

LIFE SCIENCES GRADE 11

Practical Task Term 3: Gaseous Exchange

Date: _____

Name: _____

Duration: 60 minutes

Stanmorephysics.com

Total	
	30

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This is a formal SBA task and needs to be done under supervised conditions in the classroom.
2. Each learner completes this task on his/her own (under test conditions).
3. Present your answers per the instructions of each question.
4. Draw all diagrams in pencil and labels in blue ink.
5. The diagrams in this task may NOT be drawn to scale.

BACKGROUND INFORMATION

What is breathing?

Breathing is the process that moves air in and out of the body (lungs). It enables oxygen to enter the body and carbon dioxide to be expelled.

Why is breathing so necessary for life?

The oxygen in the air is needed for the oxidation of food to release energy during respiration. This energy is used to perform the work needed to keep cells and organisms alive. Carbon dioxide is released during respiration and must be expelled, otherwise it will lower the pH of body fluids.

What is gaseous exchange?

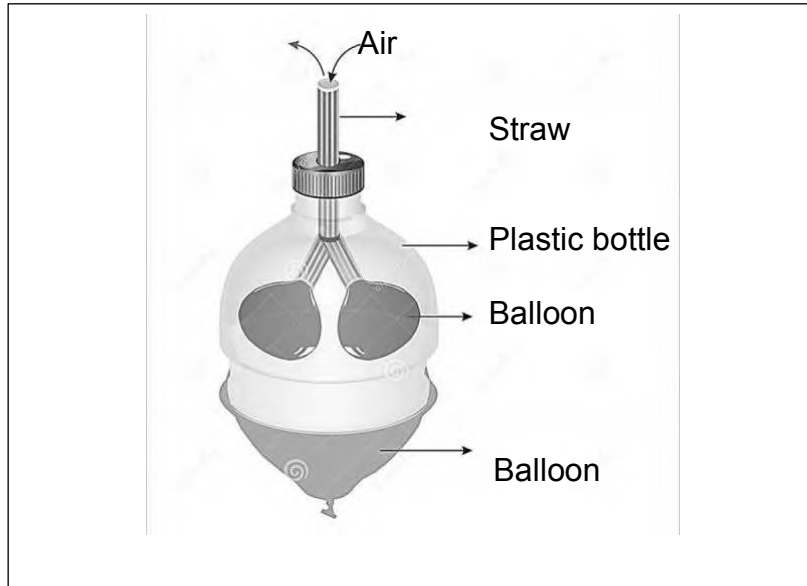
There is an exchange of gases in the lungs. When we breath in, oxygen in the air in the lungs diffuses into the blood from the alveoli. Carbon dioxide diffuses from the blood into the alveoli and is breathed out.

What is the breathing mechanism?

The breathing mechanism allows for pulmonary ventilation, commonly known as 'breathing'. This is the process of moving air into and out of the lungs. Air flows into the lungs during inspiration (inhalation) and out of the lungs during expiration (exhalation). Air flows because of pressure differences between the atmosphere and the gases inside the lungs.

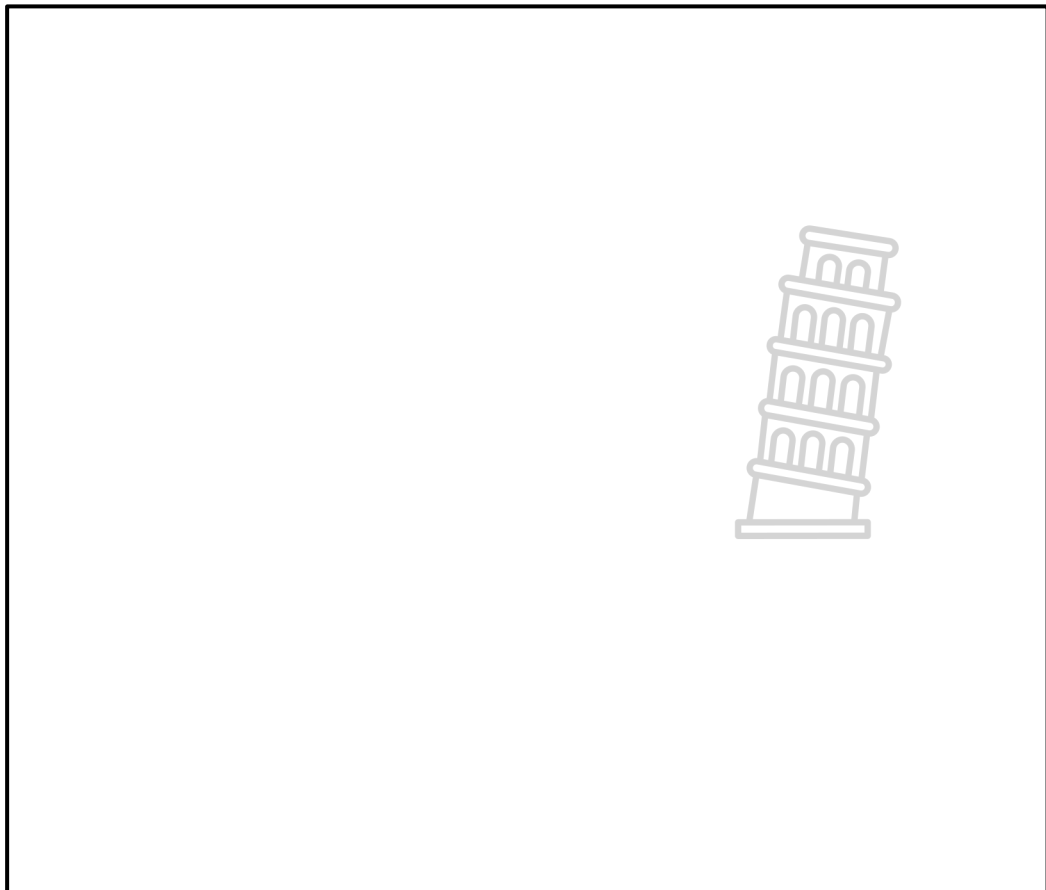
QUESTION 1: The human breathing mechanism

