# ENTRANCE EXAMINATION – 2019

SET – C

ROLL NO.

Signature of Invigilator

Time : 1 HOUR 45 MINUTES   **Total Marks: 100**

Instructions to Candidates

1. Do not write your name or put any other mark of identification anywhere in the OMR Response Sheet. IF ANY MARK OF IDENTIFICATIONS IS DISCOVERED ANYWHERE IN OMR RESPONSE SHEET, the OMR sheet will be cancelled, and will not be evaluated.

2. This Question Booklet contains the cover page and a total of 100 Multiple Choice Questions of 1 mark each

3. Space for rough work has been provided at the beginning and end. Available space on each page may also be used for rough work.

4. There is negative marking in Multiple Choice Questions. For each wrong answer, 0.25 marks will be deducted.

5. USE POSSESSION OF ELECTRONIC GADGETS LIKE MOBILE PHONE, iPhone, iPad, page ETC. is strictly PROHIBITED.

6. Candidate should check the serial order of questions at the beginning of the test. If any question is found missing in the serial order, it should be immediately brought to the notice of the Invigilator. No pages should be torn out from this question booklet.

7. Answers must be marked in the OMR response sheet which is provided separately. OMR Response sheet must be handed over to the invigilator before you leave the seat.

8. The OMR response sheet should not be folded or wrinkled. The folded or wrinkled OMR Response Sheet will not be evaluated

9. Write your Roll Number in the appropriate space (above) and on the OMR Response Sheet. Any other details, if asked for, should be written only in the space provided.

10. There are four options to each question marked A, B, C and D. Select one of the most appropriate options and fill up the corresponding oval/circle in the OMR Response Sheet provided to you. The correct procedure for filling up the OMR Response Sheet is mentioned below.

11. Use Black or Blue Ball Pen only for filling the ovals/circles in OMR Response Sheet. Darken the selected oval/circle completely. If the correct answer is 'B', the corresponding oval/circle should be completely filled and darkened as shown below
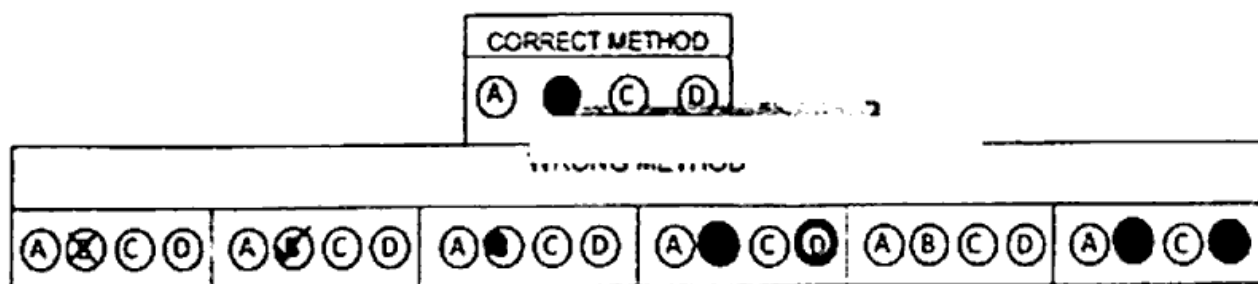
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1. A tube of sugar solution 20 cm long is placed between crossed nicols and illuminated with light of wavelength 6×10^{-5} If the optical rotation produced is $13°$ and the specific rotation is $65°$, determine the strength of the solution.
   A. 0.1 g/cc
   B. 0.2 g/cc
   C. 0.9 g/cc
   D. 1.0 g/cc

2. Two satellites S_1 and S_2 are revolving round a planet in coplanar circular orbits of radii r_1 and r_2 in the same direction, respectively. Their respective periods of revolution are 1h and 8h. The radius of orbit of satellite S_1 is equal to 10^4 What will be their relative speed (in km/h) when they are closest?
   A. $\pi/2 \times 10^4$
   B. $\pi \times 10^4$
   C. $2\pi \times 10^4$
   D. $4\pi \times 10^4$

3. A metro train starts from rest and in 5s achieves 108 km/h. After that it moves with constant velocity and comes to rest after travelling 45m with uniform retardation. If total distance travelled is 395 m, find total time travelling
   A. 12.2 s
   B. 15.3 s
   C. 9 s
   D. 17.2 s

