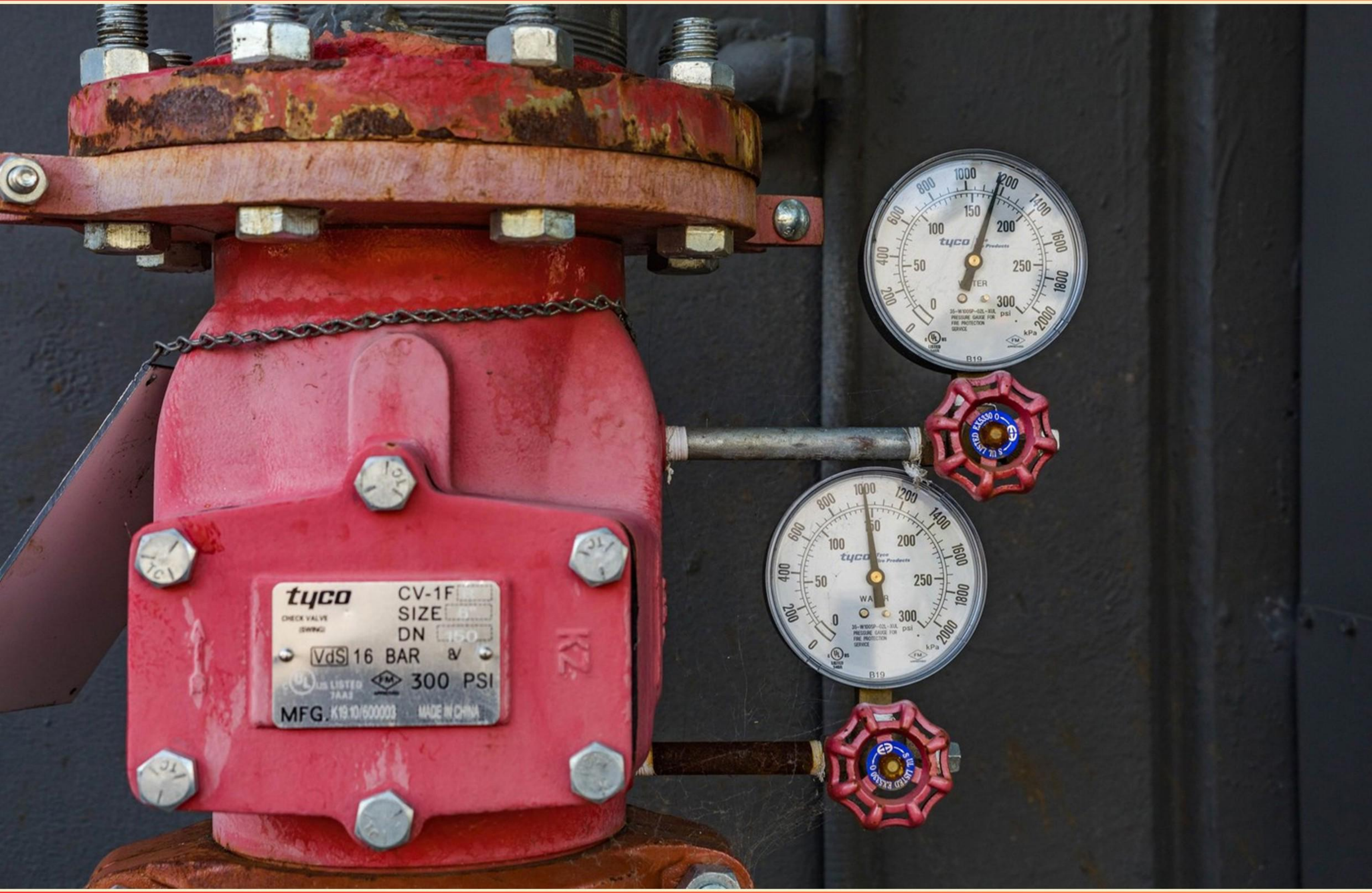
INTERMEDIATE HYDRAULICS PRACTICE TEST (SAMPLE)

STUDY GUIDE



SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

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Introduction

Preparing for a certification exam can feel overwhelming, but with the right tools, it becomes an opportunity to build confidence, sharpen your skills, and move one step closer to your goals. At Examzify, we believe that effective exam preparation isn't just about memorization, it's about understanding the material, identifying knowledge gaps, and building the test-taking strategies that lead to success.

