GATE 2022 General Aptitude (GA)

Q.1 – Q.5 Carry ONE mark each.

Q.1	Inhaling the smoke from a burning _____ could _____ you quickly.
(A)	tire / tier
(B)	tire / tyre
(C)	tyre / tire
(D)	tyre / tier

Q.2	A sphere of radius r cm is packed in a box of cubical shape.
	What should be the minimum volume (in cm^3) of the box that can enclose the sphere?
(A)	$\dfrac{r^3}{8}$
(B)	r^3
(C)	$2r^3$
(D)	$8r^3$

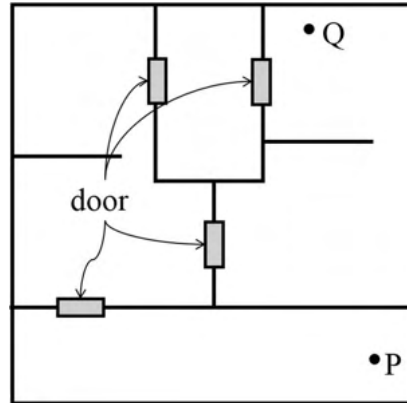| Q.3	Pipes P and Q can fill a storage tank in full with water in 10 and 6 minutes, respectively. Pipe R draws the water out from the storage tank at a rate of 34 litres per minute. P, Q and R operate at a constant rate.
	If it takes one hour to completely empty a full storage tank with all the pipes operating simultaneously, what is the capacity of the storage tank (in litres)?
(A)	26.8
(B)	60.0
(C)	120.0
(D)	127.5

Q.4	Six persons P, Q, R, S, T and U are sitting around a circular table facing the center not necessarily in the same order. Consider the following statements: • P sits next to S and T. • Q sits diametrically opposite to P. • The shortest distance between S and R is equal to the shortest distance between T and U. Based on the above statements, Q is a neighbor of
(A)	U and S
(B)	R and T
(C)	R and U
(D)	P and S

Q.5	A building has several rooms and doors as shown in the top view of the building given below. The doors are closed initially.

What is the minimum number of doors that need to be opened in order to go from the point P to the point Q?
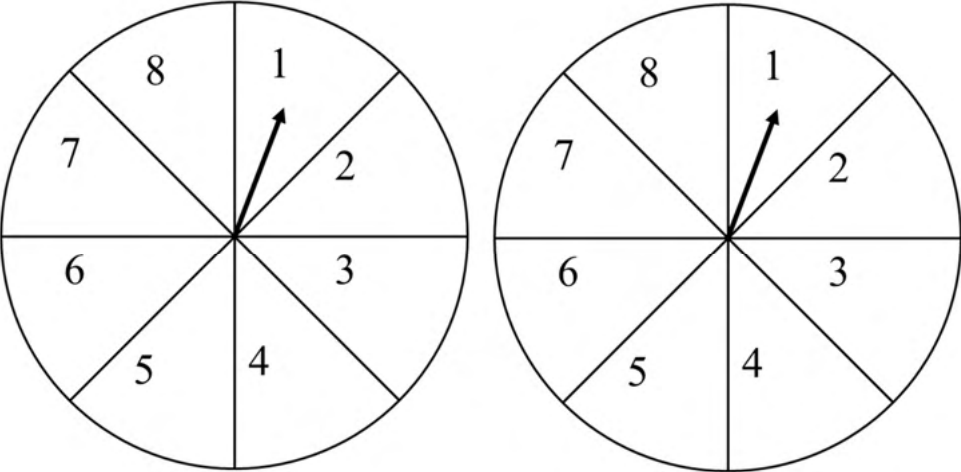

