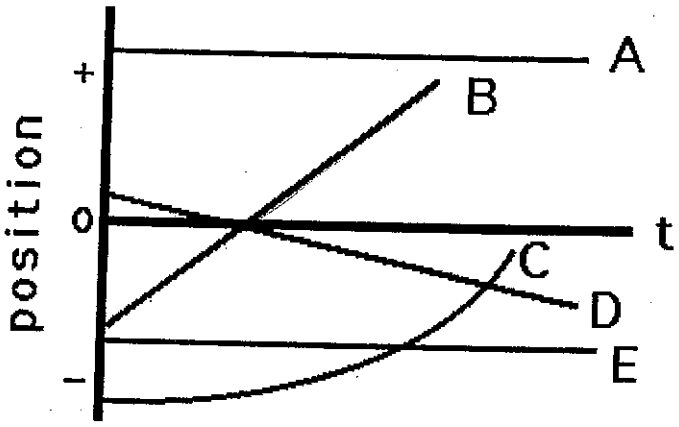
(1)

SC20F

Physics Review Sheet

Name:_____



1) Which object(s) is(are) maintaining a constant velocity?

B & D (constant slope)

2) Which object(s) is(are) not moving?

A & E (no slope)

3) Which object(s) change(s) its direction?

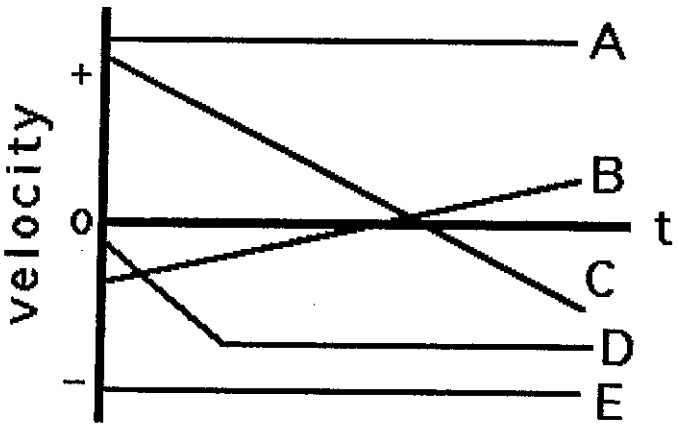
None

4) Which object is traveling fastest?

B - steepest slope

5) Which moving object is traveling slowest?

D - shallowest slope



6) Which object(s) is(are) maintaining its state of motion?

A & E - const. slope (const. speed)
(zero)

7) Which object(s) is(are) accelerating?

C & B - slows, then speeds up opposite direction
D - speeds up then const. speed.

8) Which object(s) is(are) not moving?

None

9) Which object(s) change(s) its direction?

B & C

10) Which accelerating object has the smallest acceleration?

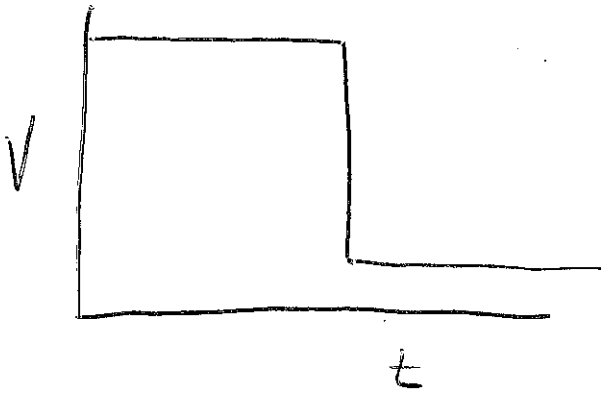
B (look shallowest slope)

11) Which object has the greatest velocity?

