Model answers for PHYSICAL (LONGSHORE DRIFT ON THE HOLDERNESS COAST) and sample questions.

1. **BACKGROUND THEORY: "Outline the geographical theories on which your investigation is based."**

PHYSICAL : Sand beach coastlines are subject to Longshore Drift caused by the swash and backwash of breaking waves. The direction of Longshore drift depends on the Dominant wave approach which in turn is determined by then mean / average wind direction. The direction of longest Fetch is also important as this determines the most powerful waves with greatest energy, and on the east coast of England this is from the north east and north north east.
On the Holderness coast the general direction of Longshore Drift is from North to South, meaning that the north side of groynes should have more sand accumulated.

2. LOCATION: "explain why the chosen location is suitable for data collection." "Assess the suitability of the location for your enquiry."

PHYSICAL : Hornsea has a gently sloping sand beach overlooked by coastguards for safety. It lies in the middle section of the Holderness coast where the general direction of longshore drift is north to south.
The water offshore is shallow and does not slope steeply and the area very rarely has dangerous storm waves.
Hornsea has a number of groynes to allow the measurement of sand build up on each side to determine the direction of longshore drift.

3. RISKS AND RISK ASSESSMENT / RISK REDUCTION: "Identify one risk and explain how the risk was reduced.'

PHYSICAL : Drowning, Hypothermia, Exposure, Wind and rain, Rising tides, Stormy weather and large waves.
Reduction : Students work in groups within sight of the teachers and the coastguards, and have access to teachers by mobile phone.
Before the field trip the weather forecast was checked and students were advised to have appropriate dress available.
Tide tables were checked before the fieldwork so that groyne measurements could be done at a falling tide close to low tide.

4a. PRIMARY DATA COLLECTION: “Assess the effectiveness of the data collection methods.” “To what extent did the data collection allow you to reach valid conclusions?” “Explain how one data collection method may not have been accurate.” “Justify one data collection method used.” Remember if the question does not specify ‘primary’ or ‘secondary’ then both can be referred to.

PHYSICAL : 1. For a groyne take the measurement from the top of the groyne to the upper level of the sand on the north and south facing sides using a metre rule /ruler to the nearest cm/mm? This was done at 10 sites along the groyne at 2 metre intervals using a tape, a systematic sampling method. This was repeated for 10 groynes in total along the beach chosen for convenience and safety.
What you could have done….. may be useful in evaluating your methods.
2. Survey a beach transect / profile from the rear of the beach to the shoreline. Two ranging poles were used and a tape to set the poles 5 m apart. This is systematic sampling of the beach profile. A clinometer was used to measure the angle of each 5 m section down the beach.
3. The direction of longshore drift caused by the swash and backwash of obliquely approaching waves was assessed using an orange. The orange was thrown into the sea close to the shoreline and it will float enough to be seen and followed. The movement of the orange as it is affected by the swash and backwash is tracked for one minute and the total distance of longshore drift measured with a tape in metres.

4b. SECONDARY DATA COLLECTION

1. Hornsea wave buoy data. Wave data for several years can be found on the website for the Hornsea Buoy set a few kms offshore.

https://coastalmonitoring.org/realtimedata/?chart=72

More information about the Hornsea coast can be found on coastal explorer

https://coastalexplorer.eastriding.gov.uk/documents.html

2. Weather forecast. The meteorological office weather forecast was looked at for the day of the fieldwork to investigate the temperature, wind speed, chance of rain and probable storminess/height of waves to help inform on clothing required and safety.

https://weather.metoffice.gov.uk/forecast/gcxfsn499#?date=2025-02-13

3. Tide times. Tide table were looked at to time the fieldwork at a low and falling tide to make access to the full length of groynes easier and safer.

https://www.tide-forecast.com/locations/Hornsea/tides/latest

4c. POSSIBLE PROBLEMS WITH DATA COLLECTION AND HOW IT MAY AFFECT THE RELIABILITY OF CONCLUSIONS. HOW COULD DATA COLLECTION HAVE BEEN IMPROVED?

PHYSICAL : 1. 10 places on 10 groynes is quite a large sample. But more groynes and more sites along each groyne could have been used to give a more reliable data set and make conclusions more reliable. A random sampling method could have been used to choose the sites along each groyne rather than the systematic one.

