

Name \_\_\_\_\_ Hour \_\_\_\_\_



## ARMAGEDDON/FINAL REVIEW

|        |                       |    |
|--------|-----------------------|----|
| Pre    | DUE <b>Tues. 5/3</b>  | /5 |
| #1-10  | DUE <b>Thurs. 5/5</b> | /5 |
| #11-16 | DUE <b>Fri. 5/6</b>   | /5 |
| #17-19 | DUE <b>Mon. 5/9</b>   | /5 |
| #20-25 | DUE <b>Tues. 5/10</b> | /5 |

**p. 6 Bucket Questions are OPTIONAL...Worth 1 sticker! /25 TOTAL**

Each day some pages are due as your ticket to the movie. If you are not done with them, you will not be able to watch the movie and will lose points on that section. **Parts from the movie are in bold** starting on p. 2.

### Pre-Movie Portion:

Scientists estimate that an asteroid between 4-8 miles wide caused the extinction of the dinosaurs. If the actual width was 6 **miles**, convert this to **meters**?

The movie states the asteroid is traveling at 22,000 **mph** and is the size of Texas. **Convert this to m/sec.**

Calculate the **kinetic energy** the asteroid would hit with. Assume an asteroid the size of Tx made mostly out of iron would have a weight of approximately  $7.0 \times 10^{20}$  pounds. **(Change to kg!)**  
( $1.54 \times 10^{28}$  J)

Calculate the **gravitational force** ( $F_g$ ) between the earth and the asteroid when it was 6436,000 meters from the earth's center. (This is the r value) ( $3.06 \times 10^{21}$  N)

Calculate the **energy** contained in the asteroid. ( $E=mc^2$ ) ( $2.86 \times 10^{37}$  J)

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Show your work please!

1. **Approximately how large are the initial asteroids that destroy New York City?**
2. **How long do the scientists in the movie have before the asteroid hits?** \_\_\_\_\_
3. **Explain why they want to blow the asteroid up from the inside rather than hitting it on the outside.**
  
4. **How fast is the asteroid traveling in mph?** \_\_\_\_\_
5. Assuming that the asteroid is traveling at **constant speed**, how many **miles** away must the asteroid be when they first discover it? (Use numbers from #2 and 4)  
 $V = \Delta x / \Delta t$  (speed in mph and time in hours) (9.5 million miles)
  
6. Calculate the momentum of the asteroid assuming the mass is  $3.18 \times 10^{20}$  kg from p. 1.  
(convert v to m/s!) (3.13 x 10<sup>24</sup> kg·m/s)
  
7. **Why did Neil Armstrong appear to bounce while on the moon?**
  
8. Calculate the acceleration due to gravity on the surface of the moon. Show your work!  
(1.62 m/s<sup>2</sup>)
  
9. Calculate Armstrong's weight (in N) on the moon if his mass on the earth was 75 kg.  
(121 N)
  
10. How many g's would you experience on the surface of the moon compared to Earth?  
(0.16 g's)

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11. **They estimate it will take \_\_\_\_\_ 60 hrs \_\_\_\_\_ to get to the moon.**
12. Use the time from #11 and the fact that the moon is  $3.84 \times 10^8$  m away to find the **velocity** of the shuttle in **mph** in the movie. **Assume it moves at constant speed.** (3978 mph)
  
13. **Explain their plan to keep the asteroid from hitting the earth.**
  
14. **Why does the Russian begin to spin the space station when the “astronauts” are coming aboard?**
  - a. How fast would it need to spin if it had a radius of 50 m in order to accomplish this? (Use  $a_c = v^2/r$  when  $a_c = 9.8 \text{ m/s}^2$ ) (22.1 m/s)
  
  - b. What is the period of its rotation? (14.2 sec)
  
15. Calculate the deceleration the shuttle Freedom undergoes when they land on the asteroid going 500 **mph** and they stop in about 52 sec. ( $-4.3 \text{ m/s}^2$ )
  
16. At lift off, a 2,000,000 kg space shuttle is able to accelerate from 0 to 1341 m/sec in about 2 **min.**
  - a. Calculate the acceleration. (Careful with the units) ( $11.2 \text{ m/s}^2$ )
  
  - b. Calculate the horsepower of the shuttle if it travels 80,500 m during that time. (20 million hp) (Solve for Power in Watts and convert to hp)

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17. A space shuttle orbits between 200-385 miles above the surface of the earth. Find the velocity needed to keep the shuttle in orbit at **200 miles** above the surface. (Don't forget the distance to the center of the earth!) (change miles to m → find r → find gravity at that height → find v in m/s) (7720 m/s)

18. The approximate mass of the asteroid is  $3.18 \times 10^{20}$  kg.

a. If it has a radius of 285,000 m, calculate the acceleration due to gravity on its surface. (0.261 m/s<sup>2</sup>)

b. How many g's would you feel on the asteroid if you were 75 kg? (0.0266 g's)

c. Calculate how long ( $\Delta t$ ) it would take a rock to fall on the asteroid if you dropped it from a height of 2 meters above the asteroid's surface. (3.9 sec)

d. **Watch during the movie when objects such as rocks fall on the asteroid. Do they fall at a realistic speed? What should be happening?**

19. Explain in physics terms what would happen if you could fire a machine gun in space. Which **conservation of momentum** equations would show this?

