GU-RET 2016

GAUHATI UNIVERSITY RESEARCH ELIGIBILITY TEST

GEOLOGY

Booklet Series : Ⓐ

Invigilator's Name and Signature

BOOKLET NO.

OMR SHEET NO.

ROLL NO.

TIME : **2 HOURS 20 MINUTES**   TOTAL MARKS : 80

Number of Pages in this Booklet : **13**

Instructions for Candidates

1. Write your Roll No. and OMR Sheet No. in the boxes provided above.

2. This paper consists of two sections : **Section B** with 50 (fifty) multiple choice questions (MCQ) and **Section C** with 8 (eight) descriptive questions. Each MCQ has 4 (four) answers, out of which ONLY one is correct. You have to darken the circle (on the OMR Sheet) for the correct answer corresponding to the question given in this booklet.

   Example : Ⓐ Ⓑ Ⓒ Ⓓ

   where Ⓒ is the correct answer. No marks will be given for markings made in this booklet. The descriptive questions in **Section C** MUST be answered in the space provided in this booklet. **No extra pages will be provided in any case**.

3. Use a BLACK ball point pen in your OMR Sheet.

4. Read the instructions given inside this booklet before attempting to answer any questions.

5. DO NOT write your name, roll no, phone no, or anything, or put any marks anywhere in this booklet, otherwise your candidature will be disqualified.

6. If you are found to resort to any kind of unfair means such as carrying extra material other than pen, pencil, watch, eraser, and scale, or copying from somebody or from external material, your candidature will be disqualified.

7. Use of mobile phones, calculators, log tables or any other tables, wearable smart devices such as smart Android watches or objects of similar nature CAN NOT be used inside the examination hall.

8. At the end of the examination, you have to return this booklet and the OMR Sheet back to the invigilator.

9. There is no negative marks for incorrect answer.

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Section B (50 Marks)

1. A volumetric percentage of matrix $< 15\%$ in a sandstone would classify it as a

   (A) mudstone
   (B) wacke
   (C) arenite
   (D) none of these

2. The RMR System can be used for

   (A) estimation of shear strength of rock mass
   (B) estimation of average stand-up time for an arched roof
   (C) Both (A) and (B)
   (D) None of the above

3. Which one of the following elements possesses highest entropy?

   (A) Mg
   (B) Fe
   (C) Ca
   (D) Cl

4. Which one of the following tectonic settings is characterised by depressed isotherm?

   (A) Mid oceanic ridge
   (B) Subduction zone
   (C) Island arc
   (D) None of the above

5. Identify the numbers of component of the system $(CaMgFe)_3Al_2Si_3O_{12}$

   (A) 1
   (B) 2
   (C) 3
   (D) None of the above

6. Compressibility can be described as the reciprocal of

   (A) Bulk modulus
   (B) Young's modulus
   (C) Rigidity modulus
   (D) None of the above

7. Which of the following type of foraminiferal test is the most primitive test?

   (A) Agglutinated test
   (B) Calcareous test
   (C) Porcelaneous test
   (D) Hyaline test

8. In the Belt of Schuppen of Assam Arakan Basin, coal is found in the following horizon

   (A) Renji Formation
   (B) Tikak Parbat Formation
   (C) Nagaon Formation
   (D) Laisong Formation

9. The sapropelic coals are mainly composed of

   (A) Spore and pollen grain
   (B) Woody tissues
   (C) Algal material
   (D) Both (A) and (C)

10. Norite is a gabbroic rock in which

    (A) Opx > Cpx
    (B) Opx < Cpx
    (C) Opx = Cpx
    (D) Opx is absent

11. Which of the following exhibits a distinctive texture called Spinifex texture?

    (A) Tholeiites
    (B) Picrites
    (C) Spillites
    (D) Komatiites

12. Which of the following is an orthorhombic pyroxene?

    (A) Cummingtonite
    (B) Grunerite
    (C) Tremolite
    (D) Anthophyllite

13. The emplacement of Erinpura Granite marks the close of

   (A) Dharwar orogeny
   (B) Delhi orogeny
   (C) Eastern Ghat orogeny
   (D) Satpura orogeny