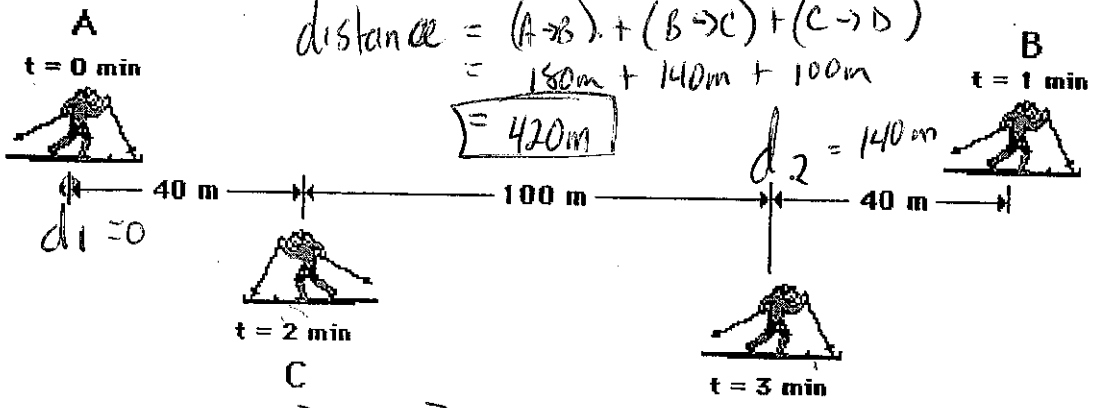
A (or E)

12) Sketch a position-time graph for an object moving in the + direction with constant speed; first a slow constant speed and then a fast constant speed.

13) Sketch a velocity-time graph for an object which first moves with a fast, constant speed in the + direction, and then with a slow constant speed in the + direction.



14) The diagram below shows the position of a cross-country skier at various times. At each of the indicated times, the skier turns around and reverses the direction of travel. In other words, the skier moves from A to B to C to D. Use the diagram to determine the **distance** traveled by the skier and the resulting **displacement** during these three minutes.



distance = (A→B) + (B→C) + (C→D)
= 180m + 140m + 100m
= 420m

$d_1 = 0$

$d_2 = 140\ m$

displacement = $\vec{d} = \vec{d}_2 - \vec{d}_1$ (change in position)

$\Delta\vec{d} = +140\ m$

15) Use the diagram in #14 to determine the **average speed** and the **average velocity** of the skier during these three minutes. = 180 s

Speed = $v = \frac{d}{t} = \frac{420m}{180s} = 2.3\ m/s$

Velocity = $\vec{v} = \frac{\vec{d}}{t} = \frac{+140m}{180\ s} = +0.78\ m/s$

16) An object is initially moving at -8 m/s. Four seconds later the object comes to rest. Determine the acceleration of the object.

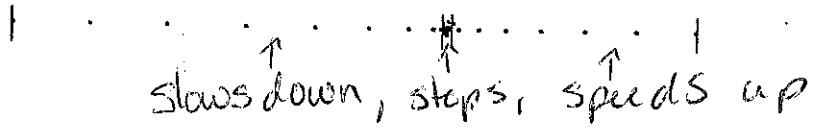
$$a = \frac{V_2 - V_1}{\Delta t}$$

$$= \frac{0 - (-8\,m/s)}{4s}$$

$$= +2\,m/s^2$$

17) Ticker tape diagrams are sometimes referred to as oil drop diagrams. Imagine a car with a leaky engine that drips oil at a regular rate. As the car travels through town, it would leave a trace of oil on the street. That trace would reveal information about the motion of the car. Renatta Oyle owns such a car and it leaves a signature of Renatta's motion wherever she goes. Analyze the three traces of Renatta's ventures as shown below. Assume Renatta is traveling from left to right. Describe the characteristics of Renatta's motion during each section of the diagram.

1.



