Registration No. :

Centre of Exam. : _____

Name of Candidate : _____

_____
Signature of Invigilator

ENTRANCE EXAMINATION, 2016

M.Sc. ENVIRONMENTAL SCIENCES

[Field of Study Code : SESM–223]

Time Allowed : 3 hours   *Maximum Marks* : 100

INSTRUCTIONS FOR CANDIDATES

Candidates must read carefully the following instructions before attempting the Question Paper :

(i) Write your Name and Registration Number in the space provided for the purpose on the top of this Question Paper and in the Answer Sheet.

(ii) **Please darken the appropriate Circle of Question Paper Series Code on the Answer Sheet.**

(iii) The Question Paper is divided into two parts : Part—A and Part—B. Both parts have multiple-choice questions. All answers are to be entered in the Answer Sheet provided with the Question Paper for the purpose. The answer to each question is to be indicated by darkening the appropriate choice [i.e., (a), (b), (c) or (d)] in the circles, against each question number on the Answer Sheet.

(iv) Part—A consists of 45 questions. Answer any 30 questions. Each question carries 1 mark. **There will be negative marking and ¼ mark will be deducted for each wrong answer.**

(v) Part—B consists of 95 questions. Answer any 70 questions. Each question carries 1 mark. **There will be negative marking and ¼ mark will be deducted for each wrong answer.**

(vi) Calculators/Log Tables may be used.

(vii) Answer written by the candidates inside the Question Paper will not be evaluated.

(viii) Pages at the end have been provided for Rough Work.

(ix) Return the Question Paper and Answer Sheet to the Invigilator at the end of the Entrance Examination. **DO NOT FOLD THE ANSWER SHEET.**

INSTRUCTIONS FOR MARKING ANSWERS

1. Use only Blue/Black Ballpoint Pen (do not use pencil) to darken the appropriate Circle.

2. Please darken the whole Circle.

3. Darken ONLY ONE CIRCLE for each question as shown in example below :

Wrong	Wrong	Wrong	Wrong	Correct
● ⓑ ⓒ ●	ⓧ ⓑ ⓒ ⓓ	ⓧ ⓑ ⓒ ⓧ	◉ ⓑ ⓒ ●	ⓐ ⓑ ⓒ ●

4. Once marked, no change in the answer is allowed.

5. Please do not make any stray marks on the Answer Sheet.

6. Please do not do any rough work on the Answer Sheet.

7. Mark your answer only in the appropriate space against the number corresponding to the question.

8. **Ensure that you have darkened the appropriate Circle of Question Paper Series Code on the Answer Sheet.**

/38-**A** 2

1. $\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{1}{8}$ is equal to

   (a) $\frac{\pi}{2}$

   (b) $\frac{\pi}{3}$

   (c) $\frac{\pi}{4}$

   (d) $\frac{\pi}{6}$

2. $\begin{vmatrix} 1 & a & a^2 - bc \\ 1 & b & b^2 - ca \\ 1 & c & c^2 - ab \end{vmatrix}$ is equal to

   (a) 1

   (b) $4\,a^2\,b^2\,c^2$

   (c) $(a-b)(b-c)(c-a)$

   (d) 0

3. If the points $A(8, 8)$, $B(k, 2)$ and $C(3, -2)$ are collinear, then k is equal to

   (a) 0

   (b) 1

   (c) 5

   (d) 2

4. The function

   $$f(x) = \begin{cases} \dfrac{k\cos x}{\pi - 2x}, & \text{if } x \ne \dfrac{\pi}{2} \\ 3, & \text{if } x = \dfrac{\pi}{2} \end{cases}$$

   will be continuous for which of the following values of k?

   (a) 2

   (b) 3

   (c) 4

   (d) 6

5. If $y = \sqrt{e^{\sqrt{x}}}$, then $\dfrac{dy}{dx}$ is equal to

(a) $\dfrac{e^{\frac{1}{2}\sqrt{x}}}{4\sqrt{x}}$

(b) $\dfrac{e^{\sqrt{x}}}{2\sqrt{x}}$

(c) $\dfrac{e^{\sqrt{x}}}{4\sqrt{x}}$

(d) $\dfrac{e^{\sqrt{x}}}{\sqrt{x}}$

6. The velocity of light is maximum in

(a) diamond

(b) water

(c) vacuum

(d) glass

7. When a ray of white light enters from air into a glass lens, it undergoes a change in

(a) frequency only

(b) speed only

(c) frequency and speed both

(d) wavelength and speed both

8. Bragg's equation will have no solution, if

(a) $\lambda > 2d$

(b) $\lambda < 2d$

(c) $\lambda < d$

(d) $\lambda = d$

9. If

$$y = \tan^{-1}\left(\frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}}\right)$$

then $\dfrac{dy}{dx}$ is equal to

(a)   0

(b) $-\dfrac{1}{2}$

(c) $\dfrac{1}{2}$

(d) $\dfrac{\pi}{2} - \dfrac{x}{2}$

10. Coordinates of a point on the parabola $y = (x-3)^2$, where tangent is parallel to the chord joining the points (3, 0) and (4, 1), are

