

**SCIENCE (CHEMISTRY/ PHYSICS)
ENTRANCE TEST SAMPLE PAPER**

Sample paper only provide:

5 MCQ + 1 SAQ for Chemistry

5 MCQ + 1 SAQ for Physics

Actual Paper

Total 30 MCQ + 4 SAQ

15 MCQ and 2 SAQ for Chemistry

15 MCQ and 2 SAQ for Physics

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

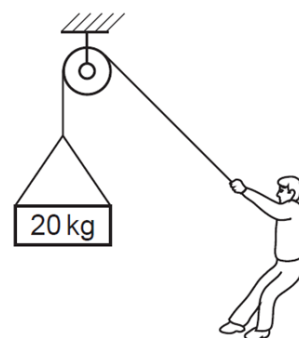
An object is falling under gravity with terminal velocity. Its speed is _____.

- 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

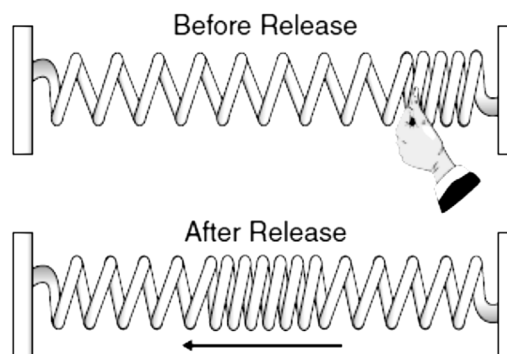


()

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 _____.

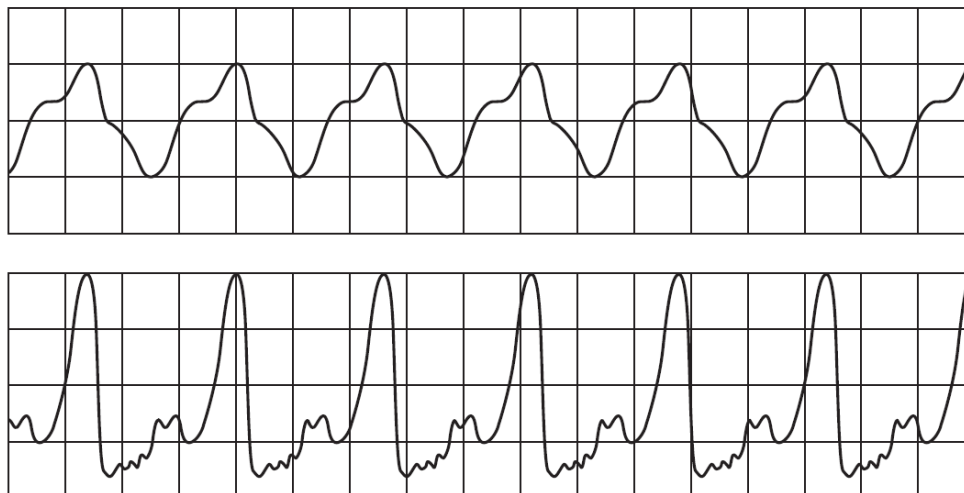
- A transverse wave
- B refracted wave
- C longitudinal wave
- D super-positioned wave



()

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.

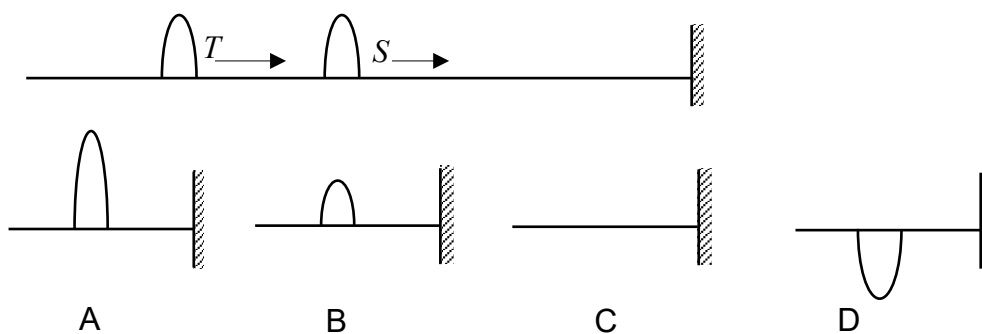


The waveforms show that the sounds produced have a different property. What is the property?

- A Speed
- B Frequency
- C Wavelength
- D The quality of sound ()

Question 5

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:



()

Question 6

Methanol boils at 65°C and water boils at 100°C. Given that methanol and water are completely miscible with each other, which is the **MOST SUITABLE** method to separate a mixture of these two liquids?

- A. Evaporation
- B. Crystallisation
- C. Fractional distillation
- D. Paper chromatography ()

Question 7

Two isotopes of carbon are ^{12}C and ^{13}C . Which statement about the isotopes is **TRUE**?

- A. They have the same number of electrons and neutrons.
- B. They have the same number of electrons and protons.
- C. They have the same number of neutrons and protons.
- D. They have the same number of nucleons and electrons. ()

Question 8

The electronic configuration of atom **D** is 2, 7. The electronic configuration of atom **E** is 2, 6. What is the formula of the compound formed between atoms **D** and **E**?

- A. D_2E
- B. DE_2
- C. D_6E
- D. DE_7 ()

Question 9

A label is missing from a bottle of green solution **C**. In order to identify the solution, two chemical tests are carried out.

Test 1: A few drops of aqueous sodium hydroxide are added to a sample of solution **C**. A green precipitate is formed.

