

SECTION B

Questions 5–8 relate to the **British Geological Survey geological map extract of Worcester at 1:50,000 and 1:25,000 scales.**

Answer **all** questions in the spaces provided.

This section should take approximately 1 hour to complete.

5. (a) Refer to the outcrop of the Precambrian Malverns Complex (**MvC**) on the **geological map (Map 1)**.

- (i) State the most common superficial deposit (drift) found to the east and west of the Malverns Complex (**MvC**). [1]

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- (ii) Describe the outcrop pattern of the Malverns Complex (**MvC**). [2]

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- (b) **Figure 5** is a field sketch of the boundary between the Malverns Complex (**MvC**) and the Wyche Formation (**Wy**) at **GR 766452**.

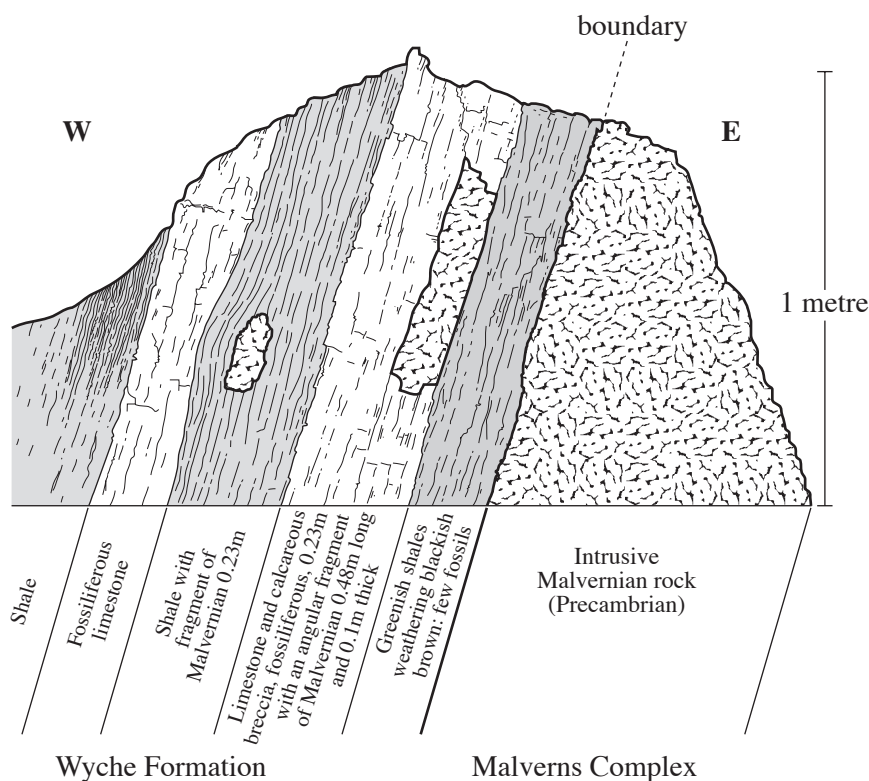


Figure 5

Source: Geology of country around Worcester (BGS-1997)

With reference to **Figure 5** and the **generalized geological column**,

- (i) complete the table below to identify the characteristics of the Wyche Formation (**Wy**), [4]

Formation	Wyche Formation (Wy)	Malverns Complex (MvC)
Dip direction	•	Not applicable
Apparent dip angle (degrees)	•	Not applicable
Rock type (igneous, sedimentary or metamorphic)	•	Intrusive igneous
Age	•	Precambrian

- (ii) outline the evidence from **Figure 5** that the Malverns Complex (**MvC**) did **not** intrude the Wyche Formation (**Wy**), [2]

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- (iii) name the type of boundary between the Wyche Formation (**Wy**) and Malverns Complex (**MvC**) present at this locality. [1]

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Total 10 marks

6. **Figure 6a** shows a Bouguer gravity anomaly map across the East Malvern Fault which includes the area of **Map 1**. **Figure 6b** is a partly completed gravity anomaly profile along the line of section on **Map 1** (A – B) extended to **C** on **Figure 6a**.

