

# 1.1 Physical Quantities & Units

## Question Paper

Course	CIE A Level Physics (9702) 2019-2021
Section	1. Physical Quantities & Units
Topic	1.1 Physical Quantities & Units
Difficulty	Hard

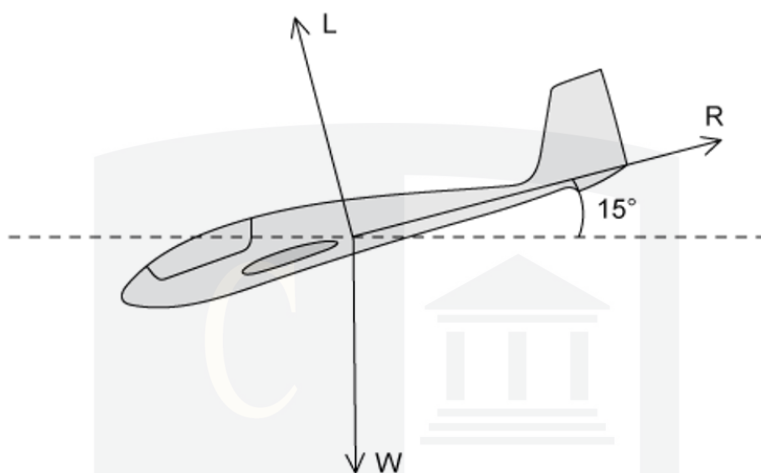
**Time allowed:** 10

**Score:** /10

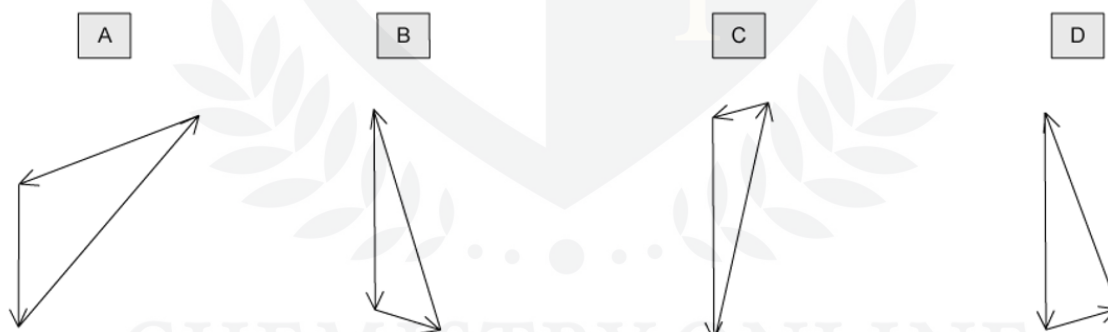
**Percentage:** /100

### Question 1

A glider is descending at a constant speed at an angle of  $15^\circ$  to the horizontal. The diagram shows the directions of the lift **L**, air resistance **R** and weight **W** acting on the glider.



Which vector triangle could represent the forces acting on the glider?

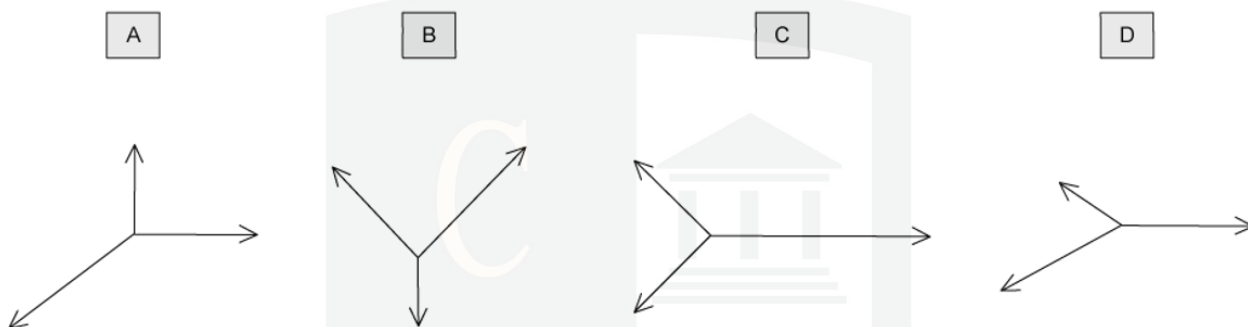


[1 mark]

## Question 2

The diagrams represent systems of coplanar forces acting at a point. The lengths of the force vectors represent the magnitudes of the forces.

