Instructor(s): *S. Obukhov*

PHYSICS DEPARTMENT

PHY 2020 Midterm Exam 3 November 16, 2016

Name (print, last first): _____ Signature: _____

On my honor, I have neither given nor received unauthorized aid on this examination.

YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.

(1) **Code your test number on your answer sheet (use lines 76–80 on the answer sheet for the 5-digit number)**. Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY**. Code your UFID number on your answer sheet.
(2) Print your name on this sheet and sign it also.
(3) Do all scratch work anywhere on this exam that you like. **Circle your answers on the test form.** At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout.
(4) **Blacken the circle of your intended answer completely, using a #2 pencil or blue or black ink**. Do not make any stray marks or some answers may be counted as incorrect.
(5) **The answers are rounded off. Choose the closest to exact. There is no penalty for guessing. If you believe that no listed answer is correct, leave the form blank.**
(6) Hand in the answer sheet separately.

MULTIPLE CHOICE

Choose the one alternative that best completes the statement or answers the question.

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1. About what percentage of molecules in the air make up the atmosphere below a 6-kilometer altitude?

   (1) more than 50%. (2) 40%. (3) 20%. (4) 50%. (5) 30%.

2. When a suction cup sticks to a wall it is

   (1) pushed to the wall by the atmosphere.
   (2) pulled to the wall by the vacuum.
   (3) both of these.
   (4) none of these.
   (5) —

3. A column that extends from sea level to the top of the atmosphere contains a certain mass of air. If the column instead contained the same mass of water, its height would be about

   (1) 10.3 meters. (2) 5.6 kilometers. (3) 3/4 meter. (4) none of these (5) —

4. When a gas in a container is squeezed to half its volume with no change in temperature, the gas pressure

   (1) doubles. (2) halves. (3) remains the same. (4) quadruples. (5) —

5. A car with closed windows makes a left hand turn. A helium-filled balloon in the car moves to the

   (1) left. (2) back. (3) front. (4) right. (5) none of these.

6. Compared to a giant iceberg, a hot cup of coffee has

   (1) higher temperature, but less internal energy.
   (2) a greater specific heat and more internal energy.
   (3) more internal energy and higher temperature.
   (4) —
   (5) none of these

7. When an iron ring is heated, the hole becomes

(1) larger.
(2) either smaller or larger, depending on the ring thickness.
(3) smaller.
(4) neither smaller nor larger.
(5) —

8. It is important that the two metals that compose a bimetallic strip have

(1) different rates of expansion. (2) equal thicknesses. (3) different conductivities. (4) all of these. (5) none of these.

9. If you wish to expand the volume of a sample of water at 4°C,
(A) lower its temperature a bit.
(B) raise its temperature a bit.

(1) either A or B (2) A only (3) B only (4) neither A nor B (5) —

10. Long ago a runaway greenhouse effect transformed the planet

(1) Venus. (2) Mars. (3) Mercury. (4) — (5) all of these.

11. When coal dust is spread on snow on a sunny day

(1) more melting occurs. (2) less melting occurs. (3) no change in melting rate occurs. (4) — (5) —

12. Compared to sea level, water in an open pot in the mountains boils at

(1) a lower temperature. (2) a higher temperature. (3) the same temperature. (4) — (5) none of these

13. When a vapor condenses, energy is
(A) absorbed by the vapor.
(B) released from the vapor.

(1) B only (2) A only (3) both A and B (4) neither A nor B (5) —

14. A refrigerator

(1) transfers internal energy from inside to outside.
(2) produces cold.
(3) transfers heat into cold.
(4) causes internal energy to disappear.
(5) none of these

15. To turn 50 grams of boiling water to steam requires

(1) more than 540 calories. (2) 500 calories. (3) 50 calories. (4) none of these (5) 540 calories.

16. Which will melt more ice when placed on its surface, a kilogram of wood or a kilogram of iron of the same high temperature?

(1) 1 kg of wood. (2) 1 kg of iron. (3) both the same (4) netiehr of these (5) —

17. The minimum amount of steam at 100°C needed to melt 1 gram of 0°C ice is

(1) 0.125 gram. (2) 8 grams. (3) 6.75 grams. (4) 0.148 gram. (5) none of these.

18. The lowest temperature possible in nature is

(1) −273 degrees C. (2) 4 K. (3) 0 degrees C. (4) — (5) none of these

19. Water freezes at atmospheric pressure and a temperature of

(1) all of these. (2) none of these. (3) about 273 kelvin. (4) 0 degrees Celsius. (5) 32 degrees Fahrenheit.

20. If a 10°C piece of iron is heated until it has twice as much internal energy, its temperature will be

(1) 293°C. (2) 566°C. (3) 273°C. (4) 20°C. (5) none of these.

21. As a parcel of air is swept upward, with no heat input or output, its temperature

(1) decreases. (2) remains the same. (3) increases. (4) — (5) —

22. The greater the temperature difference between input and output reservoirs of a heat engine, the

(1) greater the efficiency. (2) smaller the efficiency. (3) both of these. (4) none of these. (5) —

23. The ideal efficiency for a heat engine operating between the temperatures of 227°C and 27°C is

(1) 40%. (2) 88%. (3) 20%. (4) 25%. (5) none of these.

24. Systems alone tend to move toward a state of

(1) more entropy. (2) no entropy. (3) less entropy. (4) none of these (5) —

25. Both a transverse wave and a longitudinal wave have

(1) all of these. (2) wavelength. (3) amplitude. (4) frequency. (5) speed.

26. The frequency of a simple pendulum does NOT depend on

(1) its mass. (2) the acceleration due to gravity. (3) its length. (4) all of these. (5) none of these.

27. The frequency of a certain wave is 10 hertz and its period is

(1) 0.1 seconds. (2) 100 seconds. (3) 10 seconds. (4) none of these. (5) —

28. Sound waves cannot travel in

(1) a vacuum. (2) water. (3) steel. (4) air. (5) —

29. One reason for the higher pitch of your voice after you've inhaled some helium is that sound travels

(1) faster in helium than in air.
(2) slower in helium than in air.
(3) the same speed in helium but with a longer wavelength.
(4) —
(5) —

30. A piano tuner knows that a key on the piano is tuned to the frequency of a test tuning fork when the fork and key struck at same time produce beats of

(1) 0 Hz. (2) 1 Hz. (3) 3 Hz. (4) 2 Hz. (5) 4 Hz.