Name: ___________________________________________

Exam 2--PHYS 151-S14

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

1. When you exhale, your chest cavity gets __________; this causes a _________ pressure in your lungs than outside your body.
   a. bigger, larger
   b. bigger, smaller
   c. smaller, larger
   d. smaller, smaller

2. Superfluids, which are near the absolute zero temperature, have __________.
   a. no pressure gradient
   b. no laminar flow
   c. no viscosity
   d. no density

3. Consider this pipe. Which of these best describes the velocity of the fluid, \( v_2 \)?
   a. \( v_2 > v_1 \)
   b. \( v_2 < v_1 \)
   c. \( v_2 = v_1 \)
   d. \( v_2 = 0 \text{ m/s} \)

4. The iron lung operates based on which of these principles?
   a. Charles’ Law
   b. Conservation of Energy
   c. Boyle’s Law
   d. Ideal Gas Law

5. Which of these is not a characteristic of ideal fluid flow?
   a. laminar
   b. irrotational
   c. steady
   d. nonviscous
   e. all of these are characteristics

6. This figure shows a pressure-measuring device. A dense fluid fills the region shaded gray. Which of these expressions best characterizes the 2 pressures, \( P_1 \) and \( P_2 \)?
   a. \( P_1 < P_2 \)
   b. \( P_1 > P_2 \)
   c. \( P_1 = P_2 \)
   d. \( P_1 = 0 \text{ Pa} \)

7. What part of the eye is continuously replenished?
   a. lens
   b. cornea
   c. retina
   d. vitreous humor
   e. aqueous humor

8. When measuring blood pressure, there are 2 separate measurements. One of these, the diastolic pressure, occurs when ______.
   a. the blood flow stops
   b. the heart relaxes
   c. the heart contracts
   d. the blood flow is constricted

9. Glaucoma is the result of __________.
   a. a high pressure in the aqueous humor
   b. blocked drainage of the vitreous humor
   c. detachment of the retina
   d. none of these
10. In which of these is the rate of blood flow the greatest?
   a. aorta
   b. capillaries
   c. venules
   d. the blood flow is the same all throughout the systemic circuit

11. What is used to measure intraocular pressure?
   a. iron lung
   b. tonometer
   c. cloneameter
   d. sphygmometer

12. The following figure shows a piston filled with an incompressible fluid. A force, $F_1$ is applied to the end, whose cross-sectional area is $A_1$. At the other end of the piston, the cross-sectional area ($A_2$) is one-half of $A_1$. How does $F_2$ compare to $F_1$?

   \[ F_2 = 2F_1 \]
   \[ F_2 = \frac{1}{4} F_1 \]
   \[ F_2 = 4F_1 \]
   \[ F_2 = F_1 \]
   \[ F_2 = \frac{1}{2} F_1 \]

13. Liquids are _____; gases are _____.
   a. compressible; compressible
   b. compressible; incompressible
   c. incompressible; compressible
   d. incompressible; incompressible

14. In physics, pressure is defined as:
   a. Force\cdot Area
   b. Force/Area
   c. Area/Force
   d. undue influence to commit some act

15. Flow rates describes how much of a fluid passes a point in a given time. What are the units of flow rate?
   a. (kg\cdot m)/s
   b. m/s
   c. m^2/s
   d. m^3/s

16. You measure the pressure in your tires to be 35 psi. Which of these is this type of measurement?
   a. normal pressure
   b. atmospheric pressure
   c. absolute pressure
   d. gauge pressure

17. The brain and central nervous system are protected by cerebral spinal fluid (CSF). A condition known as hydrocephalus is the result of _____.
   a. the CSF changing its chemical composition
   b. too much CSF
   c. no CSF
   d. too little CSF

18. Place these in the proper order for blood flow:
   a. venules, capillaries, vena cava, aorta, arterioles
   b. aorta, arterioles, capillaries, venules, vena cava
   c. arterioles, venules, capillaries, vena cava, aorta
   d. aorta, arterioles, venules, capillaries, vena cava

19. 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 radius of the pipe is reduced by half, what is the new flow rate?

   \[ Q = \frac{\pi r^4 \Delta P}{8\eta L} \]
   a. $\frac{1}{2} Q$
   b. $8Q$
   c. $\frac{1}{8} Q$
   d. $\frac{1}{16} Q$
   e. $16Q$
20. The pulmonary circuit ___________.
   a. takes blood from the heart to lungs.
   b. delivers blood to the capillaries.
   c. takes blood from the heart to the body.
   d. takes blood to the brain.
   e. is a racing circuit for bad drivers.

