

FOCUS

on Physical Sciences

CLASS TEST

GRADE 11

PHYSICAL SCIENCES: PHYSICS
Test 2: Waves, sound and light

MARKS: 45

TIME: 1 hour

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. You may use non-programmable calculators.
3. You may use appropriate mathematical instruments.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Data sheets are attached for your use.
6. Wherever motivation, discussion, et cetera is required, write brief answers.

SECTION A

QUESTION 1: ONE-WORD ANSWERS

Give ONE word or term for EACH of the following descriptions. Write only the word or term next to the question number (1.1–1.2).

- 1.1 Sound waves with frequencies greater than 20 kHz. (1)
- 1.2 An upright image produced by a lens. (1)
- [2]**

QUESTION 2: FALSE STATEMENTS

Correct the following FALSE statements. Write the correct statement next to the question number (2.1–2.2).

- 2.1 The pitch of the sound is dependent on the amplitude of the wave. (2)
- 2.2 A compound microscope uses a converging and a diverging lens to magnify a tiny object. (2)
- [4]**

QUESTION 3: MULTIPLE-CHOICE QUESTIONS

Choose the correct answer to the following questions. Write only the letter (A–D) next to the question number (3.1–3.2).

- 3.1 In the eye of a person with normal vision, the image is formed ...
A at F
B between F and 2F
C further than 2F
D between F and the optical centre (2)
- 3.2 The wavelength of the third harmonic in a string of length L is ...
A L
B $3L/2$
C $3L/4$
D $2L/3$ (2)
- [4]**

TOTAL SECTION A: 10

SECTION B

INSTRUCTIONS AND INFORMATION

1. The formulae and substitutions must be shown in ALL calculations.
2. Round off your answers to TWO decimal places where applicable.

QUESTION 4

A learner observes water waves produced in a ripple tank. She finds that the distance between ten consecutive crests is 270 mm. She also finds that the time taken for one crest to travel 60 mm is 3 s.

Calculate:

4.1 the wavelength of the wave (2)

4.2 the speed of the waves (3)

4.3 the frequency of the waves. (3)

[8]

QUESTION 5

Lenses can converge or diverge light rays and form images. An image of an object is produced on a screen by a convex lens placed 40 cm from the screen. The image is magnified four times.

5.1 When will a lens not form an image? (1)

5.2 What type of lens will form only virtual images? (1)

5.3 Draw an accurate diagram to determine the focal length of the lens. (3)

5.4 Determine the distance of the object from the lens. (5)

5.5 What kind of lens is used for the following:

5.5.1 the eye piece of an astronomical telescope

5.5.2 the objective of a compound microscope

5.5.3 to correct myopia? (3)

[13]

QUESTION 6

A man, facing a cliff, observes that an echo is heard 5,5 seconds after he makes a sharp sound. After walking 250 m directly towards the cliff, an echo is heard 4 seconds after he makes the sharp sound.

- 6.1 What is an echo? (2)
- 6.2 Calculate the speed of sound in air from these observations. (4)
- 6.3 How far from the cliff was the man when he made his second observation of the echo? (4)
- [10]**

QUESTION 7

The velocity of sound in air on a certain day is $352 \text{ m}\cdot\text{s}^{-1}$. If the frequency of the music note, middle C, is 256 Hz, calculate the wavelength in air of upper C, which is an octave above middle C.

[4]

TOTAL SECTION B: 35
GRAND TOTAL: 45

DATA FOR PHYSICAL SCIENCES GRADE 11 PHYSICS

PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Acceleration due to gravity	g	$9,8 \text{ m}\cdot\text{s}^{-2}$
Speed of light in a vacuum	c	$3,0 \times 10^8 \text{ m}\cdot\text{s}^{-1}$
Gravitational constant	G	$6,67 \times 10^{-11} \text{ N}\cdot\text{m}^2\cdot\text{kg}^{-2}$
Coulomb's constant	k	$9,0 \times 10^9 \text{ N}\cdot\text{m}^2\cdot\text{C}^{-2}$
Charge on electron	e^-	$-1,6 \times 10^{-19} \text{ C}$
Electron mass	m_e	$9,11 \times 10^{-31} \text{ kg}$
Permittivity of free space	ϵ_0	$8,85 \times 10^{-12} \text{ F}\cdot\text{m}^{-1}$

FORMULAE

MOTION

$v_f = v_i + a\Delta t$	$\Delta x = v_i\Delta t + \frac{1}{2} a\Delta t^2$
$v_f^2 = v_i^2 + 2a\Delta x$	$\Delta x = \left(\frac{v_f + v_i}{2}\right) \Delta t$

FORCE

$F_{net} = ma$	$p = mv$
$F = \frac{Gm_1m_2}{r^2}$	$F\Delta t = \Delta p = mv - mu$
$\mu_s = \frac{f_{s(max)}}{N}$	$\mu_k = \frac{f_k}{N}$

WEIGHT AND MECHANICAL ENERGY

$F_g = mg$	$U = E_p = mgh$
$K = E_k = \frac{1}{2} mv^2$	

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WAVES, LIGHT AND SOUND

$v = f \lambda$ or $v = \nu \lambda$	$T = \frac{1}{f}$ or $T = \frac{1}{\nu}$
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ELECTROSTATICS

$F = \frac{kQ_1Q_2}{r^2}$ ($k = 9,0 \times 10^9 \text{ N}\cdot\text{m}^2\cdot\text{C}^{-2}$)	$E = \frac{F}{q}$
$E = \frac{kQ}{r^2}$ ($k = 9,0 \times 10^9 \text{ N}\cdot\text{m}^2\cdot\text{C}^{-2}$)	$E = \frac{V}{d}$
$V = \frac{W}{Q}$	$W = QEs$
$U = \frac{kQ_1Q_2}{r}$ ($k = 9,0 \times 10^9 \text{ N}\cdot\text{m}^2\cdot\text{C}^{-2}$)	$C = \frac{Q}{V}$
$C = \frac{\epsilon_0 A}{d}$	

ELECTROMAGNETISM

$\epsilon = -N \frac{\Delta\Phi}{\Delta t}$	$\Phi = BA$
$\frac{V_s}{V_p} = \frac{N_s}{N_p}$	$F = qvB$

CURRENT ELECTRICITY

$I = \frac{Q}{\Delta t}$	$R = \frac{V}{I}$
$\text{emf} = I(R + r)$	$R = r_1 + r_2 + r_3 + \dots$
$\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} + \dots$	

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