

CHAPTER 11

1. For an ideal gas, internal energy is considered to be a function of ____ only.

YOUR ANSWER: Temperature

2. In Equation 11.7 the subscript p on the partial derivative refers to differentiation at constant ____.

A. Pressure

B. Temperature

C. Phase

3. What letter is used to represent the specific heat ratio?

A. h

B. k

C. s

4. Changes in entropy are often important for compressible flows. True or False

A. True

B. False

5. Constant entropy flow is called adiabatic flow. True or False

A. True

B. False

6. Write the equation for Mach number.

YOUR ANSWER: $Ma = V/c$

7. The changes in fluid properties across a sound wave are quite large compared to their original values. True or False

A. True

B. False

8. For gas flow, what part of equation 11.32 is considered negligibly small in comparison to the other terms?

A. V

B. $g \delta z$

C. δp

9. The speed of sound is larger in fluids that are more difficult to _____.

A. Direct

B. See

C. Compress

10. "Sonification" can occur in a vacuum. True or False

A. True

B. False

11. According to Figure 11.2 of the text, at what Mach number does the drag coefficient of a sphere become independent of the Reynolds number?

YOUR ANSWER: $M = 0.9$

12. Pistol Shrimp use _____ waves to kill or stun nearby prey.

YOUR ANSWER: Sound

13. The flow region upstream of the Mach wave is called the zone of action. True or False

A. True

B. False

14. An example of a flow visualization method is which of the following?

A. Digital

B. Shadowpanel

C. Schlieren

15. It could be expected that a very large aero gas turbine engine could produce thrust levels exceeding 100,000 lbs. True or False

A. True

B. False

16. A flow that is adiabatic and frictionless is a type of isentropic flow. True or False

A. True

B. False

17. Write the conservation of mass equation for steady one-dimensional flow.

YOUR ANSWER: $m = \rho AV = \text{constant}$

18. The velocity of subsonic flow through a converging duct will _____ .

- A. Decrease
- B. Not change
- C. Increase**

19. A converging-diverging duct will accelerate a flow from subsonic to supersonic flow given the right conditions. True or False?

- A. True**
- B. False

20. The minimum area location of the converging-diverging duct is often called the _____.

YOUR ANSWER: Throat

21. Provided that the flow is steady, one dimensional, and isentropic, and that we know the Mach number and stagnation temperature, what equation can be used to calculate the temperature of an ideal gas anywhere in a converging-diverging duct?

- A. 11.53
- B. 11.60
- C. 11.56**

22. When $Ma = 1$ at the throat of the converging-diverging duct what is the condition called?

- A. Mach speed
- B. Choked flow**
- C. Vortex flow

23. By substituting $Ma = 1$ into equation 11.56 we can get a relationship for what?

- A. Critical temperature ratio**
- B. Critical pressure ratio
- C. Critical velocity ratio

24. Shown in Fig 11.13, each abrupt pressure rise shown within and at the exit of the flow passage occurs across a very thin discontinuity in the flow called a _____.

YOUR ANSWER: Normal shock wave

25. Fanno flow involves wall friction with heat transfer and constant cross-sectional area.

True or False

A. True

B. False

26. Entropy increases in Fanno flows because of ____.

YOUR ANSWER: Wall friction

27. Fanno flow corresponding to the portion of the Fanno line above the critical temperature must be what?

A. Subsonic

B. Supersonic

C. Stagnant due to friction

28. Rayleigh flow involves heat transfer with no wall friction and constant _____.

YOUR ANSWER: Cross Sectional Area

29. For a Rayleigh flow, ρV is equal to _____ due to the continuity equation.

A. A constant

B. Temperature

C. Pressure

30. The stagnation temperature in Rayleigh flow does not vary. True or False?

A. True

B. False

31. The friction force acting on the contents of the infinitesimally thin control volume surrounding the normal shock is considered to be _____.

A. There is no friction force

B. Negligible

C. Very large

32. The second law of thermodynamics requires that entropy must _____ across a normal shock wave.

YOUR ANSWER: Increase

33. Ratios of thermodynamic properties across a normal shock are a function of the Mach number. True or False

A. True

B. False

34. The propagation of weak pressure pulses, or _____, in a compressible flow can be considered to be comparable to the movement of small amplitude waves on the surface of an open-channel flow.

YOUR ANSWER: Sound waves

35. Compressible gas flows and open-channel liquid flows are strikingly similar in several ways. True or False

A. True

B. False

36. When supersonic flow is accelerating because of changes in flow direction across the Mach wave, it is also considered to be expanding. True or False

A. True

B. False

37. Expansion fans are used to illustrate supersonic flow around a _____ corner.

YOUR ANSWER: Sharp

38. Supersonic flows decelerate across _____ Mach waves.

YOUR ANSWER: Compression