**PHY 2053 FINAL REVIEW**

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This is not a comprehensive study guide, do not use it as your only study material.
Consult your syllabuses for specific learning objectives you need for the final. Good luck!

1. Which of the following is FALSE?
a) The slope of displacement-time graph will give velocity
b) Velocity is defined as the rate of change of distance
c) Distance traveled is given by the area under velocity-time graph
d) An object undergoing uniform circular motion still has an acceleration

2. What is the relationship between speed and velocity?
a) Speed gives both the velocity and the direction of a moving object
b) Velocity gives both the speed and the direction of a moving object
c) Velocity is a technical term for speed
d) Speed and velocity are the same thing

3. What quantity is represented by the area under the velocity vs. time graph?
a) Acceleration
b) Rate of displacement
c) Distance traveled
d) Final position

4. What quantity is represented by the slope of the velocity vs time graph?
a) Displacement
b) Rate of change of displacement
c) Acceleration
d) Direction of traveling

5. True or false? It is physically possible for a slope of velocity vs. time graph to be vertical.
a) Yes
b) No

6. A jogger starts her run from rest and accelerates to her steady pace of 5 mph in 5 s. How long will it take her to reach the end of a 20 yd driveway?
1 mile = 1609 m; 1 yard = 0.914 m; give the answer to 2 sig figs.
a) 9.0 s
b) 4.2 s
c) 3.8 s
d) 1.3 s

7. A plane traveling at the speed of 135 m/s, northbound, is about to land. It usually takes the pilot 10 s to come to a full stop when traveling at that speed. What is the magnitude and direction of its average acceleration during landing?

a) 1.35 $m/s^2$, due north
b) 13.5 $m/s^2$, due south
c) 135 $m/s^2$, due south
d) 12.5 $m/s^2$, due north
e) 13.5 m/s, due south

8. The plane above needs to land on a 1200 m-long runway. Find what distance it will travel as it decelerates. Is a plane crash inevitable?

a) 675 m (no)
b) 725 m (no)
c) 1200 m (can't tell)
d) 1350 m (yes)

9. Which of the following characterizes Projectile Motion?

a) gravity is the only force acting
b) parabolic trajectory, if no air resistance is assumed
c) maximum horizontal displacement is known as range and given by: $R=u^2 \sin(2x)/g$
d) acceleration only along vertical axis
e) All of the above

10. You launch a Coke bottle from a cannon at an angle of 30 deg above the horizontal. The bottle hits the ground 8 seconds later. What is the maximum height it reached?

a) 160 m
b) 110 m
c) 80 m
d) 20 m
e) Not enough information

11. The Moon orbits the Earth in a roughly circular path once per day. What is the magnitude of the Moon's average velocity over a day?

a) 1020 m/s
b) 920 m/s
c) 460 m/s
d) 0 m/s

12. Imagine a satellite orbiting the Earth. Is it true to say that the further away the satellite is from the Earth, the slower it will revolve around it?

a) True
b) False

13. A 750-kg rock is rolling down a 30 m hill. If initial speed is 0, and g = 10 m/s^2, how much work has been done on it?
a) 2.5 kJ
b) 22.5 J
c) 225 kJ
d) 225 J

14. A 40 kg block is sliding down a 25 deg. slope in 7 s, starting from rest. Assume the friction force to be 35 N. Find the net force, acceleration and final velocity.
a) 130 N, 3.3 $m/s^2$, 23 m/s
b) 165 N, 4.1 $m/s^2$, 29 m/s
c) 130 N, 4.1 $m/s^2$, 29 m/s
d) 165 N, 3.3 $m/s^2$, 23 m/s

15. What happens if you quadruple the acceleration of an object?
a) Its momentum quadruples
b) Its internal energy quadruples
c) Its mass halves
d) Its mass quadruples
e) None of the above

16. Which of the following is TRUE? Select all that applies
a) Mass and weight are the same quantity expressed in different units
b) Weight is a force, and mass is an intrinsic property of an object
c) If an object has zero weight, it has no mass
d) If the weight of a body changes, so must its mass
e) Mass describes the amount of matter within that object, and is a measure of its inertia

17. The force is what drives movement in a line. What is then the cause for angular (rotational) motion?
a) Force only
b) Torque only
c) Force and torque
d) Not enough information

18. Which of the following is NOT one of Newton's laws of motion?
a) for every action, there is a reaction with equal and opposite force
b) Resultant force on an object is equal to the rate of change of momentum
c) an object will continue resting or moving uniformly unless acted upon by a force
d) none of the above

19. What is the normal force N acting on a body that slides down an inclined plane, equal to?
a) mg
b) mg sin (θ)
c) mg cos (θ)
d) none of the above

