Revision paper in physics:

Edited at 11am 1 May 2017.

s is your student number. k = s mod 10000. T = s mod 100. m = s mod 35. a = s mod 25.

L = s mod 10. $d\_{2}=\frac{T-L}{10}$. e = s mod 8. m7 = s mod 7. m6 = s mod 6. m4 = s mod 4. m3 = s mod 3.

m2 = s mod 2.

Significant figures:

1. How many significant figures are there in your student number?

2. How many significant figures are in your T number?

3. Give the number of significant figures of the number for your T.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1: 8778000 | 2: 0.000567 | 3: 80600 | 4: 0.00067900 | 5: 346000 |
| 6: 0.000673 | 7: 95328000 | 8: 943258000 | 9: 0.000774 | 10: 9900 |
| 11: 987890 | 12: 0.0000561 | 13: 94034600 | 14: 900653540 | 15: 0.005469 |
| 16: 4365600 | 17: 0.003268 | 18: 456700 | 19: 467000 | 20: 0.0000676 |
| 21: 36.00800 | 22: 65.00 | 23: 0.00000 | 24: 7890000 | 25: 0.0003 |
| 26: 65765700 | 27: 0.000500 | 28: 56456000 | 29: 0.00056 | 30: 6756700 |
| 31: 674670 | 32: 0.00654 | 33: 434500 | 34: 0.020450 | 35: 8760076 |
| 36: 0.0065400 | 37: 5689400 | 38: 0.000600 | 39: 5930300 | 40: 0.007700 |
| 41: 4920010 | 42: 4090330 | 43: 0.0750000 | 44: 490304457 | 45: 0.0060700 |
| 46: 4790650 | 47: 0.0006277 | 48: 50403460 | 49: 0.0060600 | 50: 490400600 |
| 51: 000000 | 52: 589500 | 53: 96400800 | 54: 0.0045045 | 55: 358000500 |
| 56: 0.00143 | 57: 32122000 | 58: 1258000 | 59: 0.001474 | 60: 51200 |
| 61: 187890 | 62: 0.000021 | 63: 94034100 | 64: 200653540 | 65: 0.005419 |
| 66: 4362600 | 67: 0.003268 | 68: 412700 | 69: 427000 | 70: 0.0000671 |
| 71: 174170 | 72: 0.00214 | 73: 434300 | 74: 0.020410 | 75: 8230021 |
| 76: 0.0012400 | 77: 2189400 | 78: 0.000200 | 79: 1930300 | 80: 0.003200 |
| 81: 1920010 | 82: 4020330 | 83: 0.0120000 | 84: 490304432 | 85: 0.0060300 |
| 86: 000000 | 87: 589100 | 88: 92400800 | 89: 0.0041045 | 90: 358000200 |

Accuracy and precision:

4. Draw the example of:

m4 = 0: accurate and precise.

m4 = 1: accurate and NOT precise.

m4 = 2: NOT accurate and precise.

m4 = 3: NOT accurate and NOT precise.

Errors:

5. Calculate the compound errors for x = s, dx = 1/T; y = T, dy = 1/k.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/compound\_errors.txt

Mechanics:

Projectile:

6. Find locations from which you can hit the roof of the net of soccer goal. The roof is 3 – 1/T meters wide. Initial velocity is T m/s.

7. Find x and y for projectile with x0 = y0 = 0, v0 = T m/s, t = T seconds, A = T degrees.

Find maximum distance and maximum height.

8. Solve the projectile problem for V0 = T meters per second and A = T degrees.

9. Solve Newton differential equation for the projectile with x0 = y0 = 0, v0 = T m/s, A = T degrees.

10. Find velocity and acceleration for one-dimensional motion with the equation x = -k + Lt + Tt2.

Rotational motion:

11. Find angular velocity and linear acceleration for v = T m/s and R = k meters.

Vectors:

12. Add, subtract and multiply the vectors (T,k) and (L,s).

Collisions:

13. Calculate the final speed after absolutely inelastic collision of two balls of masses L kg and T kg, moving with velocities s m/s and k m/s respectively.

