wjec cbac

GCE MARKING SCHEME

SUMMER 2018

GCE (LEGACY) GEOLOGY - GL5 (OPTION 2) 1215/02

© WJEC CBAC Ltd.

INTRODUCTION

This marking scheme was used by WJEC for the 2018 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCE GEOLOGY - GL5 (LEGACY)

OPTION 2

SUMMER 2018 MARK SCHEME

SECTION A

1.	(a)	Basin	shaped or synform (1) 450-470 km across (1)	[2]	
	(b)	2,250 x 160 (1) 360,000 ppm (1)			
		(ii)	Magmatic segregation(1) Fractional crystallisation (1) chromite form at high temperatures (1) crystallising earlier (1) denser than magma (1) gravity settling (1) accumulates at the base of intrusion (1) low turbulence in magma (1) Max 3 marks	າຣ ³ [3]	
		(iii)	Multiple injections of magma (1) restarts crystallisation processes (assimilation of country rock (1) changes composition of the magma multiple convection currents (1) divides magma into 'cells' (1) Max 2 marks	1) (1) [2]	
	(c)	Problem: visual impact Deep orebody, low grade of ore Large quantity of waste material Unstable waste tips leached metal from waste tips acid mine drainage			
		Planni Bundii Use w Vegeta treat r seal w Credit	ing control ng/banks built around site vaste rock as an aggregate ate waste tips un-off water for contamination vaste tips to prevent leaching		
		Credit Max 2	one planning control (1) + development (1) marks	[2]	
	(d)	Chrom high d seism magne	hite is dense (1) greater gravitational pull for gravity survey (1) effect ensity of gabbro reduced by overlying granite (1) good reflector for ic survey (1) chromite layers will be conductive (1) chromite is etic (1) credit ref to satellite imagery (1)	of	
		Credit Max 4	technique (1) + (1) for development marks	[4]	
			[Total 15 ma	rks]	

SECTION B

- 2. Evaluate the use of **geophysical** surveying techniques in prospecting for:
 - (i) non-metalliferous mineral resources.
 - (ii) hydrocarbon resources.

[25]

(i) Non-metalliferous mineral deposits

Magnetic Surveying

magnetometer / land / plane / ship / graphical representation of magnetic readings / depends on changes in magnetic properties or distribution of rocks i.e. structures / anomalies,

Gravity Surveying gravimeter / changes in gravity / changes in density of the underlying rocks / reflects the rocks / minerals / structure(s) / graphical representation / anomalies. High density minerals (barite) low density minerals (halite)

Electrical surveying Resistivity & conductivity of graphite deposits

Evaluation

Advantages:	speed / accuracy / cheap? Can locate hidden resources at depth
Disadvantages:	depends on target / cost? Cannot prove existence of deposit Only one stage in the exploration process More effective for locating metalliferous deposits

(ii) Hydrocarbon resources

Seismic surveying Seismic /explosions / land / ship / reflection / record of 2-way time / graphical representation to identify structures. Can find structures that don't have a surface outcrop/deeply buried on land or at sea. Can narrow areas for further investigation. Very useful for finding structures that may contain petroleum.

Gravity survey

Can find low density bodies such as salt domes that may create hydrocarbon traps

Evaluation

Advantages:	Speed / accuracy / cheap? Can locate structures that are potential hydrocarbon traps. Can locate hidden resources at depth.
Disadvantages:	Techniques cannot determine whether hydrocarbons are present in a potential trap even if the structure and geological sequence are suitable. There is a need for further geological investigation to locate oil (drilling & downhole logging).

Credit diagrams and examples. Must evaluate for access to full marks. 25 marks

- 3. Evaluate the role of water in the processes of formation of:
 - (i) china clay
 - (ii) hydrothermal minerals
 - (iii) sedimentary metalliferous ores

Importance of water – sources: meteoric, groundwater, seawater.

- (i) China clay chemical weathering of usually igneous rocks in hot, moist climates. Water alters feldspar. Meteoric water heated by granite to increase rate of kaolinisation.
- (ii) Hydrothermal minerals water acts as the solvent for minerals dissolved from rocks. This can be sea water in mid ocean ridge settings or meteoric water circulating in rocks surrounding igneous intrusions. Water is the mechanism to collect diffuse elements from their source, transport them to another setting and deposit them in concentration depending on the water temperature and solubility of the element.
- (iii) Sedimentary Residual deposits. Placer deposits. Banded Ironstone Formations. Evaporites.

Evaluation

Other factors important not just water: source of elements, tectonic setting, geothermal gradient, rock type, rock structure, climate, relief, sea level etc.

Credit diagrams and examples. Must evaluate for access to full marks.

25 marks

4. "The formation of economic deposits of hydrocarbons and coals solely results from the thermal alteration of organic material"

Evaluate this statement with reference to geological processes.

Oil & Gas

Hydrocarbon window for oil & gas temperature controlled. However type of source, organic material, time and pressure also have an influence. For economic concentrations of hydrocarbons other geological factors such as permeability, porosity and structure are also crucial. Reservoir Rock - porosity/permeability (sandstones). Cap rock-impermeable clay/shale. Traps - anticline, fault, unconformity, salt domes.

All factors must occur in correct sequence for economic accumulations of hydrocarbons.

Coal rank increases with temperature. Increasing rank increases percentage of carbon and reduces volatiles and moisture. However pressure and time also have a significant impact.

Credit diagrams and examples. Must evaluate for access to full marks. Credit 17 marks max if only coal or only oil

25 marks

1215/02 GCE (LEGACY) GEOLOGY - GL5 (OPTION 2) SUMMER 2018 MS/ED