4. X- rays are used in determining the molecular structure of crystalline because
   A. its energy is high
   B. it can penetrate the material
   C. its wavelength is comparable to interatomic distance
   D. its frequency is low

5. Which of the following circular rods, (given radius r and length l) each made of the same material and whose ends are maintained at the same temperature will conduct most heat?
   A. $r = 2r_0$, $l = 2l_0$
   B. $r = 2r_0$, $l = l_0$
   C. $r = r_0$, $l = l_0$
   D. $r = r_0$, $l = 2l_0$

6. Two vibrating tuning forks produce progressive waves given by $y_1 = 4\sin 500\pi t$ and $y_2 = 2\sin 506\pi t$. Number of beats produced per minute is
   A. 360
   B. 180
   C. 3
   D. 60

7. A car moves from X to Y with a uniform speed v_u and returns to Y with a uniform speed v_d. The average speed for this round trip is

A. $\frac{2 v_d v_u}{v_d + v_u}$

B. $\sqrt{v_u v_d}$

C. $\frac{v_d v_u}{v_d + v_u}$

D. $\frac{v_u + v_d}{2}$

8. Dimensions of resistance in an electrical circuit, in terms of dimension of mass M, of length L, of time T and of current I, would be

A. $[ML^2T^{-3}T^{-1}]$

B. $[ML^2T^{-2}]$

C. $[ML^2T^{-1}I^{-1}]$

D. $[ML^2T^{-3}I^{-2}]$

9. Four blocks of same mass connected by strings are pulled by a force F on a smooth horizontal surface as shown in figure. The tension T1, T2 and T-3 will
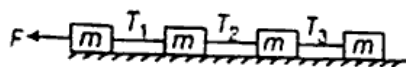
A. $T_1 = \frac{1}{4}F, T_2 = \frac{3}{2}F, T_3 = \frac{1}{4}F$

B. $T_1 = \frac{1}{4}F, T_2 = \frac{1}{2}F, T_3 = \frac{1}{2}F$

C. $T_1 = \frac{3}{4}F, T_2 = \frac{1}{2}F, T_3 = \frac{1}{4}F$

D. $T_1 = \frac{3}{4}F, T_2 = \frac{1}{2}F, T_3 = \frac{1}{2}F$

10. A uniform rod of length l and mass m is free to rotate in a vertical plane about A. The rod initially in horizontal position is released. The initial angular acceleration of the rod is :
(Moment of inertia of rod about A is (ml2/3))
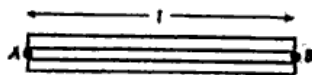
A. 3g/2l

B. 2l/3g

C. 3g/2l2

D. mg(l/2)

11. Fascia around nerve bundle of brachial plexus is derived from?

A. Prevertebral fascia
B. Clavipectoral facia
C. Deep cervical fascia
D. Pectoral fascia

12. Maximum post prandial motility is seen in *(AIIMS may 2011)* (large intestine)

A. Ascending colon
B. Descending colon
C. Sigmoid colon
D. Transverse colon

13. The pathogen Microsporum responsible for ringworm disease in humans belongs to the same Kingdom of organisms as that of:

A. Taenia, a tapeworm
B. Wuchereria, a filarial worm
C. Rhizopus, a mould
D. Ascaris, a round worm

14. *Selaginella* and *Salvinia* are considered to represent a significant step toward evolution of seed habit because:

A. Female gametophyte is free and gets dispersed like seeds
B. Female gametophyte lacks archegonia.
C. Megaspores possess endosperm and embryo surrounded by seed coat.
D. Embryo develops in female gametophyte which is retained on parent sporophyte.

15. Wernicke's syndrome is generally common in alcoholic person; which is characterised by less mental activity and dual vision. It is caused by the deficiency of

A. Riboflavin
B. Thiamine
C. Pyridoxine
D. Retinol

16. Which one of the following is the correct description of a certain part of a normal human skeleton?

A. Parietal bone and the temporal bone of the skull are joined by fibrous joint
B. First vertebra is axis which articulates with the occipital condyles
C. The 9th and 10th pairs of ribs are called the floating ribs
D. Glenoid cavity is a depression to which the thigh bone articulates

17. Secretions from which one of the following are rich in fructose, calcium and some enzymes?

A. Male accessory glands
B. Liver
C. Pancreas
D. Salivary glands

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18. How many plants in the list give below have composite fruits that develop from an inflorescence Walnut, poppy, radish, fig, pineapple, apple, tomato, mulberry