(A)	4
(B)	3
(C)	2
(D)	1

Q. 6 – Q. 10 Carry TWO marks each.

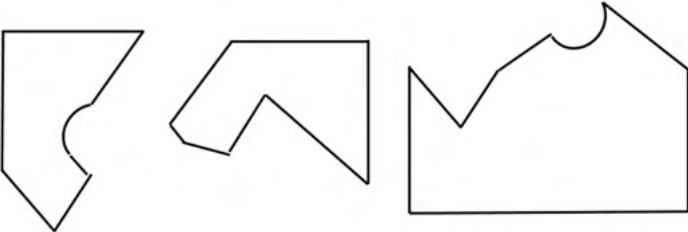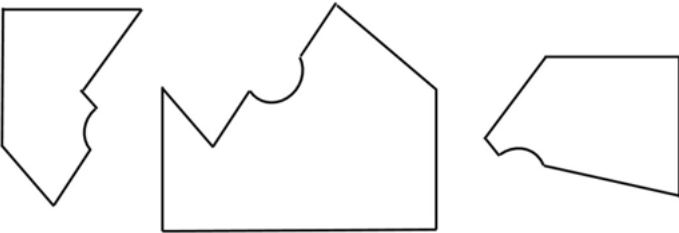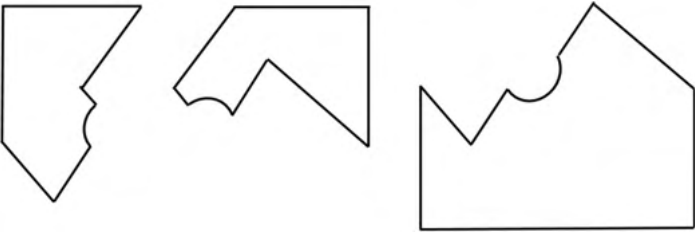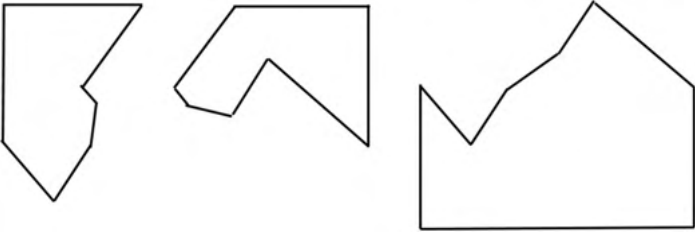| Q.6	Rice, a versatile and inexpensive source of carbohydrate, is a critical component of diet worldwide. Climate change, causing extreme weather, poses a threat to sustained availability of rice. Scientists are working on developing Green Super Rice (GSR), which is resilient under extreme weather conditions yet gives higher yields sustainably. Which one of the following is the CORRECT logical inference based on the information given in the above passage?
(A)	GSR is an alternative to regular rice, but it grows only in an extreme weather
(B)	GSR may be used in future in response to adverse effects of climate change
(C)	GSR grows in an extreme weather, but the quantity of produce is lesser than regular rice
(D)	Regular rice will continue to provide good yields even in extreme weather

Q.7	A game consists of spinning an arrow around a stationary disk as shown below. When the arrow comes to rest, there are eight equally likely outcomes. It could come to rest in any one of the sectors numbered 1, 2, 3, 4, 5, 6, 7 or 8 as shown. Two such disks are used in a game where their arrows are independently spun. What is the probability that the sum of the numbers on the resulting sectors upon spinning the two disks is equal to 8 after the arrows come to rest?
(A)	$\dfrac{1}{16}$
(B)	$\dfrac{5}{64}$
(C)	$\dfrac{3}{32}$
(D)	$\dfrac{7}{64}$

Q.8	Consider the following inequalities.
	(i) $3p - q < 4$
	(ii) $3q - p < 12$
	Which one of the following expressions below satisfies the above two inequalities?
(A)	$p + q < 8$
(B)	$p + q = 8$
(C)	$8 \leq p + q < 16$
(D)	$p + q \geq 16$

Q.9	Given below are three statements and four conclusions drawn based on the statements.
	Statement 1: Some engineers are writers.
	Statement 2: No writer is an actor.
	Statement 3: All actors are engineers.
	Conclusion I: Some writers are engineers.
	Conclusion II: All engineers are actors.
	Conclusion III: No actor is a writer.
	Conclusion IV: Some actors are writers.
	Which one of the following options can be logically inferred?
(A)	Only conclusion I is correct
(B)	Only conclusion II and conclusion III are correct
(C)	Only conclusion I and conclusion III are correct
(D)	Either conclusion III or conclusion IV is correct