Grade 11 learners set up a model to demonstrate how the breathing mechanism works as shown below.

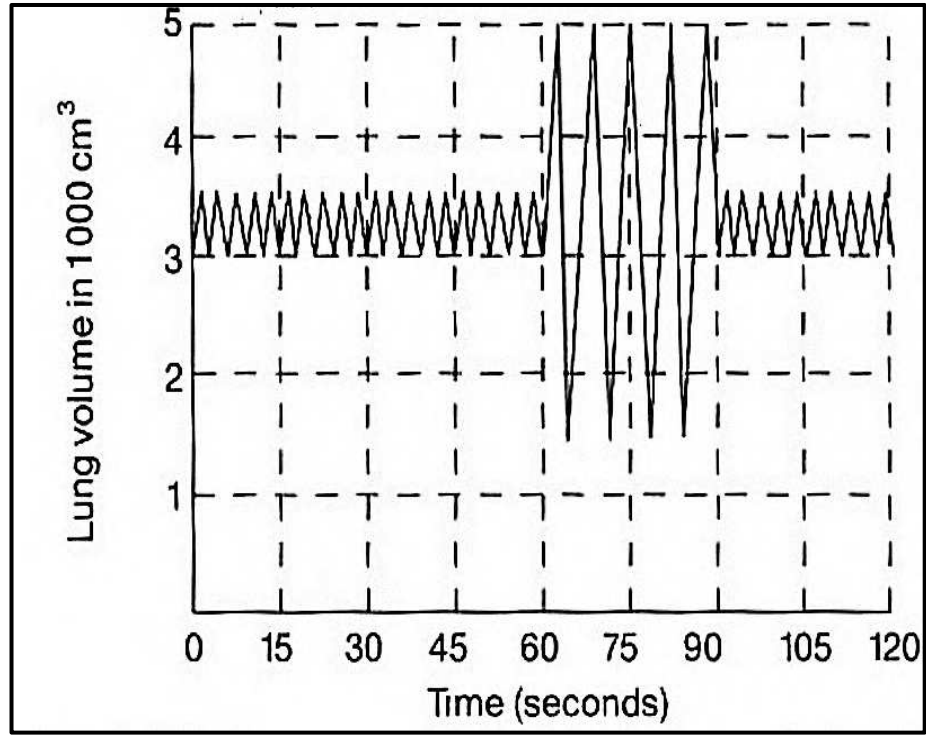


- 1.1 Draw a diagram and add annotated labels (a labelled drawing that provides an explanation for each label) showing how exhalation is demonstrated using the cold drink bottle model.

(5)



1.2 A spirometer was used to determine the volume of air in the lungs of a person during normal and deep breathing. The results obtained, are represented in the graph below.



