

Physics Midterm Review Sheet 2012 - 2013

Answers

Practice Problems

- 1 Speed is:
 - a a measure of how fast something is moving
 - b the distance covered per unit time
 - c always measured in units of distance divided by time
 - d a rate
 - e **all of these**

- 2 When you look at the speedometer in a moving car, you can see the car's:
 - a instantaneous acceleration
 - b average speed
 - c average acceleration
 - d **instantaneous speed**

- 3 Suppose you travel 20 meters in 4 seconds. Your average speed is:
 - a 8000 m/s
 - b **5 m/s**
 - c 2 m/s
 - d 50 m/s
 - e 0.2 m/s

- 4 If the force acting on an object doubles, what happens to the object's acceleration?
 - a It quadruples
 - b **It doubles**
 - c It halves
 - d It stays the same

- 5 Suppose you are in car going around a curve. The speedometer reads a constant 30 miles per hour. Which of the following is **not** true?
 - a You and the car are accelerating.
 - b Your speed is constant.
 - c Your distance per unit time is constant.
 - d **Your velocity is constant.**
 - e There is a centripetal force acting on the car caused by the road.

- 6 A vector quantity is a quantity that has:
 - a magnitude and time
 - b **magnitude and direction**
 - c time and direction
 - d speed and velocity
 - e speed and time

- 7 When velocity is represented by a vector:
- a the length of the arrow represents the speed
 - b the length of the arrow is drawn to a suitable scale
 - c the direction of the arrow shows the direction of the motion
 - d the vector can be added to another vector to find the resultant
 - e **all of these**
- 8 The vertical velocity of a projectile on Earth:
- a remains constant
 - b **changes at a rate of 10 m/s^2**
 - c changes at a rate of 5 m/s^2
 - d changes, but not at a constant rate
 - e never changes
- 9 The vector component that remains constant during a projectile is:
- a the vertical velocity
 - b the time in the air
 - c the speed
 - d **the horizontal velocity**
 - e the height
- 10 Acceleration is defined as:
- a the measure of how fast something is moving
 - b the distance covered per unit time
 - c **the rate at which velocity is changing with respect to time**
 - d the time it takes to move from one speed to another
 - e the time it takes to move from one place to another
- 11 When a person weighing 250-N sits on the floor, the floor exerts an upward force on the person of:
- a 5000 N
 - b 1000 N
 - c 500 N
 - d **250 N**
 - e 50 N
- 12 A 10-N force and a 30-N force act in opposite directions. What is the net force on the object?
- a 50 N
 - b 40 N
 - c 30 N
 - d **20 N**
 - e 10 N
- 13 A 10-N force and a 30-N force act in the same direction. What is the net force on the object?

- f 50 N
- g 40 N
- h 30 N
- i 20 N
- j 10 N

14 The Law of Inertia applies to:

- k moving objects
- l objects at rest
- m both moving and nonmoving objects
- n none of these

15 As it falls from the top of a cliff in a vacuum, a rock's velocity _____ and its acceleration _____ due to gravity.

- o increases, increases
- p decreases, decreases
- q stays the same, increases
- r increases, stays the same
- s increases, decreases

16 Forces always occur:

- a. when velocities are constant
- b alone
- c in pairs
- d in triplets
- e. in the same direction

17 Which has more mass, a kilogram of feathers, a kilogram of iron, or a kilogram of apples?

- a the feathers
- b the iron
- c the apples
- d none, they are equal

18 The acceleration produced by a net force on an object is:

- a directly proportional to the size of the net force
- b in the same direction as the net force
- c inversely proportional to the mass of the object
- d all of the above

19 An unfortunate bug splatters against the windshield of a moving car. Compared to the acceleration of the car by the bug, the acceleration of the bug by the car is:

