

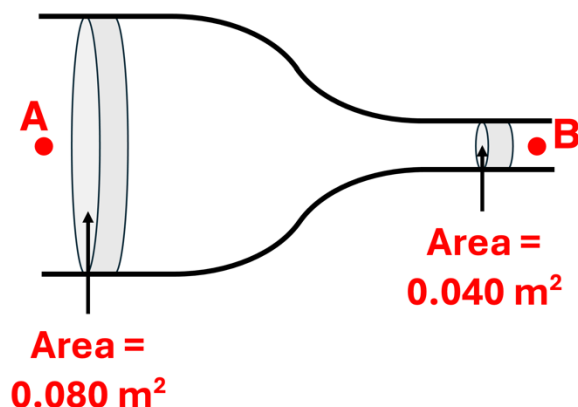
Volumetric Flow Rate and Velocity

Activity 1: Case Studies

Question Group 1

Question 1

Fluid in a pipe undergoes a sudden change from a wide cross-sectional area to a narrow cross-sectional area as it flows from location **A** to location **B**.



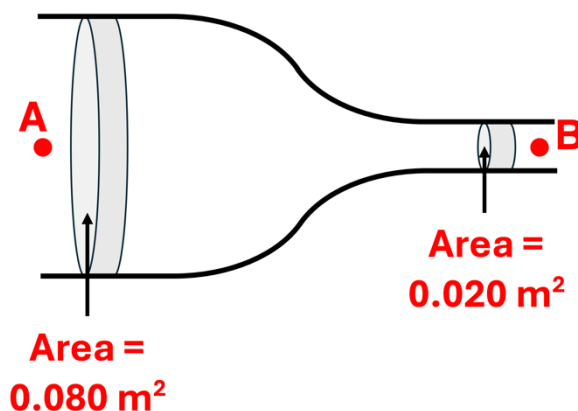
How does the volumetric flow rate (Q in m³/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

The Q_B is _____ the Q_A .

The v_B is _____ the v_A .

Question 2

Fluid in a pipe undergoes a sudden change from a wide cross-sectional area to a narrow cross-sectional area as it flows from location **A** to location **B**.



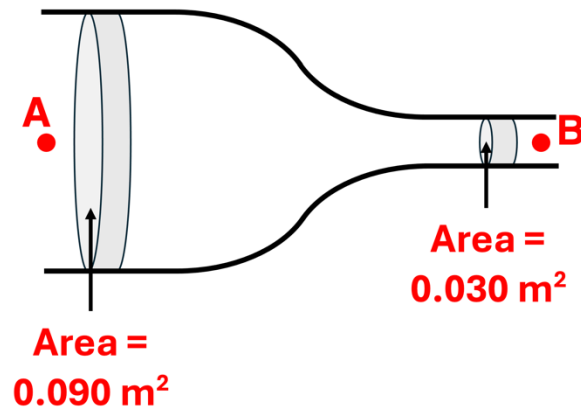
How does the volumetric flow rate (Q in m³/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

The Q_B is _____ the Q_A .

The v_B is _____ the v_A .

Question 3

Fluid in a pipe undergoes a sudden change from a wide cross-sectional area to a narrow cross-sectional area as it flows from location **A** to location **B**.



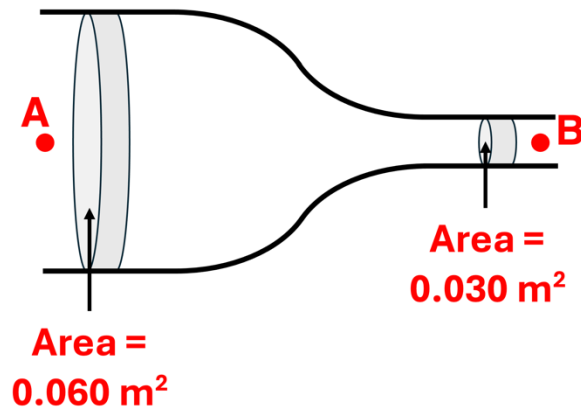
How does the volumetric flow rate (Q in m³/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

The Q_B is _____ the Q_A .

The v_B is _____ the v_A .

Question 4

Fluid in a pipe undergoes a sudden change from a wide cross-sectional area to a narrow cross-sectional area as it flows from location **A** to location **B**.



How does the volumetric flow rate (Q in m³/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

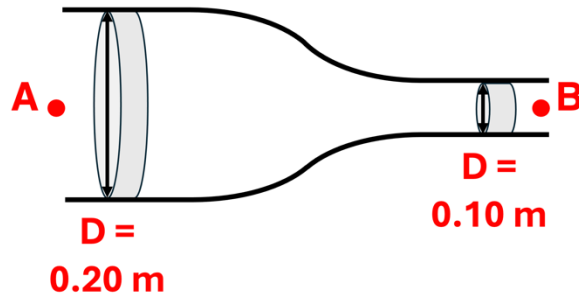
The Q_B is _____ the Q_A .

The v_B is _____ the v_A .

Question Group 2

Question 5

Fluid in a pipe undergoes a sudden change from an area with a large diameter (D) to an area with a small diameter (D) as it flows from location **A** to location **B**.



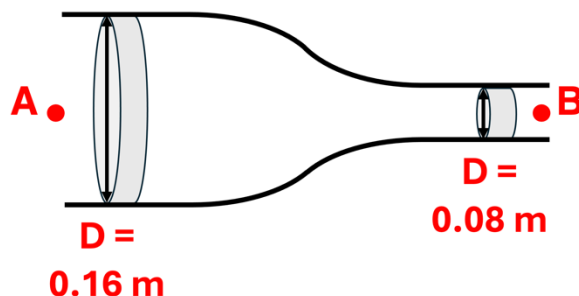
How does the volumetric flow rate (Q in m^3/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

The Q_B is _____ the Q_A .

The v_B is _____ the v_A .

Question 6

Fluid in a pipe undergoes a sudden change from an area with a large diameter (D) to an area with a small diameter (D) as it flows from location **A** to location **B**.



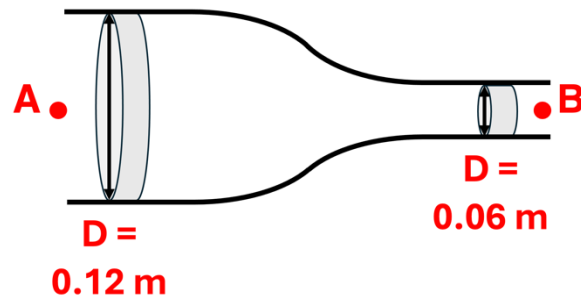
How does the volumetric flow rate (Q in m^3/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

The Q_B is _____ the Q_A .

The v_B is _____ the v_A .

Question 7

Fluid in a pipe undergoes a sudden change from an area with a large diameter (D) to an area with a small diameter (D) as it flows from location **A** to location **B**.



