Instructor(s): *C. Parks*

PHYSICS DEPARTMENT
PHY2053, Summer 2014   EXAM 1 – Got to catch 'em all!   June 11, 2014

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 <u>blue</u> or <u>black</u> 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.

<u>Given Information:</u>
$g = 9.80$ m/s^2 $G = 6.67 \times 10^{-11}$ Nm^2/kg^2 1 kg = 1000 g   1 m = 100 cm
1 hour = 60 minutes   1 minute = 60 seconds   1 rev = 2π radians

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1. In lecture, I showed that the acceleration due to gravity (g) is proportional to the mass of the Earth and inversely proportional to the square of its radius. The same relationship holds for other planets, but their "g" will be different and the same object will have a different weight on a different planet. Snorlax weighs 4510 N on Earth. What is his weight on Jupiter if Jupiter's radius is 11 times the Earth's and Jupiter's mass is 320 times the Earth's?

   (1) 12,000 N   (2) 130,000 N   (3) 3,800,000 N   (4) 42,000,000 N   (5) None of these.

2. Snorlax is 2.1 m tall and has a mass (m) of 460 kg. Assume that he can be approximated as a sphere. The volume of a sphere is $V = 4\pi r^3/3$ where r is the radius of the sphere. Find the density of Snorlax. The density (ρ) is $\rho = m/V$. (Hint: use the height as the diameter (not the radius) of Snorlax.)

   (1) 0.095 g/cm^3 (2) 95 g/cm^3 (3) 0.012 g/cm^3 (4) 12 g/cm^3 (5) None of these.

3. After yet another failed attempt to capture Pikachu, Team Rocket attempts to escape in their balloon. They fly east because of the wind. The first part of the trip is at 20 ft/s for 2 minutes. Then they fly for 15 ft/s for 200 s. Finally they fly at 9 ft/s for 3 minutes. What is Team Rocket's average speed?

   (1) 14 ft/s   (2) 15 ft/s   (3) 16 ft/s   (4) 17 ft/s   (5) None of these.
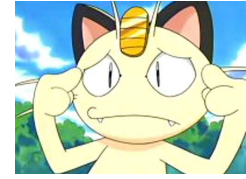
4. Once again, Brock has seen a girl and is immediately in love. She is driving at a constant 20 m/s when she passes him. He starts out after her and catches up to her after traveling 300 m. Assuming Brock starts at the instant she is beside him, what constant acceleration does he need? Assume, also, that Brock was traveling at 5 m/s in the same direction she was traveling when she passed him.

   (1) 2.0 m/s^2 (2) 2.7 m/s^2 (3) 1.5 m/s^2 (4) 3.0 m/s^2 (5) None of these.

5. Meowth slips and falls into a deep well. Jessie and James hear the splash 3.9 seconds later. How deep is the well? The speed of sound is 340 m/s. Assume Meowth falls from rest.

   (1) 67 m   (2) 75 m   (3) 1300 m   (4) 86 m   (5) None of these.

6. Team Rocket's escape balloon is 85 m up. Ash calls for Squirtle to use his watergun attack to hit the balloon. To amplify the attack, Ash tells Squirtle to use a 20-m long tube pointing vertically toward the balloon. While the water is in the tube, it accelerates upward at 30 m/s^2. When the water leaves the tube, the water accelerates downward at g. What is the water's speed when it hits Team Rocket's balloon?
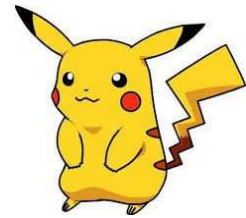
   (1) None of these.   (2) 5.0 m/s   (3) 10 m/s   (4) 15 m/s   (5) 20 m/s

7. Ash yells, "Pikachu, go!" Pikachu runs 12 m at 45° N of E and then runs 15 m at 20° W of N. How far is Pikachu from his starting point?

   (1) 23 m
   (2) 27 m
   (3) 26 m
   (4) 36 m
   (5) None of these.

8. Once again, Ash yells, "Pikachu, go!" Again, Pikachu runs 12 m at 45° N of E and then runs 15 m at 20° W of N. This time Psyduck, confused as always, walks 6 m due S. Both Pokemon start out together. How far apart are they now?

   (1) 29 m
   (2) 33 m
   (3) 32 m
   (4) 17 m
   (5) None of these.

9. Ponyta and Rapidash are standing together. Suddenly, Ponyta runs N at 13 m/s and Rapidash runs E at 11 m/s. What is the velocity of Ponyta as seen by Rapidash?