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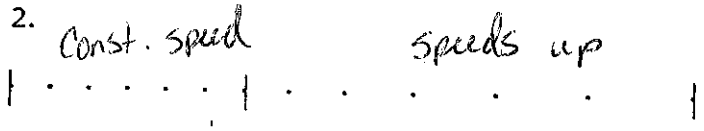

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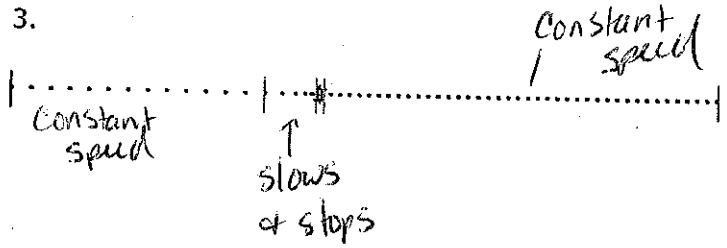
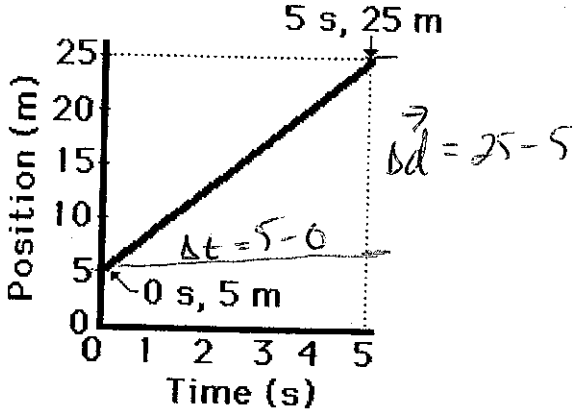


18) Determine the velocity (i.e., slope) of the object as portrayed by the graph below.

$\vec{v} = \frac{\Delta \vec{d}}{\Delta t}$

$= \frac{25m - 5m}{5s - 0s}$

$\vec{v} = \frac{+20m}{5s} = +4 m/s$

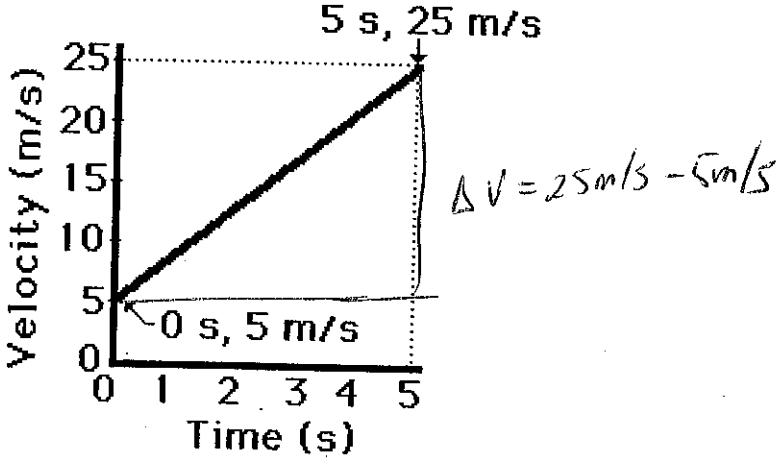


19) Consider the velocity-time graph below. Determine the acceleration (i.e., slope) of the object as portrayed by the graph.

$\vec{a} = \frac{\Delta \vec{v}}{\Delta t}$

$= \frac{25 m/s - 5 m/s}{5 s}$

$= +4 m/s^2$



20) Mac and Tosh are arguing in the cafeteria. Mac says that if he throws his jello with a greater speed it will have a greater inertia. Tosh argues that inertia does not depend upon speed, but rather upon mass. With whom do you agree? Why?

21) Ben Tooclose is being chased through the woods by a bull moose which he was attempting to photograph. The enormous mass of the bull moose is extremely intimidating. Yet, if Ben makes a zigzag pattern through the woods, he will be able to use the large mass of the moose to his own advantage. Explain this in terms of inertia and Newton's first law of motion.

the moose has lots of mass, so it has lots of inertia. it is hard for it to change its motion.

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22) If the forces acting upon an object are balanced, then the object
A. must not be moving.
B. must be moving with a constant velocity.
C. must not be accelerating. ← Best answer! (Bad Question)
D. none of the above.

23) Calculate the total stopping distance for a car that is traveling at 100 km/h (27.8 m/s) on a icy road (k = 0.15). The reaction time of the driver is 1.5 s.

