STUDYING FOR PHYSICAL SCIENCES PAPER 1 (PHYSICS)

INEFFECTIVE STUDY METHODS?



- READING NOTES
- SUMMARIZING NOTES

EFFECTIVE STUDY METHODS



MAKING AN `A3' SUMMARY PER SECTION



PRACTSING PAST PAPER QUESTIONS PER SECTION
(DON'T FORGET THE A3 SUMMARY)



DOING ENTIRE PAST PAPERS
(IN LAST FEW DAYS)

THE `A3' SUMMARY PER SECTION (LAYOUT GUIDE)

DEFINITIONS

- Use your CAPS or SAGS document.



- Definitions must word for word word
- Help with understanding!

CONCEPTS & APPLICATIONS

- Use your CAPS or SAGS document.
- Make use of pictures to help you understand and remember.



- Keep adding to this as you past paps.



EQUATIONS

- Use the data sheet!



- Conversions cm to m, g to kg
- Extra useful equations not on data sheet $v=u+at$



WORK, ENERGY AND POWER

DEFINITIONS	CONCEPTS & APPLICATIONS	EQUATIONS
Use your CAPS or SAGS document.	Use your CAPS or SAGS document.	Use the data sheet!
Definitions must be word for word	Make use of pictures to help you understand and remember.	Conversions
Help with understanding!	Keep adding to this as you do past papers	Extra useful equations not on data sheet

Use the CAPS document

Work

- Define the work done on an object by a constant force F as $F\Delta x\cos\theta$, where F is the magnitude of the force, Δx the magnitude of the displacement and θ the angle between the force and the displacement. (Work is done by a force – the use of the term 'work is done against a force', e.g. work done against friction, must be avoided.)
- Draw a force diagram and free-body diagrams.
- Calculate the net work done on an object.
- Distinguish between *positive net work done* and *negative net work done* on the system.

Work-energy theorem

- State the work-energy theorem: The work done on an object by a net force is equal to the change in the object's kinetic energy OR the work done on an object by a net force is equal to the change in the object's kinetic energy.
  In symbols: $W_{net} = \Delta K = K_f - K_i$
- Apply the work-energy theorem to objects on horizontal, vertical and inclined planes (for both frictionless and rough surfaces).

Conservation of energy with non-conservative forces present

- Define a *conservative force* as a force for which the work done in moving an object between two points is independent of the path taken. Examples are gravitational force, the elastic force in a spring and electrostatic forces (coulombic forces).
- Define a *non-conservative force* as a force for which the work done in moving an object between two points depends on the path taken. Examples are frictional force, air resistance, tension in a chord, etc.
- State the principle of conservation of mechanical energy: The total mechanical energy (sum of gravitational potential energy and kinetic energy) in an isolated system remains constant. **NOTE:** A system is isolated when the net external force (excluding the gravitational force) acting on the system is zero.
- Solve conservation of energy problems using the equation: $W_{nc} = \Delta E_k + \Delta E_p$
- Use the relationship above to show that in the absence of non-conservative forces, mechanical energy is conserved.

Power

- Define *power* as the rate at which work is done or energy is expended.

  In symbols: $P = \frac{W}{\Delta t}$
- Calculate the power involved when work is done.
- Perform calculations using $P_{ave} = Fv_{ave}$ when an object moves at a constant speed along a rough horizontal surface or a rough inclined plane.
- Calculate the power output for a pump lifting a mass (e.g. lifting water through a height at constant speed).

DEFINITION

1. Define the work done on an object by a constant force F as $F \Delta x \cos\theta$, where F is the magnitude of the force, Δx the magnitude of the displacement and θ the angle between the force and the displacement. (Work is done by a force – the use of the term 'work is done against a force', e.g. work done against friction, must be avoided.)

2. State the work-energy theorem: The work done on an object by a net force is equal to the change in the object's kinetic energy OR the work done on an object by a net force is equal to the change in the object's kinetic energy.

3. Define a *conservative force* as a force for which the work done in moving an object between two points is independent of the path taken. Examples are gravitational force, the elastic force in a spring and electrostatic forces (coulombic forces).

4. Define a *non-conservative force* as a force for which the work done in moving an object between two points depends on the path taken. Examples are frictional force, air resistance, tension in a chord, etc.