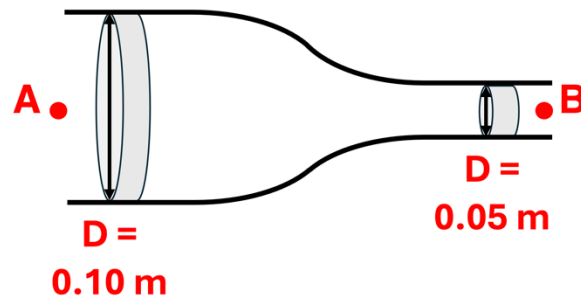
How does the volumetric flow rate (Q in m^3/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

The Q_B is _____ the Q_A .

The v_B is _____ the v_A .

Question 8

Fluid in a pipe undergoes a sudden change from an area with a large diameter (D) to an area with a small diameter (D) as it flows from location **A** to location **B**.



How does the volumetric flow rate (Q in m^3/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

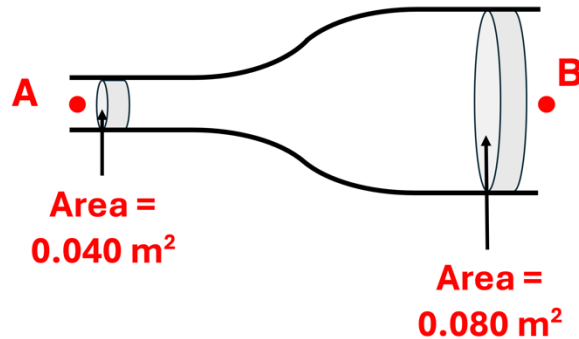
The Q_B is _____ the Q_A .

The v_B is _____ the v_A .

Question Group 3

Question 9

Fluid in a pipe undergoes a sudden change from a narrow cross-sectional area to a wide cross-sectional area as it flows from location **A** to location **B**.



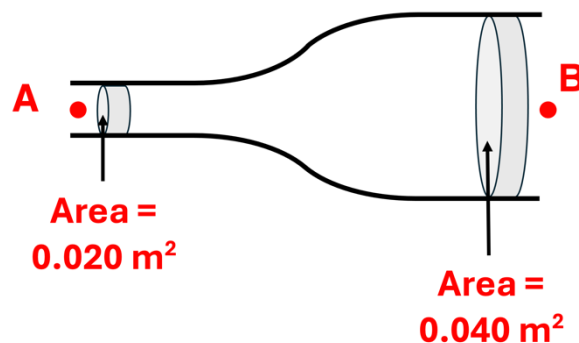
How does the volumetric flow rate (Q in m³/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

The Q_B is _____ the Q_A .

The v_B is _____ the v_A .

Question 10

Fluid in a pipe undergoes a sudden change from a narrow cross-sectional area to a wide cross-sectional area as it flows from location **A** to location **B**.



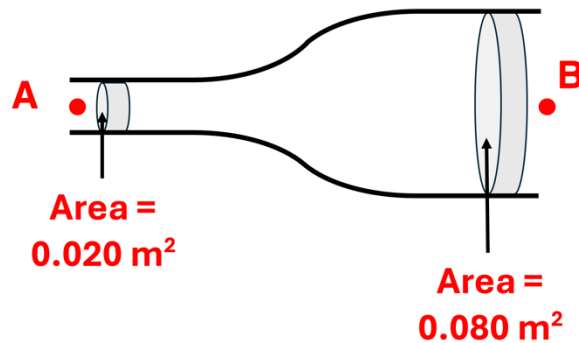
How does the volumetric flow rate (Q in m³/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

The Q_B is _____ the Q_A .

The v_B is _____ the v_A .

Question 11

Fluid in a pipe undergoes a sudden change from a narrow cross-sectional area to a wide cross-sectional area as it flows from location **A** to location **B**.



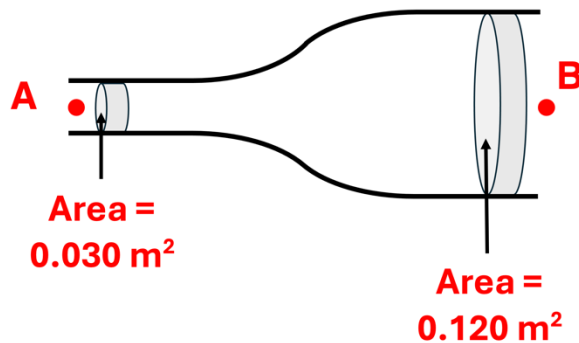
How does the volumetric flow rate (Q in m³/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

The Q_B is _____ the Q_A .

The v_B is _____ the v_A .

Question 12

Fluid in a pipe undergoes a sudden change from a narrow cross-sectional area to a wide cross-sectional area as it flows from location **A** to location **B**.



How does the volumetric flow rate (Q in m³/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

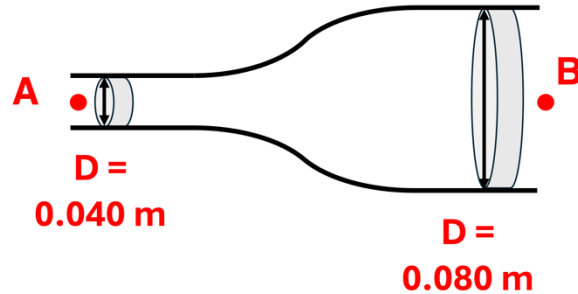
The Q_B is _____ the Q_A .

The v_B is _____ the v_A .

Question Group 4

Question 13

Fluid in a pipe undergoes a sudden change from an area with a small diameter (D) to an area with a large diameter (D) as it flows from location **A** to location **B**.



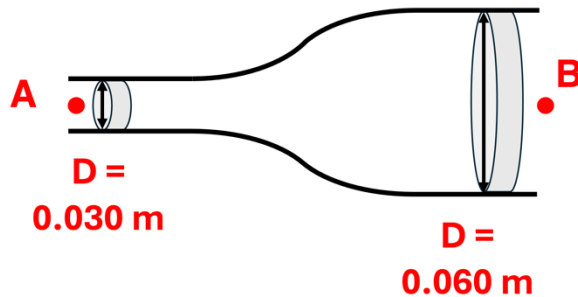
How does the volumetric flow rate (Q in m^3/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

The Q_B is _____ the Q_A .

The v_B is _____ the v_A .

Question 14

Fluid in a pipe undergoes a sudden change from an area with a small diameter (D) to an area with a large diameter (D) as it flows from location **A** to location **B**.

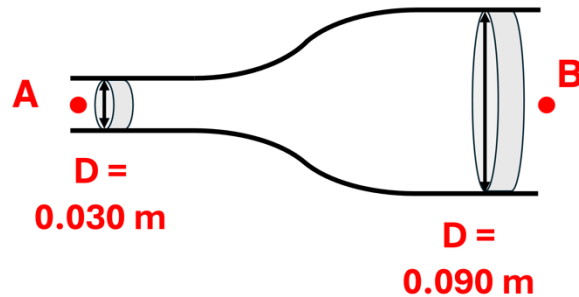


How does the volumetric flow rate (Q in m^3/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

The Q_B is _____ the Q_A .