Reaction distance: $v = \frac{d}{t}$

$27.8\,m/s = \frac{d}{1.5\,s}$

$d = (27.8\,m/s)(1.5\,s)$

$d = 41.7\,m$

Braking distance: $d = kv^2$

$= (0.15)(27.8\,m/s)^2$

$d = 115.93\,m$

Total = $115.9\,m + 41.7\,m = 157.6\,m$

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Fill in the blanks:

1. Aristotle said that natural motion was toward the center of the Earth.

2. You can find velocity from a position - time graph.

3. Newton's first law concerns inertia

4. Newton's third law concerns situations such as a rocket lifting off; it states that for every action there is an equal and opposite reaction.

5. A Vector is a measurement that includes a direction as well as a quantity.

6. A normal unit for acceleration is m/s^2. (abbreviations are OK)

7. An object travelling to the right would have a positive velocity

8. This is a vector measurement that shows how far an object is from a certain point displacement ($\vec{d}$)

9. Acceleration shows a change in velocity over time.

10. The instantaneous velocity can be found using a tangent line on a curved displacement-time graph.

11. When a ball roles down a ramp, it will not roll forever because friction will act on it slowing it down.

12. Two vehicles end up at the same point after the same amount of time; both vehicles would have the same Average velocity regardless of the fact that they may have had different speeds during the trips.

13. A displacement time graph with a straight line slope indicates that the object is travelling with a Constant velocity.

Problems (Show work!!! Use proper notation!! Watch your units!!)

1. A car leaves the start of a race at 3.6 s; it finishes the race at 2minutes. What is Δt for the race (in seconds)?

$2\text{min} = 120\text{ seconds} - 3.6\text{ s} = 116.4\text{ s}$

2. Convert 125 Km/h into metres per second.

$125\text{ km/hr} \div 3.6 = 34.7\text{ m/s}$

3. An object travels from -15 m to 28m at a velocity at .5 m/s. How long does this take?

d_1 d_2

$\vec{V} = \frac{\Delta d}{\Delta t}$

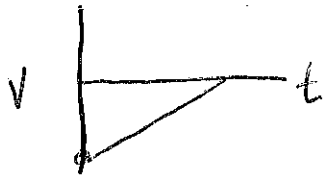
$0.5\text{ m/s} = \frac{(28\text{m}) - (-15\text{m})}{\Delta t}$

$\Delta t = \frac{(28\text{m}) - (-15\text{m})}{0.5\text{ m/s}}$

$\Delta t = 86\text{ s}$

4. Sketch a velocity time graph showing an object starting off travelling left with a positive constant acceleration.

(negative)



V = negative.

a = +ve ∴ slowing down.

5. A runner is at 5 m at the beginning of a race. After 35s the runner is at -98m. What is the runner's average velocity for the distance he ran?

$V = \frac{d_2 - d_1}{\Delta t} = \frac{(-98\text{m}) - (5\text{m})}{35\text{s}}$

