Exam 2--PHYS 151--S16

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. Which of these are characteristics of ideal fluid flow?
   I. steady
   II. laminar
   III. rotational
   IV. turbulent
   a. I & II
   b. II & III
   c. II & IV
   d. I only

2. Liquids are ________; gases are ________.
   a. compressible; incompressible
   b. incompressible; incompressible
   c. incompressible; compressible
   d. compressible; compressible

3. Which of these is a unit for flow rate?
   a. m\(^2\)/s
   b. m/s
   c. m\(^3\)/s
   d. m\(^2\)/s\(^3\)
   e. m/s\(^3\)

4. Which of these principles says that the flow rate must be constant in a closed system?
   a. Conservation of Energy
   b. Pascal’s Principle
   c. Bernoulli’s Principle
   d. Boyle’s Law
   e. Equation of Continuity

5. Consider this pipe. Which of these best describes the velocity of the fluid, \(v_2\)?

   \[
   \begin{align*}
   P_1 & \quad P_2 \\
   A_1 & \longrightarrow \\
   v_1 & \quad v_2 \\
   A_2 & \quad \end{align*}
   \]
   a. \(v_2>v_1\)
   b. \(v_2<v_1\)
   c. \(v_2=v_1\)
   d. \(v_2=0\) m/s

6. The Poiseuille equation, given below, describes the flow rate of an ideal fluid in a cylindrical pipe. A fluid flows through a pipe at a rate \(Q\). If the viscosity of the fluid is increased by a factor of 2, what is the new flow rate?

   \[
   Q = \frac{\pi r^4 \Delta P}{8 \eta L}
   \]
   a. \(\frac{1}{2} Q\)
   b. \(2Q\)
   c. \(\frac{1}{4} Q\)
   d. \(\frac{1}{16} Q\)
   e. \(4Q\)

7. Which of these has the lowest viscosity?
   a. air
   b. jello
   c. maple syrup
   d. liquid water

8. According to the Poiseuille equation, a viscous fluid needs _______ to maintain flow.
   a. a lengthening of the path
   b. a constriction of the pipe
   c. an increase in height
   d. a continuous drop in pressure
9. Water flows through a 1-cm diameter pipe connected to a 1/2-cm diameter pipe. Compared to the speed of the water in the 1-cm pipe, the speed in the 1/2-cm pipe is:
   a. one-quarter  
   b. one-half  
   c. the same  
   d. double  
   e. four times

10. Consider this simple diagram of the heart. Which part is the left atrium?
    
    ![Heart Diagram]
    
    a. a  
    b. b  
    c. c  
    d. d

11. Consider the simple diagram of the heart in the previous question. In which section does blood arrive with its lowest pressure?
    
    a. a  
    b. b  
    c. c  
    d. d

12. Consider the simple diagram of the heart. Where is the blood just before going into the pulmonary circuit?
    
    a. a  
    b. b  
    c. c  
    d. d

13. The pressure occurs when the heart contracts?
    
    a. systolic  
    b. diastolic  
    c. laminar  
    d. hypertension

14. Consider this coronary artery, which is partially blocked. What happens to the speed of the blood flowing through the blocked section?
    
    a. it increases  
    b. it decreases  
    c. it stays the same

15. A person’s blood pressure is generally measured on the arm, at approximately the same level as the heart. How would the results differ if the measurement were made on the person’s leg instead?
    
    a. blood pressure would be lower  
    b. blood pressure would not change  
    c. blood pressure would be higher

16. An iron lung helps a person to breathe. When the person wants to inhale, how does the pressure inside the iron lung compare to the pressure outside of it?
    
    a. the pressure inside is higher  
    b. the pressure inside is lower  
    c. the pressure inside is the same as outside  
    d. it depends on the person’s breathing rate