This guide was designed to help you do exactly that.

Whether you're preparing for a licensing exam, professional certification, or entry-level qualification, this book offers structured practice to reinforce key concepts. You'll find a wide range of multiple-choice questions, each followed by clear explanations to help you understand not just the right answer, but why it's correct.

The content in this guide is based on real-world exam objectives and aligned with the types of questions and topics commonly found on official tests. It's ideal for learners who want to:

• Practice answering questions under realistic conditions,

• Improve accuracy and speed,

• Review explanations to strengthen weak areas, and

• Approach the exam with greater confidence.

We recommend using this book not as a stand-alone study tool, but alongside other resources like flashcards, textbooks, or hands-on training. For best results, we recommend working through each question, reflecting on the explanation provided, and revisiting the topics that challenge you most.

Remember: successful test preparation isn't about getting every question right the first time, it's about learning from your mistakes and improving over time. Stay focused, trust the process, and know that every page you turn brings you closer to success.

Let's begin.

How to Use This Guide

This guide is designed to help you study more effectively and approach your exam with confidence. Whether you're reviewing for the first time or doing a final refresh, here's how to get the most out of your Examzify study guide:

1. Start with a Diagnostic Review

Skim through the questions to get a sense of what you know and what you need to focus on. Your goal is to identify knowledge gaps early.

2. Study in Short, Focused Sessions

Break your study time into manageable blocks (e.g. 30 – 45 minutes). Review a handful of questions, reflect on the explanations.

3. Learn from the Explanations

After answering a question, always read the explanation, even if you got it right. It reinforces key points, corrects misunderstandings, and teaches subtle distinctions between similar answers.

4. Track Your Progress

Use bookmarks or notes (if reading digitally) to mark difficult questions. Revisit these regularly and track improvements over time.

5. Simulate the Real Exam

Once you're comfortable, try taking a full set of questions without pausing. Set a timer and simulate test-day conditions to build confidence and time management skills.

6. Repeat and Review

Don't just study once, repetition builds retention. Re-attempt questions after a few days and revisit explanations to reinforce learning. Pair this guide with other Examzify tools like flashcards, and digital practice tests to strengthen your preparation across formats.

There's no single right way to study, but consistent, thoughtful effort always wins. Use this guide flexibly, adapt the tips above to fit your pace and learning style. You've got this!

Questions

1. A ________ valve is a two-way valve with an external drain and is usually provided with a bypass check valve.

   A. Deceleration

   B. Four-way

   C. Needle

   D. Directional control

2. A pump suction has static head z_s = 2 m, suction line head loss h_f = 3 m, vapor pressure head p_v/ρg = 0.8 m, atmospheric head p_atm/ρg = 10 m. Compute NPSH_available.

