The exam consists of **30 Multiple Choice Questions**
Choose the correct answer out of **5 Options**
Each correct answer is worth **0.5 Mark**

Section 1 (Prefixes for powers of ten): Q1, Q2 and Q3

(Q1) The prefix **Tera** equals:

A	B	C	D	E
10^{12}	10^{-9}	10^{3}	10^{-3}	10^{-6}

(Q2) The prefix **milli** equals:

A	B	C	D	E
10^{9}	10^{-9}	10^{3}	10^{-3}	10^{-6}

(Q3) The prefix **Giga** equals:

A	B	C	D	E
10^{-9}	10^{9}	10^{3}	10^{-3}	10^{6}

Section 2 (Units and Dimensions): Q4, Q5, Q6, Q7, Q8, Q9,and Q10.

(Q4) The SI base units have the dimensions of:

A	B	C	D	E
Mass, Weight, Time	Length, Density, Time	Mass, Length, Time	Weight, Length, Time	Mass, Length, Speed

(Q5) A quantity has a dimension of $[M\ L\ T^{-2}]$, then its unit in (SI) :

A	B	C	D	E
$Kg.m^{-2}.s^{2}$	$Kg.m^{2}.s^{-2}$	$Kg.m.s^{-2}$	$Kg^{2}.m^{2}.s$	$Kg.m.s^{-2}$

(Q6) A quantity has a unit of $Kg.m^{-2}$, then its dimension is:

A	B	C	D	E
$[M^{2}\ L^{2}\ T^{2}]$	$[M\ L^{2}\ T^{2}]$	$[M^{2}\ L\ T]$	$[M\ L^{-2}]$	$[M\ L^{-1}\ T^{-2}]$

(Q7) The dimension of **Acceleration** is:

A	B	C	D	E
$[M^2\ L^2\ T^2]$	$[L^2\ T^2]$	$[\ L\ T^{-2}]$	$[\ L^{-2}\ T]$	$[\ L\ T^{-1}]$

(Q8) The unit of **Stress** is:

A	B	C	D	E
m / s	Kg / m^3	W (Watt)	$N/\ m^2$	N

For the questions **Q9** and **Q10**: The Gravitational Force F_g can be calculated according to the formula:

$$F_g = G \times \frac{M \times m}{r^2},$$

where **G** = Gravitational constant; **r** = Distance; (**M** and **m**) = two Masses .

(Q9) The **Unit** of **G** is:

A	B	C	D	E
$Kg^2.m^2.s^2$	$Kg^{-1}.m^3.s^{-2}$	$Kg^2.m.s$	$Kg.m^{-1}.s^{-1}$	$Kg.m^{-1}.s^{-2}$

(Q10) The **Dimension** of **G** is:

A	B	C	D	E
$[M^2\ L^2\ T^2]$	$[M\ L^2\ T^2]$	$[M^2\ L\ T]$	$[M\ L^{-1}\ T^{-1}]$	$[M^{-1}\ L^3\ T^{-2}]$

Section 3 (Conversion of units): Q11, Q12 and Q13.

(Q11) **One mile (1 mi)** is equivalent to **1609 m** so **36 mph** is approximately equals to:

A	B	C	D	E
36 m.s^{-1}	16.09 m.s^{-1}	160.9 m.s^{-1}	10 m.s^{-1}	20 m.s^{-1}

(Q12) A sphere with a radius of **r = 45 mm** has a volume of:

A	B	C	D	E
$2 \times 10^{-9}\ m^3$	$8 \times 10^{-6}\ m^3$	$6 \times 10^{-3}\ m^3$	$3.817 \times 10^{-4}\ m^3$	$8 \times 10^{-9}\ m^3$

(Q13) A square with an edge of exactly **22 mm** has an area of:

A	B	C	D	E
$4.84 \times 10^{-4}\ m^2$	$4.84 \times 10^{-2}\ m^2$	$4.84\ m^2$	$4.4 \times 10^{-4}\ m^2$	$4.84 \times 10^{-6}\ m^2$

Section 4 (Concepts and definitions): Q14, Q15, Q16 and Q17.

Complete the statements with the choices below.

A	B	C	D	E
the fractional change	force	Young's modulus	Kilometer (Km)	meter (m)

