



**NSW DEPARTMENT OF
PRIMARY INDUSTRIES**

(UA1)

Coal Mining Qualifications Board

EXAMINATION FOR CERTIFICATE OF COMPETENCY AS UNDER MANAGER

(Coal Mines Regulation Act 1982)

MAITLAND

Tuesday, 21st November, 2006 9:30 a.m. to 11.30 a.m.

MINE ENVIRONMENT, FIRES & RESCUE

All Four (4) questions are to be attempted.

All questions are of equal value - **25 marks each.**

UNDERMANAGERS PART A EXAMINATION

UA1 Mine Environment Fires and Rescue

Question 1.

In regards to the spontaneous combustion of coal underground please answer the following:

- a) In your own terms define spontaneous combustion in mining. (3 marks)
- b) Explain the potential effects of the following factors on spontaneous combustion. (10 marks)
 - i) Rank
 - ii) Particle size
 - iii) Ventilation pressure differentials
 - iv) Geological conditions
 - v) Seam gas
- c) When coal heats, gases appear at characteristic temperatures. This is sometimes shown by using the 'fire ladder'. Sketch the fire ladder and the characteristic gases that appear as coal reaches higher temperatures or simply list them in order from the first gases to appear and up to the gases that appear at higher temperatures. (6 marks)
- d) Inertisation is used to extinguish or control outbreaks of spontaneous combustion underground. Explain three different types of inertisation and the difficulties and advantages of using each. (6 marks)

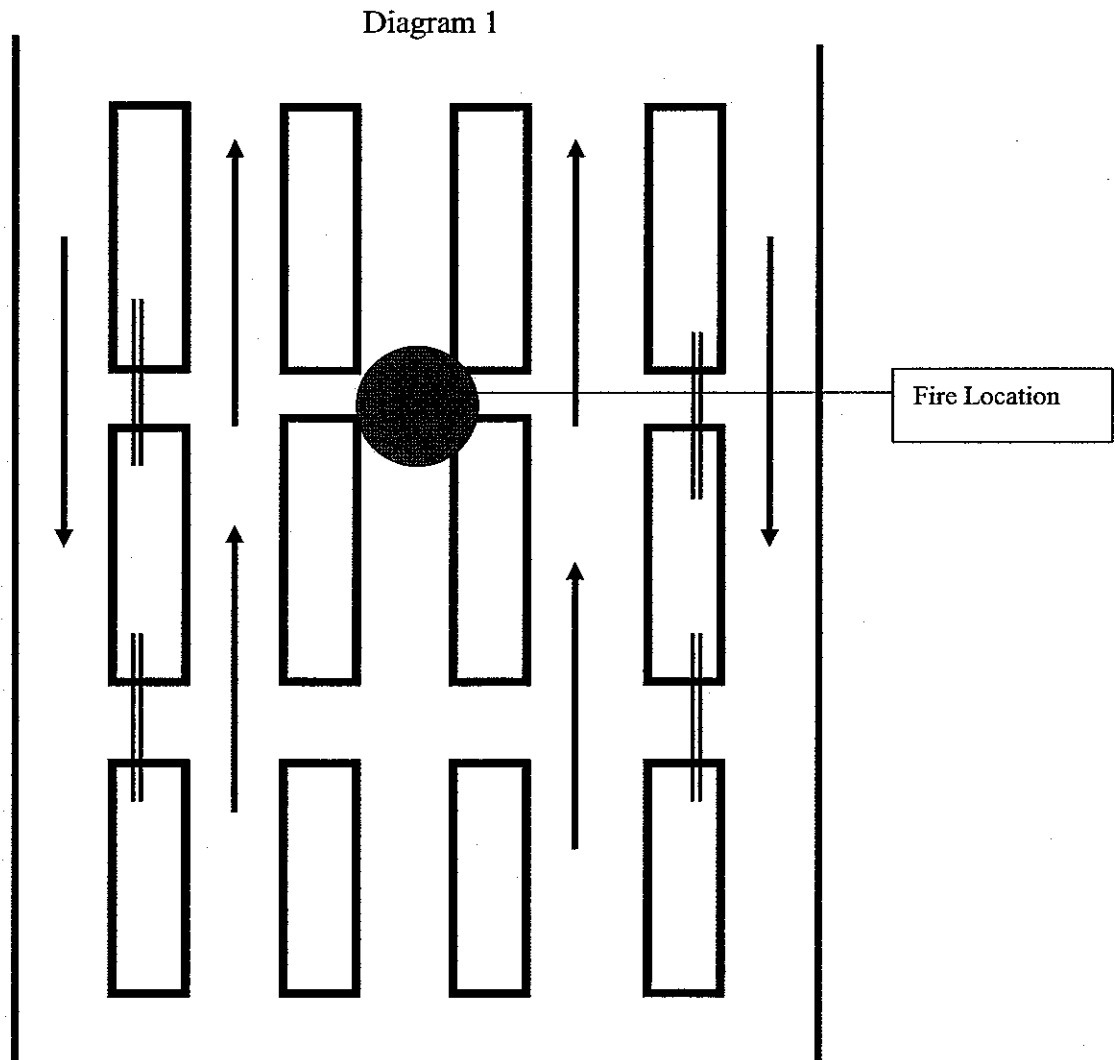
Question 2.