   A. 6.2 m

   B. 8.2 m

   C. 10.0 m

   D. 11.2 m

3. In the hydraulic jump scenario, Fr1 ≈ 1.91; which is the upstream flow regime?

   A. Yes, the upstream flow is supercritical and a hydraulic jump is possible

   B. No, the upstream flow is subcritical

   C. The flow is exactly critical

   D. Not enough information to tell

4. The minimum pressure head required to avoid cavitation is represented by which of the following?

   A. NPSH_available

   B. NPSH_required

   C. both

   D. neither

5. A sharp-edged entrance into a pipe has K = 0.5. If the pipe velocity is 0.8 m/s, compute the entrance head loss h_L.

   A. 0.008 m

   B. 0.016 m

   C. 0.032 m

   D. 0.064 m

6. Which statement best describes cavitation risk assessment in pumps?

A. NPSHA and NPSHR are not related to cavitation risk.

B. Cavitation risk is determined solely by discharge pressure.

C. Cavitation risk is determined solely by pump speed.

D. Cavitation risk depends on the relationship between NPSHA and NPSHR.

7. Write the Chezy–Manning equation used for open-channel flow and define the roughness coefficient.

A. V = (1/n) R^(2/3) S^(1/2); Q = (1/n) A R^(1/3) S^(1/2); n is Manning roughness.

B. V = n R^(2/3) S^(1/2); Q = n A R^(2/3) S^(1/2); n is a friction factor.

C. V = (1/n) R^(2/3) S^(1/2); Q = (1/n) A R^(2/3) S^(1/2); n is Manning roughness coefficient.

D. V = (1/n) R^(2/3) S^(1/2); Q = (1/n) A R^(2/3) S^(3/2); n is roughness.

8. How many ports does a double pilot-operated check valve have?

A. 4

B. 3

C. 5

D. 2

9. For open-channel specific energy, which expression gives E in terms of depth y and velocity V?

A. E = Q^2/(2gA^2)

B. E = γh

C. E = V^2/(2g) + y

D. E = y + V^2/(2g)

10. What does NPSH stand for and what does it indicate in pump systems?

A. Net Positive Suction Head; the minimum pressure at the suction required to avoid cavitation

B. Negative Pressure Suction Head

C. Normal Positive Suction Head

D. Net Pressure Suction Head

Answers

1. A
2. B
3. A
4. C
5. B
6. D
7. C
8. A
9. D
10. A

Explanations

1. A ________ valve is a two-way valve with an external drain and is usually provided with a bypass check valve.

A. Deceleration

B. Four-way

C. Needle

D. Directional control

Slowing the actuator near the end of its stroke is what this device is designed to do. A deceleration valve is a two-port valve that meters flow to the reservoir through an external drain as the actuator nears the end of its travel, reducing speed gradually instead of allowing a hard impact. The external drain provides a dedicated path for the fluid being vented, so only a controlled amount is allowed to bypass back to tank, which smooths the motion. The bypass check valve often paired with this type ensures that in the opposite direction or when rapid movement is needed, fluid can bypass the throttled path and move more quickly. This combination—a two-way valve that throttles and drains to tank, plus a bypass check for freedom of motion in the other direction—fits the described device. Other valves serve different purposes: a needle valve focuses on precise throttling without a dedicated external drain or bypass for end-of-stroke deceleration; a four-way valve controls direction for a cylinder in two or more positions; a directional control valve is a broader category that isn't specifically the two-way, drain-equipped deceleration type described.

2. A pump suction has static head z_s = 2 m, suction line head loss h_f = 3 m, vapor pressure head p_v/ρg = 0.8 m, atmospheric head p_atm/ρg = 10 m. Compute NPSH_available.

A. 6.2 m

B. 8.2 m

C. 10.0 m

D. 11.2 m

NPSH_available is the amount of pressure head (energy) available at the pump suction to prevent cavitation. It comes from the total pressure head on the suction side minus any losses and the vapor pressure head that could cause cavitation. Use this relation: NPSH_available = p_atm/ρg + z_s − h_f − p_v/ρg. Plugging in the numbers: 10 m (atmospheric) + 2 m (static head) − 3 m (suction line losses) − 0.8 m (vapor head) = 8.2 m. So the pump has 8.2 meters of NPSH available. This value should be compared to the pump's required NPSH to ensure cavitation is avoided. The other numbers would result from misapplying signs or omitting a term, such as forgetting to subtract h_f or adding instead of subtracting p_v/ρg.

