

Instructor(s): *S. Obukhov*PHYSICS DEPARTMENT  
FINAL EXAM

PHY 2004

December 14, 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.

Specific heat of water: $c = 1\text{cal/g}\cdot^{\circ}\text{C}$	$g = 9.80\text{ m/s}^2$	$G = 6.67 \times 10^{-11}\text{m}^3/\text{kg}\cdot\text{s}^2$
Density of water: $\rho_w = 1\text{ g/cm}^3$	Density of air $1.20\text{ kg/m}^3$	1 atm = $10^5\text{ Pa}$
Heat of fusion for water: $H_f = 80\text{ cal/g}$	Heat of vaporization for water: $H_v = 539\text{ cal/g}$	
Universal gas constant: $R = 8.314\text{ J/mole K}$		

1. To become a negative ion, an atom must
  - (1) gain an electron.
  - (2) lose an electron.
  - (3) gain a proton.
  - (4) lose a proton.
  - (5) —
  
2. Two charges that are separated by one meter exert 1-N forces on each other. If the charges are pushed together so the separation is 25 centimeters, the force on each charge will be
  - (1) 16 N
  - (2) 1 N
  - (3) 8 N
  - (4) 4 N
  - (5) 2 N
  
3. Superconductors are noted for their
  - (1) absence of electric resistance.
  - (2) high electric resistance.
  - (3) low electric resistance.
  - (4) bright colors.
  - (5) low cost.
  
4. An uncharged pith ball is suspended by a nylon fiber. When a positively-charged rubber rod is brought nearby, the pith ball
  - (1) moves toward the rod.
  - (2) moves away from the rod.
  - (3) is unaffected.
  - (4) none of these.
  - (5) —
  
5. Electric potential, measured in volts, is the ratio of electric energy to the amount of electric
  - (1) charge.
  - (2) current.
  - (3) voltage.
  - (4) resistance.
  - (5) none of these.
  
6. If two copper wires of the same length have different thickness, then the thicker wire has
  - (1) less resistance.
  - (2) more resistance.
  - (3) both the same
  - (4) —
  - (5) —

7. One kilowatt-hour is a unit of
- (1) energy.                      (2) voltage.                      (3) resistance.                      (4) power.                      (5) current.
8. A 60-W and a 100-W light bulb are connected in series to a 120-V outlet. Which bulb draws more current?
- (1) both the same                      (2) 100-W bulb                      (3) 60-W bulb                      (4) —                      (5) —
9. A heater draws 20A when connected to a 110-V line. If the electric power costs 20 cents per kilowatt hour, the cost of running the heater for 10 hours is
- (1) \$4.40.                      (2) \$11.00.                      (3) \$0.44.                      (4) \$1.10.                      (5) none of these
10. As more lamps are connected in a series circuit, the overall current in the power source
- (1) decreases.                      (2) increases.                      (3) stays the same.                      (4) —                      (5) —
11. The equivalent resistance of any series of resistors in a circuit is
- (1) none of these.  
(2) always less than the resistance of the lowest resistor.  
(3) often less than the resistance of the lowest resistor.  
(4) usually half the value of the lowest resistor.  
(5) —
12. Magnetic field lines about a current-carrying wire
- A.** circle the wire in closed loops.  
**B.** extend radially from the wire.
- (1) A only                      (2) B only                      (3) both A and B                      (4) —                      (5) neither of these
13. The direction of the force exerted on a moving charge in a magnetic field is
- (1) at right angles to the direction of the motion.  
(2) in the direction of the motion.  
(3) opposite its motion.  
(4) —  
(5) —
14. If a compass is moved from the Northern Hemisphere to the Southern Hemisphere, its magnetic needle will change direction
- (1) hardly at all.                      (2) by 90 degrees.                      (3) by 180 degrees.                      (4) randomly and rapidly.                      (5) —
15. When a magnet is moved to and fro in a wire coil, voltage is induced. If the coil has twice as many loops, the voltage induced is
- (1) half.                      (2) four times as much.                      (3) the same.                      (4) twice.                      (5) none of these.

16. An efficient step-up transformer boosts

**A.** voltage.

**B.** power.

**C.** energy.

- (1) A only      (2) B only      (3) C only      (4) A, B, and C      (5) none of these

17. A step-up transformer steps up voltage by ten times. If voltage input is 120 volts, voltage output is

- (1) 1200 V.      (2) 120 V.      (3) 60 V.      (4) 12000 V.      (5) none of these.