Q.10	Which one of the following sets of pieces can be assembled to form a square with a single round hole near the center? Pieces cannot overlap.
(A)	
(B)	
(C)	
(D)	

PART A: COMPULSORY SECTION FOR ALL CANDIDATES
Q.11 – Q .17 Carry ONE mark each
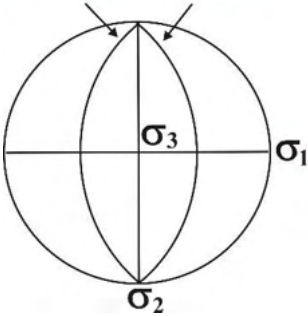
Q.11	Which one of the following is the typical product of ductile deformation?
(A)	Gouge
(B)	Breccia
(C)	Cataclasite
(D)	Mylonite
Q.12	Which one among the following coastal erosional landforms is caused by the action of sea waves?
(A)	Ventifact
(B)	Kettle
(C)	Cirque
(D)	Cliff

Q.13	In which one of the following regions of the electromagnetic spectrum does the maximum atmospheric scattering occur?
(A)	UV
(B)	IR
(C)	Radiowave
(D)	Microwave
Q.14	Which one of the following is the Poisson's ratio for an incompressible fluid?
(A)	0
(B)	0.25
(C)	1
(D)	0.5
Q.15	Which among the following Period(s) belong(s) to the Paleozoic Era?
(A)	Carboniferous
(B)	Paleogene
(C)	Silurian
(D)	Cretaceous

| Q.16 | The average bulk density of a fully saturated sandstone reservoir with a fractional porosity of 0.23 is _____ g/cc. [*round off to 2 decimal places*]

[Assume matrix density for sandstone = 2.63 g/cc and fluid density = 1.05 g/cc] |
| --- | --- |
| | |
| Q.17 | For a productive alluvial aquifer with hydraulic conductivity = 105 m/day and hydraulic gradient = 0.01, the flow rate is _____ m/day. [*round off to 2 decimal places*] |

Q.18 – Q .26 Carry TWO marks each

| Q.18 | The relationship between conjugate shear fractures and the principal stresses in a homogenous, isotropic, deformed body is shown in the stereoplot given below (σ_1, σ_2 and σ_3 are compressive stresses). Which one of the given fault regimes is indicated according to the Anderson's theory of faulting for the formation of conjugate shear fractures under plane strain?

Conjugate Fractures |
| --- | --- |
| (A) | Dextral strike-slip |
| (B) | Sinistral strike-slip |
| (C) | Reverse |
| (D) | Normal |

Q.19	How many independent elastic parameters are needed to describe a homogenous isotropic material?
(A)	21
(B)	2
(C)	36
(D)	3
Q.20	Which one of the following is a mafic volcanic rock?
(A)	Dacite
(B)	Trachyte
(C)	Rhyolite
(D)	Basalt
Q.21	The intercepts of a crystal face on the crystallographic axes are ∞a, 2b, 3c. Which one of the following is its Miller Index?
(A)	(032)
(B)	(023)
(C)	(203)
(D)	(320)

Q.22	Match the locations in Group I with the corresponding economic deposits in Group II.
	Group I **Group II**
	P. Wajrakarur 1. Chromite
	Q. Sukinda 2. Diamond
	R. Malanjkhand 3. Barite
	S. Mangampeta 4. Copper
(A)	P-3; Q-4; R-1; S-2
(B)	P-3; Q-1; R-4; S-2
(C)	P-2; Q-1; R-4; S-3
(D)	P-2; Q-4; R-1; S-3
Q.23	Choose the CORRECT statement(s) on seismic wave propagation in an elastic isotropic medium.
(A)	P-waves are polarized in the direction of propagation.
(B)	S-waves are polarized in the direction of propagation.
(C)	Rayleigh waves are elliptically polarized.
(D)	Love waves are elliptically polarized.