5. State the principle of conservation of mechanical energy: The total mechanical energy (sum of gravitational potential energy and kinetic energy) in an isolated system remains constant. **NOTE:** A system is isolated when the net external force (excluding the gravitational force) acting on the system is zero.

6. Define *power* as the rate at which work is done or energy is expended.

WORK, ENERGY AND POWER

WORK, ENERGY AND POWER/*ARBEID, ENERGIE EN DRYWING*

$W = F\Delta x\cos\theta$ **Work definition**	$U = mgh$ or/*of* $E_p = mgh$
$K = \frac{1}{2}mv^2$ or/*of* $E_k = \frac{1}{2}mv^2$	$W_{net} = \Delta K$ or/*of* $W_{net} = \Delta E_k$ **Work energy theorem** $\Delta K = K_f - K_i$ or/*of* $\Delta E_k = E_{kf} - E_{ki}$
$W_{nc} = \Delta K + \Delta U$ or/*of* $W_{nc} = \Delta E_k + \Delta E_p$	$P = \frac{W}{\Delta t}$ **Power definition**
$P_{ave} = Fv_{ave}$ / $P_{gemid} = Fv_{gemid}$	

Do I know all the UNITS for these quantities???

EQUATIONS

$$W = F\Delta x\cos\theta$$

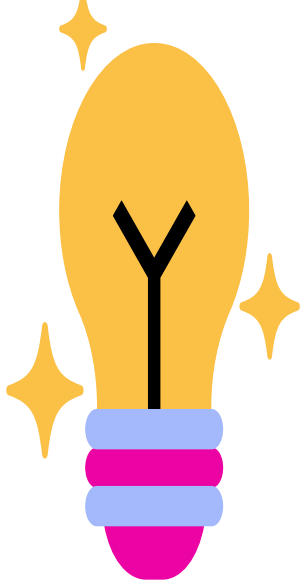
$$W_{net} = \Delta K$$

$$\Delta K = K_f - K_i$$

$$W_{nc} = \Delta E_k + \Delta E_p$$

$$P = \frac{W}{\Delta t}$$

$$P_{ave} = Fv_{ave}$$



OTHER THEORY

FREE BODY DIAGRAMS Help us get F_{net}

WORK AND ENERGY ARE SCALARS

IF NO FRICTION USE Law of conservation of mechanical energy

$(E_P + E_k) = (E_P + E_k)$

As you are doing past papers you can add on here

ELECTROSTATICS



Can you name every quantity on this table AND state the unit of measurement ???

ELECTROSTATICS/*ELEKTROSTATIKA*

$F = \frac{kQ_1Q_2}{r^2}$ **Coulombs Law**	$E = \frac{kQ}{r^2}$
$V = \frac{W}{q}$ **EMF definition**	$E = \frac{F}{q}$ **Electric field at a point definition**
$n = \frac{Q}{e}$ or/*of* $n = \frac{Q}{q_e}$	

Calculating number of electrons

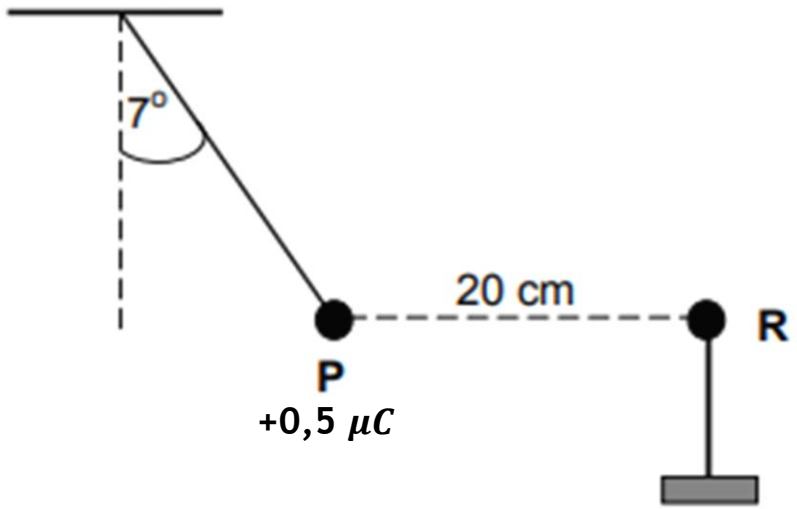
E is measured in $N.C^{-1}$ and is a VECTOR

USEFUL CONVERSIONS:

mm → m (divide 1000)
μC → C ($x10^{-6}$)
nC → C ($x10^{-9}$)
pC → C ($x10^{-12}$)

Free body diagrams in electrostatics?

