Instructor(s): *S. Obukhov*

PHYSICS DEPARTMENT

PHY 2020 Midterm Exam 1 September 20, 2017

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.

1. To a fair approximation, Early Greeks knew the

   (1) all of the above
   (2) Earth-Moon distance.
   (3) size of the Moon.
   (4) size of Earth.
   (5) —

2. Eratosthenes' measurements of Earth's size involved

   (1) all of the above
   (2) a deep well in Syene.
   (3) a pillar's shadow in Alexandria.
   (4) surveying the distance between Alexandria and Syene.
   (5) —

3. An educated scientific guess is a

   (1) hypothesis.
   (2) theory.
   (3) either of these
   (4) neither of these
   (5) —

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

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

5. A roller-coaster ride with 6 passengers takes 3 minutes. Neglecting friction, a similar ride with 12 passengers aboard would take

   (1) 3 minutes. (2) 18 minutes. (3) 1.5 minutes. (4) 6 minutes. (5) —

6. A moving van with a stone lightly glued to the midpoint of its ceiling smoothly moves at constant velocity. When the glue gives way, the stone falls and hits the floor

   (1) exactly below the midpoint of the ceiling.
   (2) ahead of the midpoint of the ceiling.
   (3) behind the midpoint of the ceiling.
   (4) none of the above
   (5) —

7. Due to inertia, perhaps a railroad train in motion should continue moving indefinitely when its engine is turned off. This is not observed because railroad trains

   (1) encounter opposing forces.
   (2) ride on straight tracks.
   (3) aren't massive enough.
   (4) are too heavy.
   (5) —

8. Two students engaged in a tug-of-war each pull a rope in opposite directions with a force of 400 N. The net force on the rope is

   (1) zero and rope tension is 400 N.
   (2) zero and rope tension is 800 N.
   (3) 400 N and rope tension is also 400 N.
   (4) 400 N and rope tension is 800 N.
   (5) —

9. The net force on any object in equilibrium is

   (1) zero.
   (2) less than its weight.
   (3) non-zero when motion is involved.
   (4) equal to its weight.
   (5) —

10. If a car increases its velocity from zero to 60 m/s in 10 seconds, its acceleration is

    (1) 6 m/s^2. (2) 600 m/s^2. (3) 60 m/s^2. (4) 3 m/s^2. (5) —

11. One half second after starting from rest, a freely falling object will have a speed of about

    (1) 5 m/s.
    (2) 2 m/s.
    (3) 20 m/s.
    (4) 10 m/s.
    (5) none of the above

12. As water drops fall at a steady rate from a leaking faucet they

    (1) get farther apart.
    (2) get closer together.
    (3) remain at a relatively fixed distance from one another.
    (4) —
    (5) —

13. A river 100 m wide flows 1 m/s due south. A boat that travels 1 m/s relative to the water is pointed due east as it crosses from the west bank. Relative to its starting point, the boat travels

(1) 141 m.
(2) 200 m.
(3) more than 200 m.
(4) 100 m.
(5) nowhere.

14. A heavy ball hangs by a string, with a second string attached to its bottom (Figure 4.8 in your book). A quick pull on the bottom string breaks the

(1) bottom string.
(2) top or bottom string equally.
(3) top string.
(4) —
(5) —

15. A heavy block at rest is suspended by a vertical rope. When the block accelerates upward by the rope, the rope tension

(1) is greater than its weight.
(2) is less than its weight.
(3) equals its weight.
(4) —
(5) —

16. A tow truck exerts a force of 3000 N on a car, which then accelerates at 2 m/s^2. What is the mass of the car?

(1) 1500 kg
(2) 500 kg
(3) 3000 kg
(4) 1000 kg
(5) none of these

17. A car traveling at 22 m/s comes to an abrupt halt in 0.1 second when it hits a tree. What is the deceleration of the car?

(1) 220 m/s^2.
(2) 800 m/s^2.
(3) 110 m/s^2.
(4) 880 m/s^2.
(5) need more information

18. A bowling ball and a baseball accelerate equally when falling in a vacuum because

(1) the ratio of their weights to mass is the same.
(2) their velocities are the same
(3) the force of gravity is the same for each in a vacuum.
(4) the force of gravity does not act in a vacuum.
(5) none of the above

19. A skydiver steps from a helicopter and falls for a few seconds until terminal velocity is reached. Thereafter, until he opens his parachute, his acceleration

(1) is zero.
(2) is constant.
(3) increases.
(4) decreases.
(5) none of the above

20. Arnold Strongman and Suzie Small each pull very hard on opposite ends of a rope in a tug-of-war. The greater force on the rope is exerted by

(1) both the same, interestingly.
(2) Suzie, surprisingly.
(3) Arnold, of course.
(4) —
(5) —

21. A car traveling at 100 km/h strikes an unfortunate bug and splatters it. The force of impact is

(1) the same for both. (2) greater on the bug. (3) greater on the car. (4) — (5) —

22. A pair of air pucks on an air table are set in motion when a compressed spring between them is released. If one puck moves with twice the speed of the other, then its mass is

(1) half the mass of the other.
(2) twice the mass as the other.
(3) the same mass as the other.
(4) need more information
(5) —

23. When a cannonball is fired from a cannon, which undergoes the greater acceleration?

(1) the cannonball (2) the recoiling cannon (3) both the same (4) — (5) —

24. A vertical vector of 3 units combined with a horizontal vector of 4 units has a resultant of

(1) 5 units. (2) 7 units. (3) 1 unit. (4) — (5) —

25. A same-size iron ball and wooden ball are dropped simultaneously from a tower and reach the ground at the same time. The iron ball has a greater

(1) momentum.
(2) speed.
(3) acceleration.
(4) all of the above
(5) none of the above

26. Whether a truck comes to a stop by crashing into a haystack or a brick wall, the impulse is

(1) both the same
(2) greater with the haystack.
(3) greater with the brick wall.
(4) —
(5) —

27. A falling 1-N apple hits the ground with a force of about

(1) need more information
(2) 10 N.
(3) 1 N.
(4) 4 N.
(5) 2 N.

28. A piece of putty moving with 1 unit of momentum strikes and sticks to a heavy bowling ball that is initially at rest. Both move with a combined momentum of

(1) 1 unit.
(2) less than 1 unit.
(3) more than 1 unit.
(4) need more information
(5) —

29. Two billiard balls having the same mass and speed roll toward each other. What is their combined momentum after they meet?

(1) zero
(2) twice the sum of their original momentums
(3) half the sum of their original momentums
(4) need more information
(5) —

30. A 2-kg rifle that is suspended by strings fires a 0.01-kg bullet at 200 m/s. The recoil velocity of the rifle is about

(1) 1 m/s.
(2) 0.001 m/s.
(3) 1 m/s.
(4) 0.01 m/s.
(5) none of these