Physical quantities - 2018

1. 9702/11/M/J/18/No.1

What is a unit for stress?

(A) $kg\,m^{-1}s^{-2}$ B $kg\,m^{-2}s^{-2}$ C Nm^{-1} D Nm

Handwritten:
$Stress = \dfrac{Force}{Area}$

$= \dfrac{N}{m^2} = \dfrac{kg\,m\,s^{-2}}{m^2}$
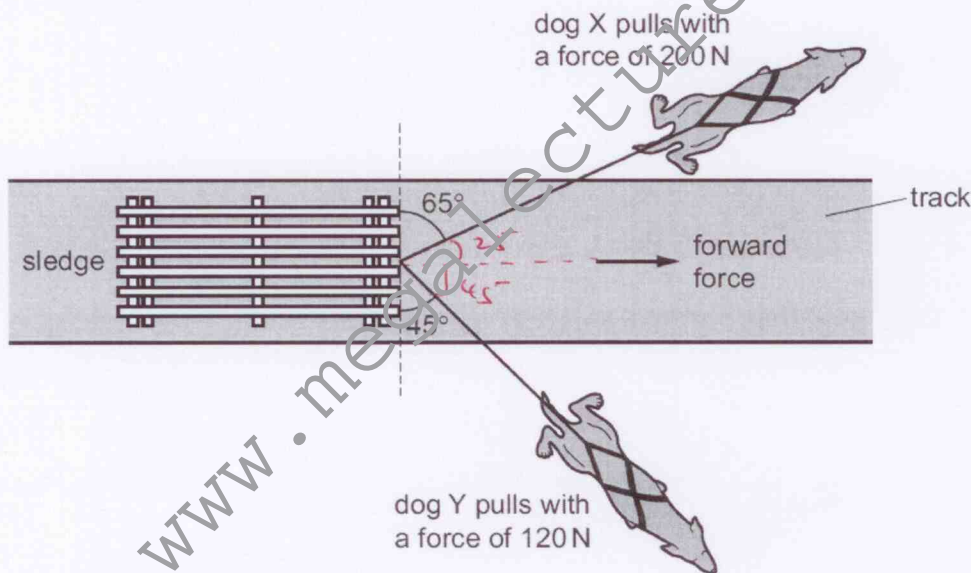
$= kg\,m^{-1}s^{-2}$

2. 9702/11/M/J/18/No.2

Physical quantities can be classed as vectors or as scalars.

Which pair of quantities consists of two vectors?

A   kinetic energy and force

B   momentum and time

(C)   velocity and electric field strength

D   weight and temperature

3. 9702/11/M/J/18/No.3

Two dogs pull a sledge along an icy track, as shown.

dog X pulls with a force of 200 N

65°

track

forward force

45°

sledge

dog Y pulls with a force of 120 N

Dog X pulls with a force of 200 N at an angle of 65° to the front edge of the sledge. Dog Y pulls with a force of 120 N at an angle of 45° to the front edge of the sledge.

What is the resultant forward force on the sledge exerted by the two dogs?

A   80 N   B   170 N   (C)   270 N   D   320 N

Handwritten:
Find the horizontal components of both forces and sum them up.

$Rf = 200\cos 25 + 120\cos 45$

$= 181 \cdot 26 + 84 \cdot 8$

$= 266 \cdot 06\, N \simeq 270\,N$

www.youtube.com/megalecture

4. 9702/12/M/J/18/No.1

A sheet of gold leaf has a thickness of 0.125 μm. A gold atom has a radius of 174 pm.

Approximately how many layers of atoms are there in the sheet?

A 4 B 7 C 400 D 700

Handwritten:
diameter of atom
= 174 pm × 2
= 348 pm.

Layers = $\dfrac{0.125 \times 10^{-6} \text{ m}}{348 \times 10^{-12} \text{ m}}$

= 359 ≈ 400

5. 9702/12/M/J/18/No.2

The drag coefficient C_d is a number with no units. It is used to compare the drag on different cars at different speeds. C_d is given by the equation

$$C_d = \frac{2F}{v^n \rho A}$$

where F is the drag force on the car, ρ is the density of the air, A is the cross-sectional area of the car and v is the speed of the car.

What is the value of n?

A 1 B 2 C 3 D 4

Handwritten:
$1 = \dfrac{m^2 s^{-2}}{(m s^{-1})^n}$

when n = 2.