14. A map is prepared in the scale of $1\,\text{cm} = 2.5\,\text{km}$. What is the equivalent ratio scale?

   (A) $1 : 250000$
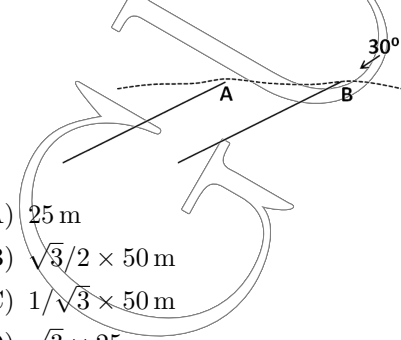   (B) $1 : 2500$
   (C) $1 : 2.5$
   (D) $1 : 25000$

15. Which of the following gives a measure of variation or dispersion in a group of data?

   (A) Mean
   (B) Standard deviation
   (C) Median
   (D) Mode

16. Which of the wavelength band represent 'the visible' part of the electromagnetic spectrum?

   (A) $4 - 7\,\text{nm}$
   (B) $0.4 - 0.7\,\text{mm}$
   (C) $0.4 - 0.7\,\text{m}$
   (D) $0.4 - 0.7\,\mu\text{m}$

17. A sandstone horizon with parallel bedding is encountered from A to B along a field traverse. If the amount of true dip of the beds is measured as $\sim 30°$ and the distance between A and B is $50\,\text{m}$, what is the true thickness of this sandstone horizon?

   (A) $25\,\text{m}$
   (B) $\sqrt{3}/2 \times 50\,\text{m}$
   (C) $1/\sqrt{3} \times 50\,\text{m}$
   (D) $\sqrt{3} \times 25\,\text{m}$

18. Identify the correct arrangement of the given minerals in increasing chemical stability

   (A) K-feldspar, Na-Feldspar, Hornblende , Quartz
   (B) Na-Feldspar, K-feldspar, Hornblende, Quartz
   (C) Na-Feldspar, K-feldspar, Quartz , Hornblende
   (D) Na-Feldspar, Hornblende, K-feldspar, Quartz

19. In which of the following conditions interference colour of a mineral is best observed?

   (A) Extinction position
   (B) When rotated $90°$ from extinction position
   (C) At rotated $45°$ from the extinction position
   (D) In extinction position but when the analyzer is out

20. The given triangular plot has three end member components to form a QFL triangle (Q =quartz, F =feldspar, L =lithic fragments). Name the rock with its composition in the field A
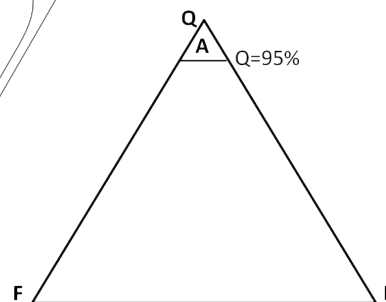
   (A) Arkose
   (B) Quartz arenite
   (C) Feldspathic arenite
   (D) Lithic arenite

21. Calcium compensation depth (CCD) is where

   (A) $CaCO_3$ starts appearing below this depth ($\sim 3500 - 5500\,\text{m}$ for modern oceans)
   (B) $CaCO_3$ is completely dissolved
   (C) Rate of dissolution of $CaCO_3$ equals the rate of supply of $CaCO_3$ to the sea floor
   (D) Net accumulation of $CaCO_3$ takes place below this depth

22. Which of the following is NOT a suitable technique used for determining diagenetic paleotemperatures?

   (A) Conodont colour alteration
   (B) Vitrinite reflectance
   (C) Oxygen isotope ratio
   (D) Carbon isotope ratio

23. Heavy minerals are often used as provenance indicators. Identify the possible provenance if assemblages of heavy minerals in a sandstone is : garnet, kyanite, sillimanite, staurolite, epidote

   (A) Metamorphic high rank
   (B) Sedimentary
   (C) Acid igneous
   (D) Basic igneous

24. Very large scale slumps and syndepositional faults are developed on major deltas. While the syndepositional faults are called growth faults, the giant slumps developed on tectonically active continental slopes are known as