1.2.1 What volume of air was breathed out during one normal exhalation? (1)

1.2.2 How many times did exhalation take place during 1 minute of normal breathing? (1)

1.2.3 How many times did deep exhalation take place in 30 seconds? (1)

1.2.4 Which muscles are actively involved in normal breathing? (2)

(10)

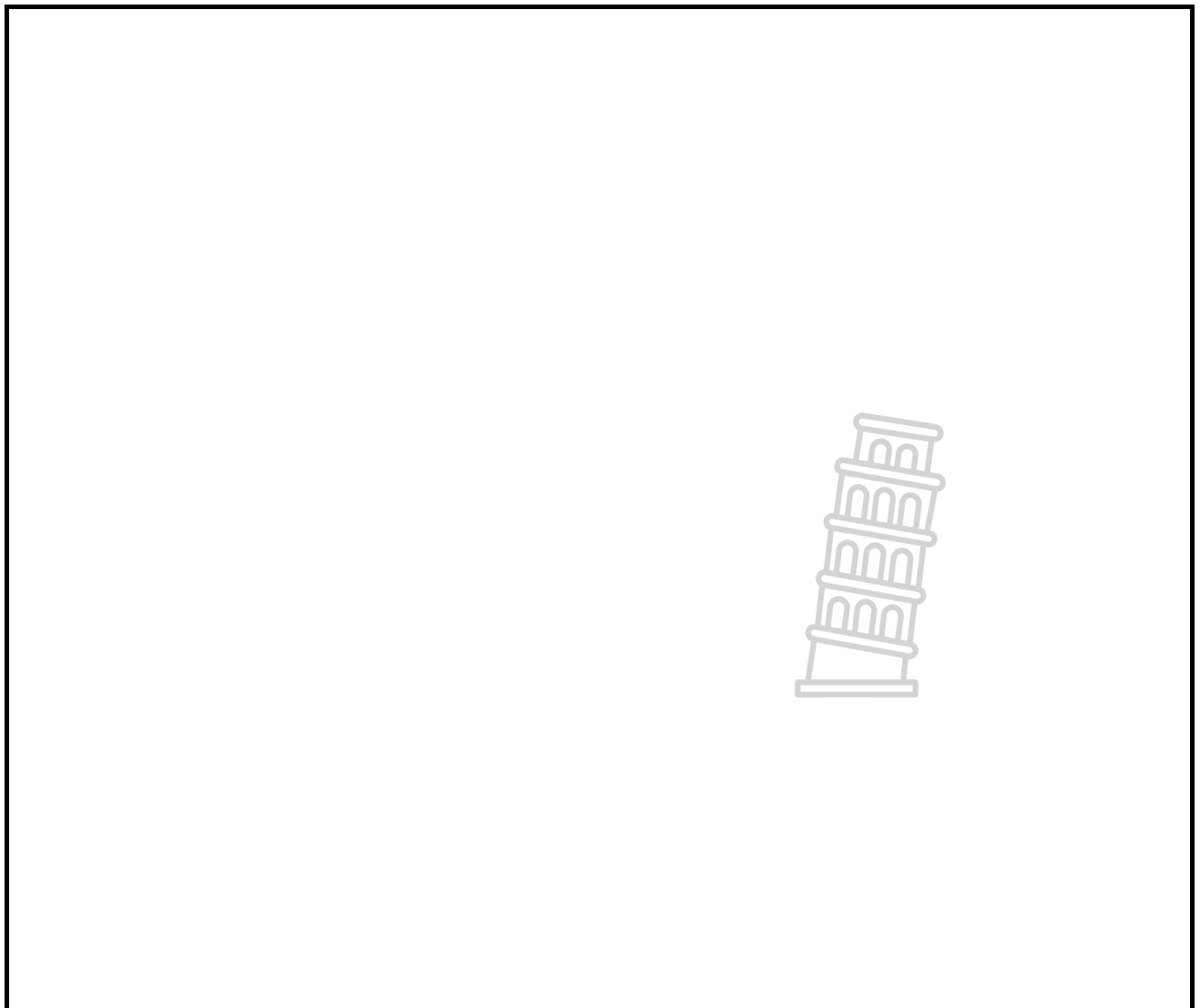
QUESTION 2: Breathing rate and activity

The following table shows the volume of air inhaled by a person over a period of 120 seconds.

Time (sec)	Volume of air inhaled (litres)
15	3,5
30	3,5
45	3,5
60	5,0
75	5,0
90	4,5
105	4,0
120	3,5

2.1 Use the information in the table to draw a line graph.

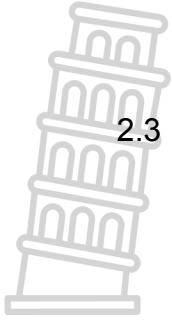
(6)





2.2 How long did this person exercise? (1)

(1)



2.3 Explain your answer to QUESTION 2.2 (2)

(2)

(9)

QUESTION 3: TB (tuberculosis) and COVID-19

Study the information and answer the questions.