Which system of forces is in equilibrium?



[1 mark]

## Question 3

Which formula could be correct for the speed  $v$  of ocean waves in terms of the density  $\rho$  of sea-water, the acceleration of free fall  $g$ , the height  $h$  of the wave and the wavelength  $\lambda$ ?

**A**  $v = \sqrt{\rho gh}$

**B**  $v = \sqrt{\frac{g}{h}}$

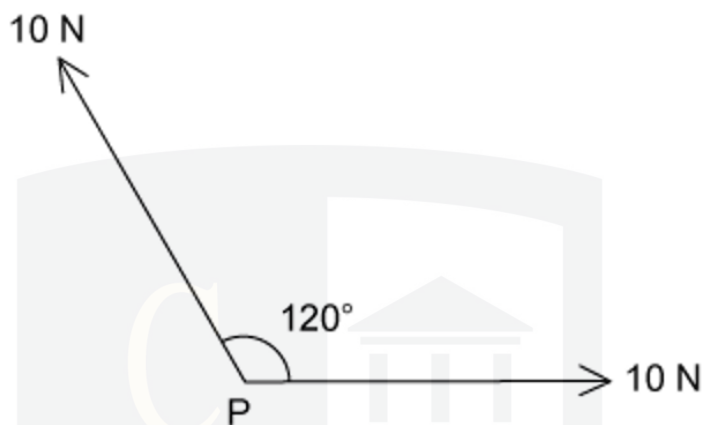
**C**  $v = \sqrt{g\lambda}$

**D**  $v = \sqrt{\frac{g}{\rho}}$

[1 mark]

#### Question 4

Two forces, each of 10 N, act at a point  $P$  as shown in the diagram. The angle between the force vectors is  $120^\circ$



What is the magnitude of the resultant force?

- A**      5 N      **B**      10 N      **C**      17 N      **D**      20 N

[1 mark]

#### Question 5

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

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

where  $F$  is the drag force on the car,  $\rho$  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

[1 mark]

### Question 6

When a constant braking force is applied to a vehicle moving at speed  $v$ , the distance  $d$  moved by the vehicle as it comes to rest is given by the expression

$$d = kv^2$$

where  $k$  is a constant.

When  $d$  is measured in metres and  $v$  is measured in metres per second, the constant has a value of  $k_1$ .

What is the value of the constant when the distance is measured in metres, and the speed is measured in kilometres per hour?

- A**  $0.0772k_1$     **B**  $0.278k_1$     **C**  $3.60k_1$     **D**  $13.0k_1$

[1 mark]

### Question 7

The frictional force  $F$  on a sphere falling through a fluid is given by the formula

$$F = 6\pi a\eta v$$

where  $a$  is the radius of the sphere,  $\eta$  is a constant relating to the fluid and  $v$  is the velocity of the sphere.

What are the units of  $\eta$ ?

- A**  $kg\ m\ s^{-1}$     **B**  $kg\ m^{-1}\ s^{-1}$     **C**  $kg\ m\ s^{-3}$     **D**  $kg\ m^3\ s^{-3}$

[1 mark]

### Question 8

Which statement is **incorrect** by a factor of 100 or more?

- A Atmospheric pressure is about  $1 \times 10^5$  Pa
- B Light takes  $5 \times 10^2$  s to reach us from the Sun
- C The frequency of ultraviolet light is  $3 \times 10^{12}$  Hz
- D The life-span of a man is about  $2 \times 10^9$  s

[1 mark]

### Question 9

Which estimate is realistic?

- A The kinetic energy of a bus travelling on an expressway is 30,000J
- B The power of a domestic light is 300W
- C The temperature of a hot oven is 300K
- D The volume of air in a car tyre is  $0.03\text{m}^3$

[1 mark]

### Question 10

The speed  $v$  of a liquid leaving a tube depends on the change in pressure  $\Delta P$  and the density  $\rho$  of the liquid. The speed is given by the equation

$$v = k \left( \frac{\Delta P}{\rho} \right)^n$$

where  $k$  is a constant that has no units.

What is the value of  $n$ ?

**A**

$\frac{1}{2}$

**B**

1

**C**

$\frac{3}{2}$

**D**

2

[1 mark]

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