Question 15

Fluid in a pipe undergoes a sudden change from an area with a small diameter (D) to an area with a large diameter (D) as it flows from location **A** to location **B**.

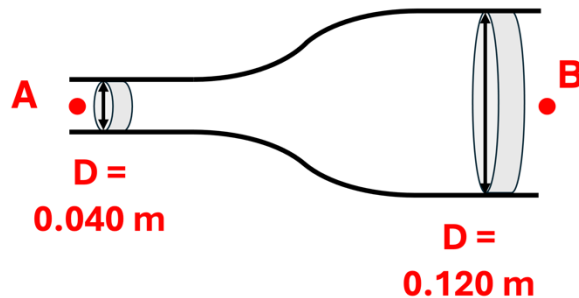


How does the volumetric flow rate (Q in m^3/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

The Q_B is _____ the Q_A .

Question 16

Fluid in a pipe undergoes a sudden change from an area with a small diameter (D) to an area with a large diameter (D) as it flows from location **A** to location **B**.



How does the volumetric flow rate (Q in m^3/s) and the flow velocity (v in m/s) at **B** compare to that at **A**?

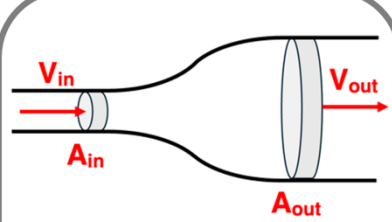
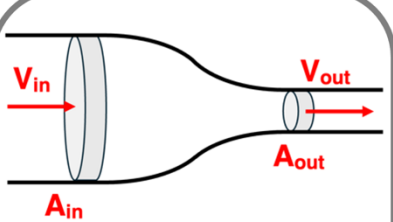
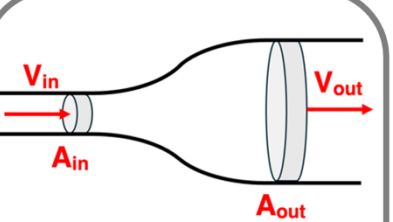
The Q_B is _____ the Q_A .

Activity 2: Ranking Tasks

Question Group 5

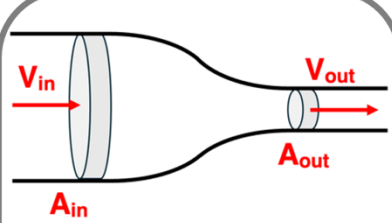
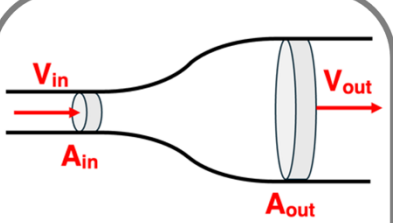
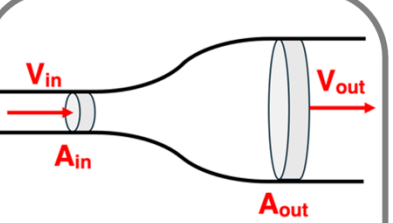
Question 17

Consider the three situations in which fluid in a pipe flows between regions with a different cross-sectional area (**A**). Rank the V_{out} values for the three situations.

 $V_{in} = 20 \text{ cm/s}$ $A_{in} = 0.002 \text{ m}^2$ $A_{out} = 0.008 \text{ m}^2$	 $V_{in} = 5 \text{ cm/s}$ $A_{in} = 0.004 \text{ m}^2$ $A_{out} = 0.002 \text{ m}^2$	 $V_{in} = 12 \text{ cm/s}$ $A_{in} = 0.006 \text{ m}^2$ $A_{out} = 0.012 \text{ m}^2$
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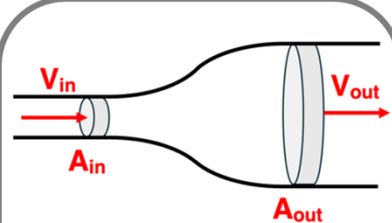
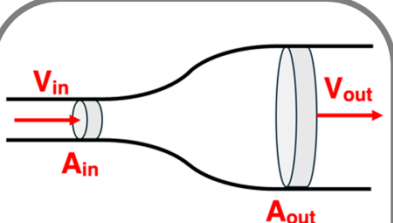
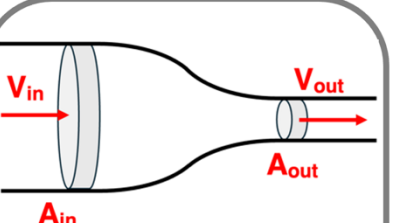
Question 18

Consider the three situations in which fluid in a pipe flows between regions with a different cross-sectional area (**A**). Rank the V_{out} values for the three situations.

 $V_{in} = 5 \text{ cm/s}$ $A_{in} = 0.004 \text{ m}^2$ $A_{out} = 0.002 \text{ m}^2$	 $V_{in} = 12 \text{ cm/s}$ $A_{in} = 0.006 \text{ m}^2$ $A_{out} = 0.012 \text{ m}^2$	 $V_{in} = 20 \text{ cm/s}$ $A_{in} = 0.002 \text{ m}^2$ $A_{out} = 0.008 \text{ m}^2$
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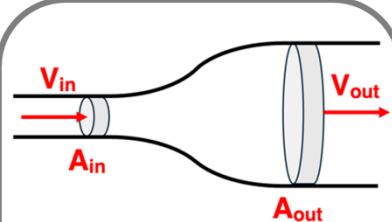
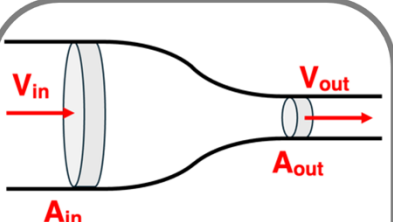
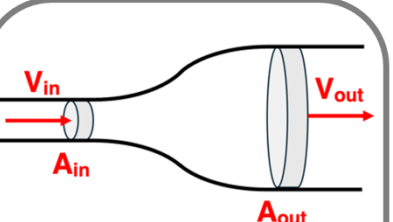
Question 19

Consider the three situations in which fluid in a pipe flows between regions with a different cross-sectional area (**A**). Rank the V_{out} values for the three situations.