$= -2.94\text{ m/s}$

6. A rocket accelerates at 3.35m/s² for 1 minute. What is its final velocity?

$a = \frac{V_2 - V_1}{\Delta t}$

$3.35\text{m/s}^2 = \frac{V_2 - 0}{60\text{s}}$

$V_2 = (3.35\text{ m/s}^2)(60\text{s})$

$V_2 = 201\text{ m/s}$

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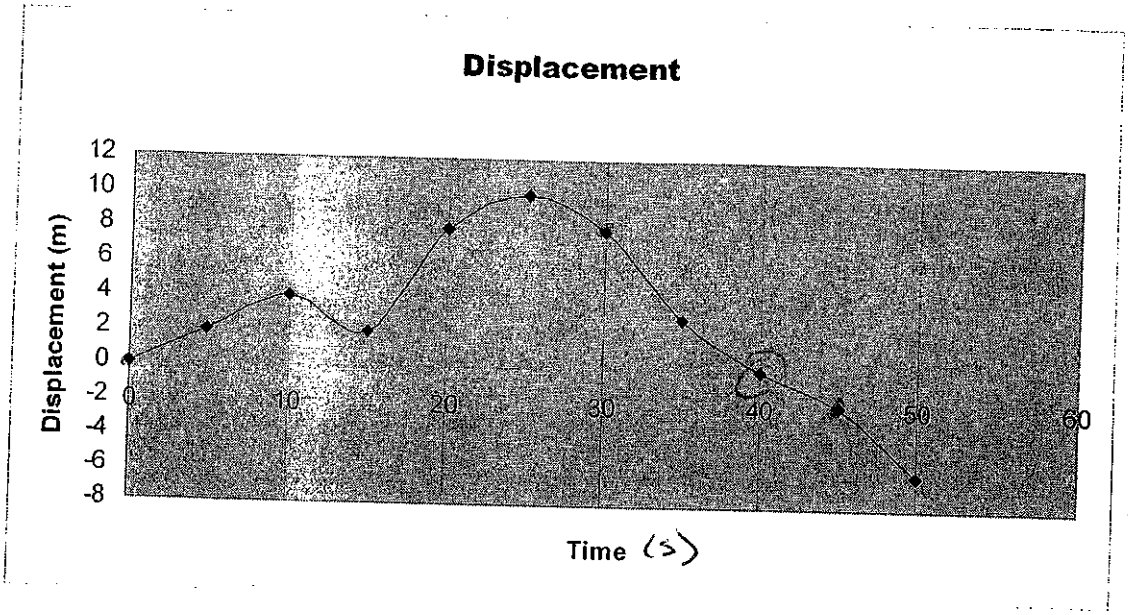

Answer the following questions regarding the above graph:

1. What is this object's maximum distance from centre (in m)?

10 m

2. At what instant(s) in time does the object have a velocity of 0 m/s?

10 s , 15 s , 25 s

3. During what time intervals does the object have a positive velocity?

0 → 10s , 15 → 25s ,

4. What is the object's average velocity between 0 sec. and 25 sec?

$v = \frac{\Delta d}{\Delta t} = \frac{+10m - 0m}{25s} = +0.4\ m/s$

5. What is the object's average velocity between 30s and 45s?

$v = \frac{\Delta d}{\Delta t} = \frac{(\ m) - (\ m)}{45s - 30s} = \frac{-10m}{15s} = -0.67\ m/s$

6. What is the object's instantaneous velocity at 40 s. Feel free to draw on the graph if you need to.

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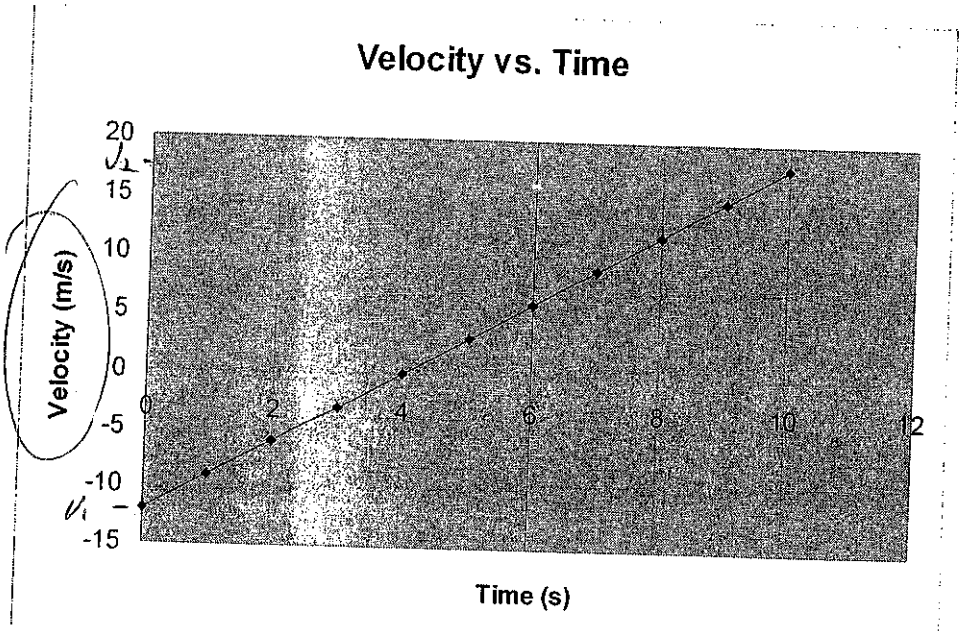