Q.24	The difference in arrival times of P- and S-waves generated by an earthquake and recorded at a seismological station is one second. Assuming a homogeneous and isotropic Earth, a P-wave velocity (V_P) of 3 km/s, the ratio of P- to S-wave velocities (V_P/V_S) of 2.0, the distance between the station and the hypocenter is _____km. [*round off to 1 decimal place*]
Q.25	Assuming the rate of rotation of the Earth is 7.27×10^{-5} radians/s and the radius of Earth is 6371 km, the centrifugal acceleration at $60°$ latitude for a spherically rotating Earth is _____$\times 10^{-3}$ m/s^2. [*round off to 1 decimal place*]
Q.26	The angle of inclination of the remanent magnetization of a volcanic rock measured at a location is $45°$. The magnetic latitude of the location of the volcanic rock at the time of its magnetization is _____ $°$N. [*round off to 1 decimal place*]

PART B (SECTION 1): FOR GEOLOGY CANDIDATES ONLY
Q.27 – Q.44 Carry ONE mark Each

Q.27	A coarse-grained igneous rock consists of 55% olivine, 25% augite and 20% enstatite. According to the IUGS classification, the rock is
(A)	websterite
(B)	lherzolite
(C)	wehrlite
(D)	harzburgite
Q.28	The rock-type used to build the walls of the Red Fort in Delhi is
(A)	sandstone
(B)	marble
(C)	granite
(D)	basalt

Q.29	During crystallization of a magma, which one of the following schematic paths (I, II, III and IV) describes the behavior of compatible elements in the residual melt?
	Fraction of crystals →
(A)	II
(B)	IV
(C)	I
(D)	III
Q.30	In the geological map of India, which one of the following geological units has the largest area?
(A)	Vindhyan Supergroup
(B)	Deccan Volcanic Province
(C)	Singhbhum Granite
(D)	Mesozoic rocks of Kutch
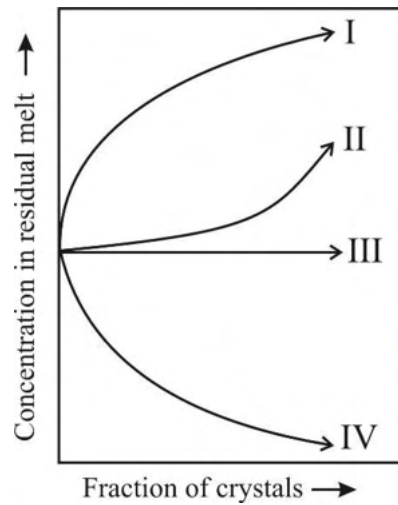
Q.31	Which one of the following cross-stratifications provides the paleocurrent direction on the truncated bedding surface of an undeformed cross-stratified sedimentary strata?
(A)	Tabular
(B)	Hummocky
(C)	Trough
(D)	Herringbone
Q.32	Which one of the following is a dinosaur?
(A)	*Stegodon*
(B)	*Stegosaurus*
(C)	*Equus*
(D)	*Otoceras*
Q.33	The Hoek-Brown failure envelope is typically the segment of which one of the following?
(A)	Straight line
(B)	Ellipse
(C)	Parabola
(D)	Hyperbola

Q.34	Which one of the following is the optical spectral window suitable for remote sensing?
(A)	$0.02 - 0.2$ µm
(B)	$0.4 - 14$ µm
(C)	$0.8 - 2.0$ µm
(D)	$0.01 - 1$ m
Q.35	A radioactive nucleus $^{290}_{92}X$ decays to $^{278}_{87}Y$. The number of α and β particles emitted during this decay are
(A)	12α and $1\beta^+$
(B)	6α and $1\beta^-$
(C)	3α and $1\beta^+$
(D)	3α and $1\beta^-$
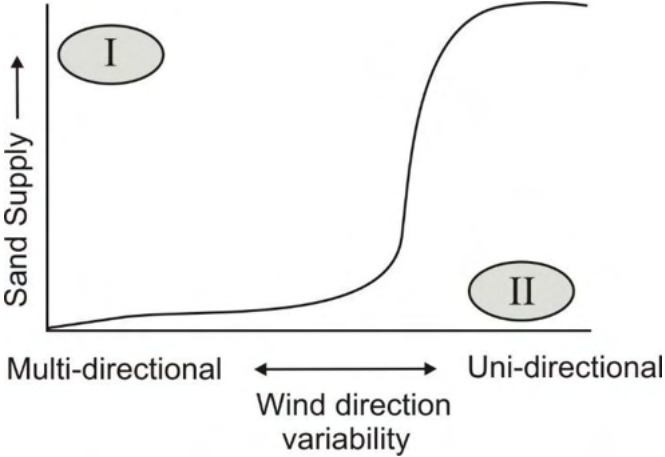
Q.36	The silicate mineral(s) that commonly occur(s) in regionally metamorphosed siliceous dolomitic limestone is/are
(A)	diopside
(B)	cordierite
(C)	tremolite
(D)	wollastonite
Q.37	Which of the natural hazard(s) listed below can be caused by Earthquakes?
(A)	Tsunamis
(B)	Landslides
(C)	Cyclones
(D)	Lightning
Q.38	Which of the following is/are the driving force(s) behind plate motion?
(A)	Slab-Pull
(B)	Ridge-Push
(C)	Mantle Convection
(D)	Advection