 $V_{in} = 12 \text{ cm/s}$ $A_{in} = 0.006 \text{ m}^2$ $A_{out} = 0.012 \text{ m}^2$	 $V_{in} = 20 \text{ cm/s}$ $A_{in} = 0.002 \text{ m}^2$ $A_{out} = 0.008 \text{ m}^2$	 $V_{in} = 5 \text{ cm/s}$ $A_{in} = 0.004 \text{ m}^2$ $A_{out} = 0.002 \text{ m}^2$
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Question 20

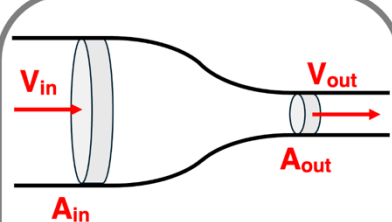
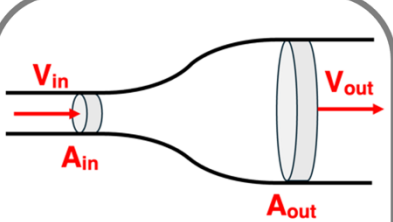
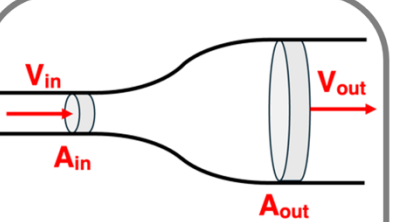
Consider the three situations in which fluid in a pipe flows between regions with a different cross-sectional area (**A**). Rank the V_{out} values for the three situations.

 $V_{in} = 12 \text{ cm/s}$ $A_{in} = 0.006 \text{ m}^2$ $A_{out} = 0.012 \text{ m}^2$	 $V_{in} = 5 \text{ cm/s}$ $A_{in} = 0.004 \text{ m}^2$ $A_{out} = 0.002 \text{ m}^2$	 $V_{in} = 20 \text{ cm/s}$ $A_{in} = 0.002 \text{ m}^2$ $A_{out} = 0.008 \text{ m}^2$
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Question Group 6

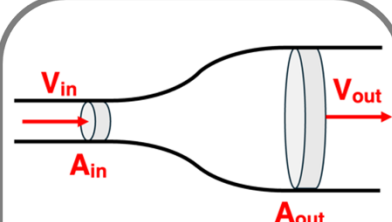
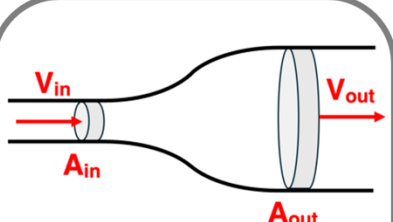
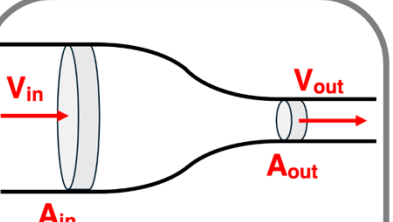
Question 21

Consider the three situations in which fluid in a pipe flows between regions with different diameters (**D**). Rank the V_{out} values for the three situations.

 $V_{\text{in}} = 12 \text{ cm/s}$ $A_{\text{in}} = 0.012 \text{ m}^2$ $A_{\text{out}} = 0.006 \text{ m}^2$	 $V_{\text{in}} = 40 \text{ cm/s}$ $A_{\text{in}} = 0.004 \text{ m}^2$ $A_{\text{out}} = 0.016 \text{ m}^2$	 $V_{\text{in}} = 32 \text{ cm/s}$ $A_{\text{in}} = 0.006 \text{ m}^2$ $A_{\text{out}} = 0.012 \text{ m}^2$
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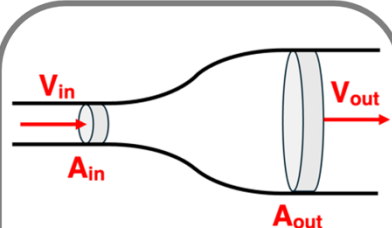
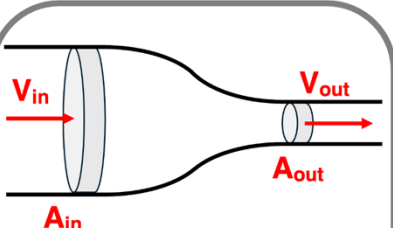
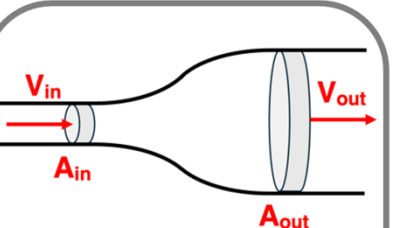
Question 22

Consider the three situations in which fluid in a pipe flows between regions with different diameters (**D**). Rank the V_{out} values for the three situations.

 $V_{\text{in}} = 40 \text{ cm/s}$ $A_{\text{in}} = 0.004 \text{ m}^2$ $A_{\text{out}} = 0.016 \text{ m}^2$	 $V_{\text{in}} = 32 \text{ cm/s}$ $A_{\text{in}} = 0.006 \text{ m}^2$ $A_{\text{out}} = 0.012 \text{ m}^2$	 $V_{\text{in}} = 12 \text{ cm/s}$ $A_{\text{in}} = 0.012 \text{ m}^2$ $A_{\text{out}} = 0.006 \text{ m}^2$
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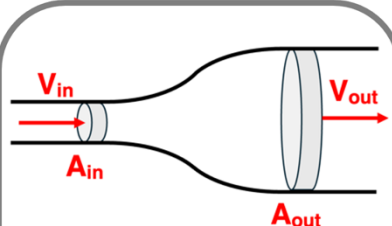
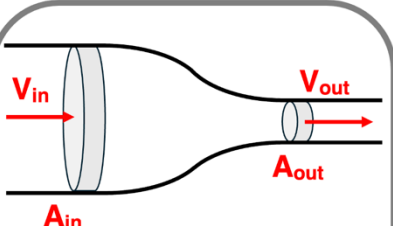
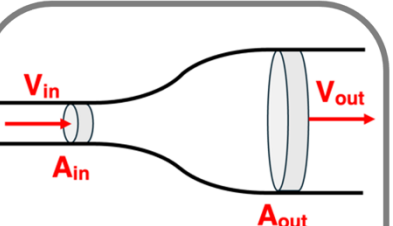
Question 23

Consider the three situations in which fluid in a pipe flows between regions with different diameters (**D**). Rank the V_{out} values for the three situations.

 $V_{in} = 32 \text{ cm/s}$ $A_{in} = 0.006 \text{ m}^2$ $A_{out} = 0.012 \text{ m}^2$	 $V_{in} = 12 \text{ cm/s}$ $A_{in} = 0.012 \text{ m}^2$ $A_{out} = 0.006 \text{ m}^2$	 $V_{in} = 40 \text{ cm/s}$ $A_{in} = 0.004 \text{ m}^2$ $A_{out} = 0.016 \text{ m}^2$
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Question 24

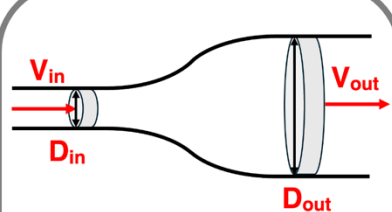
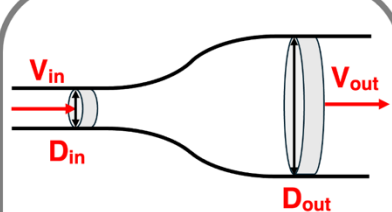
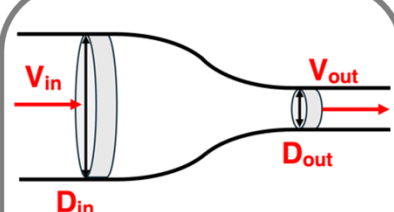
Consider the three situations in which fluid in a pipe flows between regions with different diameters (**D**). Rank the V_{out} values for the three situations.