21. According to the Poiseuille equation, a viscous fluid needs ________ to maintain flow.
   a. a constriction of the pipe
   b. a continuous drop in pressure
   c. an increase in height
   d. a lengthening of the path

22. Why is blood flow so much slower in the capillaries than in the aorta?
   a. the combined area of the capillaries is bigger than the aorta
   b. the blood is more viscous
   c. the blood in the capillaries is less dense
   d. the systemic circuit is very long

23. Which of these changes in temperature is smaller?
   a. 1ºF
   b. 1ºC
   c. 1 K
   d. they all represent the same change in temperature

24. Gravitational energy is best described as an energy of
   a. motion
   b. fields
   c. position
   d. chemicals

25. Energy is defined as the capacity to do _______.
   a. power
   b. force
   c. work
   d. joules

26. Which of these is an appropriate unit for energy?
   a. slug
   b. N/m
   c. $\text{kg} \frac{\text{m}^2}{\text{s}^2}$
   d. Js
   e. all of these are units for energy

27. The Fahrenheit scale is based on the freezing point of water and which of these other temperatures?
   a. the deprivation of free radicals
   b. the boiling point of water
   c. the freezing point of ice
   d. absolute zero

28. Friction almost always does __________ work.
   a. positive
   b. negative
   c. zero

29. You move a box with a mass of 10 kg up a stairwell that is 5 m high. How much work have you done on the box?
   a. 5 J
   b. 500 J
   c. 50 J
   d. 10 J
   e. 2 J

30. You drop a ball from a height of 5 m. What is its velocity when it reaches the ground?
   a. 50 m/s
   b. 5 m/s
   c. 2 m/s
   d. 10 m/s
   e. there is not enough information

31. An engine requires 80 J of energy to lift a 2 kg object 1 m in height. What is the engine’s efficiency?
   a. 120%
   b. 50%
   c. 25%
   d. 75%
   e. 30%
32. A 1 kg block reaches a speed of 2 m/s in just 4 s. What is the power expended?

a. 4 W  
b. 1 W  
c. 0.5 W  
d. 2 W  
e. 8 W

33. Power is best described as:

a. kinetic energy + potential energy  
b. energy/time  
c. work  
d. work/energy  
e. energy*time

34. An object moves at a constant velocity. Which of these best describes the work being done on the object?

a. zero work  
b. positive work  
c. negative work  
d. none of these

35. This figure shows three blocks; each is moving to the right. Which of the forces F is doing negative work?

a. a  
b. b  
c. c  
d. none of these

36. The figure in the previous problem shows three blocks; each is moving to the right. Which of the forces F is doing zero work?

a. a  
b. b  
c. c  
d. none of these

37. Work is given by this equation:

\[ W = Fd \cos \theta \]

What does \( \cos 180^\circ \) equal?

a. 0  
b. 2  
c. -1  
d. 1/2  
e. 1

38. Potential energy refers to _______ energy or the ability to do _______.

a. stored, work  
b. regular, motion  
c. moving, work  
d. acting, power

39. You throw a ball up in the air and it returns to your hand as in this figure. At which position, as the ball is returning to your hand, does it have the most kinetic energy?

a. A  
b. B  
c. C  
d. none of these

40. Which of these is the body temperature of a healthy person?

a. 98°C  
b. 20°C  
c. 37°C  
d. 42°C
41. How much energy is required to raise the temperature of 2 kilogram of water from 37°C to 42°C? (The specific heat of water is 1 kcal/(kg°C); the latent heat of vaporization for water is 500 kcal/kg; the latent heat of fusion for water is 80 kcal/kg.)
   a. 10 kcal
   b. 160 kcal
   c. 5400 kcal
   d. 10,000 kcal

42. A person sweats and 0.1 kg of water evaporates from their skin. How much heat is dissipated through this evaporation? (The specific heat of water is 1 kcal/(kg°C); the latent heat of vaporization for water is 500 kcal/kg; the latent heat of fusion for water is 80 kcal/kg.)
   a. 0.1 kcal
   b. 50 kcal
   c. 80 kcal
   d. 25 kcal

