PHYSICS ENTRANCE TEST SAMPLE PAPER

Sample paper only provides:

10 MCQ and 2 SAQ

Actual Paper

Total 30 MCQ + 4 SAQ

Each MCQ is 2 marks

Each SAQ is 10 marks

Instructions

1. This is a **closed-book** test.

2. It has a time limit of **90 minutes** and allows for only **ONE attempt (submission)**.

3. Alert the invigilator if you are facing technical difficulties.

4. You are to **ensure** that:

- your laptops, computers and any other devices used for this test is in good functioning order and have uninterrupted power supply and internet connection throughout the duration of the test.
- you are in a conducive environment throughout the duration of the test.
- your answers are correctly saved by the end of the test.

5. You are **allowed** to use:

- a scientific calculator.
- a blank piece of paper (no larger than A4 size) for rough work. The paper will not be accepted for submission at the end of the test.

6. You are **not allowed** to:

- leave the test or leave your devices throughout the duration of the test.
- use the washroom throughout the duration of the test.
- communicate with any person, either face-to-face or through any communication device, other than the invigilator.
- refer to any references, e.g. textbooks, resources from a laptop or smart devices etc.
- share materials (e.g. electronic calculator) during the test.
- use any communication devices such as mobile phones, tablets, smart watches, headsets during the test.

7. Enter the password provided by the invigilator to start Test paper.

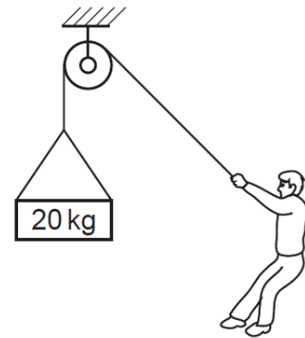**SECTION A - ANSWER ALL QUESTIONS (20 Marks)**

Question 1

An object is falling under gravity with terminal velocity. Its speed is _____.

A   increasing
B   staying constant
C   decreasing to zero
D   decreasing to a lower value

Question 2

A person supports a mass of 20 kg suspended from a rope.
What is the tension in the rope?

A   0 N
B   10 N
C   20 N
D   200 N

Question 3

A stretched spring attached to two fixed points is compressed on one end and released, as shown below. The resulting wave travels back and forth between the two fixed ends of the spring until it comes to a stop. This mechanical wave is an example of a _____.

A   transverse wave
B   refracted wave
C   longitudinal wave
D   super-positioned wave
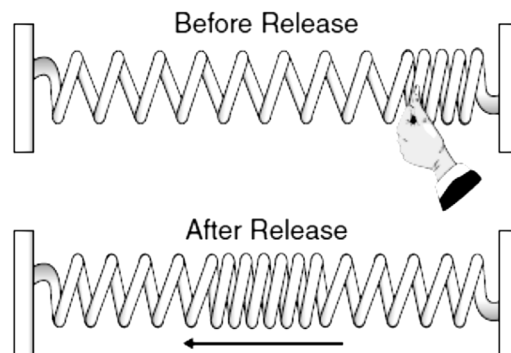
Question 4

The sounds produced by two musical instruments are directed towards a microphone connected to an oscilloscope. The waveforms produced on the screen are shown.
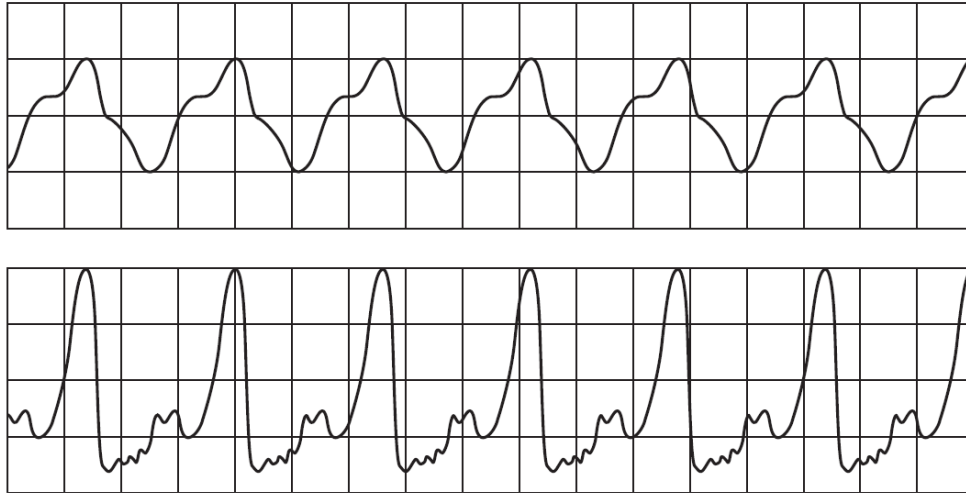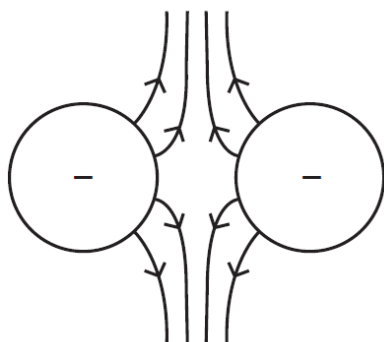
The waveforms show that the sounds produced have a different property.
What is the property?