1. What is this object's velocity at 6 seconds?

5 m/s

2. What is this object's average acceleration?

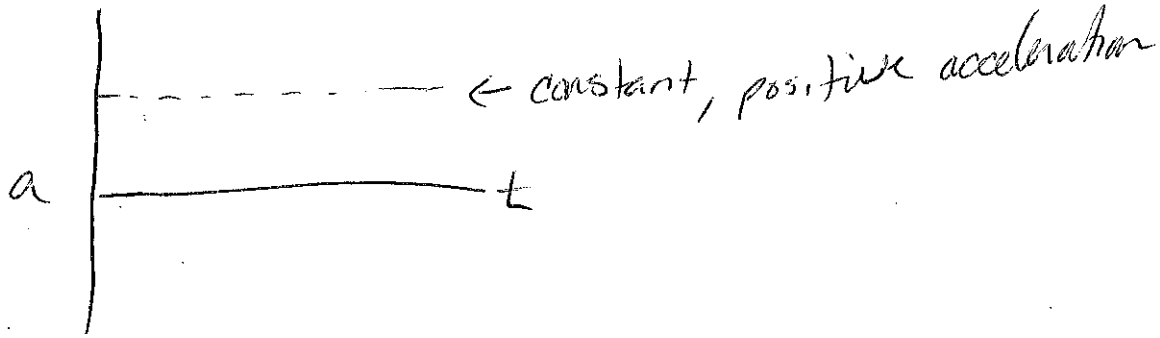
$$a = \frac{\Delta V}{\Delta t} = \frac{V_2 - V_1}{10\,s} = \frac{(+17.5\,m/s) - (-12.5\,m/s)}{10\,s} = \frac{+30\,m/s}{10\,s}$$

$= 3\,m/s^2$

3. During what time interval is the object travelling left?

0 – 3 seconds (negative velocity)

4. Sketch a graph showing what the acceleration-time graph would look like for a graph such as this.



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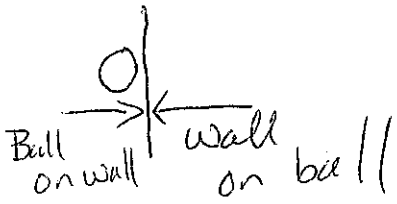
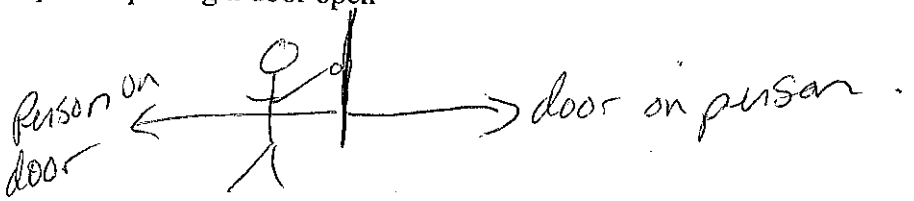
1. Draw a force diagram to show the action and reaction forces for the following situations:

a. a ball hitting a wall



b. a person pulling a door open



2. Name 5 things in a car that reduces the force felt by a passenger during a second collision in a car accident.

- air bags
- seat belts
- crumple zone
- padding (dash)
- Bumpers

etc.

3. Is the following statement true or false? Explain why.

"An object that is moving must have a constant force applied to it, otherwise, the object would not move."

FALSE - A force is only required to change motion.

4. What happens to an object if an unbalanced force is applied to it?

acceleration.

5. On ice, you have a k value of 0.25. Travelling at 135 km/h, what is your total stopping distance in metres? Disregard reaction time.

$= 37.5\ m/s$

(Braking dist)

$d = kv^2$

$= (0.25)(37.5\ m/s)$

$= 351\ m$