    A. Two

    B. Three

    C. Four

    D. Five

19. Which one of the following is a case of wrong matching

    A. Micropropagation - In vitro production of plants in large numbers

    B. Callus - Unorganised mass of cells produced in tissue culture

    C. Somatic hybridization - Fusion of two diverse cells

    D. Vector DNA - site for tRNA synthesis

20. A scrubber in the exhaust of a chemical industrial plant removes

    A. Gases like ozone and methane

    B. Particulate matter of the size 2.5 micrometer or less

    C. Gases like sulphur dioxide

    D. Particulate matter of the size 5 micrometer or above

21. Biodiversity of a geographical region represents

    A. Endangered species found in the region.

    B. The diversity in the organisms living in the region.

    C. Genetic diversity present in the dominant species of the region.

    D. Species endemic to the region.

22. Which of the following is a worm but not flatworm?

    A. *Echinococcus*

    B. *Enterobius*

    C. *Taenia*

    D. *Dugesia*

23. The Scutellum of the grass embryo is a

    A. Vestigial organ

    B. Absorptive organ

    C. Reserve food storage organ

    D. Photosynthetic organ

24. Example of *amide* enzyme is

    A. Lipase

    B. Zymase

    C. Lactase

    D. Arginase

25. Doctrine of evolution is concerned with:

    A. Special creation theory

    B. Biogenesis

    C. Agenesis

    D. Gradual changes

26. In a dicotyledonous stem, the sequence of tissue from the outside to the inside is :

    A. Phellem-Pericycle-Endodermis-Phloem

    B. Phellem-Phloem-Endodermis-Pericycle

    C. Phellem-Endodermis-Pericycle-Phloem

    D. Pericycle-Phellem- Endodermis- Phloem

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27. Bones of vertebrates are derived from embryonic
    A. Ectoderm
    B. Epiderm
    C. Mesoderm
    D. Endoderm

28. Which of the following National parks has the highest density of tigers among protected areas in the world?
    A. Jim Corbett
    B. Kaziranga
    C. Keoladeo Ghana
    D. Manas

29. Which of the following substances, if introduce in the blood stream, would cause coagulation, at the site of its introduction ?
    A. Fibrinogen
    B. Prothrombin
    C. Heparin
    D. Thromboplastin

30. Which one of the following depresses brain activity and produces feelings of calmness, relaxation and drowsiness.
    A. Valium
    B. Morphine
    C. Hashish
    D. Amphetamines

31. Cri-du-chat syndrome in humans is caused by the :
    A. fertilization of an XX egg by a normal Y-bearing sperm
    B. loss of half of the short arm of chromosome 5
    C. loss of half of the long arm of chromosome 5
    D. trisomy of 21st chromosome

32. Angiotensinogen is a protein produced and secreted by :
    A. macula densa cells
    B. endothelial cells (cells lining the blood vessels)
    C. liver cells
    D. juxtaglomerular (JG) cells

33. People living at sea level have around 5 million RBC per cubic millimeter of their blood whereas those living at an altitude of 5400 metres have around 8 million. This is because at high altitude :
    A. people get pollution-free air to breathe and more oxygen is available
    B. atmospheric O_2 level is less and hence more RBC's are needed to absorb the required amount of O_2 to survive
    C. there is more UV radiation which enhances RBC production
    D. people eat more nutritive food, therefore more RBCs are formed

34. Epithelial cells of the intestine involved in food absorption have on their surface :
    A. pinocytic vesicles
    B. phagocytic vesicles
    C. zymogen granules
    D. micro-villi

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35. The shared terminal duct of the reproductive and urinary system in the human male is
    A. Ureter
    B. Vas deferens
    C. Vasa defrentia
    D. Urethra

36. During which phase (s) of the cell cycle, amount of DNA in a cell remains at 4C level if the initial amount is denoted as 2C?
    A. G_1 and S
    B. Only G_2
    C. G_2 and M
    D. G_0 and G_1

37. Mammillary bodies are present in
    A. Thalamus
    B. Epithalamus
    C. Hypothalamus
    D. Midbrain

38. The plant hormone, Gibberellic Acid is generally NOT associated with
    A. stem elongation
    B. parthenocarpy
    C. parthenogenesis
    D. malt production

