

Physics Final Review Concepts

Define the following terms and list their units if applicable:

1. speed
2. acceleration
3. gravity
4. velocity
5. instantaneous velocity
6. vector
7. scalar
8. weight
9. range
10. hang time
11. trajectory
12. mass
13. momentum
14. force
15. inertia
16. friction
17. net force
18. free body diagram
19. equilibrium
20. freefall
21. energy
22. power
23. kinetic energy
24. potential energy
25. work
26. distance
27. charge

Answer the following questions:

1. What does the slope of a position time graph represent?
2. What does the slope of a velocity time graph represent?
3. In a vacuum, which would hit the ground first a feather or a penny?
4. If a ball is dropped from a cliff at the same time one is fired horizontally which hits the ground first?
5. What is the acceleration due to gravity on earth (include units)?
6. Explain how an airbag helps save lives in terms of force, impulse and time.
7. Explain how a lightning bolt is formed.

Physics Final Exam
Problem Review

Show all of your work.

$$d=vt$$

$$v= at$$

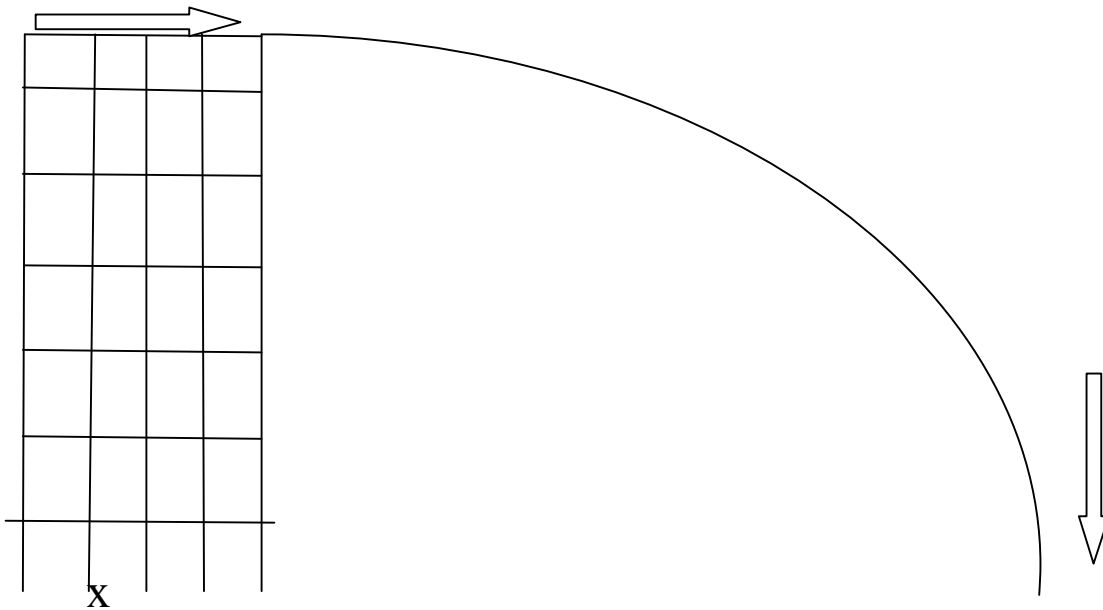
$$d= 1/2at^2$$

$$g=9.8 \text{ m/s}^2$$

1 Dimensional Motion Problems

- 1) An object is moving at a constant speed of 30 m/s for 8 s. How far has it gone?
- 2) An object travels 450 m in 30 s. How fast was it moving?
- 3) An object starts from rest and accelerates at 15 m/s² for 12 s. What is its speed?
- 4) An object starts from rest and accelerates at 4 m/s². How far does it go in 20 s?

2 Dimensional Motion Problems



- 5) An object is fired horizontally off a cliff with a velocity of 700 m/s. It hits the ground 3.5 s later.
 - a) How far from the base of the cliff does the object fall?
 - b) How high is the cliff?

$$d=vt$$

$$v= at$$

$$d= 1/2at^2$$

$$g=9.8 \text{ m/s}^2$$

- 6) A football is kicked to start a game. It reaches a maximum height of 15 m. The horizontal component of its velocity is 40 m/s.
 - a) What is the hang time?
 - b) What is the range of the football?

Momentum Problems

$$\text{mom} = mv \quad Ft = \Delta \text{mom}$$

- 7) A 1400 kg car is moving at 30 m/s. What is its momentum?
- 8) If the momentum of a 3 kg toy boat is 51 kg m/s, what is the speed of the toy boat?
- 9) A 25 kg object is accelerated from rest to a speed of 30 m/s in a time of 15 s. What force was applied?
- 10) The ion thrusters on a space ship provide 7500 N of force for 95 s. If the spaceship has a mass of 25,000 kg and starts at rest, what will its final velocity be?
- 11) A 5 kg ball moving at 10 m/s hits a 10 kg ball which is at rest. After the collision, the 5 kg ball comes to a rest. What is the speed of the 10 kg ball?
- 12) A 1500 kg car moving at 30 m/s hits a 900 kg car at rest. If they stick together after the collision, what is their speed?

Newton's Laws Problems

$$w = mg \quad g = 9.8 \text{ m/s}^2 \quad F = ma \quad \text{Friction} = F_n \mu$$

13) What is the weight of a 30 kg object?

14) A 30 N force of friction acts on a box which is being pushed across the floor. A 90 N force is applied to the object. What is the net force acting on the box?

15) A 10 N force of friction acts against a sled being pulled on the snow. The net force was 40 N. What was the applied force?

16) An 80 N net force is applied to a 20 kg object. What is its acceleration?

17) A 300 N force is applied to an object and a 110 N force of friction works against it. If the object has a mass of 35 kg, what is its acceleration?

18) An object has a friction force of 70 N. If $\mu = 0.4$, what is the normal force?

Work, Power and Energy Problems

$$W = fd \quad w = mg \quad P = W/t \quad KE = \frac{1}{2} mv^2 \quad PE = mgh$$

- 19) Two students use a force of 250 N to push a stalled car 75 m across a parking lot. How much work did the students do on the car?

- 20) How much work is done on a 20 kg box if it is raised 12 m?
- 21) A 150 N force is used to move a mass 30 m in 40 s. How much power was used?
- 22) A 5 kg object is held 20 m above the ground. What is its potential energy?
- 23) A 1450 kg car is moving at 20 m/s. What is its kinetic energy?
- 24) A 50 kg object has a potential energy of 19,600 J. How high off the ground is it?
- 25) A 60 kg snowboarder starts from rest on a mountain that is 90 m high. When the snowboarder has reached the ground, how fast are they going?

$$KE = (1/2)mv^2 \quad W = \Delta KE \quad W = fd$$

- 26) A 40 kg object is brought from rest to a speed of 20 m/s. How much work was done on the object?
- 27) 4000 J of work is done on a 100 kg object moving at 5 m/s. What is the object's new speed?

Answers: 1) 240 m 2) 15 m/s 3) 180 m/s 4) 800 J 5a) 2,450 m b) 60 m
 6a) 3.5 s b) 140 m 7) 42,000 kg m/s 8) 17 m/s 9) 50 N 10) 28.5 m/s 11) 5 m/s
 12) 18.75 m/s 13) 294 N 14) 60 N 15) 50 N 16) 4 m/s² 17) 5.4 m/s² 18) 175 N
 19) 18,750 J 20) 2,352 J 21) 112.5 J 22) 980 J 23) 290,000 J 24) 40 m
 25) 42 m/s 26) 8000 J 27) 10.2 m/s