- (a)
 - i) Draw and label the Coward triangle for methane (7 marks)
 - ii) List 4 types or modes of ignition of flammable gas that can occur by the use of a mobile roof bolter (4 marks)
 - iii) Sketch and label the Ellicott explosibility diagram. (4 marks)
- (b)
 - i) Sketch and describe how a coal dust explosion can progress and propagate throughout a mine? (5 marks)
 - ii) Describe the mechanisms of how stonedust can suppress a coal dust explosion underground and what methods are implemented underground to achieve this? (5 marks)

UNDERMANAGERS PART A EXAMINATION

Question 3.

- a) Name the 5 different classifications of fires and describe them. (3 marks)
- b) What are the appropriate methods of extinguishing these fires? (3 Marks)
- c) What are the products of combustion of coal? (3 Marks)
- d) What is the "Jones Tricket Ratio" used for? (3 Marks)
- e) A fire has broken out in a panel as shown in diagram 1. Please explain how you would organise the fire fighting activities to extinguish the fire. (7 Marks)



- f) What are the major risks associated with fighting underground fires? (6 Marks)

UNDERMANAGERS PART A EXAMINATION

Question 4.

Under the NSW Mines Rescue Emergency Preparedness and Mine Rescue Guideline, procedures are described for the deployment of rescue Brigadespersons.

- a) When No life is endangered, what barriers are to be established if less than five (5) Rescue Brigadespersons are to use Self Contained Breathing Apparatus (SCBA) to enter an irrespirable atmosphere. (8 Marks)
- b) If 3 Brigadespersons are inbye the fresh air base (FAB)
 - i) What is the minimum number of FAB officials required? (3 Marks)
 - ii) How many people are required to be on standby? (3 Marks)
- c) What minimum equipment is required by the team? (6 Marks)
- d) What are the FAB requirements? (5 Marks)

End UA1



**NSW DEPARTMENT OF
PRIMARY INDUSTRIES**

(UA2)

Coal Mining Qualifications Board

EXAMINATION FOR CERTIFICATE OF COMPETENCY AS UNDER MANAGER

(Coal Mines Regulation Act 1982)

MAITLAND

Tuesday, 21st November, 2006 12 noon to 2.00 p.m.

GEOLOGY, GEOTECHNICS & SURVEYING

All Four (4) questions are to be attempted.

All questions are of equal value - **25 marks each.**

UNDERMANAGERS PART A EXAMINATION

UA2 Geology Geotechnics and Surveying

Question 1.

- a) Sketch and describe the operation of a roof monitoring device that would be suitable for investigating a shale roof of 5 metres thick, overlain by massive sandstone. (8 marks)
- b) Explain what information you would gather and how you would develop a roof support system for the roof mentioned in (1). (9 marks)
- c) Sketch and describe how floor heave occurs. (4 marks)
- d) Sketch and describe how creep occurs. (4 marks)

Question 2.

Mine Subsidence.

You are an undermanager at a new longwall mine. The mine is working at depths ranging from 250m to 400m, extracting a seam 4m thick. The proposed panel lengths are 3 km.

The area has the following infrastructure on the surface. Discuss the possible solutions to allow mining and also the maximum likely allowable subsidence, strain and tilts to occur in relation to each.

- a) Major Freeway (3 Marks)
- b) Major Railway Line (3 Marks)
- c) Local river (4 Marks)
- d) Residential Estate (3 Marks)
- e) Industrial Estate (3 Marks)
- f) Major Power Line (3 Marks)
- g) Telstra Fibre Optic Cable (3 marks)
- h) Local farm houses (3 Marks)

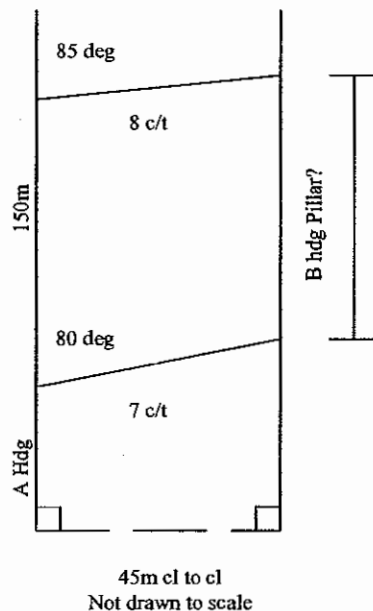
UNDERMANAGERS PART A EXAMINATION

Question 3.

