basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

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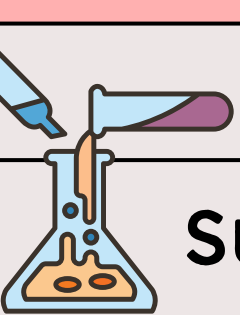REPUBLIC OF SOUTH AFRICA

Grade 10 Term 3 Topics

These are the major term 3 topics as listed in the Grade 10 Physical Sciences <u>ATP document for 2023/2024</u>.

Remember: your school may do topics in a different order or in different terms.

| Topic	Physics or Chemistry
<u>Quantitative aspects of chemical change</u>	Chemistry
<u>Vectors and scalars</u>	Physics
<u>Motion in one dimension (mechanics)</u>	Physics
<u>Equations and graphs of motion</u>	Physics
<u>Energy</u>	Physics

QUANTITATIVE ASPECTS OF CHEMICAL CHANGE

Sub topics to study and practice

	SUB-TOPIC	FORMULAE/THINGS TO KNOW	☑
	Define and calculate number of moles. Calculate mass, molar mass, number of particles, compounds, atoms	$n = \dfrac{m}{M}$ $n = \dfrac{N}{N_A}$	
	State Avogadro's law and calculate moles and volume using molar gas at STP	$n = \dfrac{V}{V_m}$	
	Define and calculate concentration	$C = \dfrac{n}{V}$	
	Determine percentage composition of an element in a compound	% element = $\dfrac{\text{mass of element}}{\text{mass of compound}}$ × 100	
	Define and determine the empirical formula from % composition.		
	Define water of crystallisation and determine number of moles of water crystallisation.		
	Perform stoichiometric calculations based on balanced equations (mass, concentration, volume)		
	Determine theoretical yield and percentage yield	% yield = $\dfrac{\text{actual yield}}{\text{theoretical yield}}$ × 100	

QUANTITATIVE ASPECTS OF CHEMICAL CHANGE
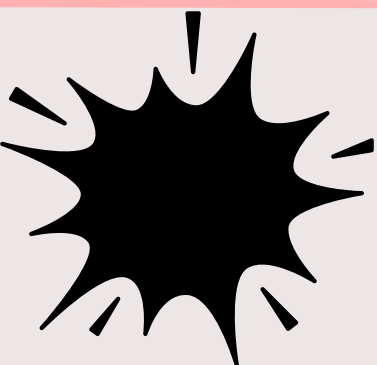
$$n = \frac{m}{M} \qquad n = \frac{N}{N_A}$$

$$n = \frac{V}{V_m} \qquad c = \frac{m}{MV} \qquad c = \frac{n}{V}$$

$$\text{\% composition} = \frac{\text{mass of element}}{\text{total mass of compound}} \times 100$$

$$\text{\% yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100$$
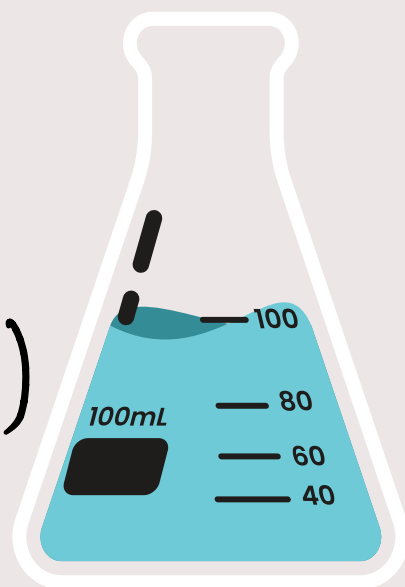
*NOT on formula sheet

Constants:

⭐ Avogadro's constant (N_A)

$6{,}02 \times 10^{23}$

⭐ Molar volume at STP (V_m)