(a)   (0, 9)

(b) $\left(\dfrac{7}{2}, \dfrac{1}{4}\right)$

(c)   (1, 4)

(d) $\left(\dfrac{1}{4}, \dfrac{7}{2}\right)$

11. The total flow in a stream is termed as

(a)   runoff

(b)   base flow

(c)   medium flow

(d)   load

12. Water within the ground moves downward through the unsaturated zone under

(a)   hydraulic situation

(b)   action of gravity

(c)   hydraulic conductivity

(d)   hydrostatic pressure

13. How many neutrons are there in ^{238}U ?

    (a)   146

    (b)   92

    (c)   238

    (d)   176

14. Two most abundant elements found in nebula (gas clouds) in the universe are

    (a)   Fe and Ni

    (b)   N and O

    (c)   O and Si

    (d)   H and He

15. Quartz and tourmaline are examples of

    (a)   gold mineralization

    (b)   index mineral

    (c)   piezoelectric crystals

    (d)   tetragonal crystals

16. Dating past events in terms of tree rings are known as

    (a)   stratigraphy

    (b)   dendrochronology

    (c)   micropalaeontology

    (d)   chronostratigraphy

17. Trace elements obey

   (a) Boyle's law

   (b) Henry's law

   (c) Newton's law

   (d) Nernst's law

18. Which of the following makes soil distinct from sediment?

   (a) Organic matter

   (b) Water

   (c) Grain size

   (d) Humus

19. Tsunamis never affect ships in deep ocean due to their

   (a) long wavelength

   (b) high amplitude

   (c) short wavelength

   (d) high frequency

20. Lysocline is all about

   (a) density

   (b) salinity

   (c) pressure

   (d) carbonate compensation depth

21. Which of the following substances is not ionic?

    (a) CF_4

    (b) $SrBr_2$

    (c) KCN

    (d) $CO(NO_3)_3$

22. The correct order of increasing 1st ionization potential is

    (a) K < Na < H

    (b) Na < K < H

    (c) K < H < Na

    (d) H < Na < K

23. Which of the following metals does not liberate H_2 on reaction with dil. HCl?

    (a) Sn

    (b) Zn

    (c) Mg

    (d) Ag

24. The bond length of C—H, C—O, C—C and C=C bonds increases in the order

    (a) C—O < C—H < C—C < C=C

    (b) C—H < C—O < C—C < C=C

    (c) C—C < C=C < C—O < C—H

    (d) C—H < C=C < C—O < C—C

25. The molecular geometry for ammonia (NH_3) is

    (a) trigonal planar

    (b) tetrahedral

    (c) trigonal pyramidal

    (d) linear

26. The correct order of acids from their stronger to weaker acidic character is

(a) $H_2SO_3 > HNO_2 > H_3PO_4 > H_2CO_3$

(b) $HNO_2 > H_2SO_3 > H_2CO_3 > H_3PO_4$

(c) $H_2SO_3 > H_3PO_4 > HNO_2 > H_2CO_3$

(d) $H_2CO_3 > H_2SO_3 > HNO_2 > H_3PO_4$

27. PF_5 shows

(a) sp^2 hybridization

(b) sp^3 hybridization

(c) sp^3d hybridization

(d) sp^3d^2 hybridization

28. The compound which could contain exactly one triple bond is

(a) C_6H_{10}

(b) C_5H_{12}

(c) C_5H_{10}

(d) C_6H_{12}

29. Which of the following is less reactive?

(a) Fe

(b) Pt

(c) Co

(d) Ni

30. Aqua regia reacts with platinum to yield

(a) $Pt(NO_3)_4$

(b) H_2PtCl_6

(c) $PtCl_4$

(d) $PtCl_2$

31. Which one of the following will have the highest concentration of lignin?

    (a) Blue-green bacteria

    (b) Red algae

    (c) Leaves

    (d) Wood

32. A biome is a large regional unit characterized by

    (a) a major soil type

    (b) a major vegetation type and associated fauna in a specific climate zone

    (c) different levels of environmental pollution

    (d) different proportions of photosynthetically active radiation

33. The role of an organism in the ecological system is known as

    (a) mimicry

    (b) habitat

    (c) microhabitat

    (d) niche

34. Biotic potential (r)

    (a) depends on temperature only

    (b) depends on prey-predator interactions only

    (c) depends on environmental conditions other than temperature and prey-predator interactions