18. If you drop a bar magnet in a vertical copper pipe it will fall slowly because

- (1) it induces a magnetic field in the pipe that resists motion of the magnet.  
(2) of air resistance.  
(3) the copper is a good conductor of both electricity and magnetism.  
(4) of electron repulsion.  
(5) —

19. A hockey puck sliding across the ice finally comes to rest because

- (1) of friction.      (2) it seeks its proper and natural state.      (3) that's just the way it is.      (4) —      (5) —

20. A sheet of paper can be quickly jerked beneath a container of milk without toppling, which best demonstrates

- (1) inertia.      (2) net force.      (3) the difference between force and mass.      (4) —      (5) —

21. Which of the following is a vector quantity?

- (1) none of these      (2) volume      (3) area      (4) mass      (5) —

22. A vehicle undergoes acceleration when it

**A.** changes its direction.

**B.** loses speed.

**C.** loses speed.

- (1) A, B, and C      (2) A only      (3) B only      (4) C only      (5) —

23. A freely-falling watermelon falls with constant

- (1) acceleration.      (2) speed.      (3) velocity.      (4) distances each successive second.      (5) —

24. A 1-kg mass at the Earth's surface weighs

- (1) 10 N.      (2) 1 N.      (3) 12 N.      (4) 5 N.      (5) none of these

25. The speed of a 4-kg ball with a momentum of 12 kg m/s is

- (1) 3 m/s.      (2) 4 m/s.      (3) 48 m/s.      (4) 12 m/s.      (5) none of these

26. A bungee jumper attains a speed of 30 m/s just as the bungee cord begins to stretch. If the period of stretch is 2 s while coming to a halt, the jumper's average deceleration is about
- (1)  $1.5 g$                       (2)  $0.5 g$                       (3)  $2 g$                       (4)  $g$                       (5) —
27. The work done in pushing a TV set a distance of 2 m with an average force of 20 N is
- (1) 40 J.                      (2) 800 J.                      (3) 2 J.                      (4) 20 J.                      (5) 10 J.
28. A 2-kg ball is held 4 m above the ground. Relative to the ground its potential energy is
- (1) 80 J.                      (2) 8 J.                      (3) 32 J.                      (4) 6 J.                      (5) more than 80 J.
29. A motorcycle moving at 50 km/h skids 10 m with locked brakes. How far will it skid with locked brakes when traveling at 150 km/h?
- (1) 90 m                      (2) 30 m                      (3) 50 m                      (4) 10 m                      (5) —
30. The circumference of a bicycle wheel is 2 meters. If it rotates at 1 revolution per second, then its linear speed is
- (1) 2 m/s.                      (2) 6.28 m/s.                      (3) 3.14 m/s.                      (4) 1 m/s.                      (5) 3 m/s.
31. A ring and a disk both at rest roll down a hill together. Which rolls slower?
- (1) ring    (2) depends on the masses    (3) disk    (4) both roll at the same speed    (5) need more information
32. The force of Earth's gravity on a capsule in space increases as it comes closer. When the capsule moves to half its distance, the force toward Earth is then
- (1) four times greater.                      (2) twice.                      (3) three times greater.                      (4) none of these.                      (5) —
33. If you throw a stone horizontally from the top of a cliff, one second after leaving your hand its vertical distance below the top of the cliff is
- (1) 5 m.                      (2) 10 m.                      (3) 15 m.                      (4) —                      (5) —
34. If an elephant grows proportionally to twice its height, the area of its ears would be about
- (1) four times more.                      (2) six times more.                      (3) twice.                      (4) eight times more.                      (5) none of these.
35. A completely submerged object always displaces its own
- A.** weight of fluid.                      **B.** volume of fluid.                      **C.** density of fluid.
- (1) B                      (2) A                      (3) C                      (4) all of these                      (5) none of these

36. If a weighted air-filled balloon sinks in deep water, it will
- (1) be acted on by a continuously decreasing buoyant force.
  - (2) likely burst if water pressure is great enough.
  - (3) likely sink to an equilibrium level before reaching bottom.
  - (4) none of these
  - (5) —
37. When a suction cup sticks to a wall it is
- A.** pulled to the wall by the vacuum.                      **B.** pushed to the wall by the atmosphere.
- (1) B                      (2) A                      (3) both A and B                      (4) neither of these                      (5) —
38. A large block of wood and a smaller block of iron on weighing scales both register 1 ton. Taking buoyancy of air into account, which has the greater mass?
- (1) wood                      (2) iron                      (3) both have the same mass.                      (4) need more information                      (5) —
39. A substance that heats up relatively slowly has a
- A.** low specific heat capacity.                      **B.** high specific heat capacity.
- (1) B                      (2) A                      (3) either of these                      (4) neither of these                      (5) —
40. The ideal efficiency for a heat engine operating between the temperatures 2700 K and 300 K is
- (1) 80%.                      (2) 24%.                      (3) 89%.                      (4) 10%.                      (5) none of these