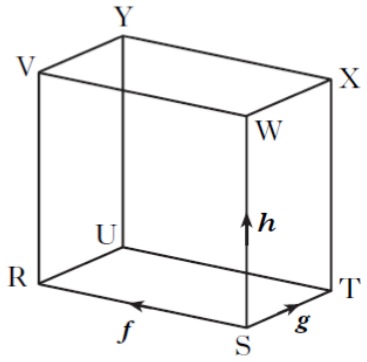
Please attempt the following questions in preparation for the online session on 9th March.

Q1

The diagram RSTUVWXY represents a cuboid.

$\overrightarrow{SR}$ represents vector *f*, $\overrightarrow{ST}$ represents vector *g* and $\overrightarrow{SW}$ represents vector *h*.

Express $\overrightarrow{VT}$ in terms of *f*, *g* and *h*.



Q2

Three vectors can be expressed as follows

$\overrightarrow{AB} = -2i - 6j + 3k$

$\overrightarrow{BC} = 3i + 9j - 7k$

$\overrightarrow{EC} = 2i + 3j + k$

(a) Find $\overrightarrow{AC}$.

(b) Hence, or otherwise, find $\overrightarrow{AE}$.

Q3

The vector **u** has components $\begin{pmatrix} -3 \\ 0 \\ 4 \end{pmatrix}$

Find a unit vector parallel to **u**.

Q4
Given that S(-4,5,1), T(-16,-4,16) and U(-24,-10,26) are collinear, calculate the ratio in which T divides SU.

Q5
Relative to a suitable coordinate system A and B are the points (-2,1,-1) and (1,3,2) respectively.
A, B and C are collinear and C is positioned such that BC = 2AB.
Find the coordinates of C.

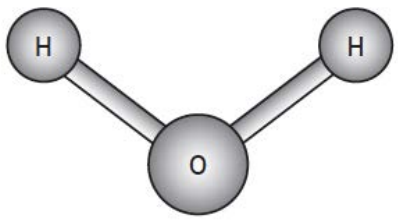
Q6
P and R are the points (1,3,-2) and (4,-3,4) respectively.
The point Q divides PR in the ratio 1:2.

(a) Find the coordinates of Q.

(b) $k\overrightarrow{PR}$ is a vector of magnitude 1 where $k > 0$.
Determine the value of k.

Q7
Given that $QP = \begin{pmatrix} -1 \\ 3 \\ -2 \end{pmatrix}$ and $QR = \begin{pmatrix} -5 \\ 1 \\ 1 \end{pmatrix}$, find the size of angle PQR.

Q8
The diagram shows a model of a water molecule.
Relative to suitable coordinate axes, the oxygen molecule is the point Q(-2,2,5).

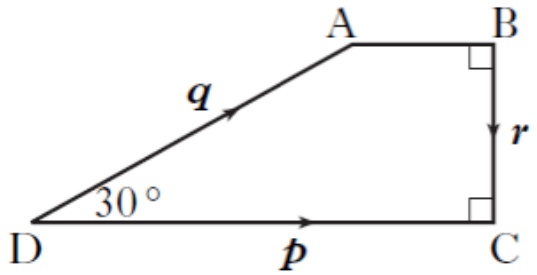


The hydrogen atoms are positioned at the points P(-4,-6,21) and R (-10,18,7) as in the diagram below.

(a) Express $\overrightarrow{QP}$ and $\overrightarrow{QR}$ in component form.

(b) Hence, find the size of angle BAC.

Q9
The vectors **p**, **q** and **r** are represented
on the diagram shown, where angle ADC = 30°.



It is also given that |**p**| = 4 & |**q**| = 3.

(a) Evaluate **p.(q + r)**

(b) Evaluate **r.(p - q)**