 $V_{in} = 40 \text{ cm/s}$ $A_{in} = 0.004 \text{ m}^2$ $A_{out} = 0.016 \text{ m}^2$	 $V_{in} = 12 \text{ cm/s}$ $A_{in} = 0.012 \text{ m}^2$ $A_{out} = 0.006 \text{ m}^2$	 $V_{in} = 32 \text{ cm/s}$ $A_{in} = 0.006 \text{ m}^2$ $A_{out} = 0.012 \text{ m}^2$
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Question Group 7

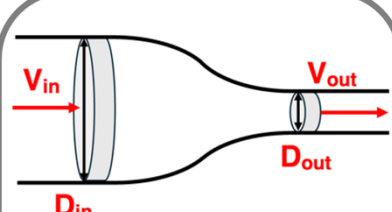
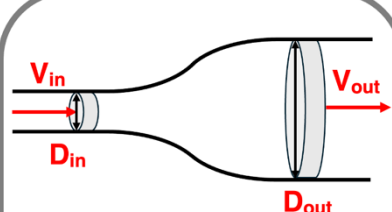
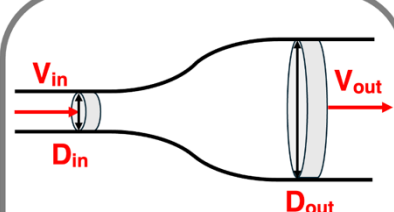
Question 25

Consider the three situations in which fluid in a pipe flows between regions with a different cross-sectional area (**A**). Rank the V_{out} values for the three situations.

 $V_{in} = 48 \text{ cm/s}$ $D_{in} = 0.020 \text{ m}$ $D_{out} = 0.080 \text{ m}$	 $V_{in} = 32 \text{ cm/s}$ $D_{in} = 0.060 \text{ m}$ $D_{out} = 0.120 \text{ m}$	 $V_{in} = 6 \text{ cm/s}$ $D_{in} = 0.100 \text{ m}$ $D_{out} = 0.050 \text{ m}$
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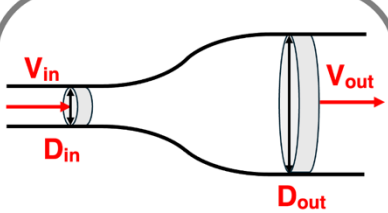
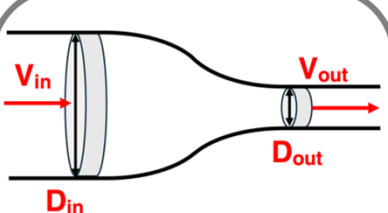
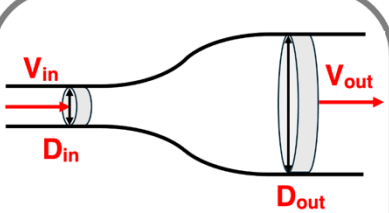
Question 26

Consider the three situations in which fluid in a pipe flows between regions with a different cross-sectional area (**A**). Rank the V_{out} values for the three situations.

 $V_{in} = 6 \text{ cm/s}$ $D_{in} = 0.100 \text{ m}$ $D_{out} = 0.050 \text{ m}$	 $V_{in} = 48 \text{ cm/s}$ $D_{in} = 0.020 \text{ m}$ $D_{out} = 0.080 \text{ m}$	 $V_{in} = 32 \text{ cm/s}$ $D_{in} = 0.060 \text{ m}$ $D_{out} = 0.120 \text{ m}$
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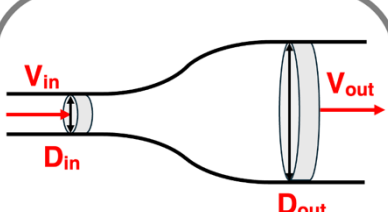
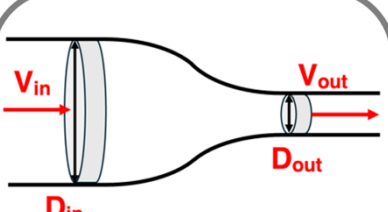
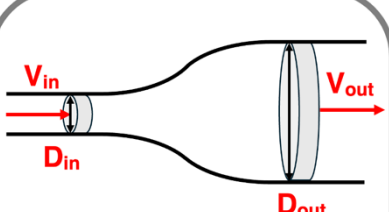
Question 27

Consider the three situations in which fluid in a pipe flows between regions with a different cross-sectional area (**A**). Rank the V_{out} values for the three situations.

 $V_{in} = 32 \text{ cm/s}$ $D_{in} = 0.060 \text{ m}$ $D_{out} = 0.120 \text{ m}$	 $V_{in} = 6 \text{ cm/s}$ $D_{in} = 0.100 \text{ m}$ $D_{out} = 0.050 \text{ m}$	 $V_{in} = 48 \text{ cm/s}$ $D_{in} = 0.020 \text{ m}$ $D_{out} = 0.080 \text{ m}$
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Question 28

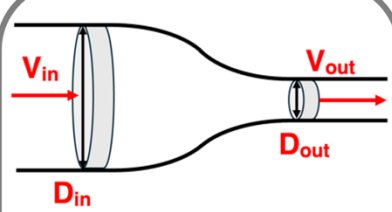
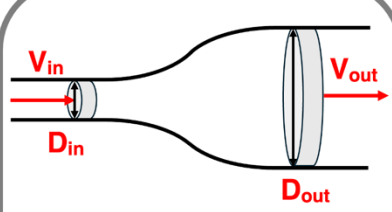
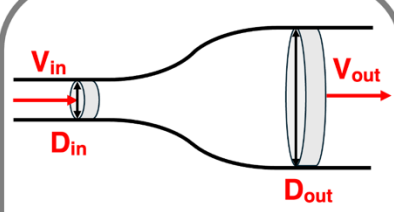
Consider the three situations in which fluid in a pipe flows between regions with a different cross-sectional area (**A**). Rank the V_{out} values for the three situations.

