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

(1) Code your test number on your answer scansheet (use lines 76–80 for the 5-digit number). Code your name and UFID on your answer sheet. **Do not insert a hyphen or space into your UFID.**

(2) Blacken the circle of your intended answer completely, using a #2 pencil or black pen. Do not make any stray marks, or your sheet may not scan correctly.

(3) Print your name on this exam paper and sign it after reading the “**Honor Code**” statement.

(4) Do all scratch work on this exam and on the scratch paper provided. When you finish, place your scratch paper inside this exam paper and return all the materials to the Proctor. No credit will be given unless the scan sheet, exam paper, and scratch paper are all returned.

(5) Write your test number onto your formula sheet and take it home. It is your record of taking this exam.

(6) For each problem, choose the answer that is closest to exact. (We suggest you work all problems to at least three significant figures.) Assume that given angles are exact.

(7) You may have only the following items on your desk:
   - Calculator (graphing calculator is OK);
   - Five sheets of approved notes (8.5 inch × 11 inch); No other aids are allowed or required;
   - Scratch paper (as provided by proctors);
   - Pen/pencil & eraser;
   - UF Gator-one ID card.

   Other than your calculator and your wristwatch, you may not have any other electronic devices in your sight (no cell phones, PDAs, pagers, iPods, etc.)

(8) All of the problems will be graded and will be tabulated to generate a final score. Therefore, you should submit work for all of the problems.

(9) All work must be shown to receive full credit. Work must be clear and unambiguous. Be sure that you hand your completed work to the Proctor.

(10) Each problem is worth 5 points.

(11) Following the UF Honor Code, your work on this examination must reflect your own independent effort, and you must not have given, nor received, any unauthorized help or assistance.

On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “**On my honor, I have neither given nor received unauthorized aid in doing this assignment.**” If true, please initial here: _____

**DO NOT OPEN EXAM UNTIL INSTRUCTED**
1. In order to receive credit for this problem, you must correctly code ("bubble") both your 8-digit UFID and your 5-digit test number onto your scan sheet and also select the correct response below. Check right now that both numbers are correctly bubbled. Code your UFID as if it were an ordinary 8-digit number and do not insert a blank space or hyphen in the middle.

(1) I have correctly bubbled my UFID and test number.
(2) I don’t think this is important.
(3) I bubbled the wrong test number.
(4) I don’t have time to check.
(5) I bubbled the wrong UFID.

2. Mia Hamm kicked a soccer ball that traveled 30 m. If the ball initially left the ground with a speed of 20 m/s, what was the angle between the initial velocity vector and horizontal ground?

(1) 23.6° (2) 30° (3) 60° (4) 45° (5) 47.3°

3. Over the edge of a 20 m high building, a student throws a ball straight up with a velocity of 6.2 m/s. How long does it take the ball to reach the ground?

(1) 2.75 s (2) 1.48 s (3) 4.9 s (4) 1.38 s (5) 0.6 s

4. (continuation of the preceding problem) How fast is it going when it hits the ground?

(1) 20.75 m/s (2) 430 m/s (3) 6.2 m/s (4) 124 m/s (5) 2.1 m/s

5. A force of 125 N is applied to a full grocery cart whose mass is 35 kg. There is a frictional force of 100 N acting against the motion. What is the acceleration of the cart?

(1) 0.71 m/s² (2) 1.4 m/s² (3) 6.4 m/s² (4) 875 m/s² (5) 8.75 m/s²

6. You push a small car with a force of 500 N at a 30° angle to the horizontal. How much force actually goes into moving the car along the level road?

(1) 433 N (2) 500 N (3) 250 N (4) 350 N (5) 0

7. When a bicyclist’s speed is tripled, by what factor does its kinetic energy change?

(1) 9 (2) 2 (3) 3 (4) 4 (5) Not enough information to tell.

8. A 100 kg piece of ice is floating in water. What mass of ice will be above the water level if the density of the ice is 920 kg/m³?

(1) 8 kg (2) 10 kg (3) 11 kg (4) 13 kg (5) More information is needed to generate an answer.

9. A ball of mass 0.22 kg is moving with a speed of 7.5 m/s in the positive x-direction and collides head-on with a 5.0 kg ball at rest. If the collision is perfectly elastic, what will be the velocities of the two balls after collision? Let the sign designate the positive or negative x-direction, and the velocity of the small ball is listed first.