20. When you walk on a floor, which direction does the friction acting on your feet point?
a) Opposite direction of your walk
b) In the direction of your walk
c) You cannot tell

21. Which of the following physical quantities is conserved? Choose all that applies.
a) Force
b) Momentum
c) Energy
d) Mass

22. An Army trainee does 10 pull-ups in 10 s, by pulling himself up and down by the height of Δh. What is the average power supplied by his muscles?
a) mg Δh
b) (2mg Δh)/10
c) 20 mg Δh
d) (20 mg Δh)/ 10

23. Now solve the problem above if the weight of the trainee is 70 kg, and Δh=52 cm. The arms usually make up 10% of body mass and don't get lifted or moved.
a) 750 W
b) 640 W
c) 360 W
d) 65 W

24. True or false? If there is no air resistance, the work done by a pendulum oscillating on a thread is equal both ways as the pendulum only does work against gravity.
a) True
b) False

25. Which of the following describes elastic collisions? Select all that applies
a) Total kinetic energy of colliding objects before is exactly equal the total kinetic energy after
b) Total kinetic energy before is greater than total kinetic energy after
c) Relative speed of the objects before is equal to the relative speed after
d) The objects collide and move in opposite directions with the same speed
e) Not enough information

26. Which of the following characterizes a massless and non-extensible string?
a) The string is strong enough to pull an object with a large mass without tearing
b) It transfers force from one end to another with the same magnitude
c) Neither a) nor b)
e) Both a) and b)

27. A cart weighing 3 kg and moving at 2 m/s, is hit from behind by a cart weighing 4 kg and moving at 4 m/s. What is the final velocity of the collision as they move together after the collision?
a) 3.1 m/s
b) -3.1 m/s
c) 3.0 m/s
d) -3.5 m/s

28. In an explosion, the initial and final momenta of the exploding object are the same and equal to zero.
a) True
b) False

29. A rock is rolling down the slope of Mount Washington. The rock has the mass of 4 kg. What is the height of Mt. Washington if the rock had the kinetic energy of 75.15 kJ upon reaching its foothill at sea level.
a) 1421 m
b) 1800 m
c) 1917 m
d) 3764 m

30. Compare how much work you do by walking vs running three flights of stairs?
a) Running makes for more work
b) Walking and running produce the same work
c) You need to know the height to compare
d) None of the above

31. A 0.5 kg particle moves in circles round a trajectory with a radius of 3 m, at a constant angular speed of $\pi$ rad/s. What is the net torque acting on the particle?
a) 0 Nm
b) $9\pi/2$ Nm
c) $\pi/2$ Nm
d) None of the above

32. What are the conditions for Equilibrium of a system?
a) no net force
b) no net moment

c) no net momentum
d) A and B
e) A, B and C

33. Is there a difference between direction and orientation of a vector?
a) Yes
b) No

34. If an object has non-zero acceleration, its ___ may also be constant.
a) Linear momentum
b) Speed
c) Kinetic energy
d) B and C

35. An ultracentrifuge at the UCF microbiology lab can rotate at 50,000 revolutions per min. A test tube with a bacterial lysate is plugged into the centrifuge 4 cm from the axis of rotation. Find its centripetal acceleration in $m/s^2$.
a) $1.1 \times 10^6$ $m/s^2$
b) $5.4 \times 10^3$ $m/s^2$
c) $7.3 \times 10^8$ $m/s^2$
d) $4.6 \times 10^6$ $m/s^2$
e) None of the above

36. The Moon's acceleration due to gravity, g, is approximately 1/6 of the Earth's. What can you tell about the value of the constant G on its surface, according to Newton's law of gravitation?
a) $G_M = 6G_E$
b) $G_M = G_E/6$
c) $G_M = G_E$
d) $G_M = (G_E)^6$

37. Pluto has approximately 1/500 the Earth's mass, and 1/15 its radius. What is the acceleration of gravity near the surface of Pluto?
a) 4.5 $m/s^2$
b) 18 $m/s^2$
c) 300 $m/s^2$
d) Not enough information

38. A car weighing 200 kg and speeding at 36 m/s hits a median barrier on I-4 West over a period of 11 milliseconds before coming to a stop. What is the impulse of the collision?
a) —3600 Nm
b) +3600 Nm
c) —7200 Nm
d) +395 Nm

39. Which trajectory will a satellite follow after hitting the Earth's escape velocity of 11 km/s?
a) Ellipse
b) Straight line
c) Perfect circle
d) Hyperbola

40. When an object rolls, its acceleration is slower than when it slides.
a) True
b) False

41. Which row has only scalar quantities?
a) Kinetic energy and acceleration
b) Torque and work
c) Velocity and time
d) Force and momentum
e) Temperature and displacement