   (A) Turbidites
   (B) Submarine slump
   (C) Submarine mass movement
   (D) Olisthostromes

25. The figure below represent equal area projection showing radiation pattern characteristic of a particular faulting associated with an earthquake. Identify the type of fault assuming that the fault on which the earthquake occurred is at the centre of the sphere (C =compression first motion, and R =rarefaction first motion)
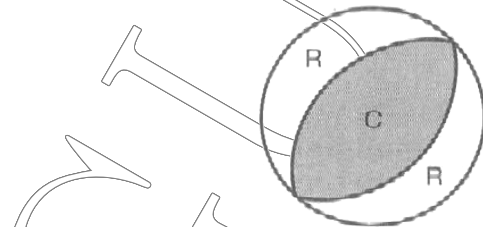
   (A) Thrust
   (B) Strike slip fault
   (C) Normal fault
   (D) oblique slip fault

26. Consider the two statements

   1. Cross cutting relationships of joints with foliations can give insight of sequence of deformational events
   2. Tectonic deformation is commonly accompanied by formation of a foliation in the rocks

   Which is the correct answer?

   (A) both the statements are true and 2 is the explanation of 1
   (B) both the statements are correct but 2 is not the explanation of 1
   (C) statement 1 is correct but 2 is wrong
   (D) statement 1 is wrong but 2 is correct

27. At a shallow depth the typical seismic velocity in a sequence of loosely consolidated mudstone and sandstone is of the order of 1800 m/s and the typical frequency is around 60 Hz. Assuming a typical resolution power of 1/4 of wavelength, what is the minimum size of a bed that can be detected through seismic reflection?

   (A) 3.0 m
   (B) 75 m
   (C) 30 m
   (D) 7.5 m

28. The 'Oil Window' to form liquid petroleum is in the temperature range of

   (A) $50° - 120°C$
   (B) $20° - 120°C$
   (C) $80° - 150°C$
   (D) $> 120°C$

29. Identify the correct stratigraphic order (left to right) of the given lithostratigraphic units in Meghalaya

   (A) Basement Gneissic Complex, Mylliem Granite, Khasi Greenstone, Shilong Group
   (B) Basement Gneissic Complex, Mylliem Granite, Shilong Group, Khasi Greenstone
   (C) Shilong Group, Basement Gneissic Complex, Khasi Greenstone, Mylliem Granite
   (D) Basement Gneissic Complex, Shilong Group, Khasi Greenstone, Mylliem Granite

30. Which of the following Neogene stratigraphic horizons in Arunachal Himalaya can be correlated with the 'Boulder Conglomerate' in Western Himalaya?

(A) Kimin Formation

(B) Subansiri Formatuion

(C) Dafla Formation

(D) Dihing Boulder Bed

31. The basic volcanics chronologically correlatable to the Sylhet Trap is

(A) Deecan Trap

(B) Rajmahal Trap

(C) Abor Volcanics

(D) Malani Volcanics

32. Identify the type of unconformity in the given figure
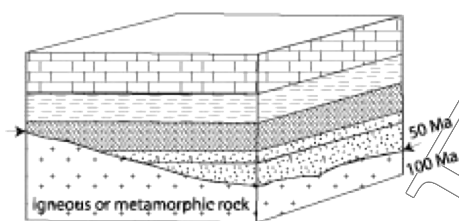
(A) Non conformity

(B) Disconformity

(C) Angular unconformity

(D) Paraconformity

33. The outer planets of the Solar System are composed mostly of

(A) Ice

(B) Silicates

(C) Hydrogen and helium

(D) Helium and krypton

34. Land plants first appeared on the earth in

(A) Silurian

(B) Devonian

(C) Carboniferous

(D) Ordovician

35. The figure below shows a schematic illustration of application of biochronology to age calibration of a local stratigraphic section. The age of the FAD (First Appearance Datum) for species 'A' established by radiometric dating of an associated ash bed. What will be the approximate age of the FAD for species B, if rate of sedimentation is estimated to be $3\,\text{m/Ma}$?
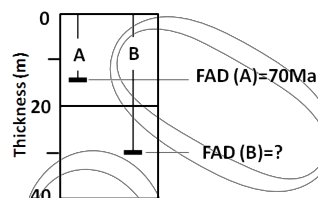
(A) 85 Ma