    (d) does not depend on environmental conditions

35. The transition zone between two communities is known as

    (a) ecotype

    (b) ecophene

    (c) ecotone

    (d) keystone

36. The haploid chromosome number of rice is 12. Which of the following tissues will have 36 chromosomes?

   (a) Coleoptile

   (b) Scutellum

   (c) Endosperm

   (d) No tissue will have 36 chromosomes

37. Eagles predating fish that eat algae belong to

   (a) trophic level I

   (b) trophic level II

   (c) trophic level III

   (d) trophic level IV

38. The transaminase enzyme is present in

   (a) liver

   (b) pancreas

   (c) intestine

   (d) None of the above

39. Which of the following is not a sensible grouping of amino acids based on their polarity properties?

   (a) Ala, Leu, Val

   (b) Asp, Ile, Pro

   (c) Arg, His, Lys

   (d) Phe, Trp, Tyr

40. Hydrogen is transformed from ingested food to NAD or NADP to form NADH or NADPH in

   (a) photosynthesis

   (b) respiration

   (c) transportation of water from roots

   (d) transportation of photosynthate to roots

41. 18-carat gold is

    (a)   100% pure gold

    (b)   75% pure gold

    (c)   50% pure gold

    (d)   15% pure gold

42. Ozone is considered as a pollutant in

    (a)   stratosphere

    (b)   troposphere

    (c)   ionosphere

    (d)   mesosphere

43. Which one of the following environmental treaties is considered as successful mission?

    (a)   Kyoto Protocol

    (b)   Montreal Protocol

    (c)   Male Declaration

    (d)   Copenhagen Accord

44. An inversion in ambient atmosphere is caused by

    (a)   stagnant winds

    (b)   low atmospheric pressure and temperature

    (c)   cooler air on top of warmer air

    (d)   warmer air on top of cooler air

45. Which one of the following classes of organic compounds does not contain oxygen?

    (a)   Ketone

    (b)   Amide

    (c)   Alcohol

    (d)   Amine

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Answer *any* **seventy** questions

46. The solution of the differential equation $(1 + y^2)(1 + \log x) dx + x \, dy = 0$ at $x = 1$ and $y = 1$ is given by

(a) $\frac{1}{2}(\log x)^2 + \log x + \tan^{-1} y = \frac{\pi}{4}$

(b) $(1 + \log x) \tan^{-1} y = \frac{\pi}{2}$

(c) $\log x + (\log x)^2 + \tan^{-1} y = 0$

(d) $(1 + \log x)(1 + \tan^{-1} y) = \frac{\pi}{2}$

47. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = \hat{j} - \hat{k}$ and there is a vector $\vec{c}$ such that $\vec{a} \times \vec{c} = \vec{b}$ and $\vec{a} \cdot \vec{c} = 3$, then the vector $\vec{c}$ is equal to

(a) $5\hat{i} + 3\hat{j} + 2\hat{k}$

(b) $\frac{5}{3}\hat{i} + \frac{2}{3}\hat{j} + \frac{2}{3}\hat{k}$

(c) $5\hat{i} + 2\hat{j} + 3\hat{k}$

(d) $\frac{5}{2}\hat{i} + \frac{2}{3}\hat{j} + \hat{k}$

48. The equation of the plane passing through the point $(0, 7, -7)$ and containing the line

$$\frac{x + 1}{-3} = \frac{y - 3}{2} = \frac{z + 2}{1}$$

is

(a) $2x + 3y + 4z = 0$

(b) $2x + 3y + 4z = 1$

(c) $x + y + z = 1$

(d) $x + y + z = 0$

49. In an examination, an examinee either guesses or copies or knows the answer to a multiple-choice question with four choices. The probability that he makes a guess is $\frac{1}{3}$ and the probability that he copies the answer is $\frac{1}{6}$. The probability that his answer is correct, given that he copied it is $\frac{1}{8}$. The probability that his answer is correct, given that he guessed it is $\frac{1}{4}$. Then, the probability that he knew the answer to the question, given that he correctly answered it, is equal to

(a) 1

(b) $\frac{1}{2}$

(c) $\frac{24}{29}$

(d) $\frac{17}{29}$

50. Which of the following infinite series is convergent?

(a) $\dfrac{2}{1^2+1}+\dfrac{2^2}{2^2+1}+\dfrac{2^3}{3^2+1}+\cdots$

(b) $\dfrac{1}{3}+\dfrac{8}{9}+\dfrac{27}{27}+\dfrac{64}{81}+\dfrac{125}{243}+\cdots$

(c) $\dfrac{\lfloor 2}{3}+\dfrac{\lfloor 3}{3^2}+\dfrac{\lfloor 4}{3^3}+\dfrac{\lfloor 5}{3^4}+\cdots$

(d) $\dfrac{1}{2}+\dfrac{\lfloor 2}{8}+\dfrac{\lfloor 3}{32}+\dfrac{\lfloor 4}{128}+\cdots$

51. Which of the following is not a test to determine if an infinite series is convergent or divergent?

(a) D'Alembert's ratio test   (b) Comparison test

(c) Cauchy's root test   (d) Unit root test

52. The value of $\lim\limits_{x\to 0^+}\dfrac{\log(\tan x)}{\log x}$ is

(a) $+\infty$ (b) $-\infty$

(c) 1   (d) 0

53. The value of $\displaystyle\int\dfrac{x+1}{\sqrt{4+5x-x^2}}\,dx$ is equal to

(a) $-\sqrt{4+5x-x^2}+\dfrac{7}{2}\sin^{-1}\left(\dfrac{2x-5}{\sqrt{41}}\right)+C$

(b) $\sqrt{4+5x-x^2}+\dfrac{1}{2}\sin^{-1}\left(\dfrac{2x-5}{\sqrt{41}}\right)+C$