17. Intraocular pressure is the pressure of fluids in the __________.
    
    a. bladder  
    b. eye  
    c. brain  
    d. lungs

18. If you weight 180 pounds and stand on one leg, what is the stress on your knee joint, whose area is 0.5 square inches?
    
    a. 180 psi  
    b. 360 psi  
    c. 900 psi  
    d. 90 psi
19. Work happens when a force causes _________.
   a. disarray.
   b. defamation
   c. deformation
   d. displacement

20. Consider this roller coaster. At which location does the cart have the most potential energy?

   a. A
   b. B
   c. C
   d. D
   e. the cart has the same potential energy at all locations

21. Consider the roller coaster in the previous problem. At which location does the cart have the highest speed?

   a. A
   b. B
   c. C
   d. D
   e. the cart has the same speed at all locations

22. If I do negative work on an object, the energy will _________.
   a. vary between positive and negative values
   b. remain the same
   c. decrease
   d. increase

23. Which of these are units of work?
   a. N/m
   b. Nm
   c. Nm/s
   d. m/N

24. An object is traveling a speed v and has a kinetic energy K. If it speeds up to 2v, what is the object’s kinetic energy?
   a. \( \frac{1}{4}K \)
   b. \( \frac{1}{2}K \)
   c. K
   d. 2K
   e. 4K

25. Consider this diagram of a guy pushing a car to the right. What type of work is the frictional force \( F_{\text{friction}} \) doing on the car?

   a. positive work
   b. negative work
   c. zero work
   d. it depends on the weight of the car

26. I move an object of mass m to a height h. What work have I done on this object?
   a. \( \frac{m}{gh} \)
   b. \( F/h \)
   c. mgh
   d. mg/h

27. A mechanical system is 40% efficient. If I put in 100 Joules of energy, how much work will the system do?
   a. 140 J
   b. 100 J
   c. 40 J
   d. 60 J

28. Potential energy is the energy of _________.
   a. position
   b. acceleration
   c. velocity
   d. motion
29. Energy from food comes in the form of carbohydrates, proteins, and ___________.
   a. calories
   b. grains
   c. muscles
   d. meat
   e. lipids

30. Which is larger, TMR or BMR?
   a. TMR
   b. BMR
   c. both are the same
   d. it depends on the person’s metabolism

31. Lipids contain about _______ the energy density of carbohydrates.
   a. ten times
   b. one-tenth
   c. twice
   d. one-half

32. Donuts have a high _________ density and a low ___________ density.
   a. sugar; carbohydrate
   b. nutrient; energy
   c. energy; nutrient
   d. lipid; sugar

33. A food calorie (1 Cal) is equivalent to how many calories (cal)?
   a. 1 Cal = 1000 cal
   b. 1 Cal = 0.001 cal
   c. 1 Cal = 1 cal
   d. 1 Cal = 100 cal

34. The work done to move an object might be 100 cal. However, a person’s body might require 500 cal to complete the action. Why is there a discrepancy between the completed work and the required energy?
   a. kinetic energy requires more work than potential energy
   b. muscles are very inefficient
   c. work is always less than energy
   d. the conversion of chemical energy requires more work

35. The typical BMR of a person is 65 cal/hour. Then, what is the minimum calorie intake a person needs to function for 24 hours?
   a. 100 cal
   b. 1000 cal
   c. 1600 cal
   d. 3000 cal

36. Which of these is a good source of lipids?
   a. bananas
   b. lean meat
   c. bread
   d. olive oil

37. Which of these is a way the body responds when it is cold and needs to be warmer:
   I. Sweating
   II. Shivering
   III. Contraction of blood vessels in the skin
   IV. Increase BMR
   a. II & III
   b. I only
   c. II, III, & IV
   d. I, II, & III
   e. II & IV

38. Most of the body’s heat is lost by which of these mechanisms?
   a. convection
   b. radiation
   c. sweating
   d. conduction

