Task 2 in physics:

Study materials:

https://physics15.weebly.com/uploads/3/0/2/7/30272185/c5phys2023.docx

https://physics15.weebly.com/uploads/3/0/2/7/30272185/c6phys2023.docx

Instructions:

Write all your answers in this Word Document and email the Word Document with your answers to me.

Try to write only text. Try to avoid pictures, videos and other things, which make files big.

Write your name(s)

Write your student number(s)

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

m9 = s mod 9

e = s mod 8

m7 = s mod 7

m6 = s mod 6

m5 = s mod 5

m4 = s mod 4.

m3 = s mod 3

m2 = s mod 2

1. How do you use physics?

2. Round your student number to 7 significant figures.

3. Are these statements true?

Similarity of mechanics, fluid and thermodynamics:

Mechanical system moves from high potential energy to low potential energy,

fluid flows from high pressure to low pressure,

heat flows from hot to cold, from high temperature to low temperature.

4. Any standing wave must have an integer number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

5. In a standing wave, the place with zero amplitude are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

6. A standing wave with greater frequency corresponds with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy.

7. You press the pedal with force of L Newtons. The area of the cross-section of the tube under the pedal is 1 squared millimetre. The area of the cross-section of the tube near the car wheals is 1 squared centimetre. Find the force on the car wheals.

Solution: Pressure is the same. The force is directly proportional to the area of the cross-section.

The force on the wheals will be 100 times bigger than the force on the pedal: 100L Newtons.

s = 22123456

L = s Mod 10

F = 100 \* L

MsgBox F

MsgBox "Force is measured in Newtons."

MsgBox "1 significant figure"

$F=CρAv^{2}$ (resistance force (fluid mechanics))

8. Find fluid resistance force for C = $ρ $= A = v = s mod 25.

s = 22123456

a = s Mod 25

C = a

ro = a

area = a

v = a

resistanceForce = C \* ro \* area \* v \* v

MsgBox resistanceForce

MsgBox "Force is measured in Newtons."

MsgBox "1 or 2 significant figures"

9. How will water level change if all floating icebergs will melt?

10. Why do cats often stretch in hot places?

11. Calculate heat engine efficiency for Q1 = 100J and Q2 = 50J.

Q1 = 100

Q2 = 50

efficiency = 1 - Q2 / Q1

MsgBox efficiency

MsgBox “Efficiency is dimensionless.”

MsgBox “1 significant figure”

12. Find T1.

Q1 = 12000

Q2 = 6000

T2 = 300

T1 = Q1 \* T2 / Q2

MsgBox T1

MsgBox “Temperature is measured in Kelvins”

MsgBox “1 significant figure”

13. Calculate compound capacitance of C1 = 1 Farad, C2 = 2 Farad, C3 = 3 Farad.

C1=1

C2=2

C3=3

' For parallel circuit:

CP = C1 + C2 + C3

MsgBox CP

' For series circuit:

CS = C1 \* C2 \* C3 / (C1 \* C2 + C1 \* C3 + C2 \* C3)

MsgBox CS

MsgBox “Capacitance is measured in Farad.”

MsgBox “1 significant figure”

14. What is resistance of inductor to direct current?

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

s = 22123456

T = s Mod 100

Avogadro\_number = 6 \* 10 ^ 23

'

' For Fluorine = F:

If T = 9 Then atomic\_weight = 0.018998: density = 1.696: GoTo 1

' For Magnesium = Mg:

If T = 12 Then atomic\_weight = 0.024: density = 1600: GoTo 1

' For Phosphorus = P:

If T = 15 Then atomic\_weight = 0.031: density = 1820: GoTo 1

' For Sulfur = S:

If T = 16 Then atomic\_weight = 0.032: density = 2000: GoTo 1

' For Chlorine = Cl:

If T = 17 Then atomic\_weight = 0.035: density = 3.2: GoTo 1

' For Argon = Ar:

If T = 18 Then atomic\_weight = 0.04: density = 1.8: GoTo 1

' For Patassium = K:

If T = 19 Then atomic\_weight = 0.039: density = 890: GoTo 1

' For Titenium = Ti:

If T = 22 Then atomic\_weight = 0.048: density = 4506: GoTo 1

' For Manganese = Mn:

If T = 25 Then atomic\_weight = 0.055: density = 7430: GoTo 1

' For Iron = Fe:

If T = 26 Then atomic\_weight = 0.056: density = 7874: GoTo 1

' For copper = Cu:

If T = 29 Then atomic\_weight = 0.064: density = 9000: GoTo 1

' For Bromine = Br:

If T = 35 Then atomic\_weight = 0.08: density = 3119: GoTo 1

'

MsgBox "You must find data for your T"

GoTo 2

'

1 distance\_between\_particles = (density \* Avogadro\_number / atomic\_weight) ^ (-1 / 3)

MsgBox distance\_between\_particles

2 your\_data = is\_missing

MsgBox “Distance is measured in metres”

MsgBox “1 significant figure”