 $V_{in} = 48 \text{ cm/s}$ $D_{in} = 0.020 \text{ m}$ $D_{out} = 0.080 \text{ m}$	 $V_{in} = 6 \text{ cm/s}$ $D_{in} = 0.100 \text{ m}$ $D_{out} = 0.050 \text{ m}$	 $V_{in} = 32 \text{ cm/s}$ $D_{in} = 0.060 \text{ m}$ $D_{out} = 0.120 \text{ m}$
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Question Group 8

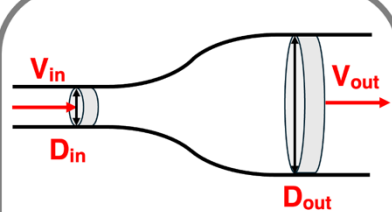
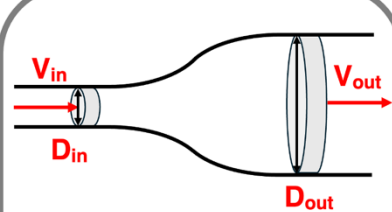
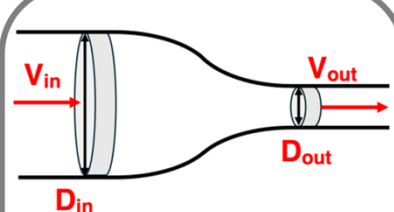
Question 29

Consider the three situations in which fluid in a pipe flows between regions with different diameters (D). Rank the V_{out} values for the three situations.

 $V_{in} = 12 \text{ cm/s}$ $D_{in} = 0.240 \text{ m}$ $D_{out} = 0.120 \text{ m}$	 $V_{in} = 64 \text{ cm/s}$ $D_{in} = 0.050 \text{ m}$ $D_{out} = 0.100 \text{ m}$	 $V_{in} = 80 \text{ cm/s}$ $D_{in} = 0.060 \text{ m}$ $D_{out} = 0.120 \text{ m}$
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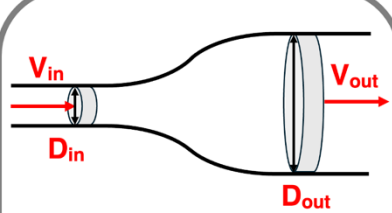
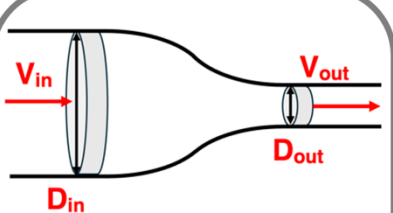
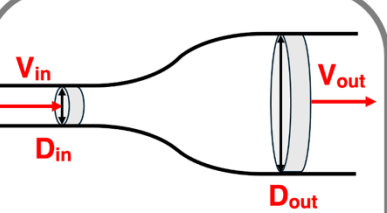
Question 30

Consider the three situations in which fluid in a pipe flows between regions with different diameters (D). Rank the V_{out} values for the three situations.

 $V_{in} = 64 \text{ cm/s}$ $D_{in} = 0.050 \text{ m}$ $D_{out} = 0.100 \text{ m}$	 $V_{in} = 80 \text{ cm/s}$ $D_{in} = 0.060 \text{ m}$ $D_{out} = 0.120 \text{ m}$	 $V_{in} = 12 \text{ cm/s}$ $D_{in} = 0.240 \text{ m}$ $D_{out} = 0.120 \text{ m}$
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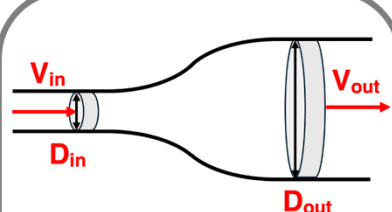
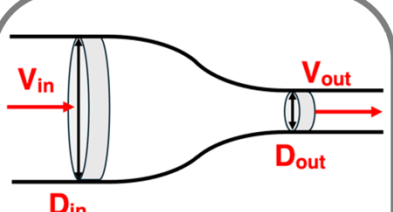
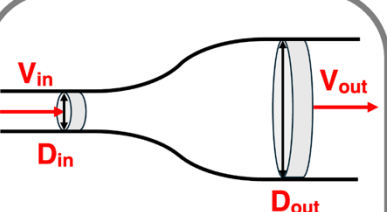
Question 31

Consider the three situations in which fluid in a pipe flows between regions with different diameters (D). Rank the V_{out} values for the three situations.

 $V_{in} = 80 \text{ cm/s}$ $D_{in} = 0.060 \text{ m}$ $D_{out} = 0.120 \text{ m}$	 $V_{in} = 12 \text{ cm/s}$ $D_{in} = 0.240 \text{ m}$ $D_{out} = 0.120 \text{ m}$	 $V_{in} = 64 \text{ cm/s}$ $D_{in} = 0.050 \text{ m}$ $D_{out} = 0.100 \text{ m}$
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Question 32

Consider the three situations in which fluid in a pipe flows between regions with different diameters (D). Rank the V_{out} values for the three situations.

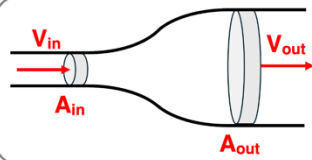
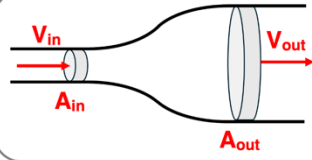
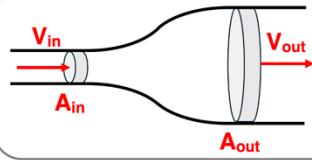
 $V_{in} = 64 \text{ cm/s}$ $D_{in} = 0.050 \text{ m}$ $D_{out} = 0.100 \text{ m}$	 $V_{in} = 12 \text{ cm/s}$ $D_{in} = 0.240 \text{ m}$ $D_{out} = 0.120 \text{ m}$	 $V_{in} = 80 \text{ cm/s}$ $D_{in} = 0.060 \text{ m}$ $D_{out} = 0.120 \text{ m}$
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Activity 3: Law Breakers

Question Group 9

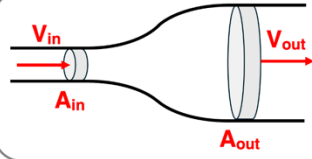
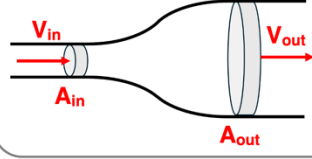
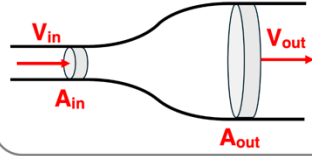
Question 33

Fluid in a pipe flows from a narrow to a wide section. The cross-sectional areas (A) and flow velocities (V) are listed. Identify all situations that violate the law of conservation of mass.

	$V_{in} = 80 \text{ cm/s}$ $A_{in} = 6 \text{ cm}^2$	$V_{out} = 40 \text{ cm/s}$ $A_{out} = 12 \text{ cm}^2$
	$V_{in} = 90 \text{ cm/s}$ $A_{in} = 6 \text{ cm}^2$	$V_{out} = 30 \text{ cm/s}$ $A_{out} = 18 \text{ cm}^2$
	$V_{in} = 24 \text{ cm/s}$ $A_{in} = 8 \text{ cm}^2$	$V_{out} = 48 \text{ cm/s}$ $A_{out} = 16 \text{ cm}^2$

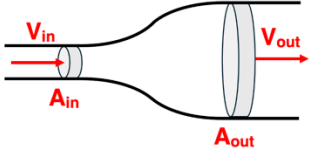
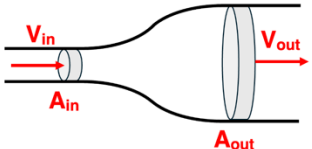
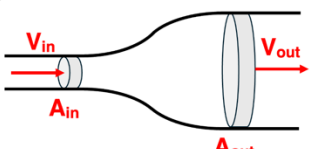
Question 34

Fluid in a pipe flows from a narrow to a wide section. The cross-sectional areas (A) and flow velocities (V) are listed. Identify all situations that violate the law of conservation of mass.