Now the charged sphere **P** is suspended from a light, inextensible string. Another sphere, **R**, with a charge of – 0,9 µC, on an insulated stand, is brought close to sphere **P**. As a result sphere **P** moves to a position where it is 20 cm from sphere **R**, as shown below. The system is in equilibrium and the angle between the string and the vertical is 7°.



7.2 Draw a labelled free-body diagram showing ALL the forces acting on sphere **P**. (3)

7.3 State Coulomb's law in words. (2)

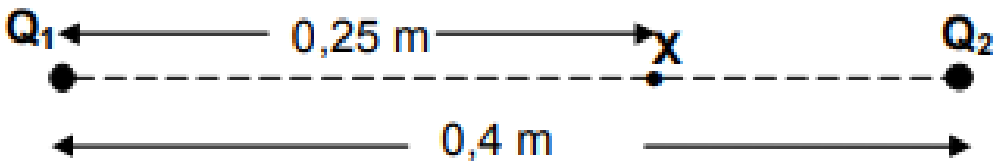
7.4 Calculate the magnitude of the tension in the string. (5)

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Direction for electric field (E) - do you know how to work out the direction for E?

QUESTION 8 (Start on a new page.)

Two charged particles, Q_1 and Q_2, are placed 0,4 m apart along a straight line. The charge on Q_1 is + 2 x 10^{-5} C, and the charge on Q_2 is – 8 x 10^{-6} C. Point **X** is 0,25 m **east** of Q_1, as shown in the diagram below.



Calculate the:

8.1 Net electric field at point **X** due to the two charges

E due to Q_1 at point X = ... $N.C^{-1}$ **RIGHT**

E due to Q_2 at point X = ... $N.C^{-1}$ **RIGHT**

What direction will a **POSITIVE** charge move at that particular point?

CURRENT ELECTRICITY



Can you name every quantity on this table AND state the unit of measurement ???

ELECTRIC CIRCUITS/*ELEKTRIESE STROOMBANE*

$R = \frac{V}{I}$ **Ohm's Law**	$emf\ (\varepsilon) = I(R + r)$ **Super helpful equation**
$R_s = R_1 + R_2 + \ldots$ $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots$	$q = I\Delta t$ **Calculating amount of charge**
$W = Vq$ $W = VI\Delta t$ $W = I^2R\Delta t$ $W = \frac{V^2\Delta t}{R}$ **W = work done / electrical energy dissipated (J)**	$P = \frac{W}{\Delta t}$ **POWER DEFINITION** $P = VI$ $P = I^2R$ $P = \frac{V^2}{R}$ **P = power (W) = RATE of energy dissipated**

So many ways to calculate TOTAL current….

$$I = \frac{V}{R} = \frac{EMF}{R + r}$$

Vext = when switch is closed

$$= \frac{V(ext)}{R\,(Rs + Rp)}$$

$$= \frac{V(lost)}{r}$$

Vlost = difference between open and closed



So many ways to calculate TOTAL current….

$$I = \frac{V}{R} = \frac{V(parallel)}{R(p)}$$

$$= \frac{V(series)}{R(series)}$$

Explanation HELP…. Does the reading on the voltmeter (across the battery) INCREASE / DECREASE / REMAIN THE SAME

1. What happens to the **total resistance** of the circuit due to the change that has been made?

2. What happens to the **total current** of the circuit due to the change? (Current and resistance are inversely proportional)

3. What happens to the **lost volts** due to the change? (Current and lost volts are directly proportional as "r" is constant)

4. **According to the equation emf = IR + Ir; in order for emf to remain constant** the reading on the voltmeter must xxxxxxxxxxx (this will always be the opposite to lost volts)