(c) $\dfrac{1}{\sqrt{4+5x-x^2}}+\sin^{-1}(2x-5)+C$

(d) $\dfrac{1}{\sqrt{4+5x-x^2}}+\dfrac{7}{2}\sin^{-1}(2x-5)+C$

54. The area of the region bounded by the parabola $y^2 = 16x$ and the line $x = 4$ is equal to

(a) $\dfrac{26}{3}$ sq. units

(b) $\dfrac{128}{3}$ sq. units

(c) $\dfrac{28}{3}$ sq. units

(d) 60 sq. units

55. A die is rolled 20 times. Getting a number greater than 4 is a success. The mean and variance of the probability distribution are

(a) 2 and 3

(b) 3·6 and 1·2

(c) 6·67 and 4·44

(d) 8·53 and 2·37

56. In van der Waals' equation, the critical pressure (P_c) is

(a) $3b$

(b) $\dfrac{a}{27b^2}$

(c) $\dfrac{27a}{b^2}$

(d) $\dfrac{b^2}{a}$

57. If monochromatic green light is incident on the phosphorescent substance, then the colour of light emitted by it is

(a) same green colour

(b) nearer to red in the spectrum of white light

(c) nearer to violet in the spectrum of white light

(d) white colour

58. Polarization of light proves the

(a) corpuscular nature of light

(b) quantum nature of light

(c) transverse wave nature of light

(d) longitudinal wave nature of light

59. A bomb of mass 12 kg explodes into two pieces of masses 4 kg and 8 kg. The velocity of mass 8 kg is 6 m/sec. The kinetic energy of mass 4 kg will be

(a) 48 joule

(b) 32 joule

(c) 24 joule

(d) 288 joule

60. Two tuning forks have frequencies 450 Hz and 454 Hz respectively. On sounding these forks together, the time interval between successive maximum intensities will be

(a) $\frac{1}{4}$ second

(b) $\frac{1}{2}$ second

(c) 1 second

(d) 2 seconds

61. In a movie hall, if the distance between the projector and the screen is increased by 1%, illumination on the screen is

(a) increased by 1%

(b) decreased by 1%

(c) increased by 2%

(d) decreased by 2%

62. The ionization energy of hydrogen atom is 13·6 eV. Following Bohr's theory the energy corresponding to a transition between the 3rd and 4th orbit is

(a) 3·40 eV

(b) 1·51 eV

(c) 0·85 eV

(d) 0·66 eV

63. The work done in an isothermal expansion of a gas depends upon

(a) temperature only

(b) expansion only

(c) both temperature and expansion ratio

(d) neither temperature nor expansion ratio

64. If 10% of a radioactive material decays in 5 days, then the amount of the original material left after 20 days is approximately

(a) 60%

(b) 65%

(c) 70%

(d) 75%

65. A proton and an alpha particle enter in a uniform magnetic field with the same velocity. The period of rotation of the alpha particle will be

(a) four times that of proton

(b) two times that of proton

(c) three times that of proton

(d) same as that of proton

66. Sun emits light with maximum wavelength of 510 nm while another star X emits light with maximum wavelength of 350 nm. The ratio of surface temperature of the sun and the star is

(a) 1·45   (b) 0·68

(c) 0·46   (d) 2·1

67. Consider the fusion reaction

$$_{92}U^{236} \rightarrow X^{117} + Y^{117} + n + n$$
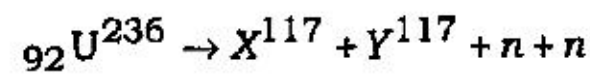
i.e., two nuclei of same mass number 117 are found plus two neutrons. The binding energy per nucleon of X and Y is 8·5 MeV, whereas of U^{236} it is 7·6 MeV. The total energy liberated will be about