39. The center which excites both the activities during rapid breathing is
    A. Ventral respiratory center
    B. lateral respiratory center
    C. Pnemotoxic center
    D. Dorsal respiratory center

40. Exchange of gases in lung alveoli occurs through
    A. Active transport
    B. Osmosis
    C. Simple diffusion
    D. Passive transport

41. Which of the following enzyme is not produced by *E.coli* during lactose catabolism?
    A. β-galactosidase
    B. Thiogalactoside transacetylase
    C. Lactose dehydrogenase
    D. Lactose permease

42. Protein synthesis in an animal cell occurs
    A. Only on the ribosomes present in cytosol
    B. Only on ribosomes attached to the nuclear envelope and endoplasmic reticulum
    C. On ribosomes present in the nucleolus as well as in cytoplasm
    D. On ribosomes present in cytoplasm as well as in mitochondria

43. Who supported Griffith effect by molecular explanation?
    A. Hershey and Chase
    B. Watson, Crick, Nirenberg
    C. Avery, McCarty and McLeod
    D. Griffith and Avery

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44. Which of the following disorders are caused due to recessive autosomal mutations?
    A. Turner's syndrome and sickle cell anemia
    B. Edward's syndrome and Down's syndrome
    C. Cystic fibrosis and Phenylketonuria
    D. Alzheimer's disease and Huntington's chorea
45. What is the effect of GnRH produced by hypothalamus?
    A. stimulates the synthesis and secretion of androgens
    B. stimulates secretion of milk in mammary glands
    C. stimulates foetal ejection reflex
    D. stimulates synthesis of carbohydrates fromm non carbohydrates in liver
46. Cattle fed with spoilt hay of sweet clover which contains dicumarol
    A. are healthier due to a good diet
    B. catch infections easily
    C. may suffer vitamin K deficiency and prolonged bleeding
    D. may suffer from beri-beri due to deficiency of vitamin B_1
47. Injury to vagus nerve in humans is not likely to affect
    A. Tongue movements
    B. Gastrointestinal movements
    C. Pancreatic secretions
    D. cardiac movements
48. How many sperms are formed from a secondary spermatocyte?
    A. 4
    B. 8
    C. 2
    D. 1
49. Which of the following have porous body and are diploblastic?
    A. *Aurelia* and *Obelia*
    B. *Adamsia* and *Euplectella*
    C. *Leucoslenia* and *spongilla*
    D. *Sycon* and *Hydra*
50. Which catalyst converts unburnt hydrocarbons into CO_2 and H_2O
    A. Platinum-Palladium
    B. Platinum- chloride
    C. Palladium-chloride
    D. Lead
51. Which of the following does not occur when the sewage is discharged into the river?
    A. Eutrophication
    B. Depletion of O2
    C. Increase in O_2
    D. Algal bloom
52. What is responsible for the opening and closing of ion channel?
    A. Electrical changes and chemical changes
    B. More Na^+ cconcentration outside of plasma membrane
    C. More K^+ concentration innerside of plasma membrane
    D. On both side of membranes Na^+ and K^+ are in equal proportion

53. Which of the following cranial nerve is a motor nerve?

    A. XII

    B. IV

    C. II

    D. III

54. Which microbes cause syphilis?

    A. *Neisseria gonorrhoeae*

    B. *Treponema pallidium*

    C. *Herpes simplex*

    D. *Trichomonbas vaginalis*

55. What is common among amylase, renin and trypsin?

    A. All proteins

    B. Proteolystic enzymes

    C. Produced in stomach

    D. Act at pH lower then 7

56. What is indicated by Pyramid of number?

    A. Number of individuals at every trophic layer.

    B. Species belonging to a particular region.

    C. Number of member of biotic community.

    D. None of the above.

57. Which of the following hormones does not act via a G-protein coupled receptor?

    A. TRH

    B. Angiotensin II

    C. ADH

    D. Thyroxine

58. Maximum voluntary ventilation is about:

    A. 60-80 L/min

    B. 125-170 L/min

    C. 200-220 L/min

    D. 90-100 L/min

59. The mechanism that ensures complete absorption of glucose from the intestinal lumen is:

    A. simple diffusion

    B. facilitated diffusion

    C. primary active transport

    D. secondary active transport

60. Polysome is formed by

    A. A ribosome with several subunits

    B. ribosomes attached to each other in a linear arrangement

    C. several ribosomes attached to a single mRNA

    D. many ribosomes attached to a strand of Endoplasmic reticulum

61. Above Curie temperature:

    A. a ferromagnetic substance becomes paramagnetic

    B. a paramagnetic substance becomes diamagnetic

    C. a diamagnetic substance becomes paramagnetic

    D. a paramagnetic substance becomes ferromagnetic

62. A parallel plate capacitor is to be designed, using a dielectric constant 5, so as to have a dielectric strength of 10^9 Vm^{-1}. If the voltage rating of the capacitor is 12kV, the minimum area of each plate required to have a capacitance of 80pF is:

A. 21.7 x 10^{-6} m^2
B. 25.0 x10^{-5} m^2
C. 12.5 x 10^{-5} m^2
D. 10.5 x 10^{-6} m^2

63. Suppose the sun expands so that its radius becomes 100 times its present radius and its surface temperature become half of its present value. The total energy emitted by it then will increase by a factor of :

A. 10^4

B. 625

C. 256

D. 16

64. Which one of the following relations is dimensionally consistent? A liquid of coefficient of viscosity η is flowing steadily through a capillary tube of radius r and length l. If Is the volume of the liquid flowing per second, the pressure difference p at the ends of the tube is given by:

A. $p = \frac{8\beta lV}{\pi r^4}$

B. $p = \frac{8\eta r^4 l}{\pi V}$

C. $p = \frac{8\pi lV}{\eta r^4}$

D. $p = \frac{8\pi R^4 V}{\pi l}$

65. Two parallel beams of positrons moving in the same direction will:
A. Repel each other
B. Will not interact with each other
C. Attract each other -
D. Be deflected normal to the plane containing the two beams.

66. Which of the following Is not considered as an organometallic compound?

A. Cis –platin

B. Ferrocene

C. Zeise's salt

D. Grignard reagent

67. When an electron positron pair annihilates, the energy released is about :

A. 0.8 x 10^{-13} J

B. 1.6 x 10^{-13} J

C. 3.2 x 10^{-13} J

D. 4.8 x10^{-13} J

68. Molal depression of freezing point of water is 1.86° per 1000g of water. 0.02 mole of urea dissolved in 100g of water will produce a lowering temperature of

A. 3.72°

B. 1.86°

C. 0.372°

D. 0.186°

$$\frac{w_2 \times 1000}{w_1 \times m}$$

$$\frac{1000}{100 \times 1.86}$$

69. A conductivity cell has two platinum electrodes of $1.2 \ cm^2$ area, separated by a distance of 0.8 cm. The cell constant is:

A. $1.5 \ cm^{-1}$

B. $0.66 cm$

C. $0.66 cm^{-1}$

D. $0.96 cm^{-1}$

70. In Dumas' method of estimation of nitrogen 0.35 g of an organic compound gave 55 mL of nitrogen collected at 300 K temperature and 715 mm pressure. The percentage composition of nitrogen in the compound would be (Aqueous tension at 300 K = 15 mm)

A. 14.45

B. 15.45

C. 16.45

D. 17.45

71. When 0.1 mol MnO_4^{2-} is oxidised the quantity of electricity required to completely oxidise MnO_4^{2-} to MnO_4^- is

A. 96500 C

B. 2×96500 C

C. 9650 C

D. 96.50 C

72. For the reaction, $X_2O_2 \ (l) \longrightarrow 2XO_2(g)$

$\Delta U = 2.1$ kcal, $\Delta S = 20$ cal K^{-1} at 300 K. Hence, ΔG is

A. 2.7 kcal

B. −2.7 kcal

C. −9.3 kcal

D. −9.3 kcal

73. The correct order of increasing thermal stability of K_2CO_3, $MgCO_3$, $CaCO_3$ and $BeCO_3$ is

A. $BeCO_3 < MgCO_3 < CaCO_3 < K_2CO_3$

B. $MgCO_3 < BeCO_3 < CaCO_3 < K_2CO_3$

C. $K_2CO_3 < MgCO_3 < CaCO_3 < BeCO_3$

D. $BeCO_3 < MgCO_3 < K_2CO_3 < CaCO_3$

74. In a first-order reaction A →B, if k is rate constant and inital concentration of the reactant A is 0.5 M, then the half-life is

A. $\dfrac{\log 2}{k}$

B. $\dfrac{\log 2}{k\sqrt{0.5}}$

$\dfrac{0.693}{k}$

C. $\dfrac{\ln 2}{k}$

D. $\dfrac{0.693}{0.5k}$

75. The Langmuir adsorption isotherm is deduced using the assumption
A. the adsorption sites are equivalent in their ability to adsorb the particles
B. the heat of adsorption varies with coverage
C. the adsorbed molecules interact with each other
D. the adsorption takes place in multilayers.