	$V_{in} = 30 \text{ cm/s}$ $A_{in} = 12 \text{ cm}^2$	$V_{out} = 60 \text{ cm/s}$ $A_{out} = 24 \text{ cm}^2$
	$V_{in} = 80 \text{ cm/s}$ $A_{in} = 6 \text{ cm}^2$	$V_{out} = 40 \text{ cm/s}$ $A_{out} = 12 \text{ cm}^2$
	$V_{in} = 30 \text{ cm/s}$ $A_{in} = 6 \text{ cm}^2$	$V_{out} = 90 \text{ cm/s}$ $A_{out} = 18 \text{ cm}^2$

Question 35

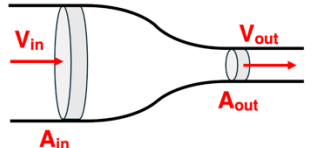
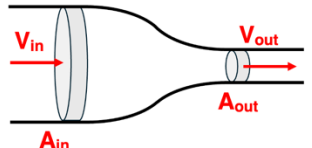
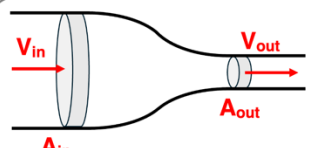
Fluid in a pipe flows from a narrow to a wide section. The cross-sectional areas (A) and flow velocities (V) are listed. Identify all situations that violate the law of conservation of mass.

	$V_{in} = 60 \text{ cm/s}$ $A_{in} = 8 \text{ cm}^2$	$V_{out} = 20 \text{ cm/s}$ $A_{out} = 24 \text{ cm}^2$
	$V_{in} = 25 \text{ cm/s}$ $A_{in} = 10 \text{ cm}^2$	$V_{out} = 50 \text{ cm/s}$ $A_{out} = 20 \text{ cm}^2$
	$V_{in} = 60 \text{ cm/s}$ $A_{in} = 10 \text{ cm}^2$	$V_{out} = 30 \text{ cm/s}$ $A_{out} = 20 \text{ cm}^2$

Question Group 10

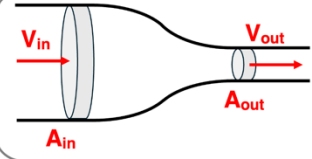
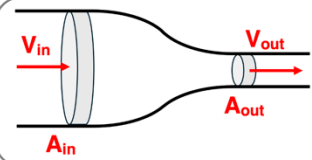
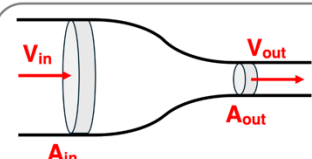
Question 36

Fluid in a pipe flows from a wide to a narrow section. The cross-sectional areas (A) and flow velocities (V) are listed. Identify all situations that violate the law of conservation of mass.

	$V_{in} = 40 \text{ cm/s}$ $A_{in} = 10 \text{ cm}^2$	$V_{out} = 80 \text{ cm/s}$ $A_{out} = 5 \text{ cm}^2$
	$V_{in} = 30 \text{ cm/s}$ $A_{in} = 24 \text{ cm}^2$	$V_{out} = 90 \text{ cm/s}$ $A_{out} = 8 \text{ cm}^2$
	$V_{in} = 60 \text{ cm/s}$ $A_{in} = 32 \text{ cm}^2$	$V_{out} = 20 \text{ cm/s}$ $A_{out} = 16 \text{ cm}^2$

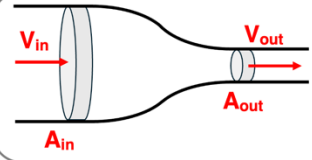
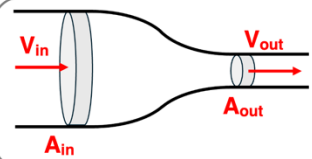
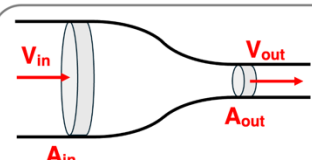
Question 37

Fluid in a pipe flows from a wide to a narrow section. The cross-sectional areas (A) and flow velocities (V) are listed. Identify all situations that violate the law of conservation of mass.

	$V_{in} = 40 \text{ cm/s}$ $A_{in} = 36 \text{ cm}^2$	$V_{out} = 120 \text{ cm/s}$ $A_{out} = 12 \text{ cm}^2$
	$V_{in} = 40 \text{ cm/s}$ $A_{in} = 10 \text{ cm}^2$	$V_{out} = 80 \text{ cm/s}$ $A_{out} = 5 \text{ cm}^2$
	$V_{in} = 60 \text{ cm/s}$ $A_{in} = 24 \text{ cm}^2$	$V_{out} = 20 \text{ cm/s}$ $A_{out} = 8 \text{ cm}^2$

Question 38

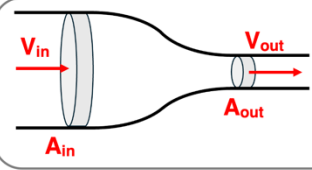
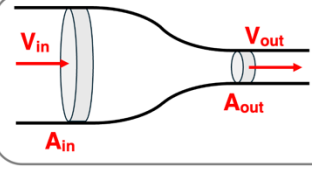
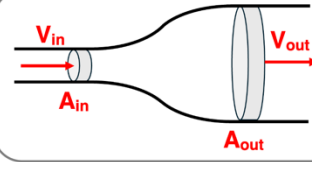
Fluid in a pipe flows from a wide to a narrow section. The cross-sectional areas (A) and flow velocities (V) are listed. Identify all situations that violate the law of conservation of mass.

	$V_{in} = 30 \text{ cm/s}$ $A_{in} = 16 \text{ cm}^2$	$V_{out} = 60 \text{ cm/s}$ $A_{out} = 8 \text{ cm}^2$
	$V_{in} = 90 \text{ cm/s}$ $A_{in} = 36 \text{ cm}^2$	$V_{out} = 30 \text{ cm/s}$ $A_{out} = 12 \text{ cm}^2$
	$V_{in} = 15 \text{ cm/s}$ $A_{in} = 24 \text{ cm}^2$	$V_{out} = 30 \text{ cm/s}$ $A_{out} = 12 \text{ cm}^2$

Question Group 11

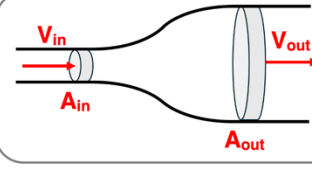
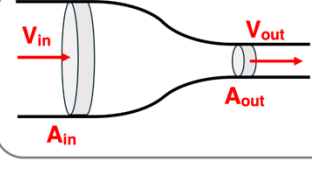
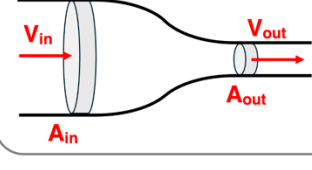
Question 39

Fluid in a pipe flows between two sections with different cross-sectional areas. The areas (A) and flow velocities (V) are listed. Identify all situations that violate the law of conservation of mass.