$22{,}4$

100mL

— 100
— 80
— 60
— 40

Sub topics to study and practice

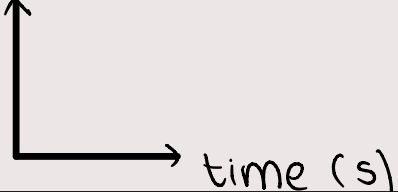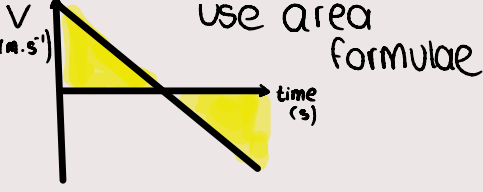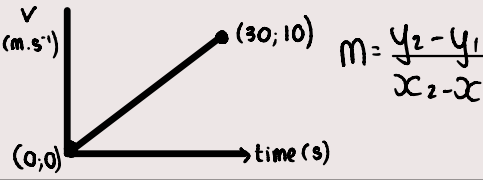| SUB-TOPIC	FORMULAE/THINGS TO KNOW	☑
List examples of vectors vs. scalars Understand difference		
How to represent vectors	with an arrow	
Equality of vectors, negative vectors and addition of vectors		
Define resultant vector and calculate resultant vector using vector addition (sum of vectors)	Choose ⊕ direction e.g. $F_{net} = F_1 + F_2 + F_3$	
Head-to-tail method to determine resultant vector		
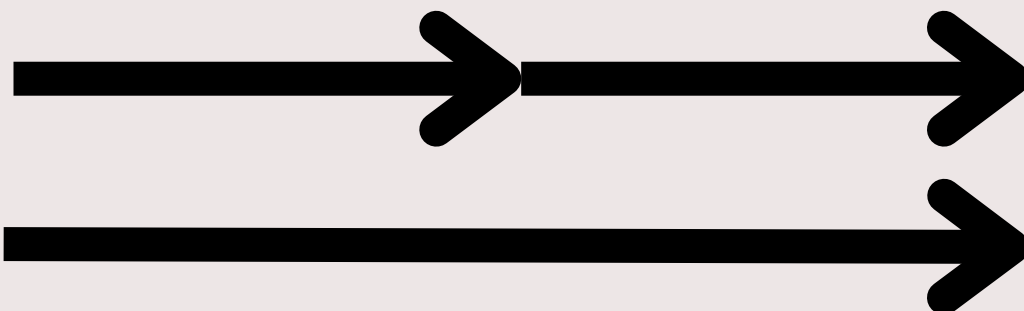
MOTION IN ONE DIMENSION

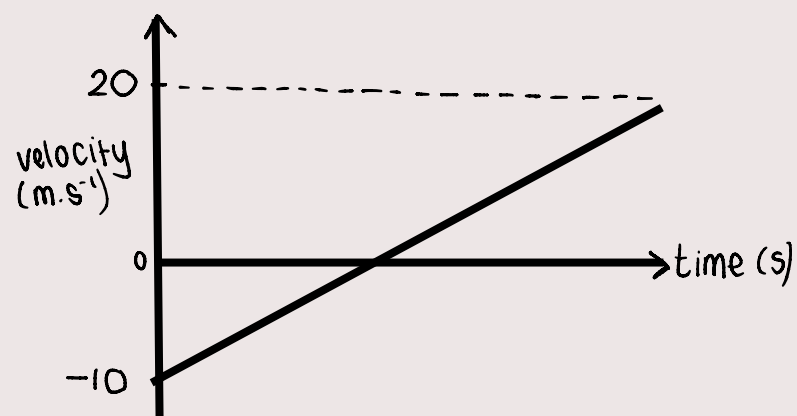**Sub topics to study and practice**

SUB-TOPIC	FORMULAE/THINGS TO KNOW	☑
Describe concepts: Frame of reference, Position relative to reference point	Describe motion in one dimension	
Define and calculate distance vs. displacement	understand difference	
Define and calculate average speed vs. average velocity	**speed** $\quad$ **velocity** $speed = \frac{Distance}{\Delta t}$ $\quad$ $V = \frac{\Delta x}{\Delta t}$	
Define and calculate acceleration	$a = \frac{\Delta V}{\Delta t}$	
Define instantaneous velocity and instantaneous speed		
Describe motion in words		

EQUATIONS AND GRAPHS OF MOTION

Sub topics to study and practice

SUB-TOPIC	FORMULAE/THINGS TO KNOW	☑
Draw the following graphs: - position vs. time - velocity vs. time - Acceleration vs. time	*graph with time (s) axis*	
Describe the motion of an object when given the above graphs		
Calculate displacement by working out the ==area== under a velocity vs time graph	use area formulae *v (m.s⁻¹) vs time (s) graph*	
Calculate acceleration by working out the gradient of a velocity vs time graph	$m = \dfrac{y_2 - y_1}{x_2 - x_1}$ *v (m.s⁻¹) vs time(s) graph, points (0;0), (30;10)*	
Use equations of motion to solve problems involving motion in the horizontal plane	$V_f = V_i + a\Delta t$ $V_f^2 = V_i^2 + 2a\Delta x$ $\Delta x = V_i\Delta t + \frac{1}{2}a\Delta t^2$ $\Delta x = \left(\dfrac{V_i + V_f}{2}\right)\Delta t$	
Solve problems for the motion of a vehicle including safety issues e.g. How speed and stopping distance are related.	* Use above equations * Draw pictures to help	

velocity (m.s⁻¹) vs time (s) graph with values 20, 0, −10

DATA SHEET FOR
MOTION IN ONE DIMENSION (MECHANICS)