   (1) 17 m/s at 40° W of N
   (2) 17 m/s at 40° E of N
   (3) 24 m/s at 40° W of N
   (4) 24 m/s at 40° E of N
   (5) None of these.
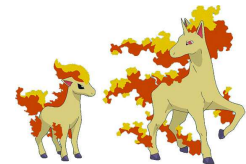
10. Scyther jumps horizontally from a 4-m high wall with a speed of 4 m/s. How far from the base of the wall does he hit the ground? The ground is level.

   (1) 3.6 m
   (2) 1.0 m
   (3) 1.6 m
   (4) 2.8 m
   (5) None of these.

11. While standing in a level field, Ash sees a Caterpie and decides to catch it with a Pokeball. The Caterpie is 11 m from Ash. If Ash throws the Pokeball at 14.3 m/s, what angle should he throw it at to catch the Caterpie? Assume that the ball is thrown from the ground and the Caterpie is also on the ground.

(1) 74°   (2) 45°   (3) 34°   (4) 24°   (5) None of these.

12. Misty knows her physics, especially Newton's laws of motion. "In an interaction between two objects, each object exerts a force on the other. These two forces are equal in magnitude and opposite in direction." Which law is this?

(1) Newton's third law
(2) Newton's second law
(3) Newton's first law
(4) Newton's law of universal gravitation
(5) None of these.

13. A 56-kg Scyther jumps up. If his acceleration off the ground is 4.1 m/s^2, what is the force pushing him up?

(1) 780 N   (2) 230 N   (3) 550 N   (4) 320 N   (5) None of these.

14. While running 4.1 m/s, a 30-kg Raichu slips, falls, and slides to a stop. The coefficient of kinetic friction between Raichu and the level floor is 0.3. For how long did he slide?

(1) 1.4 s   (2) 0.42 s   (3) 2.2 s   (4) 1.0 s   (5) None of these.

15. A 300-kg Golem, 90-kg Charizard, and a 50-kg Hitmonlee stand at the top of a ramp inclined at $\theta = 25°$. All three Pokemon have a coefficient of static friction of 0.6 on the ramp, and they are initially at rest. Which Pokemon will slide down the ramp?
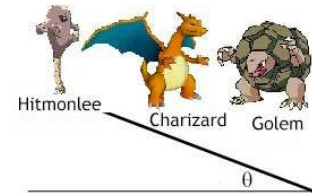
(1) None   (2) Golem   (3) Charizard   (4) Hitmonlee   (5) All three

16. A 300-kg Golem and a 160-kg Arcanine are on two frictionless inclined planes as shown. What is the angle θ needed to keep the system at rest?
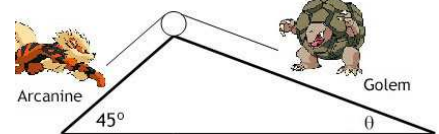
(1) 22°   (2) 45°   (3) 30°   (4) 28°   (5) None of these.

17. James of Team Rocket steals a bicycle and tries to get away. The wheels are 0.4 m in radius and they rotate at 2 rev/s. How far will he travel in 2.25 minutes?

(1) 680 m   (2) 110 m   (3) 340 m   (4) 270 m   (5) None of these.

18. Ash takes Pikachu to a playground and pushes Pikachu on a 3-m long swing. When the swing is at its lowest point, Pikachu's apparent weight is 3.8 times his actual weight. What is the speed of the swing at its lowest point?

(1) 9.1 m/s   (2) 1.3 m/s   (3) 3.3 m/s   (4) 11 m/s   (5) None of these.

19. Jigglypuff slips and rolls down a hill. His angular acceleration is 4 rad/s^2. If he starts from rest, what will be his linear speed after 10 s? Jigglypuff is 0.5 m tall and can be approximated as a sphere.

(1) 10 m/s   (2) 20 m/s   (3) 15 m/s   (4) 25 m/s   (5) None of these.

20. Starmie has radius 0.30 m. Just before it attacks, it starts to spin. A point on its edge is moving 0.5 m/s and Starmie's angular acceleration is 2.5 rad/s^2. What is the net acceleration of the point on the edge of Starmie?
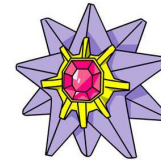
(1) 1.1 m/s^2 (2) 0.83 m/s^2 (3) 0.75 m/s^2 (4) 0.62 m/s^2 (5) None of these.

THE FOLLOWING QUESTIONS, NUMBERED IN THE ORDER OF THEIR APPEARANCE ON THE ABOVE LIST, HAVE BEEN FLAGGED AS CONTINUATION QUESTIONS: 2 8