76. The time period to coat a metal surface of 80 cm^2 with 5 x 10^{-3} cm thick layer of silver (density 1.05 g cm^{-3}) with the passage of 3A current through a silver nitrate solution is
A. 115 sec
B. 125 sec
C. 135 sec
D. 145 sec

77. Limiting molar conductivity of NH4OH (i.e. Λ°_m (NH$_4$OH)) is equal to

A. Λ°_m (NH$_4$OH) + Λ°_m (NH$_4$Cl) − Λ°_m (HCl)

B. Λ°_m (NH$_4$Cl) + Λ°_m (NHOH) − Λ°_m (NaCl)

C. Λ°_m (NH$_4$Cl) + Λ°_m (NaCl) − Λ°_m (NaOH)

D. Λ°_m (NAOH) + Λ°_m (NaCl) − Λ°_m (NH$_4$Cl)

78. Standard enthalpy of vapourisation $\Delta_{vap} H^\ominus$ for water at 100°C is 40.66 kJ mol^{-1}. The internal energy of vaporisation of water at 100°C (in kJmol—1) is: (Assume water vapour to behave like an ideal gas)

A. +43.76

B. +40.66

C. +37.56

D. −43.76

79. The Lassaigne's extract is boiled with conc. HNO_3 while testing for halogens. By doing so it.

    A. Increase the concentration of ions

    B. Decomposes Na_2S and $NaCN$, if formed

    C. Helps in the precipitation of AgCl

    D. Increases the solubility product of AgCl

80. Identity Z in the sequence of reactions,

$$CH_3CH_2CH = CH_2 \xrightarrow{HBr/ H_2 O_2} Y \xrightarrow{C_2H_5ONa} Z$$
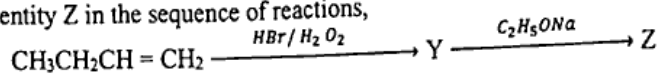
    A. $CH_3(CH_2)_4 - O - CH_3$
    B. $CH_3CH_2 - CH(CH_3) - O - CH_2CH_3$
    C. $CH3 - (CH_2)_3 - O - CH_2CH_3$
    D. $(CH_3)_2CH_2 - O - CH_2CH_3$

81. HI was heated in a sealed tube at 440°C till the equilibrium was reached; HI was found to be 22% decomposed. The equilibrium constant for dissociation is:

    A. 1.99

    B. 0.0199

    C. 0.0796

    D. 2.282

82. The phenomenon in which white transparent crystal changes into white powder is known as :
    A. Deliquescence
    B. Efflorescence
    C. Allotropy
    D. Sublimation

83. Microcosmic salt is

    A. $Na_2HPO_4. 2H_2O$

    B. $Na (NH_4) HPO_4.4 H_2O$

    C. $(NH_4)_2 HPO_4. 2H_2O$

    D. None of these

84. Among the following the strongest acid is:
    A. $CH_3 COOH$
    B. C_6H_5COOH
    C. $m-CH_3OC_6H_4COOH$
    D. $p-CH_3OC_6H_4COOH$

85. One gram sample of NH_4NO_3 is decomposed in a bomb calorimeter. The temperature of the calorimeter increases by 6.12 K. The heat capacity of the system is 1.23 kJ /g/deg. What is the molar heat of decomposition for NH_4NO_3?

    A. -7.53 kJ /mol

    B. -398.1 kJ /mol

    C. -16.1 kJ /mol

    D. -602 kJ/mol

86. Which of the following imparts green colour to the burner flame?

    A. $B(OMe)_3$

    B. $Na(OMe)$

    C. $Al(OPr)_3$

    D. $Sn(OH)_2$

87. First compound of Xe synthesized was

    A. $[XeF]^+[XePtF_5]^-$

    B. $[XeO_2]$

    C. $Xe[PtF_6]$

    D. $O_2[XeF_6]$
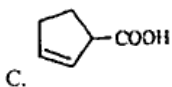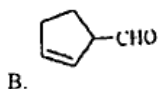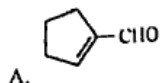
88. K_{sp} of $CaSO_4 \cdot 5H_2O$ is 9×10^{-6}, find the volume for 1 g of $CaSO_4$ (M. Wt. =136)