Q.39	Which of the following is/are copper ore mineral(s)?
(A)	Bornite
(B)	Pentlandite
(C)	Gahnite
(D)	Covellite
Q.40	Which of the following stratigraphic unit(s) of the Vindhyan Supergroup contain(s) commercially significant limestone deposit(s)?
(A)	Bhander Formation
(B)	Rewa Formation
(C)	Kaimur Formation
(D)	Rohtas Formation
Q.41	The strike and dip of the axial plane of a reclined fold is 022° and 28° SE, respectively. The plunge direction (in whole circle bearing) of the axis of the reclined fold is _____ degrees. [in integer]
Q.42	If the shrinkage factor of a crude oil is 0.7, its formation volume factor is _____. [round off to 1 decimal place]

Q.43	The cross section of a river channel is approximated by a trapezium. The river has an average channel width of 40 m and average depth of 3 m. If the average flow speed is 2 m/s, the discharge rate is _____ m^3/s. [*in integer*]
Q.44	A mineral of uniform composition is cut into a wedge shape. The birefringence of the wedge section is 0.012. The retardation at 40 μm thickness of the wedge is _____ nm. [*in integer*]

Q.45 – Q.65 Carry TWO marks Each

Q.45	The sand supply and the variability of wind direction results in different dune types. In the options below, choose the CORRECT pair of dune types marked I and II in the figure.
(A)	I – Transverse dune; II – Barchan dune
(B)	I – Star dune; II – Barchan dune
(C)	I – Barchan dune; II – Linear dune
(D)	I – Barchan dune; II – Star dune
Q.46	Which one of the following statements is CORRECT?
(A)	Salt dome traps are abundant in the Upper Assam Basin
(B)	Fold and thrust related traps are common in the Mumbai Offshore Basin
(C)	Limestone is the predominant reservoir rock in the Cambay Basin
(D)	Sandstone is the reservoir rock in the Krishna-Godavari Basin

Q.47	Identify the common metamorphic minerals labelled X and Y in the ACF diagram.
(A)	X – Anorthite; Y – Actinolite
(B)	X – Grossular; Y – Diopside
(C)	X – Wollastonite; Y – Almandine
(D)	X – Ferrosilite; Y – Andradite
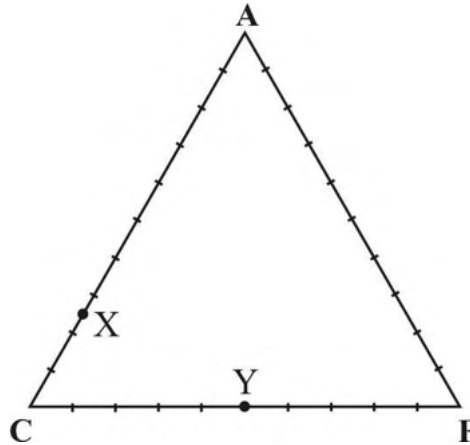
Q.48	Which one of the following schematic P-T paths is characteristic for a rock metamorphosed in a subduction zone?