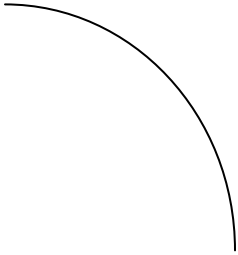
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20. If you and the machine gun have a total mass of 226 kg and you fire the bullet at 200 m/s, calculate how fast you will move backwards if the bullet has a mass of 0.04 kg. (0.035 m/s)

21. Space is a vacuum which means there are no air molecules. **What are 2 major science related errors the producers are making for special effects during all of the asteroid scenes?** (think explosions and sound...)

**Final Review Problems:**

22. A plane delivering insecticides to crops is traveling horizontally at 20 m/s at a height of 51 m. The pilot is aiming for a particular spot on the field. How far ( $\Delta x$ ) before that spot should the pilot release the insecticides? (64.5 m)



23. A baseball is hit at 30 m/s at a 53° N of E angle. Find the distance traveled horizontally ( $\Delta x$ ) and the maximum height ( $\Delta y$ ) of the baseball. (88.3 m, 29.3 m) (1. Solve  $V_{iy}$  and  $V_x$ , 2. Use  $a_y$  equation to solve  $\Delta t$ , 3. solve  $\Delta y$  and  $\Delta x$  using the correct times.)



24. A child drops a rock off a cliff that is 220 m to the bottom. If the temperature is 19 °C, how soon after you drop it will you hear it hit the bottom of the well? (7.34 sec)

$$\begin{array}{l} \text{time for the rock to fall} \quad + \quad \text{time for the sound to travel back up} \\ \Delta y = v_i \Delta t + \frac{1}{2} a \Delta t^2 \quad \quad \quad v = \Delta x / \Delta t \end{array}$$

25. What is the wavelength of a radio wave from KDWB, FM 101.3? (**Units of FM???**) (2.96 m)

**OPTIONAL Bucket Questions:**

1. What quantity does the slope of a distance vs. time graph give you?
2. What quantity does the slope of a velocity vs. time graph give you?
3. What does a horizontal line on a distance vs. time graph mean?
4. What does a horizontal line on a velocity vs. time graph mean?
5. If you multiply the units of speed x time, what unit do you get?
6. A vector is anything that has both \_\_\_\_\_ and \_\_\_\_\_
7. What is the sum of two or more vectors called?
8. What happens to the velocity of a projectile in the x direction throughout its flight?
9. What happens to the velocity of a projectile in the y direction throughout its flight?
10. What is Newton's 1<sup>st</sup> Law?
11. What is Newton's 2<sup>nd</sup> Law?
12. What is Newton's 3<sup>rd</sup> Law?
13. What exactly is a Newton? (What other units is it equal to?) Think **F=ma!**
14. What is inertia?
15. What is the unit for work and energy?
16. Potential energy (P.E.) is the energy of \_\_\_\_\_
17. Kinetic energy (K.E.) is the energy of \_\_\_\_\_
18. What is the **variable** for momentum?
19. What is the **unit** for momentum?
20. What does "T" (in periodic motion) represent and what does it mean?
21. In the pendulum equation, what is the letter L?
22. What is the speed of light?
23. If you double the mass of an object, how is the potential energy affected?
24. If you double the velocity of an object, how is the kinetic energy affected?
25. What 2 variables does the Universal law of gravitation depend on?
26. Hz is the unit for \_\_\_\_\_ and measures how many \_\_\_\_\_ pass per \_\_\_\_\_
27. What is the unit of loudness?
28. What is a transverse wave?
29. What is a longitudinal wave?
30. What is a trough?
31. What is a crest?
32. The distance from 1 part of a wave until it repeats is known as \_\_\_\_\_
33. What is a node?
34. What is an antinode?
35. Which type of wave are sound waves?
36. What speed do radio waves travel at?
37. What units are FM radio stations in?
38. What units are AM radio stations in?
39. 15 waves pass a given point every second. The **frequency** of the wave is:
40. 15 waves pass a given point every second. The **period** of the wave is:
41. Lenses refract light, which means they \_\_\_\_\_ it.
42. Mirrors reflect light, which means light \_\_\_\_\_.
43. What does a converging lens do to light?
44. What does a diverging lens do to light?
45. What is p when working with mirrors and lenses?
46. What is q when working with mirrors and lenses?
47. What is m when working with mirrors and lenses?
48. When is f negative for mirrors AND lenses?
49. When is hi negative for mirrors and lenses?
50. As you move at a speed close to the speed of light, what happens to time?
51. As you move at a speed close to the speed of light, what happens to mass?
52. As you move at a speed close to the speed of light, what happens to length?
53. What is the unit for power?
54. What is another term for potential difference?
55. What is the unit for current?
56. What is the unit for resistance?