**15.** It is given that $\mathbf{A} = \begin{pmatrix} 2 & 0 & 0 \\ 0 & -3 & 0 \\ 0 & 0 & 4 \end{pmatrix}$, $\mathbf{B} = \begin{pmatrix} -5 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ and $\mathbf{D} = \begin{pmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{pmatrix}$.

**(a)** Find $\mathbf{A} + \mathbf{B}$ and $\mathbf{AB}$.

**(b)** If $\mathbf{AD} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$, find the values of $x$, $y$ and $z$.

**(c)** If $\mathbf{E} = \begin{pmatrix} 1 & -5 & 6 \\ -2 & 3 & 7 \\ 4 & 8 & -9 \end{pmatrix}$,

**(i)** find **AE**,

**(ii)** describe the relationship between the corresponding rows of **E** and **AE**.

**16.** A molecule of the compound $C_3H_8$ contains 3 atoms of carbon (C) and 8 atoms of hydrogen (H).

A molecule of another compound $C_2H_5OH$ contains 2 atoms of carbon, 6 atoms of hydrogen and 1 atom of oxygen (O).

It is given that the atomic masses of carbon, hydrogen and oxygen are 12, 1 and 16 respectively.

The information can be represented by the matrices **P** and **Q** as shown below.

$$\mathbf{P} = \begin{pmatrix} 3 & 8 & 0 \\ 2 & 6 & 1 \end{pmatrix} \text{ and } \mathbf{Q} = \begin{pmatrix} 12 \\ 1 \\ 16 \end{pmatrix}.$$

**(a)** Find **PQ**.

**(b)** Explain what the entries in the matrix **PQ** represent.

**(c)** Let $\mathbf{M} = (35 \quad 80)$.

**(i)** Find **MPQ**.

**(ii)** Suggest a meaning for the information represented by the matrix **MPQ**.

**17.** A marketing manager interviewed two applicants, Pauline and Siew Ling, for the position of secretary. Their scores in four aspects of the job interview are listed in the table below.

| | **Qualifications** | **Experience** | **Appearance** | **Communication** |
|---|---|---|---|---|
| **Pauline** | 8 | 5 | 6 | 4 |
| **Siew Ling** | 5 | 9 | 3 | 8 |

The four aspects, qualifications, experience, appearance and communication, were assigned the scale factors 4, 5, 2 and 3 respectively.