(a) 2 MeV   (b) 20 MeV

(c) 200 MeV   (d) 2000 MeV

68. Karst topography develops in

(a) desert

(b) limestone region

(c) plateau

(d) basaltic flow

69. The groundwater contribution to a stream is known as

(a) base flow

(b) runoff

(c) storage

(d) transmission

70. Which of the following soil structures represents decreasing order of permeability?

(a) Massive—Prismatic—Granular

(b) Prismatic—Granular—Massive

(c) Granular—Prismatic—Massive

(d) Granular—Massive—Prismatic

71. Oddo-Harkins rule is all about

(a) cerium anomaly

(b) elemental abundances

(c) redox reactions

(d) elemental substitution

72. Which of the following is easily affected during pedogenesis?

(a) Zircon

(b) Quartz

(c) Feldspar

(d) Rutile

73. Siderophile elements show affinity to

(a) silicates

(b) sulfides

(c) iron

(d) gas

74. The centre of mass of the earth-moon system is called

(a) aphelion

(b) apogee

(c) barycentre

(d) perigee

75. Which of the following rocks is exposed in Delhi?

(a) Granite

(b) Quartzite

(c) Sandstone

(d) Limestone

76. A complete skeleton of a colonial coral is known as

    (a) coral reef

    (b) atoll

    (c) coral gel

    (d) base coral

77. A depression in a limestone area resulting from the merging of two or more dolines is known as

    (a) badland topography

    (b) uvala

    (c) pothole

    (d) sinkhole

78. A migmatite with artery-type granite intrusion is known as

    (a) artesian

    (b) arterite

    (c) inclined aquifer

    (d) artesian spring

79. Augite is an essential mineral of

    (a) granite and pegmatite

    (b) basalt and gabbro

    (c) limestone and marble

    (d) sandstone and siltstone

80. A similarity of time sequence in reference to correlation of stratigraphical or fossil sequence is known as

    (a) chronozone

    (b) chronotaxis

    (c) chronolithology

    (d) chronohorizon

81. Hedenbergite is a/an

    (a) hexagonal mineral

    (b) monoclinic mineral

    (c) orthorhombic mineral

    (d) cubic mineral

82. In satellite, remote-sensing microwave sensors can differentiate the

    (a) backscatter of objects

    (b) saline water from freshwater

    (c) minerals

    (d) plant species

83. Interferrometry can be done by using

    (a) visible sensors

    (b) thermal sensors

    (c) infrared sensors

    (d) microwave sensors

84. LANDSAT was initially known as

    (a) land satellite

    (b) earth resources technological satellite

    (c) land-ocean satellite

    (d) ground satellite

85. Carnotite is a mineral of

    (a) vanadium and uranium

    (b) cobalt and copper

    (c) nickel and cobalt

    (d) titanium and gold

86. What does a storm hydrograph show?

(a) How many storms have occurred during a month

(b) How much rainfall an area has had in one week

(c) How and when a rainfall event affects the discharge of the river

(d) How many storms have occurred during the fortnight

87. The ice cap of Mars is composed mostly of

(a) water ice

(b) frozen nitrogen

(c) sea ice

(d) dry ice (CO_2)

88. The mass of the earth is made up of which of the following two elements?

(a) Fe and O

(b) Si and O

(c) Ni and O

(d) Mn and O

89. The temperature of the ocean water is affected by

(a) longitude

(b) latitude

(c) river discharge

(d) thermal pollution

90. The d-electron configurations of Cr^{2+}, Mn^{2+}, Fe^{2+} and Co^{2+} are

(a) d^4, d^4, d^6 and d^7 respectively

(b) d^4, d^4, d^5 and d^7 respectively

(c) d^4, d^5, d^5 and d^6 respectively

(d) d^4, d^5, d^6 and d^7 respectively

(At. Nos. Cr = 24, Mn = 25, Fe = 26, Co = 27)

91. Nuclei pair with the same number of neutrons is

(a) ^{57}Co and ^{58}Ni

(b) ^{56}Co and ^{58}Co

(c) ^{57}Fe and ^{58}Ni

(d) ^{57}Mn and ^{57}Fe

92. During inductive effect, there will be

(a) displacement of *pi* electrons

(b) delocalization of *sigma* electrons

(c) delocalization of *pi* electrons

(d) displacement of *sigma* electrons

93. Which of the following represents the electronic configuration of Cr^{3+}?

(a) $[Ar]3d^3 4s^0$

(b) $[Ar]3d^2 4s^1$

(c) $[Ar]3d^5 4s^1$

(d) $[Ar]3d^4 4s^2$

94. Electron pair geometry of NH_3 is

(a) linear

(b) tetrahedral

(c) trigonal pyramidal

(d) octahedral

95. The oxidation number of bromine in $Br_2 \rightarrow BrO_3^-$ changes from

(a) + 1 to + 5

(b) zero to + 5

(c) + 2 to + 5

(d) zero to – 2

96. The electronic transition corresponding to the emission of visible light in atomic hydrogen is

(a) $n = 3 \rightarrow n = 4$

(b) $n = 1 \rightarrow n = 2$

(c) $n = 3 \rightarrow n = 1$

(d) $n = 5 \rightarrow n = 2$

97. In the fluorescence, emission usually occurs

(a) at lower energies than the energies of excitation

(b) at greater energies than the energies of excitation

(c) at energies that are equal to the energies of excitation

(d) both at greater as well as lower energies of excitation

98. Which of the following metal ions will form a colourless solution in aqueous medium?

(a) Cr^{3+}

(b) Sc^{3+}

(c) V^{3+}

(d) Ti^{3+}

99. The correct order of decreasing bond strength for the compounds HI, HBr, HCl and HF is

(a) HI > HBr > HCl > HF

(b) HF > HCl > HBr > HI

(c) HCl > HF > HI > HBr

(d) HBr > HCl > HI > HBr

100. The formula for hexaamminecobalt(II) tetrachloroaurate(III) is

(a) $[Co(NH_3)_6][AuCl_3]_2$

(b) $[Co(NH_3)_6][AgCl_4]_2$

(c) $[Co(NH_3)_6][AuCl_2]_2$

(d) $[Co(NH_3)_6][AuCl_4]_3$

101. Which of the following is an intensive property?

(a) Density

(b) Amount in moles

(c) Length

(d) None of the above

102. If the recommended dosage of a prescribed drug is 2 mg/kg of body weight, the amount of the drug that should be administered to a 12-pound infant (1 lb = 0·453 kg) is