3. In the hydraulic jump scenario, Fr1 ≈ 1.91; which is the upstream flow regime?

A. Yes, the upstream flow is supercritical and a hydraulic jump is possible

B. No, the upstream flow is subcritical

C. The flow is exactly critical

D. Not enough information to tell

Froude number tells you the flow regime in open-channel flow: if Fr is greater than 1, the flow is supercritical; if Fr is less than 1, it is subcritical; Fr equal to 1 means critical. Here the upstream Fr is about 1.91, which is well above 1, so the upstream flow is in the supercritical regime. A hydraulic jump typically forms when this fast, shallow (supercritical) flow is forced to slow down and deepen to a subcritical state downstream, so having a supercritical upstream condition makes a hydraulic jump possible. The other possibilities would require Fr below 1, exactly 1, or no information, none of which applies since Fr1 is given as 1.91.

4. The minimum pressure head required to avoid cavitation is represented by which of the following?

A. NPSH_available

B. NPSH_required

C. both

D. neither

Cavitation risk arises from the suction head at the pump. You have two related quantities: how much head the system can supply at the suction (NPSH available, NPSHa) and how much head the pump needs to avoid cavitation (NPSH required, NPSHr). The safe operating condition is when the available head is at least equal to the required head: NPSHa ≥ NPSHr. The minimum head necessary to prevent cavitation, from the pump's perspective, is NPSHr, while the head actually available from the system is NPSHa. In practice, both concepts are used together to assess cavitation risk, since you must ensure the system provides at least as much suction head as the pump requires. For example, if NPSHr is 4 m and NPSHa is 5 m, cavitation is avoided; if NPSHa drops to 3 m, cavitation would occur. Therefore, both quantities are relevant in describing the suction-head situation, which is why the answer reflects the involvement of both.

5. A sharp-edged entrance into a pipe has K = 0.5. If the pipe velocity is 0.8 m/s, compute the entrance head loss h_L.

A. 0.008 m

B. 0.016 m

C. 0.032 m

D. 0.064 m

*When fluid flows into a pipe through a sharp edge, the loss of mechanical energy per unit weight (head loss) is modeled as h_L = K * (V^2)/(2g), where K is the loss coefficient and V is the pipe velocity just downstream of the entrance. Here, K = 0.5 and V = 0.8 m/s. Compute the velocity head: V^2/(2g) = 0.8^2 / (2 * 9.81) = 0.64 / 19.62 ≈ 0.0326 m. Multiply by the loss coefficient: h_L ≈ 0.5 * 0.0326 ≈ 0.0163 m. So, the entrance head loss is about 0.016 m.*

6. Which statement best describes cavitation risk assessment in pumps?

A. NPSHA and NPSHR are not related to cavitation risk.

B. Cavitation risk is determined solely by discharge pressure.

C. Cavitation risk is determined solely by pump speed.

D. Cavitation risk depends on the relationship between NPSHA and NPSHR.

Cavitation risk in pumps is all about the suction side balance: bubbles form when the pressure at the impeller suction drops below the liquid's vapor pressure. The system can provide a certain amount of suction head, NPSHA (net positive suction head available), which depends on static head, velocity head, suction losses, and the liquid's vapor pressure. The pump also requires a certain amount of suction head, NPSHR (net positive suction head required), at a given flow and speed, which comes from the pump design and operating point. Cavitation risk arises when NPSHA falls short of NPSHR; if NPSHA is greater than NPSHR, the pressure stays high enough to prevent vapor formation, and cavitation is unlikely. Conversely, if they are equal or NPSHA is less, cavitation bubbles can form and collapse, causing noise, wear, and efficiency loss. So, the core idea is the relationship between NPSHA and NPSHR. The other ideas—focusing only on discharge pressure or only on pump speed—don't capture the full picture because they ignore suction conditions and the pump's required head, which are the deciding factors for cavitation risk.