Constants:

gravitational acceleration $(g) = 9,8 \ m.s^{-2}$

Formulae

Equations of motion:

$$V_f = V_i + a\Delta t$$

$$V_f^2 = V_i^2 + 2a\Delta x$$

$$\Delta x = V_i \Delta t + \frac{1}{2}a\Delta t^2$$

$$\Delta x = \left(\frac{V_i + V_f}{2} \right)$$

ENERGY

Sub topics to study and practice

Sub-topic	Formulae/things to know	☑
Define gravitational potential energy and do calculations	$E_p = mgh$	
Define kinetic energy and do calculations	$E_k = \frac{1}{2}mv^2$	
Calculate mechanical energy	$E_{mech} = E_p + E_k$	
Understand the principle of conservation of mechanical energy and use in calculations	$E_{mech A} = E_{mech B}$ $mgh_A + \frac{1}{2}mv_i^2 = mgh_B + \frac{1}{2}mv_f^2$	
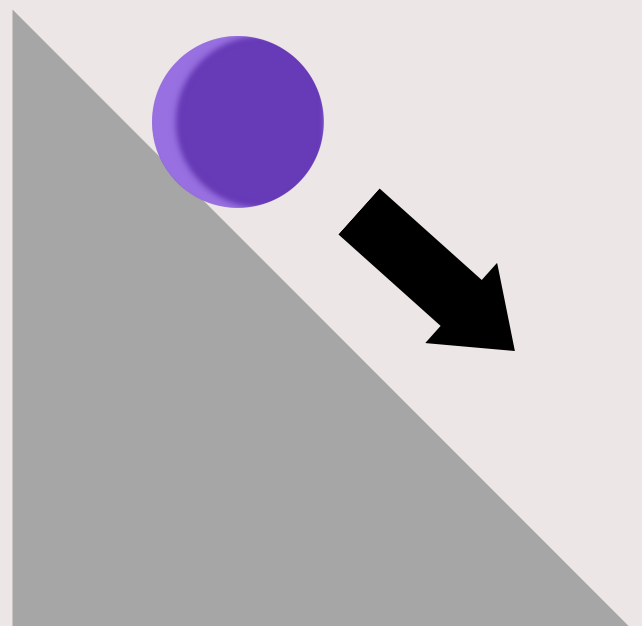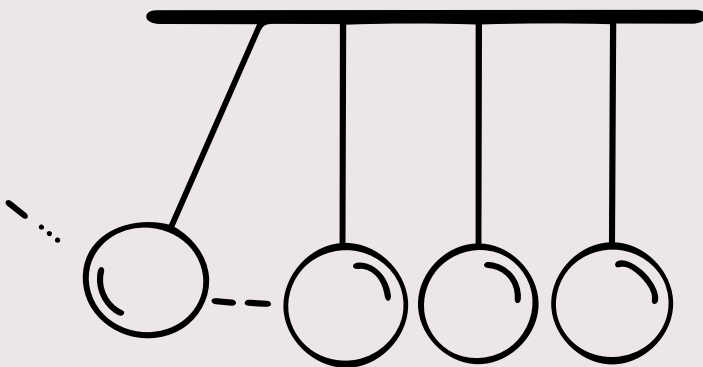
$$E_K = \frac{1}{2}mv^2 \text{ or } K = \frac{1}{2}mv^2$$

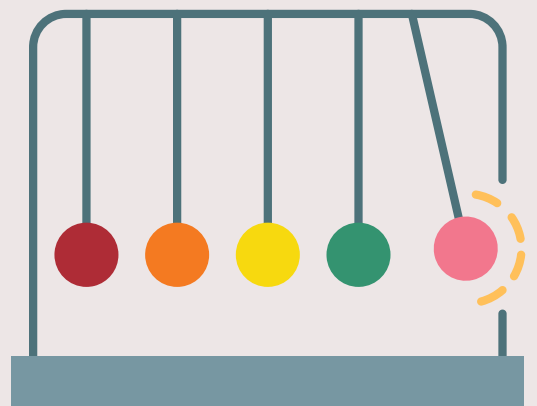$$E_p = mgh \quad \text{or} \quad U = mgh$$

$$E_{mech} = E_p + E_k$$

$$E_{mech \, A} = E_{mech \, B}$$

$$\frac{1}{2}mv_i^2 + mgh_A = \frac{1}{2}mv_f^2 + mgh_B$$

$$g = 9,8 \text{ m.s}^{-2}$$

Summary of topics compiled by Miss Martins.

Qualified Physical Sciences and Maths teacher.

Information obtained from the 2023/2024 annual teaching plans accessed at: https://www.education.gov.za/Curriculum/NationalCurriculumStatementsGradesR-12/2023ATPsFET.aspx