(a) ~11 mg

(b) ~4 mg

(c) ~3 mg

(d) ~22 mg

103. Which of the following energy profiles represents the most endothermic reaction?
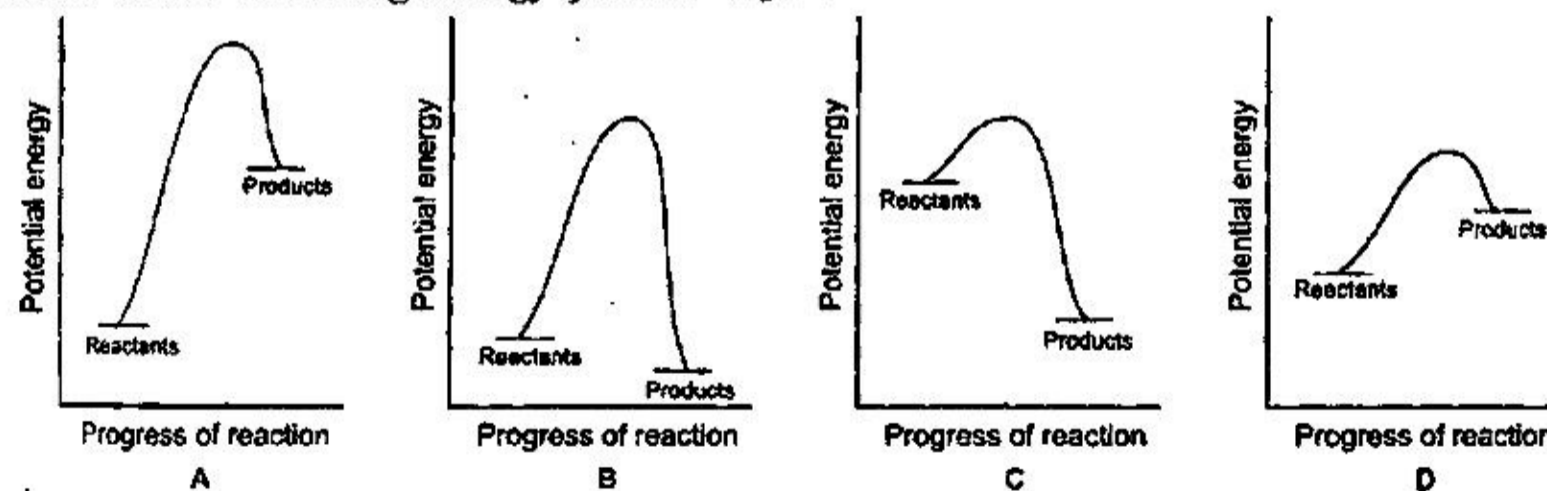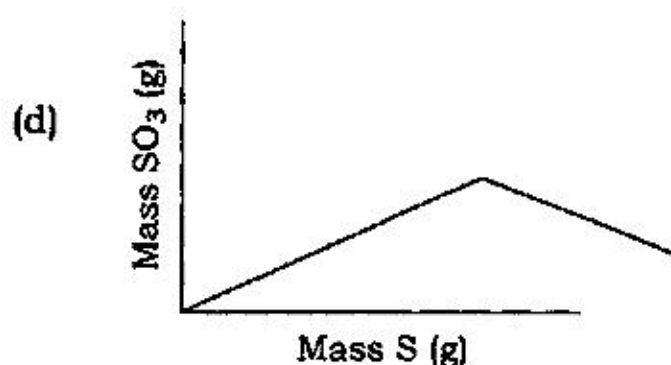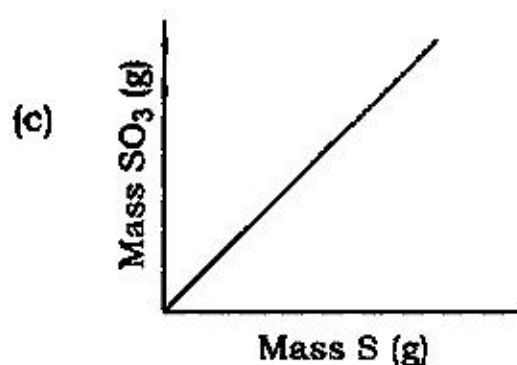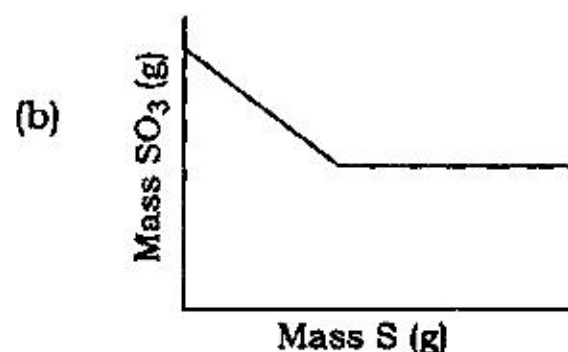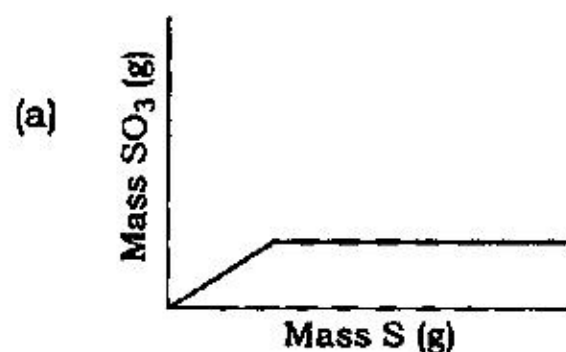