7. Write the Chezy–Manning equation used for open-channel flow and define the roughness coefficient.

A. V = (1/n) R^(2/3) S^(1/2); Q = (1/n) A R^(1/3) S^(1/2); n is Manning roughness.

B. V = n R^(2/3) S^(1/2); Q = n A R^(2/3) S^(1/2); n is a friction factor.

C. V = (1/n) R^(2/3) S^(1/2); Q = (1/n) A R^(2/3) S^(1/2); n is Manning roughness coefficient.

D. V = (1/n) R^(2/3) S^(1/2); Q = (1/n) A R^(2/3) S^(3/2); n is roughness.

In open-channel flow, the velocity is governed by Manning's form of the Chezy relation, which links how fast water moves to how rough the channel is and how steeply the channel bed slopes. The velocity depends on the hydraulic radius raised to the 2/3 power and on the slope raised to the 1/2 power, with a factor 1/n that accounts for friction from the channel surface. Specifically, velocity is V = (1/n) R^(2/3) S^(1/2). The discharge then follows from area times velocity: Q = A V = (1/n) A R^(2/3) S^(1/2). Here R is the hydraulic radius, defined as the cross-sectional area A divided by the wetted perimeter P (R = A/P), and S is the energy/slope of the channel bed. The roughness coefficient n, known as Manning's n, is an empirical parameter that represents the frictional resistance of the channel's surface and surroundings—bed texture, vegetation, obstructions, and overall roughness. Lower n values correspond to smoother channels and faster flow, while higher n values indicate rougher surfaces and slower flow. Its role is to scale the velocity to reflect how much resistance the channel presents.

8. How many ports does a double pilot-operated check valve have?

A. 4

B. 3

C. 5

D. 2

Double pilot-operated check valves are built to hold a load in place and only allow flow when commanded by pilot pressure. The core is a check valve in the main line that normally blocks flow in one direction. To control it, there are two small pilot passages that supply pressure to move the valve element off its seat. These pilot circuits are separate from the main flow path, and having two of them means you can actuate the valve from either direction or from two different pilot sources. Therefore the valve body has four ports total: two main-line ports for the hydraulic flow, and two pilot ports that receive the control signal.

9. For open-channel specific energy, which expression gives E in terms of depth y and velocity V?

A. E = Q^2/(2gA^2)

B. E = γh

C. E = V^2/(2g) + y

D. E = y + V^2/(2g)

Specific energy in open-channel flow is the energy per unit weight carried by the water, and it combines the potential energy from the depth with the kinetic energy from the flow. That gives the energy head as E = y + V^2/(2g). Here y is the depth, and V is the flow velocity, with g the acceleration due to gravity. If the velocity distribution is uniform (or we use the simple form), the velocity head is V^2/(2g) and the total specific energy is the sum of depth and velocity head. So, E = y + V^2/(2g) expresses open-channel specific energy in terms of depth and velocity. The other forms either give only the velocity head (missing the depth term) or represent pressure head rather than total energy head.

10. What does NPSH stand for and what does it indicate in pump systems?

A. Net Positive Suction Head; the minimum pressure at the suction required to avoid cavitation

B. Negative Pressure Suction Head

C. Normal Positive Suction Head

D. Net Pressure Suction Head

NPSH means Net Positive Suction Head, a measure of the suction pressure available at the pump inlet expressed as a height of liquid. It indicates the margin against cavitation—the tendency of the liquid to vaporize when the local pressure falls below its vapor pressure. Cavitation creates vapor bubbles that collapse and can damage the impeller and degrade performance. In pump systems you compare the available NPSH (NPSHa) with the pump's required NPSH (NPSHr): if NPSHa is at least equal to NPSHr, the pump operates without cavitation; if not, cavitation risk increases. The other terms listed don't reflect the standard meaning of NPSH.

Next Steps

Congratulations on reaching the final section of this guide. You've taken a meaningful step toward passing your certification exam and advancing your career.

As you continue preparing, remember that consistent practice, review, and self-reflection are key to success. Make time to revisit difficult topics, simulate exam conditions, and track your progress along the way.

If you need help, have suggestions, or want to share feedback, we'd love to hear from you. Reach out to our team at hello@examzify.com.

Or visit your dedicated course page for more study tools and resources:

https://intermediatehydraulics.examzify.com

We wish you the very best on your exam journey. You've got this!