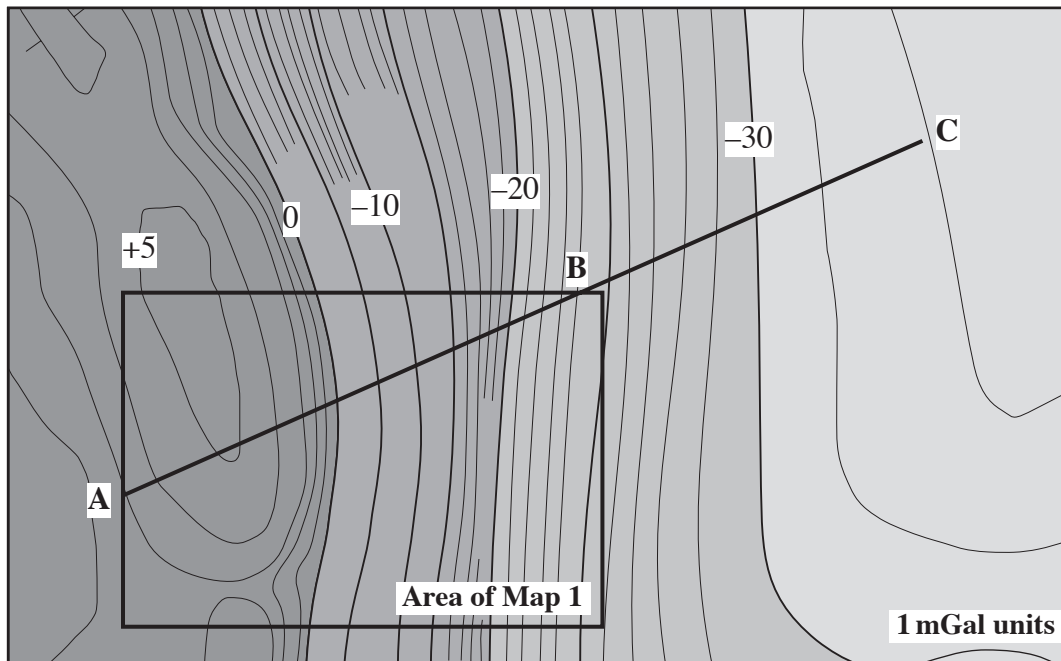


Figure 6a

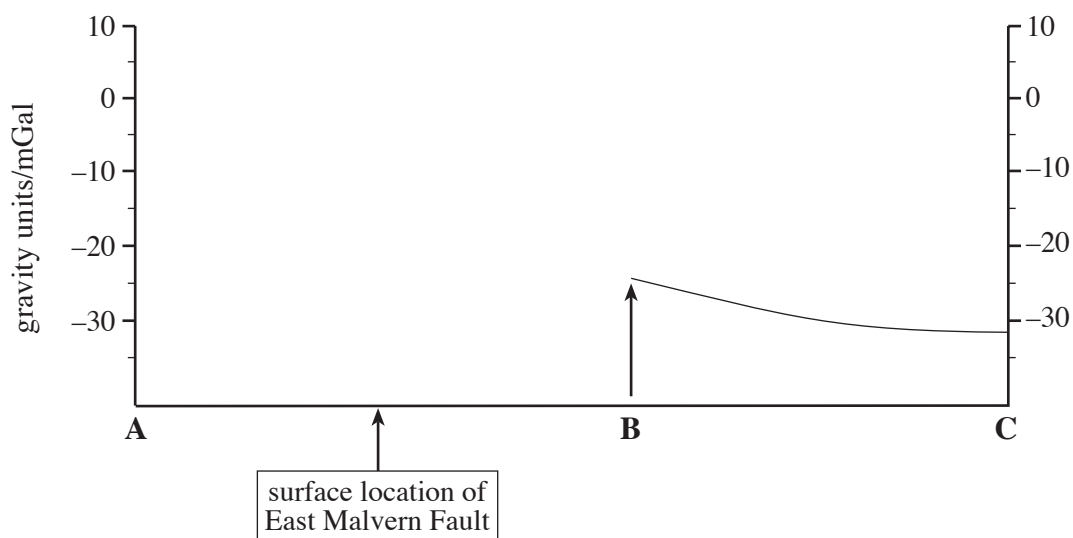


Figure 6b

Refer to **Figure 6a**, **geological Map 1** and the **cross section** as appropriate.

- (i) Complete the profile on **Figure 6b** to show the variation in gravity profile along the line of section **A** to **B**. [3]
- (ii) Explain the Bouguer gravity anomaly data in terms of :
- the probable density contrasts between rocks of the Permo-Trias and the older formations;
 - geological structure. [3]

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Total 6 marks

7. Refer to **geological Map 1**, the **cross section** and **generalised geological column** as appropriate.

- (a) Complete the table below to describe the **fold** structure responsible for the outcrop pattern of the Aymestry Limestone (**AL**) in **Map 1**, to the north east of the Colwall Fault, (**GR 752444**). [4]

Fold characteristic	Description
Fold type	•
Fold symmetry	•
Trend of axial plane trace	•
Plunge direction	•

- (b) (i) The **cross section** shows the base of Aymestry Limestone (**AL**) aligned with the base of the Woolhope Limestone (**WoL**) across the Colwall Fault.

Using the **generalised geological column**, calculate the throw (vertical displacement) of the Colwall Fault. Show your working. [2]

Throw (vertical displacement)m

- (ii) Using evidence from the **cross section only**, critically evaluate the following statement.

*The Colwall Fault and the East Malvern Fault **both***

- have similar **dips to the East**,*
- result from crustal **shortening** (compression) and*
- formed during the **same** period of deformation.*

[4]

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8. Refer to **geological Map 2** (an enlargement of the area shown on **Map 1**) and your knowledge.

- (a) *“Despite the crystalline nature of the igneous rocks, the Malverns Complex (MvC) is highly permeable and the margin of the outcrop is dominated by numerous freshwater springs.”*

Give a geological explanation for the high permeability associated with the Malverns Complex (MvC) and the presence of springs. [2]

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- (b) (i) Describe the variation in geology (rock type and structure) along the line of the Colwall tunnel (between **GR 761429** and **GR 773436**). [4]

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- (ii) Assess the possible effects the geology may have had on tunnel construction. [4]

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Total 10 marks

[illegible]