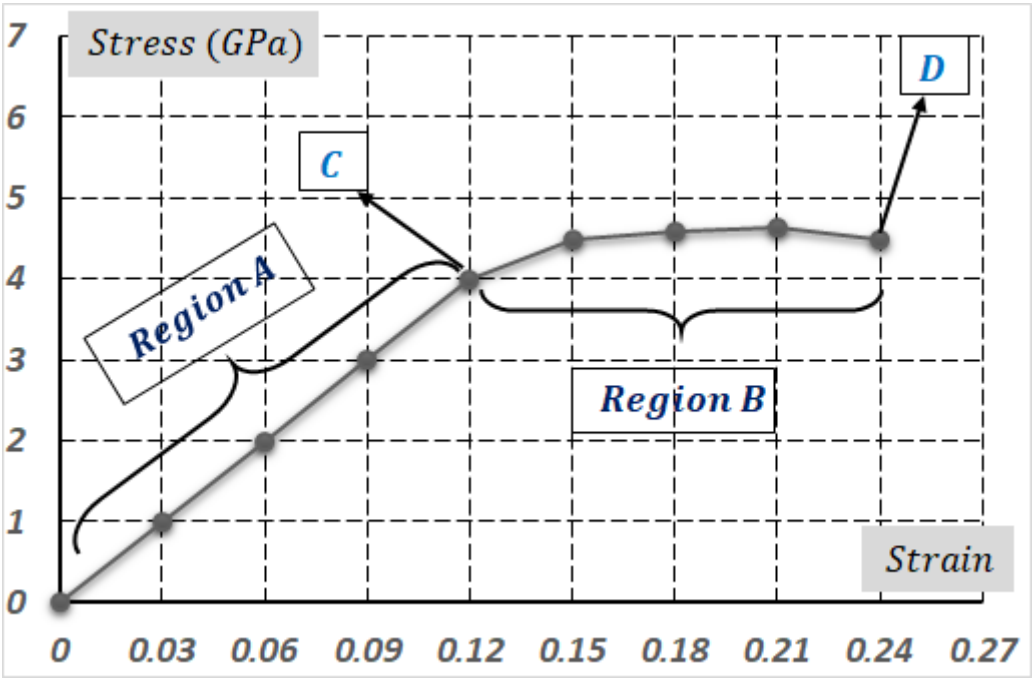
(Q14) Stress is the external ..... acting on the object per unit cross-sectional area.

(Q15) The bulk modulus is a proportionality constant that relates the pressure acting on an object to.....in volume.

(Q16) .....measures the resistance of solids to change in their length.

(Q17) In the (SI), the **Length** unit is .....

Section 5: ELASTIC MODULUS
Exercice 1 (Stress-strain curve): Answer the questions Q 18, Q 19, Q 20, Q 21 and Q 22



(Q18) The **Region A** is :

A	B	C	D	E
elastic limit	elastic behavior	breaking point	plastic behavior	None of these

(Q19) The **Region B** is :

A	B	C	D	E
elastic limit	elastic behavior	breaking point	plastic behavior	None of these

(Q20) The **Point C** is :

A	B	C	D	E
elastic limit	elastic behavior	breaking point	plastic behavior	None of these

(Q21) The **Point D** is :

A	B	C	D	E
elastic limit	elastic behavior	breaking point	plastic behavior	None of these

(Q22) Evaluate **Young's modulus** for the material whose stress–strain curve is shown above

A	B	C	D	E
33.33 Pa	3.333×10^{10} Pa	3.333×10^{7} Pa	7 GPa	0.27 Pa

Exercice 2 (Young's modulus): Answer the questions Q23, Q24, and Q25.

A $\mathbf{m = 100\ Kg}$ load is hung on a wire of length $\mathbf{L = 4.00\ m}$, cross sectional area $\mathbf{A{=}1}\times 10^{-4} m^2$, and Young's modulus $\mathbf{8} \times 10^9\ \mathbf{N}/m^2$.

(Q23) Find the value of the **Stress** :

A	B	C	D	E
9.8×10^6 N/m^2	1×10^6 N/m^2	9.8×10^4 N/m^2	1×10^4 N/m^2	8×10^{10} N/m^2

(Q24) Calculate the change in length $\Delta\mathbf{L}$:

A	B	C	D	E
4.90 mm	4.90 cm	4.90 dm	0.49 mm	9.8 mm

(Q25) Find the Value of the **Strain** :

A	B	C	D	E
1.225×10^{-3}	8.163×10^2	7.84×10^{16}	1.276×10^{-17}	8×10^{10}

Exercice 3 (Shear Modulus): Answer the questions Q 26, Q 27, and Q 28

A shearing force of **50 N** is applied to an aluminum rod with a length of **10 m**, a cross-sectional area of $1 \times 10^{-5}\ m^2$, and shear modulus of $2.5 \times 10^{10}\ N.m^{-2}$.

(Q26) Find the value of the **Stress** :

A	B	C	D	E
5×10^6 N/m^2	1×10^5 N/m^2	1×10^4 N/m^2	1×10^7 N/m^2	1×10^8 N/m^2

(Q27) Find the result displacement Δx :

A	B	C	D	E
2 cm	2 mm	4 cm	4 mm	0.01

(Q28) Deduce the value **the strain**:

A	B	C	D	E
6×10^{-6}	4×10^{-5}	2×10^{-4}	7×10^{-5}	8×10^{-5}

Exercice 4 (Bulk Modulus): Answer the questions Q29 and Q30

A cubic box with an edge of exactly $\mathbf{a = 3\ cm}$ is made of material with a bulk modulus of $\mathbf{4.8} \times 10^5\ \mathbf{N}/m^2$. This cubic box is subjected to a pressure $\mathbf{P = 1.6} \times 10^5\ \mathbf{N}/m^2$.

(Q29) As a result of this stress applied, the change in volume ΔV of this cubic is approximately :

A	B	C	D	E
9 cm^3	27 cm^3	18 cm^3	36 cm^3	64 cm^3

(Q30) The edge of this box becomes approximatly:

A	B	C	D	E
2.621 cm	4.242 cm	18 cm	1.321 cm	2.321 cm