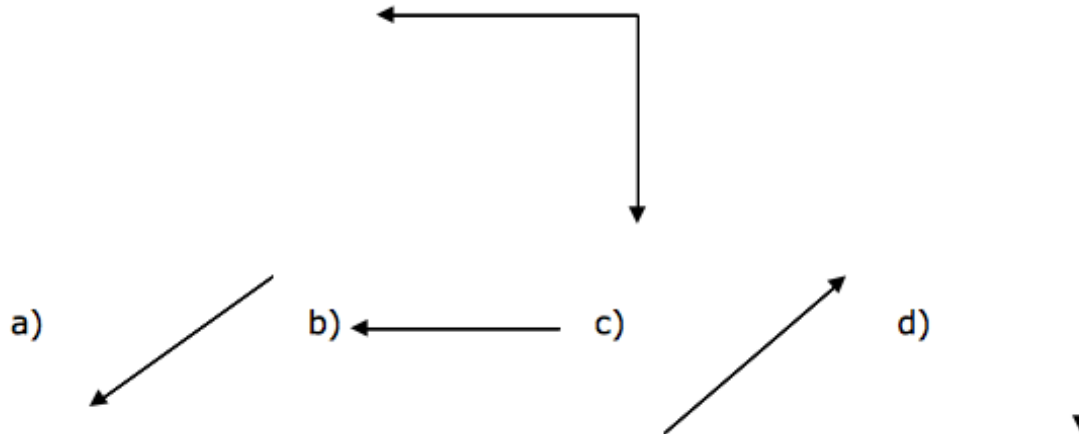
- a larger
- b smaller
- c the same

- 20 In order for an object to have kinetic energy, it must be:
- a **moving**
 - b at rest
 - c above the ground
- 21 In order for an object to have potential energy, it must be:
- a moving
 - b at rest
 - c **above the ground**
- 22 A rock is lifted to a certain height giving it 100-J of potential energy. It falls until it reaches a point just above the ground. At this point, how much kinetic energy does it have?
- a 400 J
 - b 300 J
 - c 200 J
 - d **100 J**
 - e 50 J
- 23 If you whirl a rock on the end of a string and the string suddenly breaks, the rock will:
- a fly directly away from you.
 - b fly directly toward you
 - c **fly off, tangent to its circular path**
 - d spiral away from your hand
24. A leaf falls from a tree and lands on a bench. Identify the force which is in reaction (reaction force) to the weight of the leaf.
- a. **the force of the bench on the leaf**
 - b. the force of the leaf on the bench
 - c. the force of the Earth on the leaf
 - d. the force of the leaf on the Earth

24 Which of the following is a vector quantity?

- a mass
- b **acceleration**
- c temperature
- d energy

25 Which is the resultant vector for the following components?



26 A dolphin can swim 1.85 km/hr. How far does the dolphin travel after 0.60 hours?

- a **1.1 km**
- b 2.5 km
- c 0.63 km
- d 3.7 km

27 A construction worker pushes a wheelbarrow 5.0 m with a horizontal force of 50.0 N. How much work is done by the worker on the wheelbarrow?

- a 10 J
- b 1250 J
- c **250 J**
- d 55 J

28 Objects that are falling toward the Earth move (neglect air resistance):

- a **faster and faster**
- b slower and slower
- c at a constant velocity
- d slower then faster

29 Which of the following does NOT exhibit parabolic motion?

- a a frog jumping from land into water
- b a basketball thrown to a hoop
- c **a flat piece of paper released from a window**
- d a baseball thrown to home plate

30 If it is known that a net force acts on an object, then the object is most likely:

- a at rest
 - b moving with a constant velocity
 - c being accelerated
 - d losing mass
- 31 Which has greater tangential speed, the outer rim of a vinyl record or the inner rim?
- a the outer rim
 - b the inner rim
 - c neither, they both go at the same speed
- 32 Which of the following is the rate at which energy is transferred?
- a potential energy
 - b kinetic energy
 - c mechanical energy
 - d power
- 33 A change in the force of gravity acting on an object will affect its:
- a mass
 - b friction force
 - c weight
 - d field force
- 34 How much power is expended if a 500-N person is lifted 1.0 m in 2.0 seconds?
- a 50 W
 - b 250 W
 - c 500 W
 - d 2500 W
 - e 5000 W
- 35 If you lifted an object to four times the height you lifted another object of the same mass, you have done:
- a the same work
 - b twice the work
 - c half the work
 - d four times the work
- 36 In order for an object to have kinetic energy, it must be:
- a moving
 - b at rest
 - c above the ground
- 37 In order for an object to have potential energy, it must be:
- a moving
 - b at rest
 - c above the ground

