferably three different rates and pressures.

c. One different rate and pressure.

22. A gas kick has been circuated out of a well, and the well is dead (SICP=0).

Well Data

Choke line length	**1180 feet**
Water depth	**1000 feet**
Air gap	**100 feet**
Densithy of kill mud in the well and choke line	**12.5 ppg**
Original mud density in the riser	**10.7 ppg**
Density of sea water	**8.6 ppg**

Calculate the estmated pressure of the gas trapped in the BOP beneath the closed pipe rams.

a. 612 psi.
b. 657 psi.
c. 767 psi.
d. 715 psi.

23. A floating rig is drilling a 26" hole below the 30" casing shoe. A marine riser is installed and returns are being taken up the riser.

RKB to MSL	**80 feet**
MSL to seabed	**220 feet**
RKB to 30" shoe	**600 feet**
Sea water gradient	**0.44 psi/ft**
Formation strength gradient (below sea bed)	**0.641 psi/ft**

What is the maximum static mud density that can be used without exceeding the formation strength?

a. 9.2 ppg.
b. 10.6 ppg.
c. 9.5 ppg.
d. 12.3 ppg.

24. On a floating rig, a gas kick is being circulated out from the well using the Wait and Weight Method. The pressures on drill pipe, kill line and choke line gauges are recorded. Suddenly, the choke operator observes a significant pressure increase on the kill line guage and shortly after on the drill pipe gauge. The choke line gauge, however, shows no signifcant changes. What happened to the circulating system?

a. There is a partial blockage in the choke line.
b. There is a partial or complete blockage in the kill line.
c. There is a partial blockage in the open hole section due to balling stabilizers.
d. This pressure fluctuation is normal on a floating rig, due to rig heave.

25. A well is being killed on a floating rig using the Driller's Method.
Drill pipe pressure is held constant at the Intial Circulating Pressure of 620 psi.
Casing pressure is 1010 psi.
Kill rate is 35 spm.
Choke line friction loss is 110 psi.
The supervisor wants to reduce the pump rate to 30 spm.
What is the correct way to change the pump speed while maintaining bottom hole pressure constant?

a. Reduce pump speed, while keeping kill line gauge pressure constant; thereafter continue with the new stand pipe pressure.
b. Reduce pump speed, while keeping choke pressure constant at 1010 psi.
c. Reduce pump speed, while keeping stand pipe pressure constant at 620 psi.
d. Reduce pump speed, while reducing the stand pipe pressure by 110 psi.
e. Reduce pump speed, while reducing the choke pressure by 110 psi.

26. On a subsea BOP installation what action should be taken after circulating out a gas kick and pumping kill mud back to surface? (Five Answers)

a. Reducing the hydraulic regulated pressure on the annular BOP.
b. Displace the marine riser to kill fluid density.
c. Close the diverter element.
d. Open the diverter element.
e. Switch pods.
f. Disconnect riser.
g. Close a lower ram.
h. Circulate across the BOP through kill and choke line.

27. The following data was available after a well control operation:

Well depth	**14567 ft MD 7895 ft TVD**
Air gap	**75 ft**
Water depth	**1250 ft**
Choke line length	**1356 ft**
Drilling fluid density	**11.8 ppg**
Kill fluid density	**12.8 ppg**
Sea water gradient	**0.445 psi/ft**
Atmospheric pressure	**14.7 psi**

Kill mud has been circulated back to surface, the well shut in and pressures monitored for 15 minutes, with no build up, the well was opened up through the remote choke and observed on the trip tank for a further 15 minutes with no flow. The riser has yet to be displaced to kill mud and it is estimated that 2 bbls of gas are trapped below the upper pipe rams. Calculate the expanded volume of gas at surface using the data above.

…… bbl

28. A well has been shut-in on a kick, the choke and kill lines are full of glycol and water the stabilized SICP is currently 675 psi. From the following data calculate the correct SICP.

Water depth	**1650 ft**
Sea water gradient	**0.445 psi/ft**
Air gap	**60 ft**
Choke line length	**1780 ft**
Well depth below RKB	**10,800 ft**
Mud weight	**11.3 ppg**
Glycol mix	**8.9 ppg**

…… Psi

29. A kick is shut in on a well being drilled from a floating rig. The choke line is full of a glycol/water mix and the rest of the well system is filled with mud.

Well Data

Well depth/RKB (TVD)	**11500 ft**
Casing depth/RKB (TVD)	**8700 ft**
Riser length	**1100 ft**
Choke line length	**1185 ft**
Maximum allowable mud weight at shoe	**16.2 ppg**
Mud weight	**12.7 ppg**
Glycol-mixed water density	**9.1 ppg**

With the choke line full glycol/water mix, calculate the maximum annular surface pressure that can be shut in before losses occur to the formation:

…….. psi.

30. While starting the killing operation how the BHP will be maintaned?

a. Allow the SICP to increase by the amount of the choke line friction.
b. Allow the SIDPP to decrease by the amount of the choke line friction.
c. Maintian the SICP constant.
d. Allow the SICP to decrease by the amount of the choke line friction.

31. On a floating rig a kick is taken while drilling and the following data has been recorded after shut in pressures have stabilised:

Well Data

Hole and Bit depth (RKB)	**16557 ft MD and 14340 ft TVD**
Casing shoe depth (RKB)	**13870 ft MD and 11855 ft TVD**
Formation Fracture Gradient	**0.88 psi/ft**
Mud weight	**14.9 ppg**
MSL to seabed	**930 ft**
Pressure loss through choke line	**755 psi @ 35 spm**
Pressure loss through riser	**510 psi @ 35 spm**
Shut in Drill Pipe Pressure	**530 psi**
Shut in Casing Pressure	**875 psi**

Calcualte the margin between the Intial Dynamic MAASP and the Intial Dynamic Casing Pressure at the start of the well kill operation, while maintaining a circulation rate of 35 spm.

