SCIENCE (CHEMISTRY/ PHYSICS)
ENTRANCE TEST SAMPLE PAPER

Sample paper only provides:

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)

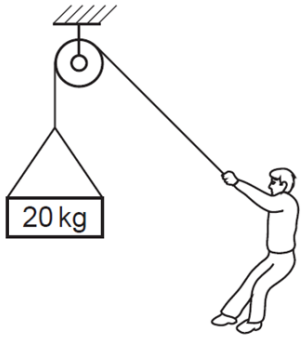
Question 1

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?

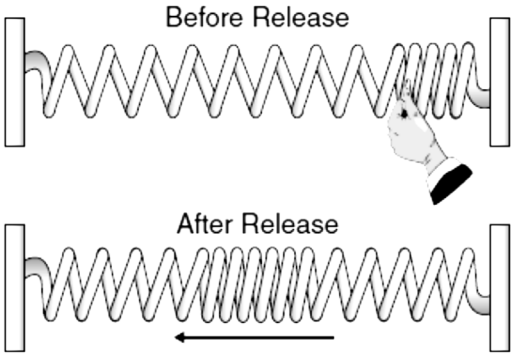


A 0 N
B 10 N
C 20 N
D 200 N

( )

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 _____.

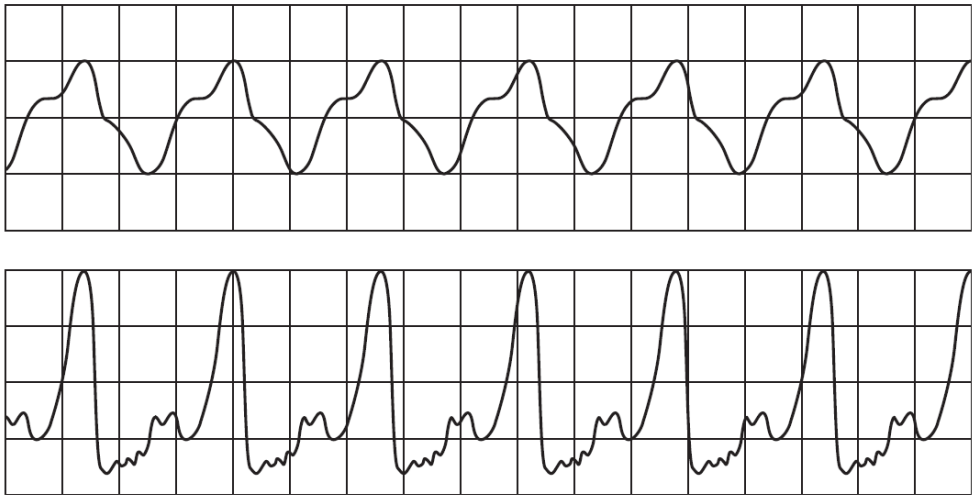


A transverse wave
B refracted wave
C longitudinal wave
D super-positioned wave

( )

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.

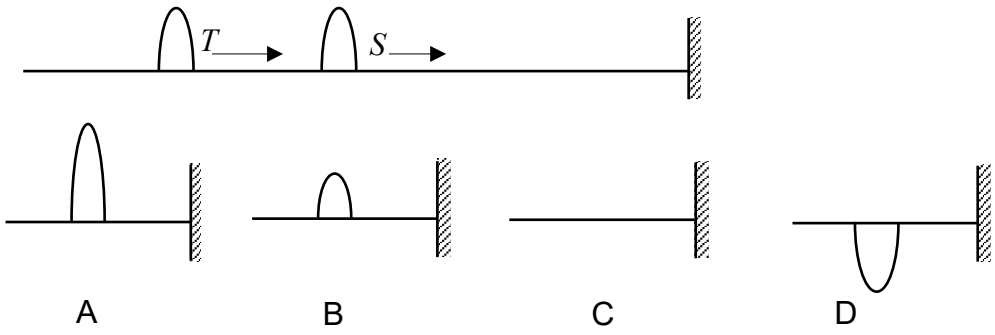


The waveforms show that the sounds produced have a different property.
What is the property?

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 areC612 and C613. 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 neucleons 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 $P = \frac{Force}{Area}$, where $Force = Mass$ x $Acceleration$, 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
																4 He helium 2
					1 H hydrogen 1						11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
	7 Li lithium 3	9 Be beryllium 4									27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
	23 Na sodium 11	24 Mg magnesium 12									70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
	39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	65 Zn zinc 30	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
	85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	– Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	112 Cd cadmium 48	108 Ag silver 47	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	– Po polonium 84	– At astatine 85	– Rn radon 86
	133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57 *	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79							
	– Fr francium 87	– Ra radium 88	– Ac actinium 89 †															

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	– Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
232 Th thorium 90	– Pa protactinium 91	238 U uranium 92	– Np neptunium 93	– Pu plutonium 94	– Am americium 95	– Cm curium 96	– Bk berkelium 97	– Cf californium 98	– Es einsteinium 99	– Fm fermium 100	– Md mendelevium 101	– No nobelium 102	– Lr lawrencium 103

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

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