2. The fieldwork was only carried out on one occasion on one day. it would have been better to repeat the fieldwork in different seasons throughout the year to see if there are seasonal difference in sand movement / accumulation.

3 A beach profile could have been measured both to the north of a groyne and to the south of a groyne to better assess how sand accumulation varies on each side of the groyne.

4. Using an orange on only one occasion to assess longshore drift is not enough. Conditions may vary on a daily and seasonal basis in terms of wind strength and direction and therefore wave approach, wave height and wave energy. It is average conditions over the year that decide the overall movement due to longshore drift. Also there is little relationship between the movement of an orange and the movement of beach sand.

5. DATA PRESENTATION : NOTE, this also begins the analysis and interpretation of the data and helps you reach conclusions and test your original hypotheses. "Explain how one data presentation method helped you interpret the data." "Describe and justify a method you used to present the data you collected."

PHYSICAL : 1. Located bars on a map of the groynes to visually show the distance from the top of the groyne to the sand surface on each side of each of the groynes.

2. Mean/ average distances from the top of each groyne to the sand on both sides of the groynes.

3. A dispersion diagram was drawn for both north and south sides of the groyne to show the different levels of sand built up on each side. The side with the smallest distance to the top of the groyne was the side where sand was accumulated and should have been to the north of the groyne.

This was done for each groyne with the 10 readings from each side and for the total data of 100 for each side of the 10 groynes.

This allowed the median height of the sand to be compared and the interquartile range (spread of the data)

Box and whisker diagrams were also drawn to give a visual comparison of the data from each side of the groyne.

4. A rose diagram of the directions of wave approaches using the Hornsea buoy data to show dominant wave approaches.

And, if you had done the transects :

5. The angles for each of the 5 metre sections of the beach profile were used to draw an accurate beach profile. The data was also used to calculate the average gradient of the beach.

6. ANALYSIS, RESULTS, CONCLUSIONS, MAY INCLUDE EVALUATION : "To what extent did results and conclusions meet original aims." "To what extent did the data collected allow you to reach valid conclusions." "Assess the extent to which the accuracy and reliability of your conclusions have been improved

PHYSICAL : 1. You need to have a few facts and figures showing what the distances were from the top of the groyne to the surface of the sand on the north and south sides of the groynes. This should show that the means and medians on the north and south sides were significantly different, showing that sand was accumulating on the north side of the groynes indicating longshore drift is from north to south. The median values are not affected by extreme values, whereas the mean takes every value into account.
2. This was confirmed by the secondary data from the Hornsea wave buoy which showed that the dominant wave approach was from the north east and north north east, meaning that the swash of each wave moved sand sediment southwards. Have a percentage ready for the waves from these directions of all wave approaches.
3. The located bar charts on the map of groynes gives a clear representation of the accumulation of sand on the north side of the groynes. Look to see if different parts of the beach show greater accumulation at the north than others, can this be explained?
4. The dispersion diagrams and box and whisker diagrams show the difference between the north and south sides of the groynes and the spread of data.

7. TITLE OF ENQUIRY AND HYPOTHESES FOR TESTING.

PHYSICAL : An investigation into longshore drift on the Holderness coast at Hornsea. Hypothesis : Longshore drift will occur from north to south building up sand and the beach on the north side of groynes.

8. OTHER IDEAS TO BE AWARE OF.

1. You may be asked what secondary sources you used, or what secondary sources could have been used to help your investigation. If the paper asks you what secondary sources you used refer to some of the below:- even if you didn't!

PHYSICAL : Map of the Yorkshire /Holderness coast and the North Sea to look at the position of Hornsea in relation to the other beaches in Holderness and fetch distances in relation to directions across the North Sea.
Wind and wave data for the Holderness coast from the Meteorological office and wave buoys situated off the coast. Hornsea buoy(Wavenet).

2. Anomalies and how they could affect your results and conclusions. Were some readings not what you expected and can you explain them?
3. What your conclusions actually were and whether you proved your hypotheses.
4. Have a few facts and figures from your data or graphs to back up your conclusions. Eg. average distance from top of groyne to the sand on each side of the groyne.