- 38 What is the direction of the force that acts on a spinning top?
- a outward
 - b inward
 - c up
 - d down
- 39 A car that travels twice as fast as another identical car when braking to a stop will skid:
- a the same distance
 - b twice as far
 - c half as far
 - d four times as far
- 40 The initial horizontal velocity of a projectile is _____ its final horizontal velocity.
- a greater than
 - b less than
 - c equal to
 - d inversely related to
- 41 A boulder falls from rest at the top of a cliff. What is the boulder's velocity after 3 seconds, assuming $g = 10 \text{ m/s}^2$?
- a 10 m/s
 - b 20 m/s
 - c 30 m/s
 - d 40 m/s
 - e 90 m/s
- 42 How far will the same boulder fall after 5 seconds?
- a 5 m
 - b 20 m
 - c 50 m
 - d 125 m
 - e 250 m

- 43 How much does a 1-kg bag of nails weigh?
- a 20 N
 - b 10 N
 - c 7 N
 - d 5 N
- 44 At what part of a path does a projectile have minimum speed?
- a when it is thrown up
 - b half-way to the top
 - c at the top of its path
 - d when it returns to the ground
- 45 If a horse pulls on a wagon, the wagon will pull back with an equal force, according to Newton's 3rd law. Will the wagon be set into motion?
- a No, because the forces cancel each other .
 - b No, because the combined weight is greater than gravity.
 - c Yes, because there is a net force acting on the wagon.
 - d Yes, because there is a time delay between action and reaction.
 - e It cannot be determined.
- 46 Suppose you are in car going around a curve. The speedometer reads a constant 30 miles per hour. Which of the following is not true?
- a You and the car are accelerating.
 - b Your speed is constant.
 - c Your distance per unit time is constant.
 - d Your velocity is constant.
 - e There is a centripetal force acting on the car caused by the road.
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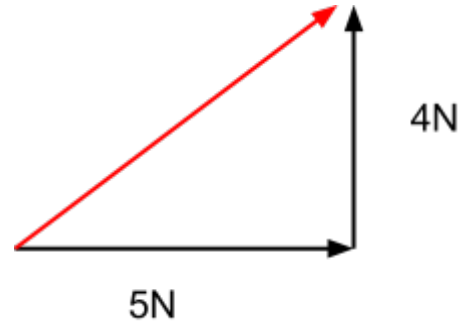
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Open ended Problems

- 1 What is the resultant force of a 4-N force acting vertically and a 5-N force acting horizontally? (You may draw this to scale)

$$a^2 + b^2 = c^2$$
$$25 + 16 = 41 = c^2$$
$$c = \sqrt{41} = 6.4\text{N}$$

$$\text{angle} = \tan^{-1}(4/5) = 38.7^\circ$$



- 2 Apply Newton's Third Law to a person dropping a ball, identifying action and reaction forces. If the ball exerts a force on the Earth, why doesn't the Earth move? Explain.

Action: earth pulls on the ball

Reaction: ball pulls on the earth

The earth doesn't move because its mass is so much bigger than the ball.

- 3 A car accelerates from rest to 45 m/s in 15 seconds. What is the car's acceleration? Assuming that the car weighs 7500-N, calculate the approximate force acting on the car.