16. Find energy and momentum of photon of s Hz frequency.

s = 22123456

h = 6.62607004 \* 10 ^ (-34)

c = 2.99792458\* 10 ^ 8

frequency = s

E = h \* frequency

Lambda = c / frequency

Momentum = h / Lambda

MsgBox E

MsgBox "Energy is measured in Joules"

MsgBox Momentum

MsgBox "Momentum is measured in kilograms times meters per second"

MsgBox "7 or 8 significant figures"

17. Calculate the energy and momentum of a photon for Lambda = 0.05k nanometers.

s = 22123456

k = s Mod 10000

h = 6.62607004 \* 10 ^ (-34)

c = 2.99792458 \* 10 ^ 8

Lambda = 0.05 \* k \* 10 ^ (-9)

E = h \* c / Lambda

MsgBox E

MsgBox "Energy is measured in Joules"

Momentum = h / Lambda

MsgBox Momentum

MsgBox "Momentum is measured in kilograms times meters per second"

MsgBox "Maximum 4 significant figures"

18. Determine the wavelength of an electron that has been accelerated through the potential difference of T Volts.

s = 22123456

k = s Mod 10000

T = s Mod 100

h = 6.62607004 \* 10 ^ (-34)

ec = 1.60217662 \* 10 ^ (-19)

em = 9.10938356 \* 10 ^ (-31)

Voltage = T

velovity = Sqr(2 \* ec \* Voltage / em)

p = em \* velovity

Lambda = h / p

MsgBox Lambda

MsgBox “Wavelength is measured in meters.”

MsgBox “1 or 2 significant figures”

19. Calculate the wavelength of k grams desk moving T centimetres per second.

s = 22123456

k = s Mod 10000

T = s Mod 100

h = 6.62607004 \* 10 ^ (-34)

m = k \* 10 ^ (-3)

v = T \* 10 ^ (-2)

p = m \* v

Lambda = h / p

MsgBox Lambda

MsgBox “Wavelength is measured in meters.”

MsgBox “1 or 2 significant figures”

20. Find the energy level and angular momentum for hydrogen according to the Bohr Model.

s = 22123456

n = s

h = 6.62607004 \* 10 ^ (-34)

Energy = -13.6 / n ^ 2

AngularMomentum = n \* h / (8 \* Atn(1))

MsgBox Energy

MsgBox “Energy is measured in electron-volts”

MsgBox “3 significant figures for energy”

MsgBox AngularMomentum

MsgBox “Angular momentum is measured in kilograms times meters squared/ second”

MsgBox “7 or 8 significant figures for angular momentum”

21. Find energy change of electron for hydrogen, n1 = T, n2 = s.

$$E= hf= 13.6Z^{2}\left(\frac{1}{n\_{2}^{2}}-\frac{1}{n\_{1}^{2}}\right)$$

s = 22123456

T = s Mod 100

n1 = T

n2 = s

Z = 1

E = 13.6 \* Z \* Z \* (1 / (n2 \* n2) - 1 / (n1 \* n1))

MsgBox E

MsgBox "Energy is measured in electron-volts."

MsgBox "1 significant figure"

22. Write ground state configuration for atom number T in Periodic Table.

23. Perform correlation and regression analyses of the periodic table for T+2 elements and for m7 + 3 elementary particles.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/correlations4periodic4table.xlsx

http://physics16.weebly.com/uploads/5/9/8/5/59854633/regression4periodic4table.txt

http://physics16.weebly.com/uploads/5/9/8/5/59854633/evergy4lifetime.xlsx

http://physics16.weebly.com/uploads/5/9/8/5/59854633/regression4elementary4particles4energies4life4times.txt

24. What particles mediate electromagnetic interaction?

A. electrons

B. protons

C. positrons

D. photons

25. What particles mediate strong interaction?

A. neutrons

B. gluons

C. photons

D. protons

26. Give the structure of neutron.

27. Give the structure of proton.

28. Find the annihilation energy of k grams of matter.

s = 22123456

k = s Mod 10000

T = s Mod 100

c = 2.99792458 \* 10 ^ 8

m = k \* 10 ^ (-3)

energy4annihilation = m \* c ^ 2

MsgBox energy4annihilation

MsgBox “Energy is measured in Joules”

MsgBox “Maximum 4 significant figures”

29. Calculate the remaining mass (it is NOT 0) of the decaying substance after k seconds if the decay ratio is T and initial mass is s. Calculate the half-life.

s = 22123456

k = s Mod 10000

T = s Mod 100

remainingmass = s \* Exp(-k \* T)

halflife = Log(2) / T

MsgBox remainingmass

MsgBox “Mass is measured in kilograms”

MsgBox halflife

MsgBox “Half-life is measured in seconds”

MsgBox “1 or 2 significant figures”

30. How many times is Electromagnetic Force weaker than the Strong Nuclear Force?

A. 137

B. 758

C. 3592

D. 126434

31. Explain main concepts, laws and theories of the physics.