

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2022
EXAMINATION CATEGORY: TECHNICAL**

PAPER III: SUBJECT SPECIALISATION PAPER FOR MINING

Date	: October 9, 2022
Total Marks	: 100
Writing Time	: 150 minutes (2.5 hours)
Reading Time	: 15 Minutes (prior to writing time)

GENERAL INSTRUCTIONS:

1. Write your Registration Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is to check the number of pages of Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO SECTIONS**, namely SECTION A & SECTION B:
 - **SECTION A** has two parts: Part I - 30 Multiple Choice Questions
Part II - 4 Short Answer Questions
All questions under SECTION A are **COMPULSORY**.
 - **SECTION B** consists of two Case Studies. Choose only **ONE** case study and answer the questions of your choice.
4. All answers should be written on the Answer Booklet provided to you. Candidates are not allowed to write anything on the question paper. If required, ask for additional Answer Booklet.
5. All answers should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating the Section, Part and Question Number will NOT be evaluated and no marks will be awarded.
6. Begin each Section and Part on a fresh page of the Answer Booklet.
7. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
8. Use of any other paper including paper for rough work is not permitted.
9. **You must hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
10. This paper has **7 printed pages**, including this instruction page.

GOOD LUCK

SECTION A

PART I: Multiple Choice Questions [30 marks]

Choose the correct answer and write down the letter of your chosen answer in the Answer Booklet against the question number e.g. 31 (d). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. When the material collected to represent a rock type, or a formation or an ore body in a quantitative sense, then it is termed as:
 - a) Specimen
 - b) Sample
 - c) Both specimen and sample can be used
 - d) Quantitative specimen

2. Strip mining is a method of
 - a) underground mining.
 - b) opencast mining with high degree of mechanization.
 - c) horizon mining.
 - d) longwall mining.

3. In mining terminology, the exploitation or winning is
 - a) a process of blasting.
 - b) a process of extracting the ore or economic mineral from the earth.
 - c) a process of ventilation in the underground mine.
 - d) the detailed mapping of an ore body.

4. Blasting gelatin is made up of
 - a) nitroglycerine and ammonium nitrate.
 - b) nitroglycerine and sodium nitrate.
 - c) nitroglycerine and guncotton.
 - d) nitroglycerine only.

5. What are the major raw material required for production of white cement and wall putty?
 - a) Crystalline limestone
 - b) Cement grade limestone
 - c) Dolomitic limestone
 - d) Gypsum

6. A bench has a length of 220 meters, width and height of 6 meters. How much material can be excavated if the whole bench is blasted for extraction? (*Note: Specific gravity of the material is 2.65*)
 - a) 13,200 MT
 - b) 12,000 MT
 - c) 5,000 MT
 - d) 14,575 MT

7. As per the MMMA 1995 and its Regulation, the maximum number of hours a worker can work in one shift is:
- 5 hours
 - 6 hours
 - 7 hours
 - 8 hours
8. A horizontal coal deposit of 15 meters thickness with 500 meters strike length is found below 200 meters sub-surface on a flat topography. What type of mining method would you apply to win the coal?
- Adit mining
 - Open cast mining
 - Drifting
 - Underground mining
9. What is Long wall method of mining?
- Mining method adopted to do deep mining.
 - Mining method adopted to do mining in plain topography.
 - Mining method generally applicable to thin coal seams.
 - Mining method adopted for very deep mining with thick coal seams.
10. A proposed mining has a deposit of 1.2 million MT of rocks. The stripping ratio (ore: overburden) estimated for the deposit is 1:0.35. What would be the volume of overburden for the whole deposit if it is excavated?
- 320,000m³
 - 450,000m³
 - 420,000m³
 - 480,000m³
11. What is artisanal mining?
- A mining method to mine precious metals.
 - A mining method to locate the petroleum.
 - A mining method to mine diamonds.
 - A small scale mining using basic hand held tools.
12. Dimensional stones and floor slabs are usually made from which one of the following rocks type?
- Quartzite and dolomite
 - Granite and marble
 - Limestone and slate
 - Gypsum and sandstone
13. As per MMMA 1995 or MMR 2022, an individual cannot apply for more than _____ mines/quarries.
- 3
 - 1
 - 2
 - 5

14. In Bhutan, which one of the following machines is mostly used to excavate material from mines/quarries?
- Excavator
 - Dozer
 - Pay Loader
 - Dragline excavators
15. As per the MMR 2022, only sectoral clearance required to obtain Exploration Permit from Department of Geology and Mines is:
- Environmental Clearance
 - SRF Land Lease Clearance
 - Dzongkhag Clearance
 - Forestry Clearance
16. The colour of the mineral in powder form is termed as:
- Luster
 - Streak
 - Cleavage
 - Colour
17. The conversion factor of land area from hectare to acre is:
- 2.471
 - 2.741
 - 2.147
 - 2.714
18. Which one of the following is an igneous rock?
- Quartzite
 - Granite
 - Gneiss
 - Limestone
19. There is a coal seam deposited in a hilly terrain and is having overburden of about 100 m thick. Traces of coal deposit are exposed at the base of the hill. Which of the following mining methods will be most suitable to extract the coal deposit efficiently?
- Shaft mining
 - Incline mining
 - Adit mining
 - Opencast mining
20. A dumper takes 10 minutes to travel from crusher point to working face when empty and 15 minutes to travel the other way around with load. It takes 1 minute to position to get loaded and another minute to position and unload the material at crusher site. If the loader takes 4 minutes to load the dumper, how many trips can it make in a shift of 8 hours?
- 15 trips
 - 16 trips
 - 17 trips
 - 18 trips