$$a = v/t$$

$$a = 45/15 = 3\text{m/s}^2$$

$$w = 7500\text{N} = mg$$

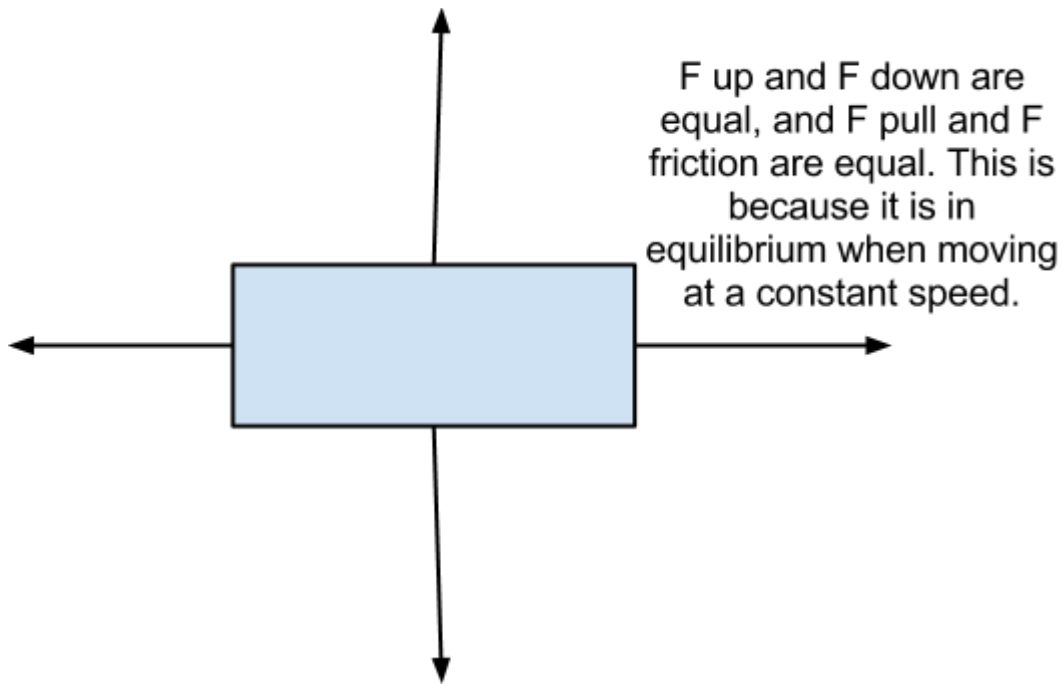
$$7500 = m \cdot 10$$

$$m = 750\text{kg}$$

$$F = ma$$

$$F = 750 \cdot 3 = 2250\text{N}$$

- 4 Draw a free-body diagram for a sled being pulled along the ground at a constant speed. Include the friction between the sled and the ground.



- 5 A child weighs 530-N on Earth. What is her mass? How much would she weigh on the moon, where $g = 1.67 \text{ m/s}^2$?

$$w = mg$$
$$530 = 10m$$
$$m = 53\text{kg}$$

$$w = mg$$
$$w = 53 \cdot 1.67$$
$$w = 88.5\text{N}$$

- 6 Complete the chart below for a projectile that is fired off a cliff on the Earth with a horizontal velocity of 20 m/s.

TIME (sec)	Horizontal Velocity (m/s)	Vertical Velocity (m/s)	Vertical Distance (m)	Horizontal Distance (m)
0	20	0	0	0
1	20	10	5	20
2	20	20	20	40
3	20	30	45	60
4	20	40	80	80
5	20	50	125	100
6	20	60	180	120

- 7 A projectile is launched horizontally off a cliff with a velocity of 25 m/s. The cliff is 125 m high.
- a How long will it take the projectile to hit the ground?

b Where will the projectile land with respect to the base of the cliff?

- 8 A 200 kg mass falls 4.00 m.

- a How much potential energy does it have before it falls?
- b How much potential energy does it have at the bottom, just before it hits the ground?
- c How much kinetic energy does it have at the bottom, just before it hits the ground?
- d How much kinetic and potential energy does the object have when it is at 2.00 m?

- 9 Angie's car coasts to a stop when she takes her foot off the gas. Draw a force diagram



- 10 Sharon exerts a force of 50 N to move a large telescope closer to the window. The mass of the telescope is 20 kg.
- a If the telescope is being moved at a constant velocity across the floor, what is the coefficient of kinetic friction (μ_k) between the telescope and the floor?
 - b How would this compare to the coefficient of static friction (greater than, equal to, or less than)? Explain your answer.