[All the diagrams are drawn to the same scale]

(a) Profile A

(b) Profile B

(c) Profile C

(d) Profile D

104. Consider the chemical reaction

$$2S + 3O_2 \rightarrow 2SO_3$$
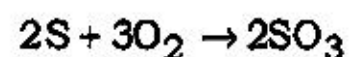
If the reaction is run by adding S indefinitely to a fixed amount of O_2, which of the following graphs best represents the formation of SO_3?

(a)

(b)

(c)

(d)

105. 10 gm of a substance dissolved in 100 gm of water raised its boiling point by 0·98 °C. Calculate the molecular weight of the substance. [Molal elevation constant for water is 0·52 °C/molality]

(a)   ~53

(b)   ~100

(c)   ~82

(d)   ~35

106. What is the oxidation of Fe in $K_3[Fe(CN)_6]$ and $[Fe(en)_3]^{2+}$?

(a)   +3 and +2

(b)   +2 and +3

(c)   +2 and zero

(d)   +3 and zero

107. The difference in weight of particles having $0.1\ \mu m$ and $10\ \mu m$ aerodynamic diameter is

(a) 10000 times

(b) 1 million times

(c) 1000 times

(d) 100 times

108. How many water molecules are there in one drop of water? [One drop of water is $\frac{1}{20}$ ml, and density of water is 1.0 g/ml]

(a) $\sim 1.7 \times 10^{21}$ molecules

(b) $\sim 2.7 \times 10^{21}$ molecules

(c) $\sim 4.7 \times 10^{21}$ molecules

(d) $\sim 8.7 \times 10^{21}$ molecules

109. According to Baeyer strain theory, which of the following should be the most stable and least strained?

(a) Cyclopropane   (b) Cyclopentane

(c) Cyclobutane   (d) Cyclohexane

110. Which of the following dicarboxylic acids is most acidic?

(a) Malonic acid   (b) Oxalic acid

(c) Succinic acid   (d) Pthalic acid

111. The compound which has geometric isomers is

(a) 1,2-dichloroethane   (b) 1,2-dichloroethene

(c) 1,1-dichloroethane   (d) 1,1-dichloroethene

112. The IUPAC name for
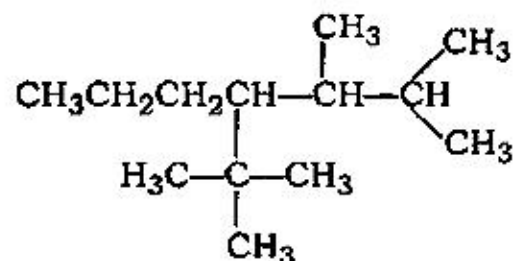
is

(a) 2,3-dimethyl-4-*t*-butylheptane

(b) 2,3-dimethyl-3-*t*-butylheptane

(c) 2,3-dimethyl-2-*t*-butylheptane

(d) 2,3-dimethyl-1-*t*-butylheptane

113. Which of the following is correct trend of acidity among different compounds?

(a) $[Fe(OH_2)_6]^{2+} < [Al(OH_2)_6]^{3+} < [Fe(OH_2)_6]^{3+}$

(b) $[Al(OH_2)_6]^{3+} < [Fe(OH_2)_6]^{2+} < [Fe(OH_2)_6]^{3+}$

(c) $[Fe(OH_2)_6]^{3+} < [Al(OH_2)_6]^{3+} < [Fe(OH_2)_6]^{2+}$

(d) $[Fe(OH_2)_6]^{3+} < [Fe(OH_2)_6]^{2+} < [Al(OH_2)_6]^{3+}$

114. Fluxionality in inorganic compound is introduced by

(a) internal rotation

(b) external rotation

(c) ring unwhizzing

(d) stereochemical rigidity

115. Shown below is a plot of the concentration of a reactant D versus time. How do the instantaneous rates at points A and B compare?

