

# CHAPTER 12

1. Turbomachines are mechanical devices that either \_\_\_\_ energy from a fluid, in the case of a turbine, or \_\_\_\_ energy to a fluid, in the case of a pump.

**YOUR ANSWER: Extract, add**

2. In terms of operating as a machine, a sail boat \_\_\_\_ energy from the air.

**A. Extracts**

**B. Adds**

3. What three types of turbomachine classifications are there?

**YOUR ANSWER: Axial flow, mixed-flow, radial flow.**

4. Absolute velocity is the vector sum of \_\_\_\_\_ velocities and \_\_\_\_\_ velocities.

**YOUR ANSWER: relative, blade.**

5. In a turbine, what causes motion?

**A. The blade moves the fluid.**

**B. The fluid moves the blade.**

**C. A motor moves the blade.**

6. Since turbine power output is proportional to the \_\_\_\_, significant power can be extracted from ocean currents.

**YOUR ANSWER: Fluid Density**

7. If energy is transferred to the fluid, is the machine a pump, or a turbine?

**YOUR ANSWER: Pump**

8. How is shaft torque related to the mass flowrate?

**A. They are inversely proportional**

**B. They are directly proportional**

**C. they are not related**

9. Shaft power is related to the shaft \_\_\_\_\_ and \_\_\_\_\_ velocity.

**YOUR ANSWER: torque, angular.**

10. Which of these is a main component of the centrifugal pump?

**A. Impeller**

B. Shroud

C. Caisson

11. Pumps can have multiple stages. True or False

**A. True**

B. False

12. The overall pump efficiency is affected by the \_\_\_\_\_ in the pump and the \_\_\_\_\_ in the bearings and seals.

A) Losses, gains

B) Hydraulic losses, mechanical losses

C) Inefficiencies, efficiencies

**YOUR ANSWER: B**

13. What are the three sources of pump efficiency?

**YOUR ANSWER: Hydraulic efficiency, mechanical efficiency, volumetric efficiency.**

14. What is cavitation?

**YOUR ANSWER: Cavitation occurs when the liquid pressure at a given location is reduced to the vapor pressure of the liquid, causing vapor bubbles to form in the liquid.**

15. The intersection of the pump performance curve and the system curve is called what?

**A. The operating point**

B. The focal point

C. The efficiency point

16. When two pumps are placed in series, what do you do to determine the resulting pump performance curve?

**A. Add heads at the same flowrate.**

B. Add flowrates at the same head.

C. Simply add the performance values.

17. The power coefficient is commonly based upon what parameter of the pump?

A. The flowrate

**B. The shaft (brake) horsepower**

C. The rotational speed of the pump shaft

18. Specific speed can be determined independent of pump size. True or False

**A. True**

B. False

19. Do centrifugal pumps typically have low or high specific speeds?

**YOUR ANSWER: Low**

20. What is another term for an axial-flow pump?

**YOUR ANSWER: A propeller pump**

21. What are used to straighten the flow leaving the rotor of an axial flow pump?

A. Turbine blades

B. An inlet

**C. Stator blades**

22. If one changes from a centrifugal pump to an axial-flow pump, what happens to the head?

A. Nothing

B. It increases

**C. It decreases**

23. What is typically the largest change in density of gas flow through a fan?

A. 10%

**B. 7%**

C. 5%

24. Which best describes the pressure change in a fan?

A. The pressure change is high

**B. The pressure change is low**

C. There is no change in the pressure

25. Name the two types of hydraulic turbines.

**YOUR ANSWER: Impulse and reaction**

26. When is a Pelton wheel most efficient?

**A. When there is a large head**

B. When there is a small head

C. When there is a large flow rate

27. In a Pelton wheel, does the relative velocity of the flow change?

**YOUR ANSWER: No**

28. What is the typical value of the term  $\beta$  (in degrees) in a Pelton wheel?

A. 180

**B. 165**

C. 150

29. Reaction turbines are best suited for \_\_\_\_\_ flow rate applications.

**YOUR ANSWER: high**

30. What is another term for a typical radial hydraulic turbine?

**A. A Francis turbine**

B. A Kaplan turbine

C. A Munson turbine

31. Cavitation damage can not occur in turbine blades. True or False

**A. True**

B. False

32. What differentiates a compressor from a pump?

**YOUR ANSWER: A compressor adds energy to the fluid, but results in a significant pressure rise and an increase in fluid density.**

33. What is one common way of obtaining high pressure ratios in a compressor?

A. Using a compressor with a higher flow rate

**B. Using a multistage compressor**

C. Pre-accelerating the flow

34. What is one advantage axial-flow compressors have over centrifugal compressors?

- A. They are more efficient
- B. They provide a larger pressure rise per stage
- C. They require less space**

35. Can stator blades add energy to the flow? Why?

**YOUR ANSWER: No, because they are stationary, and can therefore impart no energy upon the flow.**

36. Name the three typical components of a gas turbine engine.

**YOUR ANSWER: A compressor, a combustor, and a turbine.**

37. What is the most common turbine type in electric generating plants?

- A. Axial flow**
- B. Centrifugal flow
- C. Radial flow

38. What is the pressure drop across a strict impulse turbine?

**YOUR ANSWER: Zero**