$1 = \dfrac{N}{(m s^{-1})^n \times kg\, m^{-3} \times m^2}$

$1 = \dfrac{kg\, m\, s^{-2}}{(m s^{-1})^n \times \frac{kg}{m} \times m^2}$

$\dfrac{m^2 s^{-2}}{m^2 s^{-2}} = 1$.

n = 2

6. 9702/13/M/J/18/No.1

What is the best way of describing a physical quantity?

A   a quantity with a magnitude and a direction but no unit

B   a quantity with a magnitude and a unit

C   a quantity with a magnitude but no direction

D   a quantity with a unit but no magnitude

7. 9702/13/M/J/18/No.2

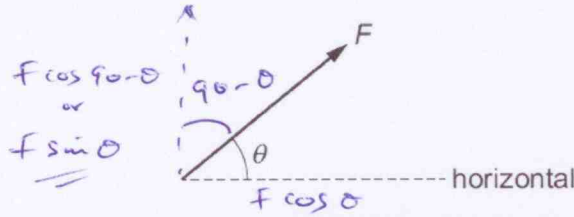Which pair includes a vector quantity and a scalar quantity?

A   displacement and acceleration

B   force and kinetic energy

C   power and speed

D   work and potential energy

Handwritten:
force — vector
K.E — scalar

Vectors	Scalars
displacement	K.E
acceleration	power
force	speed
	work
	P.E.

8. 9702/13/M/J/18/No.3

A force F acts at an angle θ to the horizontal.

$F \cos 90 - \theta$ or $F \sin \theta$ — $90 - \theta$

$F \cos \theta$ — horizontal

What are the horizontal and the vertical components of the force?

	horizontal component	vertical component
A	$F \cos\theta$	$F \cos(90° - \theta)$
B	$F \cos\theta$	$F \sin(90° - \theta)$
C	$F \sin\theta$	$F \cos\theta$
D	$F \sin\theta$	$F \cos(90° - \theta)$

9. 9702/12/F/M/18/No.1

Which unit is equivalent to the coulomb?

A ampere per second

B joule per volt

C watt per ampere

D watt per volt

$E = VIt$
$= Vq$
$= Vc$

$C = \dfrac{J}{V}$

Gnd $Q = It$

$\begin{array}{l} Q - c \\ V - v \\ E - J \end{array}$ units

10. 9702/12/F/M/18/No.2

Which row shows a quantity and an incorrect unit?

|	quantity	unit
A	efficiency	no unit ✓
B	moment of force	$N\,m^{-1}$ ✗
C	momentum	$N\,s$ ✓
D	work done	J ✓

- moment $= f \times d$
  $= Nm$

- $f \times t = \Delta p$
  $Ns = kg\,m\,s^{-1}$

- $w = f \times d$
  $= Nm = Joule$

- Efficiency $= \dfrac{Useful\ E_{out}}{Total\ E_{in}} = \dfrac{J}{J} = 1$

11. 9702/12/F/M/18/No.3

Two forces of equal magnitude are represented by two coplanar vectors. One is directed towards the east and the other is directed towards the north.

What is the direction of a single force that will balance these two forces?

A   towards the north-east

B   towards the north-west

C   towards the south-east

D   towards the south-west

R-F-

F balances the R-F-
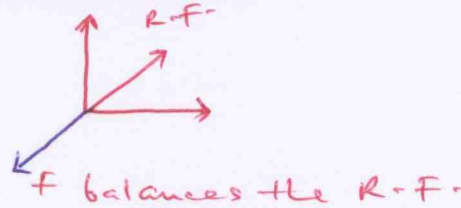
12. 9702/12/F/M/18/No.4

The density of paper is $800\,kg\,m^{-3}$. A typical sheet of paper has a width of 210 mm and a length of 300 mm.

The thickness of a pack of 500 sheets of paper is 50 mm.

What is the mass of a single sheet of paper?

A   0.5 g   B   5 g   C   50 g   D   500 g

$\rho = \dfrac{m}{V}$

$V = l \times w \times h.$

$h = \dfrac{50mm}{500} = 0.1$

$V = 300 \times 210 \times 0.1$

$= 6300\,mm^3.$

$m = \rho \times V$

$= 800\,\dfrac{kg}{m^3} \times 6300 \times 10^{-9}\,m^3$

$= 0.00504\,kg$

$= 5.04\,g.$

$\simeq 5\,g$