(A)		(B)	
(C)		(D)	

Q.49	Which one of the following is the CORRECT statement regarding the ecology of bivalves?
(A)	*Pholas* is a swimming form
(B)	*Venus* is a shallow burrower
(C)	*Pecten* is a stone borer
(D)	*Spondylus* is a deep burrower

Q.50	On a fault surface with strike and dip 320° and 55° NE, respectively, four sets of slickenlines were measured by a geologist. Given that the fault surface was measured correctly, the plunge and plunge direction of the lineation on the fault surface is
(A)	55° → 050°
(B)	20° → 320°
(C)	50° → 325°
(D)	60° → 090°
Q.51	Match the following tectonic settings in Group-I with the corresponding examples in Group-II.

Group-I		**Group-II**	
P	Rift Basin	1	Pacific Ocean
Q	Passive Margin	2	Gulf of Suez
R	Subducting Ocean	3	West coast of India
S	Collision	4	Mediterranean Sea

(A)	P-2; Q-3; R-1; S-4
(B)	P-3; Q-2; R-4; S-1
(C)	P-2; Q-1; R-3; S-4
(D)	P-4; Q-3; R-1; S-2

Q.52 Match the following igneous textures in Group-I with their definitions in Group-II.

Group-I

P	Vitrophyre	1	Alkali feldspar rimmed by plagioclase
Q	Rapakivi	2	Aggregate of radially arrayed, needle-like crystals of plagioclase with or without clinopyroxene
R	Ocelli	3	Sub-parallel skeletal, platy olivine and/or pyroxene
S	Spinifex	4	Large phenocrysts within a glassy matrix

Group-II (header shown above for 1–4 definitions)

(A) P-2; Q-3; R-4; S-1

(B) P-3; Q-4; R-2; S-1

(C) P-4; Q-1; R-2; S-3

(D) P-4; Q-1; R-3; S-2

Q.53 | Match the Volcanogenic Massive Sulfide (VMS)-type deposits in Group-I with the dominant mineralized host rocks in Group-II.

Group-I		Group-II	
P	Besshi	1	Felsic volcanics
Q	Bathurst	2	Mafic volcanics + siliciclastics
R	Kuroko	3	Mafic volcanics
S	Cyprus	4	Felsic volcanics + siliciclastics

(A) | P-2; Q-1; R-3; S-4

(B) | P-2; Q-4; R-1; S-3

(C) | P-4; Q-3; R-1; S-2

(D) | P-1; Q-4; R-2; S-3

Q.54	The following diagram shows phase relations in a system consisting of components A and B at 1 bar pressure. If the initial composition of liquid is **R**, during cooling and crystallization of magma, which of the following statement(s) is/are CORRECT?
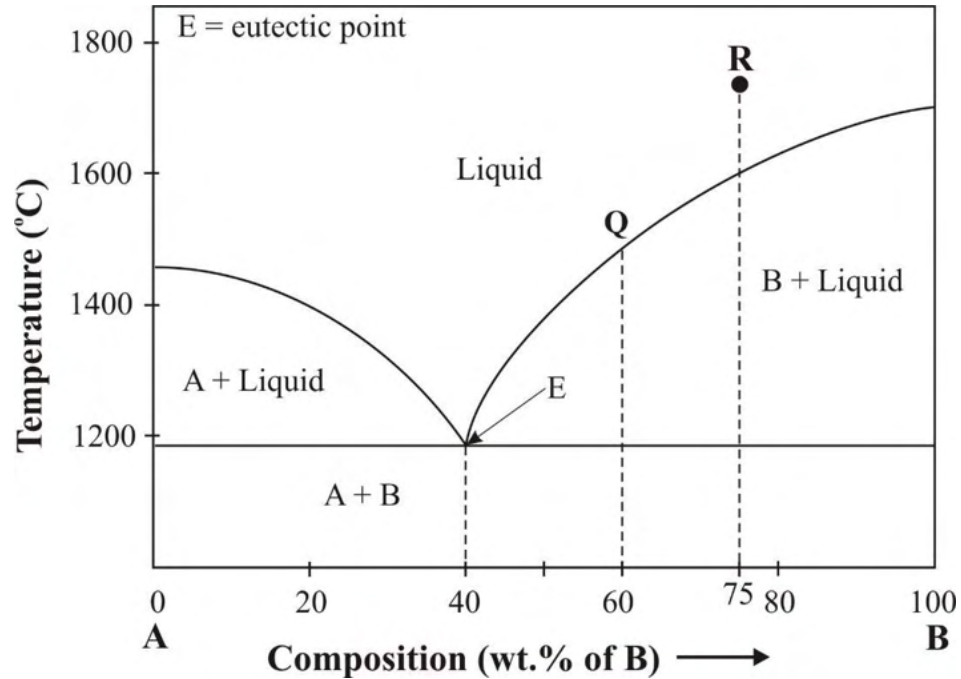
(A)	On complete crystallization of magma, the final composition (in wt.%) of rock consists of 25 of mineral **A** and 75 of mineral **B**.
(B)	On cooling of magma, mineral **A** is the first mineral to crystallize.
(C)	At point **Q**, the weight percentages of crystal and liquid are 37.5 and 62.5, respectively.
(D)	The composition (in wt.%) of liquid at point E is 40 **A** and 60 **B**.