14. Solve the collision problem for u1 = k, u2 = k/2, m1 = k, m2 = 2k.

Pulley:

15. Find the acceleration of a simple pulley for two masses: L kg and T kg.

Inclined plane:

16. Find acceleration of a mass at the inclined plane with A = T degrees and the friction coefficient μ = 1/T.

Center of mass:

17. Find the center of mass of k equal masses k meters apart located on a straight line.

Statics:

18. Find the hangover for the s blocks in the blocks stacking problem.

19. Work and energy:

m3 = 0: What is energy?

m3 = 1: Explain work.

m3 = 2: What is energy conservation?

20. Fluids:

m2 = 0: Explain Bernoulli Principle.

m2 = 1: What is Magnus Effect?

Thermodynamics:

21. The thermal expansion rate α is 1/k. The temperature change is T degrees.

a. Find the extension of m meters rod due to the temperature change.

b. Find the approximate volume change of m meters cubed cube due to the temperature change.

22. There are two bodies in a thermodynamically isolated system: C1 m1 T1 and C2 m2 T2. Find the resulting temperature T. m1 = k, m2 = 2k. C1 = k/11, C2 = k/222, T1 = k/111, T2 = k/22

23. Estimate the distances between the atoms of element number T in the periodic table of elements.

Oscillations:

m7 = 0: 24. Explain oscillations.

25. Find the displacement of a harmonic oscillator after s seconds with amplitude k, frequency k and initial phase k/2.

26. Solve the string oscillatory equation for v = T. Find the displacement after s seconds at m meters.

Waves:

m7 = 1: 27. A 100 W lamp emits electromagnetic radiation in all directions. Assuming a lamp to be a point source, calculate the intensity of the radiation:

a. at distance of 1 m from the lamp.

b. at distance of 2 m from the lamp.

m7 = 2: 28. Waves from a source have an amplitude of 5 cm and an intensity of 400 Wm-2.

a. The amplitude of the waves is increased to 10 cm. What is their intensity now?

b. The intensity of the waves is decreased to 100 Wm-2. What is their amplitude?

m7 = 3: 29. Red light of wavelength 700 nm in a vacuum travels into glass, where its speed decreases to 2×108ms-1. Determine:

a. the frequency of the light in vacuum

b. its frequency and wavelength in glass.

m7 = 4: 30. An astronomer observes light from a distant star. A particular line in its spectrum has a wavelength of 550 nm. When measures in the laboratory, the same spectral line has a wavelength of 535 nm. Determine:

a. the change in the wavelength of the spectral line

b. the speed of the star

c. the direction of the movement of the star (towards or away from the observer).

m7 = 5: 31. Describe how the fans in a stadium must move in order to produce a longitudinal stadium wave.

m7 = 6: 32. A science fiction film depicts inhabitants of one spaceship (in outer space) hearing the sound of a nearby spaceship as it zooms past at high speeds. Critique the physics of this film.

m7 = 0: 33. The sonar device on a fishing boat uses underwater sound to locate fish. Would you expect sonar to be a longitudinal or a transverse wave?

m7 = 1: 34. Give superposition of the waves.

m7 = 2: 35. What is diffraction?

m7 = 3: 36. Give the solution for the stationary waves.

m7 = 4: 37. Explain the similarities and the differences of mechanical and electromagnetic waves.

m7 = 5: 38. What is Doppler Effect?

m7 = 6: 39. Does the frequency of the wave change as it goes from one medium to another? Why?

40. Find the wavelength for v = k m/s and f = T Hz.

Maxwell Equations:

41. Solve the simplified Maxwell Equations for c = 300000000-s, red light. Take amplitude 1 V/m. Find the intensity of electric field after s seconds at m meters.

Coulomb Law:

42. Find the force between two charges of L and T Coulombs for the distance apart of m meters.

Project:

43. Improve your project.

Deadline: before mid-term exam.