Algebra-based Physics-2: Electricity, Magnetism, and Modern Physics (PHYS135B-01): Unit 1

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UNIT 0 REVIEW

Unit 0 review

Physics - *φυσική* - "phusiké": *knowledge of nature*
from *φύσις* - "phúsis": *nature*

Reading: Chapters 18 and 19 (for Unit 1)

1. Estimation/Approximation
    - Estimating the correct order of magnitude
    - Building complex quantities
    - Unit analysis
2. Review of concepts from Newtonian mechanics
    - Kinematics and Newton's Laws
    - Work-energy theorem, energy conservation
    - Momentum, conservation of momentum

UNIT 0 REVIEW PROBLEMS

SUMMARY

UNIT 1 SUMMARY

Reading: Chapters 18 and 19

1. Charge, mass, the Coulomb force, and the gravitational force
2. Force fields
3. Electric potential and capacitance

JITT - READING QUIZ RESULTS

CHARGE, CONDUCTORS AND INSULATORS

Let's begin this topic in a special way: comparison to *gravity*. What do electricity and gravity have in common? The answer lies in a notion we call *charge*...

Charge: the constant of proportionality between the strength of a *field* and the force a field exerts on an *object*.

Gravity

1. Force: $\vec{F} = G\frac{mM}{r^2}\hat{r}$
2. Parameters: r is absolute distance between two objects with masses m and M, and the direction is $\hat{r}$
3. *Charge* of one object: m
4. *Field felt by that object*: $\vec{G} = G\frac{M}{r^2}\hat{r}$
5. $\vec{F} = m\vec{G}$

Electricity

1. Force: $\vec{F} = k\frac{qQ}{r^2}\hat{r}$
2. Parameters: r is absolute distance between two objects with electric charges q and Q, and the direction is $\hat{r}$
3. *Charge* of one object: q
4. *Field felt by that object*: $\vec{E} = G\frac{Q}{r^2}\hat{r}$
5. $\vec{F} = q\vec{E}$

CONCLUSION

ANSWERS

ANSWERS

- It is zero.
- Entropy has increased, but the internal energy returns to the original value
- 0.5
- The system does work equal to 0.5 liters times 1 atm
- +1
- The negative charges in the conductor move toward the positive charges in the rod.
- The charges accelerate towards each other.
- The charges $-2q$ accelerate towards the charge $+q$.
- They are probably $\vec{v}_{\mathbf{i}} = -\hat{i} - \hat{j}$
- They are probably $\vec{v}_{\mathbf{i}} = \hat{i} - \hat{j}$
- 45 deg
- Symmetry
- About 25 deg (26.56 degrees)
- Taking the value $z = R$ represents a minimum in the field strength.
- The field is constant.
- $\frac{\sigma}{\epsilon_0}$ N/C
- 0 N/C
- The total charge on the ring
- A point charge $Q_{\mathbf{tot}}$
- $ab\hat{k}$
- Both A and B
- 0