<https://health-e.org.za/2021/03/19/impact-of-covid-on-tb/>

Studies conducted here in SA and other African settings are revealing that people with active TB or those that had TB just recently are in a higher state of risk to have the more severe types of COVID-19. This is because COVID-19 infections tend to destroy the very lung pockets that TB also destroys. This causes the accumulation of fluids in the lungs and the tissues linings become scarred and thickened.

Over a million additional cases of tuberculosis (TB), which is caused by *Mycobacterium tuberculosis*, went undiagnosed and untreated in the last year due to the impact of COVID-19-related lockdowns, significantly setting back the global effort to end TB by a massive 12 years, according to new data. This is a huge setback; on a personal human level these people are sick and staying somewhere in a house in a lockdown, infecting family members with TB.

<https://www.anovahealth.co.za/anova-news/tb-covid-19-need-know/>

3.1 Name the bacterium that causes TB (tuberculosis). (1)

3.2 From the extract state ONE effect both COVID-19 and TB have on the lungs. (1)

3.3 Explain why the effect of both COVID-19 and TB on the lungs could lead to possible death. (5)



3.4 Mention ONE reason why COVID-19 lockdowns set the global fight against TB back 12 years. (1)

3.5 Table showing TB & COVID-19 deaths in Africa and Asia from 1 March 2020 to 10 April 2021.

Continent	COVID-19 deaths	TB deaths
Africa	79 545	607 332
Asia	261 859	825 682

Adapted from <http://www.stoptb.org/covid19maps.asp>

Calculate how many times more deaths from TB were there in Africa than COVID-19 in the period given . Show all workings. (3)



(11)
TOTAL: 30

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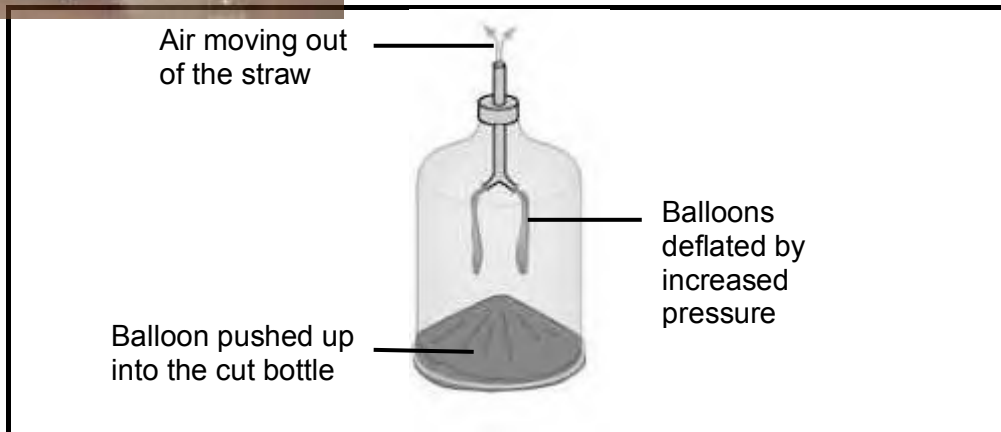
Practical Task Term 3

Marking Guideline

Total	
	30

QUESTION 1: The human breathing mechanism

1.1 Diagram of the lung model showing exhalation



Rubric for assessment of the diagram

Criterion	Mark allocation
Caption for the diagram (C)	1
Correct diagram (D) Correctly drawn per the model shown with the balloon diaphragm pushed inwards and the balloon lungs deflated	1
Correct labels (L) 1 correctly annotated label 2 correctly annotated labels 3 correctly annotated labels	1 OR 2 OR 3
Total	(5)

