

KRYPTON SHARIFF EXAMINATION BODY (KSB)

Senior 3 Physics Mock Paper

Time Allowed: 2½ hours

SECTION A: [40 marks]

Attempt all items in this section.

Item 1

During a school music gala, students wore shirts of different colours under disco lights. Some colours appeared brighter than usual while others almost disappeared. Meanwhile, the school nurse brought a chart to check the eyesight of students with difficulty reading from a distance or up close. Behind the tent, sound waves bounced off nearby walls and created echoes that interfered with announcements.

As a Physics student, your task is to:

- (i) Explain how the different colours of clothing appeared under disco lighting.
- (ii) Describe how reflection and wave behavior led to the formation of echoes.
- (iii) Differentiate between long-sightedness and short-sightedness, and explain how each can be corrected.
- (iv) Explain how understanding these concepts is useful when planning a concert or public show.

Item 2

A group of learners at Phoenix School observed the night sky during an Astronomy Club camp. They noticed some bright objects constantly changed positions while others stayed fixed. Some of the bright objects appeared to twinkle, while the Moon changed its shape over several nights. A question arose: why does the Moon appear to change its shape, and why do stars twinkle?

As a Physics student, your task is to:

- (i) Explain why stars appear to twinkle when observed from Earth.
- (ii) Describe the phases of the Moon and what causes them.
- (iii) Distinguish between stars, planets, and satellites using observations from the night sky.
- (iv) Suggest how understanding these features could guide future space exploration.

Item 3

At the coastline near Merokappa City, students observed the rise and fall of sea levels twice a

day. Some fishermen said it's easier to fish at certain hours. Meanwhile, a physics documentary explained the origin of the Universe and the life of stars. It highlighted how the Sun was once a dust cloud.

As a Physics student, your task is to:

- (i) Describe what causes ocean tides and explain why they occur twice daily.
- (ii) Briefly explain the life cycle of a star, including how the Sun will end its life.
- (iii) Using the Big Bang theory, explain how the Universe is believed to have originated.
- (iv) Justify why Venus is the hottest planet even though it is not the closest to the Sun.

SECTION B PART I: [30 marks]

Attempt only one item from this section.

All items in this section involve numerical reasoning and mechanics.

Item 4

Two carts of masses 4.0 kg and 3.0 kg are moving towards each other on a frictionless track. The 4.0 kg cart moves at 2.0 m/s while the 3.0 kg cart moves at 1.0 m/s. After collision, they stick together.

As a Physics student, your task is to:

- (i) State the law of conservation of momentum and how it applies to the collision.
- (ii) Calculate the total momentum before the collision.
- (iii) Calculate the velocity of the combined mass after the collision.
- (iv) Discuss how such collisions are useful in real-life applications such as bumper design or railway engineering.

Item 5

A student drops a metal ball from a tower 25 m high. It takes a short time to hit the ground. The ball gains speed as it falls, and a sound is heard after the ball hits the ground.

As a Physics student, your task is to:

- (i) State the meaning of acceleration due to gravity.
- (ii) Calculate the time taken by the ball to reach the ground (use $g = 10 \text{ m/s}^2$).

- (iii) Determine the final velocity of the ball just before hitting the ground.
- (iv) Explain why a feather does not fall in the same way as the metal ball, even from the same height.

SECTION B PART II: [30 marks]

Attempt only one item from this section.

These items also involve numerical and conceptual analysis in mechanics.

Item 6

A builder uses a machine to lift concrete from the ground to the top of a building 10 m high. Each bag of concrete has a mass of 50 kg. The machine takes 5 seconds to raise one bag.

As a Physics student, your task is to:

- (i) Calculate the work done in lifting one bag of concrete.
- (ii) Determine the power of the machine.
- (iii) State the type of energy transformation taking place.
- (iv) Discuss how energy and power considerations affect the design of such machines in the construction industry.

Item 7

A student performs an experiment using a spring and different weights to explore motion in a straight line. The extension of the spring increases as weights are added. At some point, the motion becomes non-uniform as the spring behaves unpredictably.

As a Physics student, your task is to:

- (i) State Hooke's law and explain its relation to straight-line motion.
- (ii) A 2.0 N force stretches the spring by 4 cm. Calculate the spring constant.
- (iii) If a 5.0 N force is applied, calculate the new extension.
- (iv) Explain why the spring stops obeying Hooke's Law after a certain point and what this means for real-life materials like rubber or steel.

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