21. Which of the following, by geological definition, is not a rock?
- Gypsum
 - Limestone
 - Granite
 - Quartzite
22. Stripping ratio is defined as a ratio of
- volume of overburden removed to tonnage of mineral extracted.
 - volume of overburden removed to volume of mineral extracted.
 - tonnage of overburden removed to volume of mineral extracted.
 - tonnage of overburden removed to tonnage of mineral extracted.
23. Which of the following is not a drilling method to drill blast hole?
- Percussion
 - Rotary
 - Rotary Percussion
 - Circular
24. Grab sampling is process of
- picking pieces of ore at one place only.
 - picking pieces of ore at random to make up a sample.
 - picking pieces of ore at regular interval.
 - picking pieces of ore in a grid fashion.
25. Environment Impact Assessment (EIA) of a proposed mining site is done usually to study which one of the following?
- To see the feasibility of a proposed mining site.
 - To collect environmental baseline data of the mining site, identify environmental impact and to propose mitigation method for each impact.
 - To study the environmental condition of a mining site.
 - To find how much the material can be excavated from the proposed mining site.
26. Demarcation pillar in a mine plan is a pillar to indicate which one of the following?
- Mine boundary
 - Magazine
 - Mine bench
 - Access road to the mine
27. A mining company has target to excavate 500 MT of ore materials in one day. A Jackhammer takes 10 minutes to make one drill hole. Approximately, how many Jackhammers are required to excavate the targeted quantity of material? *Note: A blast hole can excavate 20.8 MT per one blast and as per job routine a blaster has only 2 hours to make the hole in one shift.*
- 1 Jackhammer
 - 3 Jackhammers
 - 2 Jackhammers
 - 5 Jackhammers

28. Which one of the following is **TRUE**?
- Bhutan is rich in metallic mineral deposit
 - Bhutan is rich in non-metallic mineral deposits
 - Bhutan is rich in precious mineral deposits
 - Bhutan is rich in petroleum deposits.
29. Glass is produced from which one of the following minerals?
- Limestone
 - Gypsum
 - Dolomite
 - Quartz
30. When some limestone be called as dolomitic limestone?
- When limestone has more percentage of calcium oxide.
 - When limestone has more percentage of calcium carbonate.
 - When limestone has more percentage of iron oxide.
 - When limestone has more percentage of magnesium oxide.

PART II – Short Answer Questions [20 marks]

This part has 4 Short Answer Questions. Answer ALL the questions. Each question carries 5 marks.

- Give some of the reason as why all mines/quarries are operated by open cast mining method in Bhutan.
- Explain the ideal features of good mining site in Bhutan.
- List down and explain each of the properties of explosives.
- As per MMMA 1995, what are some of the offences while carrying out mining/quarrying in Bhutan?

SECTION B: Case Study [50 marks]

Choose either CASE I or CASE II from this section. Each case study carries 50 marks. Mark for each sub-question is indicated in the brackets.

CASE I

Assume that you are a mining engineer working for the State Mining Corporation Limited (SMCL). The company intends to operate a stone quarry in the southern belt of the country.

- What are the processes you will go through to complete formalities of mine lease as required by the Mines and Minerals Management Act, 1995 and the Mines and Minerals Management Regulations, 2022? Briefly describe how you will handle each processing steps. **(15 marks)**

2. The site was assessed to be feasible for operation, sought all the required clearances and has got the following details.
 - Tentative lease area of the quarry is 42 acres.
 - Mineable reserve of the quartzite deposit is 3 million MT.
 - Average thickness of overburden is 10m distributed over an area of 300 X 100m².
 - The site was accessible by a farm road till its base and an additional access road of 1 km is required to be constructed to reach the top of the deposit.
 - The proposed site is a gently sloping protruding ridge with dry depression on both the side.

Now SMCL intends to operate the quarry and export the construction material as ballast for the North-Eastern Frontier Railway lines in India.

Therefore, prepare a tentative Plan/Final Mine Feasibility Study (FMFS) Report of the proposed site as how you would go about with the operation of the proposed quarry to produce ballast material? **(20 marks)**

3. Assume a suitable place as dump yard (ideal dump yard) and illustrate the dumping design with an appropriate diagram. Explain why you have chosen such location. **(5 marks)**
4. Calculate the tentative Environmental Restoration Bond (ERB) fund required to be deposited using the approved formula $Ax + By + Cz$ and also making your own assumptions. **(10 marks)**

CASE II

You are a Mining Engineer working with the Department of Geology and Mines. Answer the following scenarios:

1. One of the proponents of the mine did not understand about the Ad-valorem system of Royalty payment put forth by the government. Please explain as how you will make him understand about the Ad-valorem Royalty system? **(5 marks)**
2. Explain as why underground mining is not possible or not done in Bhutan? **(5 marks)**
3. Explain as per MMR 2022, the procedure to report an accident that has taken place in a mine/quarry lease area. **(10 marks)**
4. As per MMMA 1995, what are the different types of offences and write down the penalties for each? **(10 marks)**
5. What is a Mine Restoration Plan and what information should be included in it? **(10 marks)**
6. Explain your job responsibilities if you are selected through this exam to work with the Department of Geology & Mines. **(10 marks)**

TASHI DELEK