Time (s) ⟶
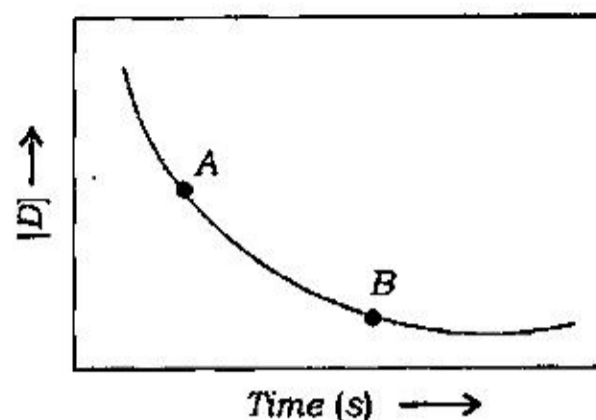
(a) The instantaneous rate at point A is less than the instantaneous rate at point B

(b) The instantaneous rate at point A is greater than the instantaneous rate at point B

(c) The instantaneous rate at point A is equal to the instantaneous rate at point B

(d) None of the above

116. Which of the following coenzymes acts as an electron sink to promote catalysis?

(a) Thiamine pyrophosphate

(b) CoA

(c) Lipoamide

(d) Pyridoxal phosphate

117. Algal bloom is usually associated with

(a) climate change

(b) salination

(c) intoxication

(d) eutrophication

118. Which one of the following is the most influential cause of loss of biodiversity?

  (a) Pollution

  (b) Climate change

  (c) Habitat loss and fragmentation

  (d) Soil erosion

119. The linkage found between sugar and base in RNA and DNA is

  (a) O-glycosidic

  (b) N-glycosidic

  (c) phosphodiester

  (d) ester

120. Which one of the following is considered as a secondary nutrient for plant growth?

  (a) Carbon

  (b) Nitrogen

  (c) Phosphorus

  (d) Sulphur

121. Pseudomonas is a

  (a) nitrogen-fixing organism

  (b) phosphorus-fixing organism

  (c) phosphorus-solubilizing organism

  (d) photosynthetic organism

122. Micelles of fatty acids in water are organized such that the _____ face the solvent and the _____ are directed toward the interior.

    (a) hydrophilic heads; hydrophobic tails

    (b) hydrocarbon chains; carboxylic acid groups

    (c) hydrophobic tails; hydrophilic heads

    (d) non-polar chains; polar head groups

123. When $[s] = K_M$, the velocity of an enzyme catalyzed reaction is about

    (a) $0.1 \times V_{max}$

    (b) V_{max}

    (c) $0.9 \times V_{max}$

    (d) $0.5 \times V_{max}$

124. The isoelectric point of an amino acid is defined as the pH

    (a) where the molecule carries no net electric charge

    (b) where the carboxyl group is uncharged

    (c) where the amino group is uncharged

    (d) of maximum electrolytic mobility

125. Which of the following inorganic substances is naturally occurring in rocks, solube in groundwater and toxic in low concentration?

    (a) Mercury

    (b) Lead

    (c) Arsenic

    (d) PCBs

126. Phytoplankton carrying out photosynthesis in a lake are dominant in

    (a) profundal zone only

    (b) limnetic zone only

    (c) benthic zone only

    (d) both profundal and benthic zones

127. Which of the following enzymes can be used for the removal of colour from the effluents of pulp mill?

(a) Peroxidase

(b) B-glucosidase

(c) Xylosidase

(d) Lipase

128. The death of a river by environmental pollutants ultimately results from

(a) the depletion of oxygen

(b) the overpopulation of algae

(c) the overabundance of toxic proteins

(d) the buildup of sediment on the river bottom

129. Wastewater testing relies on the detection of certain indicator organisms known as

(a) acid-test bacteria

(b) bacteroids

(c) coliforms

(d) dinoflagellates

130. Gram-positive bacteria retain Gram's stain owing to high percentage of _____ than Gram-negative bacteria.

(a) lipoproteins

(b) lipopolysaccharides

(c) peptidoglycan

(d) outer membrane proteins

131. Cellulose is linear polymer of

    (a) α-D-Glucose

    (b) α-D-Fructose

    (c) β-D-Glucose

    (d) β-L-Glucose

132. Which of the following statements is incorrect about invasive species?

    (a) Their population grow rapidly

    (b) They often have no major predator or herbivore

    (c) They are often competitively inferior

    (d) They usually cause decline in native population

133. Which one of the following conditions does not define the fundamental niche of a species?

    (a) Humidity

    (b) Salinity

    (c) Predator

    (d) Temperature

134. A person with phenylketonuria cannot convert

    (a) phenol into ketones

    (b) phenylalanine to tyrosine

    (c) phenylalanine to isoleucine

    (d) phenylalanine to lysine

135. Signal sequences are specific sequences of amino acids in a protein that

    (a) signal the folding of proteins

    (b) signal for the termination of translation

    (c) signal for transport of proteins to other sites within the cell

    (d) are the sites of protease cleavages

136. According to Wobble hypothesis, there is less stringent base pairing specificity of the

(a)   5′ end base of the codon

(b)   3′ end base of the anticodon

(c)   middle base of the codon

(d)   5′ end base of the anticodon

137. Which of the following is not the biofertilizer-producing bacteria?

(a)   Nostoc

(b)   Anabaena

(c)   Clostridium

(d)   Both (a) and (b)

138. Which of the following is not related to the analysis of organic chemicals?

(a)   LC

(b)   ICP

(c)   GC

(d)   ECD

139. The dark blue colour of ozone is due to intense absorption of

(a)   blue light

(b)   cosmic radiation

(c)   red light

(d)   infrared radiation

140. Tyndal effect can be observed in a

(a)   true solution

(b)   colloidal solution

(c)   solvent

(d)   precipitate

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