	$V_{in} = 60 \text{ cm/s}$ $A_{in} = 24 \text{ cm}^2$	$V_{out} = 30 \text{ cm/s}$ $A_{out} = 12 \text{ cm}^2$
	$V_{in} = 40 \text{ cm/s}$ $A_{in} = 16 \text{ cm}^2$	$V_{out} = 20 \text{ cm/s}$ $A_{out} = 8 \text{ cm}^2$
	$V_{in} = 90 \text{ cm/s}$ $A_{in} = 10 \text{ cm}^2$	$V_{out} = 30 \text{ cm/s}$ $A_{out} = 30 \text{ cm}^2$

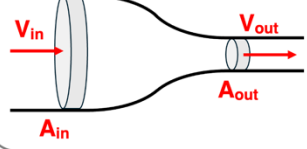
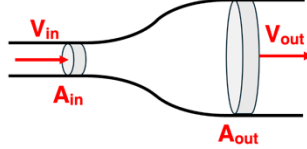
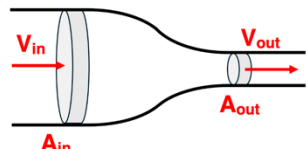
Question 40

Fluid in a pipe flows between two sections with different cross-sectional areas. The areas (A) and flow velocities (V) are listed. Identify all situations that violate the law of conservation of mass.

	$V_{in} = 20 \text{ cm/s}$ $A_{in} = 12 \text{ cm}^2$	$V_{out} = 60 \text{ cm/s}$ $A_{out} = 36 \text{ cm}^2$
	$V_{in} = 32 \text{ cm/s}$ $A_{in} = 24 \text{ cm}^2$	$V_{out} = 64 \text{ cm/s}$ $A_{out} = 12 \text{ cm}^2$
	$V_{in} = 48 \text{ cm/s}$ $A_{in} = 16 \text{ cm}^2$	$V_{out} = 24 \text{ cm/s}$ $A_{out} = 8 \text{ cm}^2$

Question 41

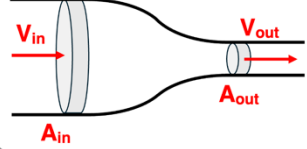
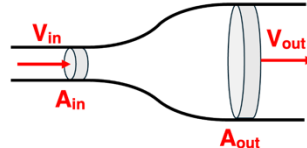
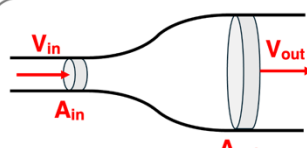
Fluid in a pipe flows between two sections with different cross-sectional areas. The areas (A) and flow velocities (V) are listed. Identify all situations that violate the law of conservation of mass.

	$V_{in} = 40 \text{ cm/s}$ $A_{in} = 24 \text{ cm}^2$	$V_{out} = 20 \text{ cm/s}$ $A_{out} = 12 \text{ cm}^2$
	$V_{in} = 90 \text{ cm/s}$ $A_{in} = 12 \text{ cm}^2$	$V_{out} = 30 \text{ cm/s}$ $A_{out} = 36 \text{ cm}^2$
	$V_{in} = 36 \text{ cm/s}$ $A_{in} = 24 \text{ cm}^2$	$V_{out} = 72 \text{ cm/s}$ $A_{out} = 12 \text{ cm}^2$

Question Group 12

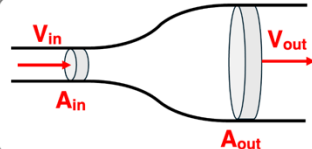

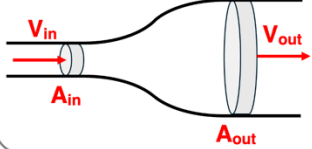
Question 42

Fluid in a pipe flows between two sections with different cross-sectional areas. The areas (A) and flow velocities (V) are listed. Identify all situations that violate the law of conservation of mass.

	$V_{in} = 48 \text{ cm/s}$ $A_{in} = 20 \text{ cm}^2$	$V_{out} = 24 \text{ cm/s}$ $A_{out} = 10 \text{ cm}^2$
	$V_{in} = 90 \text{ cm/s}$ $A_{in} = 12 \text{ cm}^2$	$V_{out} = 30 \text{ cm/s}$ $A_{out} = 36 \text{ cm}^2$
	$V_{in} = 48 \text{ cm/s}$ $A_{in} = 9 \text{ cm}^2$	$V_{out} = 24 \text{ cm/s}$ $A_{out} = 18 \text{ cm}^2$

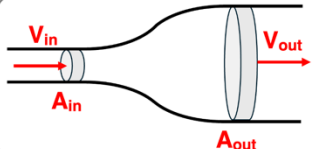
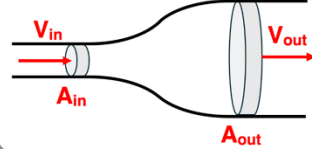

Question 43

Fluid in a pipe flows between two sections with different cross-sectional areas. The areas (A) and flow velocities (V) are listed. Identify all situations that violate the law of conservation of mass.

	$V_{in} = 20 \text{ cm/s}$ $A_{in} = 10 \text{ cm}^2$	$V_{out} = 60 \text{ cm/s}$ $A_{out} = 30 \text{ cm}^2$
	$V_{in} = 24 \text{ cm/s}$ $A_{in} = 20 \text{ cm}^2$	$V_{out} = 48 \text{ cm/s}$ $A_{out} = 10 \text{ cm}^2$
	$V_{in} = 48 \text{ cm/s}$ $A_{in} = 15 \text{ cm}^2$	$V_{out} = 24 \text{ cm/s}$ $A_{out} = 30 \text{ cm}^2$

Question 44

Fluid in a pipe flows between two sections with different cross-sectional areas. The areas (A) and flow velocities (V) are listed. Identify all situations that violate the law of conservation of mass.

	$V_{in} = 48 \text{ cm/s}$ $A_{in} = 15 \text{ cm}^2$	$V_{out} = 24 \text{ cm/s}$ $A_{out} = 30 \text{ cm}^2$
	$V_{in} = 50 \text{ cm/s}$ $A_{in} = 12 \text{ cm}^2$	$V_{out} = 25 \text{ cm/s}$ $A_{out} = 24 \text{ cm}^2$
	$V_{in} = 45 \text{ cm/s}$ $A_{in} = 30 \text{ cm}^2$	$V_{out} = 15 \text{ cm/s}$ $A_{out} = 10 \text{ cm}^2$