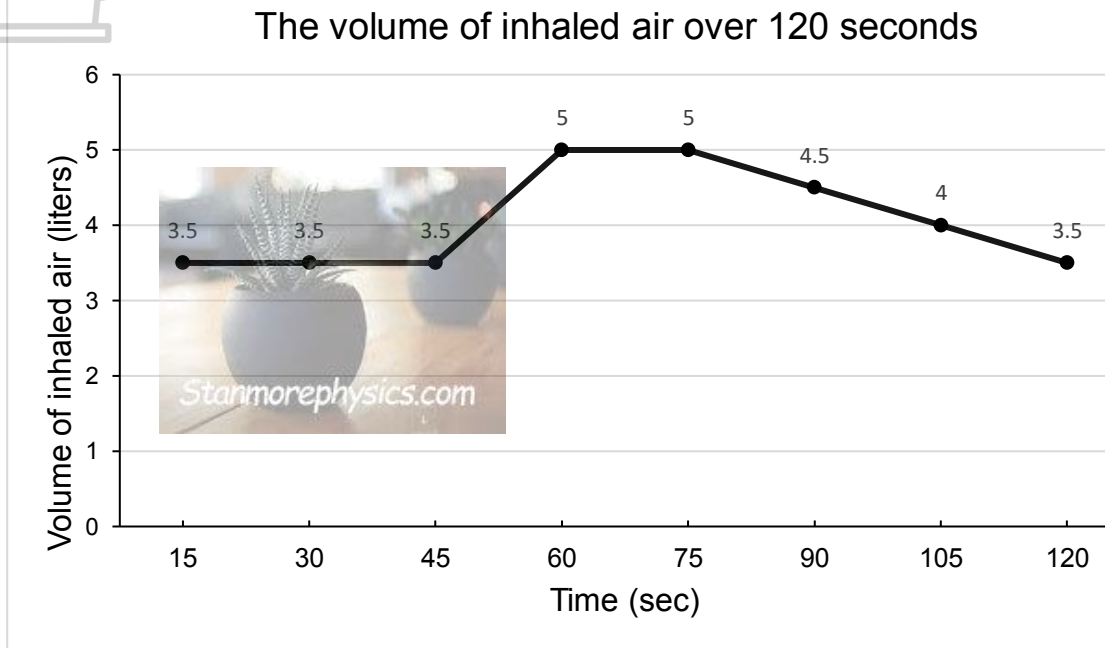
1.2.1 500cm³ ✓ (1)

1.2.2 20✓ (1)

- 1.2.3 4✓ (1)
- 1.2.4 Diaphragm✓ and external intercostal muscles✓ (2)
- (10)

QUESTION 2: Breathing rate

2.1



Rubric for assessment of the graph

Criterion	Mark Allocation
Correct type of graph (T)	1
Caption for graph (C)	1
Correct labels including units for x and y-axis (L)	1
Correct scales for x and y-axis (S)	1
Plotting of points:	
1 to 7 points correct (P)	1
All 8 points correct	OR 2

(6)

- 2.2 30 seconds✓ (1)
- 2.3
- The volume of air increased ✓ from 45 to 75 seconds
 - To supply the muscles with enough oxygen✓and
 - remove excess carbon dioxide ✓
- Any 2 (2)
- (9)**

QUESTION 3: TB (tuberculosis) and COVID-19

3.1 *Mycobacterium tuberculosis* ✓ (Note: the genus must have a capital letter and the species small letter and should be underlined by learners) (1)

- 3.2
- COVID-19 and TB
 - destroy the lung pockets ✓
 - Cause fluid to accumulate ✓ in the lungs
 - Tissue linings become scarred and thickened ✓

Mark first ONE only Any 1 (1)

- 3.3
- COVID-19 and TB causes
 - the squamous epithelium ✓ to become scarred and thickened
 - this prevents gaseous exchange ✓
 - between the alveolus and surrounding blood capillaries ✓
 - the accumulation of fluids prevents air flow to the alveoli ✓
 - therefore, less oxygen is available ✓
 - for cellular respiration ✓
 - resulting in organ failure due to lack of energy ✓
- Any 5 (5)

- 3.4
- over a million cases of tuberculosis went undiagnosed and untreated ✓
 - sick people, staying in a house due to lockdown, infected other family members causing more cases of TB ✓
- Mark first ONE only** Any 1 (1)

3.5 $\frac{607\,332}{79\,545}$ ✓ (Note: the marks are for a division calculation) (3)

= 7,64 times ✓ (11)

TOTAL: 30





Practical Task Term 3
Weighting: Practical Skills

Practical Skills						
Follow instructions	Handle equipment	Make observations	Draw a diagram	Calculation	Interpret	Design/Plan
✓		✓	✓	✓	✓	

Weighting: Cognitive Levels & Levels of Difficulty

Question	Cognitive Levels				Levels of Difficulty				Reason
	Level A Knowledge	Level B Understanding	Level C Application	Level D Evaluate, analyse & synthesize	Easy	Medium	Hard	Very hard	
1.1	1	3	1			5			
1.2.1		1				1			
1.2.2		1				1			
1.2.3		1				1			
1.2.4		2			2				
2.1	1	2	3			3	3		Concept
2.2		1				1			
2.3			2			2			
3.1	1				1				
3.2		1			1				
3.3				5			5		Task
3.4		1			1				
3.5		3					3		Task
Total	3	16	6	5	5	14	11	0	
Percentage	10	53	20	17	17	47	36	0	