……..psi

32. You may need to remove trapped gas from beneath the rams on a subsea BOP after kill fluid returns to surface. What is the correct action to take?

a. Ensure the trip tank is circulating drilling fluid into the riser, open the choke depressurize the gas and circulate a lower density fluid into the choke line, open the upper BOP and allow the drilling fluid to U-tube into the choke line before isolating the wellbore by closing a lower set of rams.

b. Isolate the wellbore by closing a lower set of rams, circulate a lower density fluid into the choke line, open the choke to depressurize the gas. Ensure the trip tank is circulating kill fluid into the riser, open the upper BOP and allow the kill fluid to U-tube into the choke line.

c. Open the choke to depressurize the gas, isolate the wellbore by closing a lower set of rams, ensure the trip tank is circulating drilling fluid into the riser, open the upper BOP and allow the drilling fluid to U-tube into the choke line. Circulate a lower density fluid into the choke line.

d. Open the upper BOP and allow drilling fluid to U-tube into the choke line, circulate kill fluid into the choke line, and open the choke to depressurize the gas.

33. From a floating rig, the top hole section is being drilled with a marine riser.

Well Data

Drilling fluid density	**9.6 ppg**
Sea water density	**8.6 ppg**
Well depth from rotary table	**1700 feet**
Water depth	**1000 feet**
Riser length	**1100 feet**

While drilling at this depth, the drilling fluid gives an overbalance of 50 psi on the formation pressure.

What drilling fluid density is required to allow the riser to be disconnected and maintain the same overbalance?

a. 12.9 ppg.

b. 10.8 ppg.

c. 11.3 ppg.

d. 9.6 ppg.

34. During a well kill operation on a subsea BOP installation, what is one advantage of using a kill line gauge to monitor the pressure changes?

a. The effect of choke line friction is reduced down to a quarter when monitoring on the kill line gauge during the kill operation.

b. The effect of choke line friction is reduced by half when monitoring on the kill line gauge during the kill operation.

c. Maintaining a constant pressure on the kill tine gauge while starting or stopping the pump compensates for the effect of choke line friction.

d. The kill line gauge is more accurate than the drill pipe pressure gauge.

35. When drilling in a high risk shallow gas area from a floating rig, it is normal to drill top-hole without a riser. Why is this? (Two Answers)

a. As the rig cannot apply sufficient tension force on the riser, to mitigate the buoyancy of the drilling fluid inside it.

b. As the riser may collapse because of the differential pressure between a shallow gas kick and the sea water.

c. As the riser may burst because of excessive pressure from a shallow gas in influx.

d. As oil-based drilling fluid can be used without a riser.

e. To avoid hydro carbons reaching the rig floor.

Subsea Kill Sheet

Well Data

Hole size	8-1/2 inch
Hole depth	15700 feet TVD 16500 MD
Casing shoe, 9-5/8 inch	14000 feet TVD 14200 MD

Internal capacities

Drill pipe 5 inch	0.01776 bbl/ft
Heavy weight drill pipe, 5 inch	Length 645 feet, capacity 0.0089 bbls/ft
Drill collars, 6-1/2 X 2-13/16 inch	Length 550 feet, capacity 0.0087 bbl/ft
Choke line, 2-1/2 inch ID	Length 1745 feet, capacity 0.0087 bbls/ft
Marine riser	Length 1700 feet, capacity 0.3892 bbl/ft

Annular capacities

Drill collar in open hole	0.0292 bbls/ft
Drill pipe/HWDP in open hole	0.0459 bbls/ft
Drill pipe/HWDP is casing	0.0489 bbls/ft
Drill pipe in marine riser	0.360 bbls/ft

Mud pump data

Pump output at 98% volumetric efficiency	0.117 bbl/stroke

Slow circulation rate data

@40 spm through the riser	480 psi with 12.4 ppg mud
@40 spm through the choke line	680 psi with 11 ppg mud

Formation strength test data

Surface leak-off pressure with 11 ppg mud	3650 psi

Kick data

Shut in drill pipe pressure	700 psi
Shut in casing pressure	1150 psi
Pit gain	30 bbls
Mud density	12.4 ppg

1. **How many strokes are required to pump from surface to the bit?**

   …… strokes.

2. **How many strokes are required to pump from the bit to casing shoe?**

   …… strokes.

3. **How much time is required to circulate from surface to choke manifold?**

   …… minutes

4. **How many strokes are required to displace the marine riser to kill mud before opening the BOPs?**

   …… strokes

5. **What is the kill mud density?**

   …… ppg

6. **What is the initial circulating pressure?**

   …… psi

7. **What is the final circulating pressure?**

   …… psi

8. **What is the initial dynamic casing pressure at the kill pump rate?**

   …….. psi

9. **What is the MAASP after circulating of the kill mud?**

   …….. psi

Model Answer:

1a. 7470

1b. 995

1c. b

2. 1091

3. C

4. 11.27

5. C

6. B

7. A, B, C

8. A

9. A, B

10. A, B

11. B

12. A

13. C, D, E

14. C

15. B

16. A

17. A

18. A

19. A

20. C

21. B

22. D

23. A

24. A

25. A

26. A, B, C, G, H

27. 120

28. 462

29. 1789

30. D

31. 357

32. B

33. A

34. C

35. B, E

Subsea kill sheet:

1. 2414 strokes
2. 824 strokes
3. 214.8 minutes
4. 5231 strokes
5. 13.25
6. 1180 psi
7. 513 psi
8. 863 psi
9. 2002 psi