- Calculate the Reduced Levels for the following level run, by completing the table below. (14 marks)

| B.S. | I.S. | F.S. | Rise/Fall | R.L. | Comments |
|-------|--------|-------|-----------|----------|--------------------------|
| 1.392 | | | | 9731.344 | Bench Mark on floor bolt |
| | 0.617 | | | | Underside North Beam |
| | -0.603 | | | | Underside South Beam |
| 0.414 | | 1.392 | | | Bench Mark on floor bolt |
| | -1.028 | | | | L.T.U. Beam No1 |
| | -0.802 | | | | L.T.U. Beam No2 |
| | | 0.416 | | | Bench Mark on floor bolt |

- The angle of a cut through has changed because of some minor geotech consideration. What is the new distance for the B hdg pillar as indicated on the plan? (8 Marks)



- The length of a Panel on a scale 1:4000 plan is 420mm. What is the actual length of the belt in metres? (3 marks)

UNDERMANAGERS PART A EXAMINATION

Question 4.

- a) In regards to the geotechnical aspects of mining and with the aid of sketches, describe the following: (15 marks)
- i) Horizontal stress
 - ii) Vertical stress
 - iii) Strain
 - iv) Stiffness
 - v) Young's Modulus
- b) If the rock density for sandstone is 2750kg/cubic metre, calculate the vertical stress if the depth is 320m. (5 marks)
- c) Sketch and describe the following: (6 marks)
- i) Reverse fault
 - ii) Trough fault
 - iii) Sedimentary sill

End UA2



**NSW DEPARTMENT OF
PRIMARY INDUSTRIES**

(UA3)

Coal Mining Qualifications Board

EXAMINATION FOR CERTIFICATE OF COMPETENCY AS UNDER MANAGER

(Coal Mines Regulation Act 1982)

MAITLAND

Tuesday, 21st November, 2006 2:30 p.m. to 5.00 p.m.

MINING PRACTICES & ENGINEERING

All Five (5) questions are to be attempted.

All questions are of equal value - **20 marks each.**

UNDERMANAGERS PART A EXAMINATION

UA3 Mining Practices and Engineering

Question 1.

- a) Sketch and describe the operation of an electrical transformer that would be used for a continuous miner section. (5 marks)
- b) Show the relevant incoming, outgoing and control voltages at this installation. (2 marks)
- c) Sketch and describe the operation of:
 - i) Earth leakage protection (3 marks)
 - ii) Short circuit protection (3 marks)
 - iii) Overload protection (3 marks)
- d) What does intrinsically safe mean? (2 marks)
- e) What does explosion protected mean? (2 marks)

Question 2.

- a). i) Sketch and describe the main parts of a conveyor drivehead and loop take up installation, show the direction of travel of the conveyor belting. (5 marks)
 - ii) What does the term FRAS mean when referring to conveyor belting? (2 marks)
 - iii) How does a belt slip unit work? (2 marks)
- b). Sketch and describe the operation of an on board airborne dust scrubbing system used on continuous miners. (5 marks)
- c). Sketch and describe the operation of an exhaust scrubber system for an underground diesel vehicle. (6 marks)

Question 3.

- a). Sketch and describe 3 types of winders used in Australian Coalmining. (6 Marks)
- b). As an Undermanager working at a mine using a "Man and materials" winder, list and describe four safety devices would you expect to find being used on the winder. (8Marks)
- c). Draw a detaching hook and explain its operation.(3 Marks)
- d). Draw and describe the function of a "Lilly Controller". (3 Marks)

UNDERMANAGERS PART A EXAMINATION

Question 4.

- a) List the protective equipment required on an underground mobile diesel machine in order to make it safe for use in the mine atmosphere. (6 Marks)
- b) What daily tests and inspections are required to be carried out on mobile diesel equipment underground? (6 Marks)
- c) What are the weekly tests required for the use of this equipment? (4 Marks)
- d) What are the three or six monthly tests required to be carried out on this equipment? (4 Marks)

Note: All statutory allowable diesel emission levels should be included in your answers.

Question 5.

- a). Describe what is meant by the following types of explosives and where can they be used, give an example of each? (3 marks each)
 - i) P5
 - ii) P1
 - iii) Non Permitted
- b). What are the main risks in storing and transporting explosives (5 Marks)
- c). List the advantages and disadvantages of the old AN based explosives and the new water based explosives. (6 Marks)

End UA3