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PHYSICS DEPARTMENT

PHY 2004 Exam 2 November 4, 2002

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.

DIRECTIONS

(1) **Code your test number on your answer sheet (use 76–80 for the 5-digit number)**. Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY**. Code your student 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. 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 with scratch work most questions demand.
(4) **Blacken the circle of your intended answer completely, using a #2 pencil or <u>blue</u> or <u>black</u> ink**. Do not make any stray marks or the answer sheet may not read properly.
(5) The answers are rounded off. Choose the closest to exact. There is no penalty for guessing.

>>>>>>>>**WHEN YOU FINISH** <<<<<<<<
Hand in the answer sheet separately.

Young modulus of steel	200 GPa
Density of water	1 g/cm^3
Volume expansion coefficient of benzene	$\beta = 1.24 \times 10^{-3}$ /°C
Boltzmann's constant	$k = 1.38 \times 10^{-23}$ J/K
1 atm = 100 kPa	

1. A wheel rotating at 7 rev/s slows down and stops after turning through 85 rev. Assuming uniform deceleration, what was its angular deceleration (in rad/s)?

(1) 1.81 (2) 0.96 (3) 1.25 (4) 1.52 (5) 2.14

2. A steel girder has a cross-sectional area of 150 cm^2. How large a tensile force would be required to lengthen the girder by 0.01 percent (in N)?

(1) 3.0×10^5 (2) 2.5×10^5 (3) 3.5×10^5 (4) 4.0×10^5 (5) 4.5×10^5

3. A certain piece of metal weighs 1.68 N in air and 0.77 N when submerged in water. What is the mass density of the metal (in g/cm^3)?

(1) 1.85 (2) 2.37 (3) 2.54 (4) 2.93 (5) 2.18

4. A gas is confined to a cylinder by a piston. Its original conditions are $P = 3$ atm, $T = 20$°C and $V = V_0$. After compression, $P = 30$ atm and $V = V_0/6$. What is the final temperature of the gas (in °C)?

(1) 215.3 (2) 162.5 (3) 291.7 (4) 83.9 (5) 127.4

5. A certain amount of benzene occupies 500 cm^3 at 10°C. What will its volume be at 35°C (in cm^3)?

(1) 516 (2) 527 (3) 504 (4) 510 (5) 518

6. A phonograph record rotates at a rate of 33 rev/min. How fast is a dust speck on the record moving if it is 12 cm from the axis?

(1) 0.41 m/s (2) 1.2 cm/s (3) 1.6 km/s (4) 4.2 m/s (5) 28 m/s

7. A string holds a 3.0-kg object in a horizontal circle of radius 50 cm while the object moves at a rate of 1.50 rev/sec. What is the tension in the string?

(1) 133 N (2) 540 N (3) 13.2 N (4) 0.015 N (5) 8.5 kN

8. A sphere of radius 10 cm, a solid cylinder of radius 10 cm, a solid cylinder of radius 20 cm, a cylindrical ring of radius 10 cm and a cylindrical ring of radius 20 cm all roll down an incline without slipping. When they reach the bottom of the incline which will have the greatest velocity?

(1) sphere (2) small cylinder (3) small ring (4) both cylinders (5) both rings

9. A sphere of radius 10 cm, a solid cylinder of radius 10 cm, a solid cylinder of radius 20 cm, a cylindrical ring of radius 10 cm and a cylindrical ring of radius 20 cm all roll down an incline without slipping. When they reach the bottom of the incline which will have the least velocity?

(1) both rings (2) sphere (3) large ring (4) large cylinder (5) both cylinders

10. A 2.50 cm internal diameter pipe is standing vertically with its lower end plugged. The pipe is filled with water up to a level so that there is 1200 g of water in the pipe. What is the pressure of the water on the plug at the pipe's lower end?

(1) 24 kPa (2) 240 Pa (3) 2.5 Pa (4) 4.8 Pa (5) 1.4 Pa

11. It is estimated that the sun's interior is at a temperature of 10×10^6 K. What is the average speed of a helium atom ($m = 6.64 \times 10^{-27}$ kg) in a gas at this temperature?

(1) 250 km/s (2) 1.7×10^{-21} m/s (3) 170 km/s (4) 5.4 km/s (5) 75 m/s