39. Latent heat of fusion is the energy required to ___________.
   a. raise the temperature of an object
   b. change a solid to liquid
   c. change a liquid to gas
   d. sublimate matter
40. The following describes thermal conduction. The thermal conduction through a material is 2 kcal/s. If the area of that material is doubled, what is the new rate of thermal conduction?
\[
\frac{Q}{t} = k \frac{A \Delta T}{d}
\]
   a. 1 kcal/s
   b. 2 kcal/s
   c. 4 kcal/s
   d. 8 kcal/s
   e. 16 kcal/s

41. The kelvin temperature scale is based on the triple point of water (0.01ºC) and __________.
   a. absolute zero
   b. melting temperature of silicone
   c. freezing point of water
   d. boiling point of water

42. What is absolute zero in degrees celsius?
   a. -273ºC
   b. 0ºC
   c. 32ºC
   d. -320ºC

43. For which of these temperature scales is a change in 1 degree the smallest change in temperature?
   a. fahrenheit
   b. kelvin
   c. celsius
   d. 1 degree for each is the same
   e. both kelvin and celsius are the smallest

44. Two objects have the same mass and initial temperature, but object A has a higher specific heat than object B. Which object will require more energy to raise the temperature by 20ºC?
   a. object A
   b. object B
   c. both will require the same amount of energy

45. Consider this equation which describes the rate of thermal energy flow between two objects. Which of these materials will have a higher value for \( k \)?
\[
\frac{Q}{t} = k \frac{A \Delta T}{d}
\]
   a. air
   b. water
   c. copper
   d. wood
   e. it depends on the size of the object

46. Which of these modes of thermal energy transfer requires contact between two bodies?
   I. Conduction
   II. Convection
   III. Radiation
   a. I & II
   b. II & III
   c. II only
   d. I only
Exam 2--PHYS 151--S16
Answer Section

MULTIPLE CHOICE

1. ANS: A  PTS: 1  REF: S16
2. ANS: C  PTS: 1  REF: S16
3. ANS: C  PTS: 1  REF: S16
4. ANS: E  PTS: 1  REF: S16
5. ANS: A  PTS: 1  REF: S16
6. ANS: A  PTS: 1  REF: S16
7. ANS: A  PTS: 1  REF: S16
8. ANS: D  PTS: 1  REF: S16
9. ANS: E  PTS: 1  REF: S16
10. ANS: B  PTS: 1  REF: S16
11. ANS: A  PTS: 1  REF: S16
12. ANS: C  PTS: 1  REF: S16
13. ANS: A  PTS: 1  REF: S16
14. ANS: A  PTS: 1  REF: S16
15. ANS: C  PTS: 1  REF: S16
16. ANS: B  PTS: 1  REF: S16
17. ANS: B  PTS: 1  REF: S16
18. ANS: B  PTS: 1  REF: S16
19. ANS: D  PTS: 1  REF: S16
20. ANS: A  PTS: 1  REF: S16
21. ANS: B  PTS: 1  REF: S16
22. ANS: C  PTS: 1  REF: S16
23. ANS: B  PTS: 1  REF: S16
24. ANS: E  PTS: 1  REF: S16
25. ANS: B  PTS: 1  REF: S16
26. ANS: C  PTS: 1  REF: S16
27. ANS: C  PTS: 1  REF: S16
28. ANS: A  PTS: 1  REF: S16
29. ANS: E  PTS: 1  REF: S16-RQ
30. ANS: A  PTS: 1  REF: S16-RQ
31. ANS: C  PTS: 1  REF: S16
32. ANS: C  PTS: 1  REF: S16
33. ANS: A  PTS: 1  REF: S16
34. ANS: B  PTS: 1  REF: S16
35. ANS: C  PTS: 1  REF: S16
36. ANS: D  PTS: 1  REF: S16
37. ANS: C  PTS: 1  REF: S15, S16
38. ANS: B  PTS: 1  REF: S15, S16
39. ANS: B  PTS: 1  REF: S16
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