Q.55	Which of the following systems tract(s) indicate regression?
(A)	Transgressive systems tract
(B)	Falling stage systems tract
(C)	Highstand systems tract
(D)	Lowstand systems tract
Q.56	Which of the following sedimentary feature(s) indicate(s) sub-aerial exposure of the depositional surface?
(A)	Groove cast
(B)	Double mud drape
(C)	Rain print
(D)	Adhesion ripple
Q.57	Which of the following statement(s) is/are correct?
(A)	Diatoms are algal forms.
(B)	Dinoflagellates are unicellular algae.
(C)	Petropods are planktic gastropods.
(D)	Radiolarians are organic-walled microfossils.

Q.58	Which among the following space groups is/are non-compatible with glide plane?
(A)	Pab2$_1$
(B)	Pnma
(C)	P6$_3$/c
(D)	P$\bar{3}$c1
Q.59	Which type of porphyroclast(s) listed below is/are suitable as kinematic indicators in ductile shear zones?
(A)	σ - type
(B)	Θ - type
(C)	δ - type
(D)	φ - type
Q.60	Which of the following parameter(s) is/are Rock Mass Rating (RMR) based on?
(A)	Rock Quality Designation
(B)	Uniaxial compressive strength of intact rock
(C)	Groundwater conditions
(D)	Rock composition

Q.61	A sample of 10 g coal yields 1 g of moisture, 2 g of ash and 5.6 g of volatile matter. The percentage of volatile matter content of the coal on dry ash-free basis is _____. [*round off to 1 decimal place*]
Q.62	A soil sample shows an average beta count of 6.8 counts per minute (cpm) per gram of organic carbon. The ^{14}C count rate from organic carbon of present day vegetation is 15.26 cpm/g. The age of the sample is _____ years. [*round off to 1 decimal place*] (Half-life of ^{14}C = 5370 years)
Q. 63	A digital camera with a focal length of 150 mm is flown at a height of 3000 m over a flat terrain for taking aerial photographs. The scale of the aerial photograph is 1: _____. [*in integer*]
Q. 64	The following reaction occurs at 1 bar and 823 K. Grossular + Quartz = Anorthite + 2 Wollastonite <table><tr><th rowspan="2">Mineral</th><th>Entropy ($S^{1, 823}$)</th><th>Volume ($V^{1, 823}$)</th></tr><tr><th>kJ K^{-1}</th><th>J bar^{-1}</th></tr><tr><td>Grossular</td><td>0.255</td><td>12.535</td></tr><tr><td>Quartz</td><td>0.042</td><td>2.269</td></tr><tr><td>Anorthite</td><td>0.200</td><td>10.079</td></tr><tr><td>Wollastonite</td><td>0.082</td><td>3.993</td></tr></table> Using the above molar thermodynamic data, the calculated slope of the above reaction is _____ bar K^{-1}. [*round off to 2 decimal places*]
Q.65	Operating costs of an open cast gold mine are Rs. 4000/tonne. The recovery at the mill is 90%. At a gold price of Rs. 4550/g, the cutoff grade of gold calculated on the basis of operating cost is _____ g/tonne. [*round off to 2 decimal places*]