(1) −6.9 m/s and +0.63 m/s
(2) −7.5 m/s and zero
(3) −0.33 m/s and −0.63 m/s
(4) −0.33 m/s and +0.63 m/s
(5) −6.9 m/s and +0.02 m/s
10. How much heat is required to heat 5 liters of water from 20°C to steam (water vapor) at 100°C? You may wish to know some of the following properties of H₂O: latent heat of vaporization is 538 kcal/kg; specific heat of liquid water is 1.00 kcal/(kg °C); specific heat of water vapor (steam) is 0.48 kcal/(kg °C); and the density of liquid water is 1.0 g/cm³.

(1) 3090 kcal (2) 400 kcal (3) 2690 kcal (4) 240 kcal (5) 3330 kcal

11. What is the period (in minutes) of a satellite orbiting 100 km above the surface of the Earth? You may wish to know that the radius and the mass of the Earth are 6.4 × 10⁸ km and 6 × 10²⁴ kg, respectively.

(1) 87 min (2) 92 min (3) 78 min (4) 83 min (5) None of the possible choices are correct.

12. At the threshold of my hearing, I can hear my cat walking on my hardwood floors at a distance of 3 m. What will be the intensity level of 10 cats of the same size?

(1) 10 dB (2) 1 dB (3) 30 dB (4) 3 dB (5) 14.8 dB

13. A proton (m = 1.67 × 10⁻²⁷ kg) is suspended at rest in a uniform electric field E. Take into account gravity (consider it to be pointing “DOWN”) and determine E.

(1) 1.02 × 10⁻⁷ N/C and directed UP
(2) 5.6 × 10⁻¹¹ N/C and directed DOWN
(3) 5.6 × 10⁻¹¹ N/C and directed UP
(4) 1.02 × 10⁻⁷ N/C and directed DOWN
(5) A proton cannot be stabilized under these conditions.

14. A massless frame in the shape of a square with 2 m sides has a 1 kg mass at each corner. What is the moment of inertia of the four masses about an axis through one of the masses on the corner with the axis perpendicular to the plane of the square? The answer is in units of (kg · m²).

(1) 16 (2) 12 (3) 10 (4) 8 (5) 4

15. The ends of a cylindrical steel rod are maintained at two different temperatures. The rod conducts heat from one end to the other at a rate of 10 cal/s. At what rate would a steel rod twice as long and twice the diameter conduct heat between the same two temperatures?

(1) None of the values listed are correct. (2) 10 cal/s (3) 5 cal/s (4) 40 cal/s (5) 80 cal/s

16. A dentist holds a concave mirror of radius of curvature 5.0 cm at a distance of 2.0 cm from a cavity in a tooth. The image of the cavity is

(1) virtual and located 10.0 cm in back of the mirror.
(2) real and located 10.0 cm in front of the mirror.
(3) virtual and located 5.0 cm in back of the mirror.
(4) real and located 5.0 cm in front of the mirror.
(5) real and located 7.0 cm in back of the mirror.

17. (CONTINUATION) The image of the cavity is also

(1) rightside up and 5 times larger than the cavity.
(2) upside down and 5 times larger than the cavity.
(3) rightside up and 3 times larger than the cavity.
(4) upside down and the same size as the cavity.
(5) rightside up and the same size as the cavity.
18. Three children try to ride a see-saw at the same time. The see-saw is 5 m long and its pivot point is in the middle. The first girl weighs 25 N and sits at the far left, 2.5 m away from the pivot point. The second girl weighs 30 N and sits 1.25 m to the left of the pivot point. If the boy weighs 50 N, how far to the right of the pivot point should he sit to balance the see-saw?

(1) 2.0 m  (2) 2.5 m  (3) 1.25 m  (4) 1.75 m  (5) None of these choices are correct.

19. The index of refraction of zircon is 1.92. What is the critical angle for light passing from air into zircon?

(1) None of these choices are correct.  (2) 24°  (3) 31°  (4) 42°  (5) 17°

20. A circuit consists of two parallel resistors, one is 10 Ω and the other is 25 Ω, connected to a 10 V battery. What is the voltage across the 25 Ω resistor?

(1) 10 V  (2) 25 V  (3) 2.5 V  (4) 0.29 V  (5) None of these choices are correct.

THE FOLLOWING QUESTIONS, NUMBERED IN THE ORDER OF THEIR APPEARANCE ON THE ABOVE LIST, HAVE BEEN FLAGGED AS CONTINUATION QUESTIONS: 17