43. Which of these has a higher thermal conductivity?
   a. air
   b. plastic
   c. copper
   d. wood

44. The following describes thermal conduction. The thermal conduction through a material is 2 kcal/s. If the thickness of that material is doubled, what is the new rate of thermal conduction?
   \[ \frac{Q}{I} = k \frac{AA\Delta T}{d} \]
   a. 1 kcal/s
   b. 2 kcal/s
   c. 4 kcal/s
   d. 8 kcal/s
   e. 16 kcal/s

45. Which of these is a means of energy transfer?
   I. conservation
   II. conduction
   III. convection
   IV. reservation
   a. I, II, & III
   b. III & IV
   c. II & III
   d. I & II

46. There are 3 sources of energy from food. These include carbohydrates, _____, & ____.  
   a. sugars, glycogen
   b. proteins, lipids
   c. vitamins, minerals
   d. water, proteins

47. Which of these nutrients provides the most energy per unit mass?
   a. proteins
   b. carbohydrates
   c. sugars
   d. water
   e. lipids

48. What is BMR?
   a. biased metabolic rate
   b. basic metabolic rate
   c. basal metabolic rate
   d. byzantine metabolic rate

49. The BMR of a person is about 70 kcal/hr. What is the minimum number of kcal that person should consume in 24 hours?
   a. 100 kcal
   b. 1700 kcal
   c. 2500 kcal
   d. 4000 kcal

50. Tall, thin people have a higher BMR because...
   a. they have a greater surface area to heat
   b. their heart beats faster
   c. their body temperature is generally higher than others
   d. they have a higher blood pressure due to their height
51. The body’s ability to regulate its temperature is called
   a. calorimetry
   b. homeostasis
   c. vaporization
   d. convection

52. The human body loses most of its heat energy through which of these forms of heat transfer?
   a. radiation
   b. evaporation
   c. convection
   d. conduction

53. Which of these is a way the body produces heat:
   I. Sweating
   II. Shivering
   III. Dilation of blood vessels in the skin
   IV. Increase BMR
   a. I, II, & III
   b. I & IV
   c. II & III
   d. II, III, & IV

54. You are using version A of this exam. Please bubble “A” for this question.
   a. A
   b. B
   c. C
   d. D
MULTIPLE CHOICE

1. ANS: C  PTS: 1
2. ANS: C  PTS: 1
3. ANS: A  PTS: 1
4. ANS: C  PTS: 1
5. ANS: E  PTS: 1
6. ANS: B  PTS: 1
7. ANS: E  PTS: 1
8. ANS: B  PTS: 1
9. ANS: A  PTS: 1
10. ANS: D  PTS: 1
11. ANS: B  PTS: 1
12. ANS: E  PTS: 1
13. ANS: C  PTS: 1
14. ANS: B  PTS: 1
15. ANS: C  PTS: 1
16. ANS: D  PTS: 1
17. ANS: B  PTS: 1
18. ANS: B  PTS: 1
19. ANS: D  PTS: 1
20. ANS: A  PTS: 1
21. ANS: B  PTS: 1
22. ANS: A  PTS: 1
23. ANS: A  PTS: 1
24. ANS: C  PTS: 1
25. ANS: C  PTS: 1
26. ANS: C  PTS: 1
27. ANS: B  PTS: 1
28. ANS: B  PTS: 1
29. ANS: B  PTS: 1
30. ANS: D  PTS: 1
31. ANS: C  PTS: 1
32. ANS: C  PTS: 1
33. ANS: B  PTS: 1
34. ANS: A  PTS: 1
35. ANS: B  PTS: 1
36. ANS: A  PTS: 1
37. ANS: C  PTS: 1
38. ANS: A  PTS: 1
39. ANS: C  PTS: 1
| 40. | ANS: C | PTS: 1 |
| 41. | ANS: A | PTS: 1 |
| 42. | ANS: B | PTS: 1 |
| 43. | ANS: C | PTS: 1 |
| 44. | ANS: A | PTS: 1 |
| 45. | ANS: C | PTS: 1 |
| 46. | ANS: B | PTS: 1 |
| 47. | ANS: E | PTS: 1 |
| 48. | ANS: C | PTS: 1 |
| 49. | ANS: B | PTS: 1 |
| 50. | ANS: A | PTS: 1 |
| 51. | ANS: B | PTS: 1 |
| 52. | ANS: A | PTS: 1 |
| 53. | ANS: D | PTS: 1 |
| 54. | ANS: A | PTS: 1 |