

PRACTICE EXAMINATION PAPER

PHYSICAL SCIENCES

PAPER 1 | GRADE 12 | 2024

Time: 3 hours

Total: 150 marks

Language: English

This paper is for PRACTICE purposes only. Not an official Department of Basic Education paper.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of 12 questions.

2. Answer A

QUESTION 1: Multiple Choice (answer A, B, C or D)

[20 marks]

- 1.1** A ball is thrown vertically upward. At the highest point, the net force on the ball is:
A: Zero B: Equal to its weight, downward C: Less than its weight D: Greater than its weight (2)
- 1.2** Which ONE of the following is a vector quantity?
A: Speed B: Distance C: Mass D: Displacement (2)
- 1.3** A 5 kg object moves at constant velocity on a horizontal surface. The applied horizontal force is 20 N. The kinetic friction force is:
A: 0 N B: 20 N C: 49 N D: 5 N (2)
- 1.4** The momentum of an object doubles when its velocity doubles. This illustrates Newton's:
A: First Law B: Second Law C: Third Law D: Law of Universal Gravitation (2)
- 1.5** According to the work-energy theorem, the net work done on an object equals:
A: Its potential energy B: Its kinetic energy C: Its change in kinetic energy D: Its weight times displacement (2)
- 1.6** Two charges +2Q and -Q are placed 0,3 m apart. The force between them is attractive. If the distance is halved:
A: Force doubles B: Force quadruples C: Force halves D: Force stays same (2)
- 1.7** A wave has frequency 50 Hz and wavelength 2 m. Its speed is:
A: 25 m/s B: 52 m/s C: 100 m/s D: 0,04 m/s (2)
- 1.8** The Doppler effect occurs because:
A: Wave speed changes B: Relative motion between source and observer causes apparent frequency change C: Amplitude changes D: Medium properties change (2)
- 1.9** In a series circuit with two resistors, the current through each resistor is:

A: Different B: The same C: Proportional to resistance D: Inversely proportional to resistance (2)

1.10 Electromagnetic induction produces an EMF when:

- A: A conductor is stationary in a magnetic field B: The magnetic flux through a conductor changes C: A current flows through a conductor D: The conductor is heated (2)

TOTAL FOR THIS QUESTION: 20

QUESTION 2: Mechanics - Newton's Laws

[30 marks]

2.1 A 10 kg block rests on a rough horizontal surface ($\mu_k = 0,3$). A force of 60 N is applied at 30 degrees above the horizontal.

(a) Draw a free body diagram showing ALL forces on the block. (3)

Draw FBD here:

2.2 (b) Calculate the normal force N. (3)

Answer:

2.3 (c) Calculate the friction force. (2)

Answer:

2.4 (d) Calculate the acceleration of the block. (3)

Answer:

2.5 A 3 kg and 5 kg block are connected by a light string over a frictionless pulley (Atwood machine). Calculate:

(a) The acceleration of the system. (4)

Answer:

2.6 (b) The tension in the string. (3)

Answer:

2.7 A 1 200 kg car brakes from 30 m/s to rest in 6 s. Calculate:
(a) The braking force. (4)

Answer:

2.8 (b) The stopping distance using work-energy theorem. (4)

Answer:

2.9 Explain Newton's Third Law using an example of a rocket launching. (4)

Answer:

TOTAL FOR THIS QUESTION: 30

QUESTION 3: Projectile Motion and Vertical Motion

[20 marks]

3.1 A ball is thrown vertically upward with initial velocity 25 m/s from a building 50 m high.
(a) Calculate the maximum height above the ground. (4)

Answer:

3.2 (b) Calculate the total time the ball is in the air. (5)

Answer:

3.3 (c) Calculate the velocity when the ball hits the ground. **(3)**

Answer:

3.4 A projectile is launched horizontally at 20 m/s from a cliff 80 m high. Calculate:
(a) Time to reach the ground. **(3)**

Answer:

3.5 (b) Horizontal range. **(2)**

Answer:

3.6 (c) Speed just before impact. **(3)**

Answer:

TOTAL FOR THIS QUESTION: 20

QUESTION 4: Waves, Sound and the Doppler Effect

[20 marks]

4.1 A siren emits sound at 850 Hz. A car approaches at 25 m/s. Speed of sound = 340 m/s.
(a) Calculate the frequency heard by a stationary observer. **(4)**

Answer:

4.2 (b) How would this frequency change as the car moves away? Explain. **(3)**

Answer:

4.3 A string vibrates at its fundamental frequency. The string is 0,8 m long and the wave speed is 240 m/s.

(a) Calculate the fundamental frequency. (3)

Answer:

4.4 (b) What is the frequency of the 3rd harmonic? (2)

Answer:

4.5 Explain with a diagram the difference between a transverse and longitudinal wave. (4)

Draw/explain here:

4.6 The distance between two successive crests of a water wave is 0,5 m. The wave passes a point 4 times per second. Find the speed. (4)

Answer:

TOTAL FOR THIS QUESTION: 20

QUESTION 5: Electricity and Magnetism

[30 marks]

5.1 Three resistors of 6 ohm, 12 ohm and 4 ohm are connected in parallel. This combination is connected in series with a 2 ohm resistor and a battery of EMF 24V and internal resistance 1 ohm.

(a) Calculate the equivalent resistance of the parallel combination. (4)

Answer:

5.2 (b) Calculate the total resistance of the circuit. **(2)**

Answer:

5.3 (c) Calculate the current from the battery. **(3)**

Answer:

5.4 (d) Calculate the terminal voltage of the battery. **(3)**

Answer:

5.5 (e) Calculate the power dissipated in the 12 ohm resistor. **(4)**

Answer:

5.6 A coil of 200 turns and area $0,05 \text{ m}^2$ rotates at 50 Hz in a uniform magnetic field of 0,4 T.

(a) Calculate the maximum EMF induced. **(4)**

Answer:

5.7 (b) Calculate the RMS voltage. **(3)**

Answer:

5.8 Explain, with reference to Lenz's Law, why the induced current opposes the change in flux. **(4)**

Answer:

5.9

Distinguish between an AC generator and a DC generator.

(3)

Answer:

TOTAL FOR THIS QUESTION:

30