A   Speed
B   Frequency
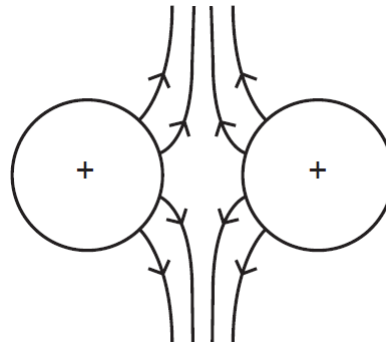C   Wavelength
D   The quality of sound

Question 5

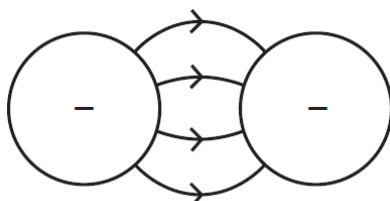Which diagram correctly shows the electric field between two charged spheres?

A

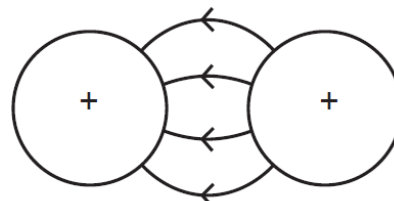B

C

D

Question 6

An electrical quantity is defined as 'the energy converted by a source in driving a unit charge round a complete circuit.' What is this quantity called?

A Power
B Current
C Electromotive force
D Potential difference

Question 7

Two pulses of the same amplitude move on a string to the right as shown below. When pulse S reflects from the fixed end of the string and interferes with T, the shape of the resultant pulse is best described by:

A B C D
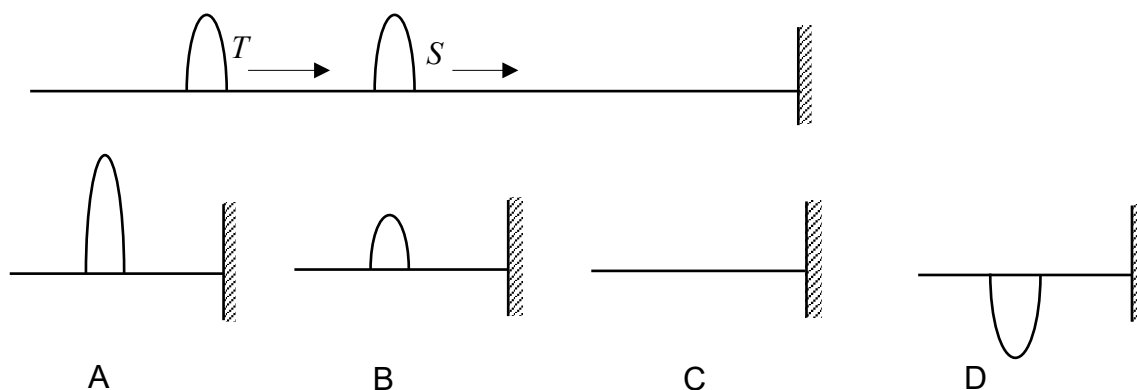
Question 8

Bubbles of gas, escaping from the mud at the bottom of a deep lake, rise to the surface. As the bubbles rise, they get larger because _____.
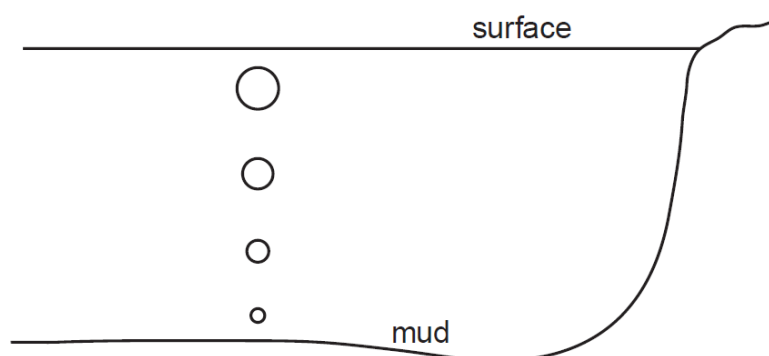
A water pressure on the bubbles decreases
B water pressure on the bubbles increases
C atmospheric pressure on the bubbles decreases
D atmospheric pressure on the bubbles increases

Question 9

Two forces have magnitudes of 11 newtons and 5 newtons. The magnitude of their sum could NOT be equal to which of the following values?

A   16 newtons
B   5 newtons
C   9 newtons
D   7 newtons

Question 10

If the resultant force acting on a body of constant mass is zero, the body's momentum is:

A   constant
B   increasing
C   decreasing
D   always zero

END OF SECTION A

SECTION B – ANSWER ALL QUESTIONS (20 Marks)

Question 1

The density ρ and the pressure P of a gas are related by the expression $c^2 = \dfrac{\gamma P}{\rho}$.

(a)   Given Pressure $P = \dfrac{Force}{Area}$, where $Force = Mass \times Acceleration$, find the base units of P.   (4 marks)

(b)   If γ has no unit and the base units of ρ are kg m^{-3}, what are the base units of c ?   (4 marks)

(c)   Basing on your answer to (b), suggest what physical quantity may be represented by c ?   (2 marks)

Question 2

A block of mass m is placed on a smooth, inclined plane of angle θ as shown in Figure 1.

(a)   Suppose $\theta = 20º$, determine the acceleration of the block after it is released.   (5 marks)

(b)   Suppose $m = 5$ kg and the length of the incline is 10 m, find the speed when it reaches the bottom of the incline.   (5 marks)
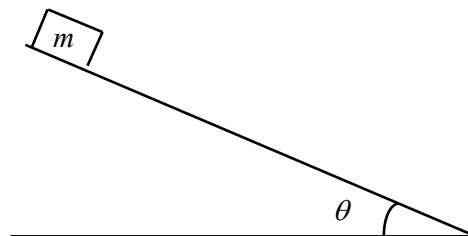

Figure 1

END OF SECTION B

Formula Table

Equations of Kinematics	$v = u + at$ $\qquad$ $s = \frac{1}{2}(v + u)t$ $v^2 = u^2 + 2as$ $\qquad$ $s = ut + \frac{1}{2}at^2$
Force and Motion	$\sum F = ma$ $\qquad$ $F_{\text{Friction}} = \mu\,\vec{N}$
Work, Energy, Power	$W = (F\cos\theta)\Delta r$ $KE = \frac{1}{2}mv^2$ $\qquad$ $PE = mgh$ $P_{\text{Average}} = \text{Work/Time} = \Delta\text{Energy/Time}$ $P \;\;= Fv$
Linear Momentum Impulse	$\vec{p} = m\,\vec{v}$ $\vec{I} = \vec{F}_{\text{Average}}\Delta t = m\vec{v}_f - m\vec{v}_i$
Torque, Moment	$\tau = rF\sin\theta = r_\perp F = rF_\perp$
Elasticity, SHM	$F = -kx$ $\qquad$ $PE_{\text{Elastic}} = \frac{1}{2}kx^2$ $\dfrac{F}{A} = Y\dfrac{\Delta L}{L}$ $\qquad$ $\dfrac{F}{A} = S\dfrac{\Delta x}{L}$
Heat and Temperature	$\Delta L = \alpha L_0 \Delta T$ $\qquad$ $\Delta V = \beta V_0 \Delta T$ $Q = mc\Delta T$ $\qquad$ $Q = ml$
Gravitational Acceleration	$g = 10 \text{ m/s}^2$