(B) 65 Ma

(C) 75 Ma

(D) 73 Ma

36. Identify the geomorphic process that may generate the landform assemblage – Cuesta, strath terrace, piedmont plain, erosional scarp

(A) Glacial

(B) Eolian

(C) Fluvial

(D) Glaciofluvial

37. Which of the following grain packing pattern will yield higher density to the rock?

(A) Cubic packing

(B) Rhombic packing

(C) Both cubic and rhombic packing

(D) Neither cubic nor rhombic packing

38. In which of the following, the best sorting of sediments are expected to developed?

(A) Eolian

(B) Fluvial

(C) Glacial

(D) Coastal

39. At the mantle-core boundary of the earth the shear wave (S wave), emanating from a seismic event is

(A) Reflected back

(B) Refracted through

(C) Absorbed

(D) Both reflected and refracted

40. Which of the following organisms represent the most important index fossils of the Paleozoic Era?

   (A) Gastropods
   (B) Trilobites
   (C) Foraminifers
   (D) All of the above

41. Particles of sediment from 1/16 mm to 2 mm diameter are called

   (A) Gravel
   (B) Pebble
   (C) Sand
   (D) Silt

42. Which of the following metamorphic facies represents highest pressure conditions?

   (A) Eclogite
   (B) Amphibolite
   (C) Greenschist
   (D) Granulite

43. Which of the following rock formations of the Cauvery basin is correlated with the Mahadek Formation of Meghalaya based on fossil records?

   (A) Dalmiapuram Formation
   (B) Uttatur Formation
   (C) Trichinopoly Formation
   (D) Ariyalur Formation

44. The best groundwater reservoirs have

   (A) low permeability and low porosity
   (B) low permeability and high porosity
   (C) high permeability and low porosity
   (D) high permeability and high porosity

45. The sandstone type uranium deposits of Meghalaya are found in

   (A) Langpar Formation
   (B) Shillong Group
   (C) Mahadek Formation
   (D) Simsang Formation

46. The Tipam Group rocks of the Assam-Arakan Basin is classified into

   (A) Tipam Sandstone Formation and Bokabil Formation
   (B) Tipam Sandstone Formation and Girujan Clay Formation
   (C) Tipam Sandstone Formation and Namsang Formation
   (D) Tipam Sandstone Formation and Langpar Formation

47. Bushveld igneous complex of South Africa is famous for its

   (A) Chromite deposits
   (B) PGE deposits
   (C) Both (A) and (B)
   (D) None of the above

48. The most ideal conditions for the chemical weathering are found in

   (A) Cold and dry regions
   (B) Cold and humid region
   (C) Hot and dry regions
   (D) Hot and humid regions

49. The difference between mudstone and shale is that

   (A) Shale contains larger grains than mudstone
   (B) Shale is layered and fissile whereas mudstone is massive
   (C) Shale contains smaller grains than mudstone
   (D) There is no difference between shale and mudstone

50. Which of the following is the largest species extinction event that took place in the geological past of the earth?

   (A) Cretaceous-Paleogene extinction event
   (B) Permian-Triassic extinction event
   (C) Ordovician-Silurian extinction event
   (D) Triassic-Jurassic extinction event

Section C (30 Marks)

Answer any 5 (five) from the following

1. Write an illustrative account on the geometric aspects of folds.   (Marks : 6)

2. Write an account on the role of tectonics in sedimentation.   (Marks : 6)

3. Briefly describe the geographical and geological distribution of economic mineral deposits in North East India.   (Marks : 6)

4. What are the controlling factors in isotopic fractionation? Briefly explain how stable isotopes can be used to understand geological processes.   (Marks : 6)

5. Explain the mechanism of mass movement. Use suitable sketches to illustrate.   (Marks : 6)

6. Explain different types of metamorphic reactions with suitable examples.   (Marks : 6)

7. What is trace fossil? Add a brief note on use of trace fossil in palaeoecological study.   (Marks : 6)

8. Write shortly about procedures for establishing lithostratigraphic units. (Marks : 6)