    A. 2.45 litre

    B. 5.1 litre

    C. 4.52 litre

    D. 3.2 litre

89. The enthalpies of all elements in their standard states are

    A. Unity

    B. Zero

    C. <0

    D. different for each element

90. Cyclohexene on ozonolysis is followed by recation with zinc dust and water gives compound E. Compound E on further treatment with aqueous KOH yields Compound F. Compound F is

A. —CHO (cyclopentene with CHO)

B. —CHO (cyclopentene with CHO)

C. —COOH (cyclopentene with COOH)

D. (cyclohexane with CO₂H, CO₂H)
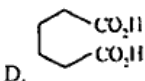
91. The momentum of a photon of energy 1 MeV in kg m/s, will be :

A. 0.33×10^6

B. 8×10^{-24}

C. 5×10^{-23}

D. 5×10^{-22}

92. Two projectiles of same mass have their maximum kinetic energies in ratio 4:1 and ratio of their maximum heights is also 4:1 then what is the ratio of their ranges?

A. 2:1

B. 4:1

C. 8:1

D. 16:1

93. A particle is moving such that its position coordinates (x, y) are
(2m, 3m) at time t = 0,
(6m, 7m) at time t = 2 s and
(13m, 14m) at time t = 5 s
Average velocity vector ($\vec{V_{av}}$) from t = 0 to t = 5 s is

A. $\frac{1}{5}(13\hat{i} + 14\hat{j})$

B. $\frac{7}{3}(\hat{i} + \hat{j})$

C. $2(\hat{i} + \hat{j})$

D. $\frac{11}{5}(\hat{i} + \hat{j})$

94. Certain quantity of water cools from 70°C to 60°C in the first 5 minutes and to 54°C in the next 5 minutes. The temperature of the surroundings is
   A. 45°C
   B. 20°C
   C. 42°C
   D. 10°C

95. Two identical bar magnets are fixed with their centres at a distance d apart. A stationary charge Q is placed at P in between the gap of the two magnets at a distance D from the centre O as shown in the figure
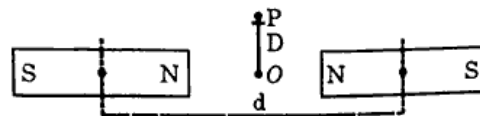
The force on the charge Q is
   A. Zero
   B. Directed along OP
   C. Directed along PO
   D. Directed perpendicular to the plane of paper

96. The half life of a radioactive substance is 10 days. This means that

   A. The substance completely disintegrates in 20 days

   B. The substance completely disintegrates in 40 days

   C. 1/8 part of the mass of the substance will be left intact at the end of 40 days

   D. 7/8 part of the mass of the substance disintegrates in 30 days

97. Two simple harmonic motions are represented by $y_1 = 4\sin\left(4\pi - \frac{\pi}{2}\right)$ and $y_2 = 3\cos(4\pi t)$. The resultant amplitude is

   A. 7
   B. 1
   C. 5
   D. $2+\sqrt{3}$

98. Two charges q1 and q2 are placed 30 cm apart, as shown in the figure. A third charge q3 is moved along the arc of a circle of radius 40 cm from C to D. The change in the potential energy of the system is $(q3/4\pi\varepsilon_0)k$, where k is :
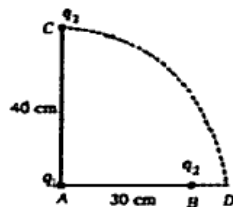
A. 8q2

B. 8q1

C. 4q2

D. 4q1

99. If the magnetic dipole moment of an atom of diamagnetic material, paramagnetic material and ferromagnetic material are denoted by μd, μp and μf respectively, then:

A. $\mu d \neq 0$ and $\mu f \neq 0$

B. $\mu p = 0$ and $\mu f \neq 0$

C. $\mu d = 0$ and $\mu p \neq 0$

D. $\mu d \neq 0$ and $\mu p = 0$

100. The dependence of acceleration due to gravity g on the distance r from the centre of the earth, assumed to be a sphere of radius R of uniform density is as shown in figures below. The correct figure is :

A.

B.

C.

D.