Test 2: Excess aqueous sodium hydroxide and aluminium are added to another sample of solution **C** and heated. A pungent gas, which turns damp red litmus paper blue, is produced.

What is **C**?

- A. Iron(II) nitrate
 - B. Iron(III) nitrate
 - C. Iron(II) sulfate
 - D. Iron(III) sulfate
- ()

Question 10

A solution of nitric acid has a concentration of 0.100 mol/dm^3 while a solution of potassium hydroxide has a concentration of 0.125 mol/dm^3 . What is the volume (in cm^3) of potassium hydroxide required to completely neutralize 20.0 cm^3 of nitric acid?

- A. 8.00
 - B. 12.0
 - C. 16.0
 - D. 32.0
- ()

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 $c^2 = \frac{\gamma P}{\rho}$.

- (a) Given Pressure $P = \frac{\text{Force}}{\text{Area}}$, where $\text{Force} = \text{Mass} \times \text{Acceleration}$, 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

An atom of an element **L** has one electron in its second electron shell.

- (a) State the atomic number of this element. (1 mark)
- (b) State which group and period of the periodic table this element is in. (2 marks)
- (c) What is the name of this element? (1 mark)
- (d) Identify **TWO** other elements in the same group. (2 marks)
- (e) Explain why this element has similar chemical properties as other members of its group in the periodic table. (1 mark)
- (f) Element **L**, oxygen and fluorine are in the same period.
- (i) Explain why these three elements are in the same period. (1 mark)
- (ii) Write the name of the compounds formed between: (2 marks)

Element **L** and oxygen:

Element **L** and fluorine:

END OF SECTION B

Formula Table

Equations of Kinematics	$v = u + at \quad s = \frac{1}{2}(v + u)t$ $v^2 = u^2 + 2as \quad s = ut + \frac{1}{2}at^2$
Force and Motion	$\sum F = ma \quad F_{\text{Friction}} = \mu \vec{N}$
Work, Energy, Power	$W = (F \cos \theta) \Delta r$ $KE = \frac{1}{2}mv^2 \quad PE = mgh$ $P_{\text{Average}} = \text{Work/Time} = \Delta \text{Energy/Time}$ $P = Fv$
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	$F = -kx \quad PE_{\text{Elastic}} = \frac{1}{2}kx^2$ $\frac{F}{A} = Y \frac{\Delta L}{L} \quad \frac{F}{A} = S \frac{\Delta x}{L}$
Heat and Temperature	$\Delta L = \alpha L_0 \Delta T \quad \Delta V = \beta V_0 \Delta T$ $Q = mc\Delta T \quad Q = ml$
Gravitational Acceleration	$g = 10 \text{ m/s}^2$

Periodic Table

The Periodic Table of the Elements

		Group																												
I	II	III	IV	V	VI	VII	0					0																		
1 H hydrogen											2 He helium																			
3 Li lithium	4 Be beryllium											5 B boron	6 C carbon	7 N nitrogen	8 O oxygen	9 F fluorine	10 Ne neon													
11 Na sodium	12 Mg magnesium											13 Al aluminium	14 Si silicon	15 P phosphorus	16 S sulfur	17 Cl chlorine	18 Ar argon													
19 K potassium	20 Ca calcium	21 Sc scandium	22 Ti titanium	23 V vanadium	24 Cr chromium	25 Mn manganese	26 Fe iron	27 Co cobalt	28 Ni nickel	29 Cu copper	30 Zn zinc	31 Ga gallium	32 Ge germanium	33 As arsenic	34 Se selenium	35 Br bromine	36 Kr krypton													
37 Rb rubidium	38 Sr strontium	39 Y yttrium	40 Zr zirconium	41 Nb niobium	42 Mo molybdenum	43 Tc technetium	44 Ru ruthenium	45 Rh rhodium	46 Pd palladium	47 Ag silver	48 Cd cadmium	49 In indium	50 Sn tin	51 Sb antimony	52 Te tellurium	53 I iodine	54 Xe xenon													
55 Cs caesium	56 Ba barium	57 La lanthanum	72 Hf hafnium	73 Ta tantalum	74 W tungsten	75 Re rhenium	76 Os osmium	77 Ir iridium	78 Pt platinum	79 Au gold	80 Hg mercury	81 Tl thallium	82 Pb lead	83 Bi bismuth	84 Po polonium	85 At astatine	86 Rn radon													
87 Fr francium	88 Ra radium	89 Ac actinium											89 Tm thulium	90 Yb ytterbium	91 Lu lutetium	92 Hf hafnium	93 Ta tantalum	94 W tungsten	95 Re rhenium	96 Os osmium	97 Ir iridium	98 Pt platinum	99 Au gold	100 Hg mercury	101 Tl thallium	102 Pb lead	103 Bi bismuth	104 Po polonium	105 At astatine	106 Rn radon

*58-71 Lanthanoid series
†90-103 Actinoid series

140 Ce cerium	141 Pr praseodymium	144 Nd neodymium	150 Sm samarium	152 Eu europium	157 Gd gadolinium	162 Dy dysprosium	165 Ho holmium	167 Er erbium	169 Tm thulium	173 Yb ytterbium	175 Lu lutetium
232 Th thorium	238 Pa protactinium	238 U uranium	238 Pu plutonium	238 Am americium	238 Cm curium	238 Bk berkelium	238 Cf californium	238 Fm fermium	238 Md mendelevium	238 No nobelium	238 Lr lawrencium

Key
 $\begin{matrix} a \\ \text{X} \\ b \end{matrix}$

 a = relative atomic mass
 X = atomic symbol
 b = proton (atomic) number