

1. Identify wrongly matched w.r.t angiosperms
- (1) Spermatogenous cell - Generative cell
 - (2) Female gametophyte - Endosperm
 - (3) PEC - Central cell
 - (4) Scutellum - Cotyledon
2. Photosynthetic CO_2 assimilation requires
- (1) H_2O
 - (2) ATP
 - (3) $\text{NADPH} + \text{H}^+$
 - (4) All the above
3. Mycoplasmas are
- (1) Wall less monerans
 - (2) Obligate aerobes
 - (3) Mostly symbionts
 - (4) Chemosynthetic autotrophs
- Elements necessary for photolysis of water
- (1) Carbon, Hydrogen, Oxygen
 - (2) Nitrogen, Phosphorus, Potassium
 - (3) Calcium, Manganese, Chlorine
 - (4) Iron, Manganese, Molybdenum
5. Cellulose microfibrils form frame work in
- (1) Middle lamellum
 - (2) Primary cell wall
 - (3) Secondary cell wall
 - (4) 2 & 3
6. In a mitochondrion, proton reservoir is
- (1) Matrix
 - (2) Intermembrane space
 - (3) F_0 of ATP synthase
 - (4) Cristae
7. The amount of D.N.A in each daughter nucleus of Meiosis II to that of G_2 nucleus of meiocyte is
- (1) Double
 - (2) Same
 - (3) Half
 - (4) One-fourth

8. Select the correct statements about lac operon.

- (i) Glucose or galactose may act as inducer.
- (ii) In the absence of lactose, the repressor binds with the operator region.
- (iii) The z-gene codes for permease.
- (iv) This was elucidated by Francois Jacob and Jacques Monod.

The correct statements are :

- (1) (i) and (ii)
- (2) (ii) and (iii)
- (3) (i) and (iii)
- (4) (ii) and (iv)

9. Removal of RNA polymerase III from nucleoplasm will affect the synthesis of

- (1) hn RNA
- (2) m RNA
- (3) r RNA
- (4) t RNA

10. Which of the following is not a constituent of cell.

- (1) Microsome
- (2) Nucleolus
- (3) Mesosome
- (4) Golgi complex

11. The component of ECG that represents the return of the ventricles from excited to normal state is

- (1) P wave
- (2) T wave
- (3) QRS complex
- (4) ST segment

12. The total number of premolars present in the buccal cavity of an adult human are

- (1) 4
- (2) 8
- (3) 12
- (4) 16

13. The enzyme that activates trypsinogen into trypsin is secreted by

- (1) Brunner's glands
- (2) Pancreatic islets
- (3) Intestinal mucosa
- (4) Goblet cells of pylorus

14. Tight junctions are a type of cell junctions, they help to

- (1) Stop substances from leaking across a tissue
- (2) Cementing to keep neighboring cells together
- (3) Connecting the cytoplasm of adjoining cells for rapid transfer of ions
- (4) Transfer impulses rapidly to the other cells

SEC : SR ELITE, AIMS SUPERIOR, NEET
15. In male cockroach, the genital pouch is bounded by

- (1) 7th and 8th sterna ventroanteriorly and 9th sternum dorsally
- (2) 9th and 10th sterna dorsally and 9th tergum ventrally
- (3) 9th and 10th terga dorsally and 9th sternum ventrally
- (4) 7th, 8th and 9th sterna ventrally and 10th tergum dorsally

16. Body with diploblastic organization, both extracellular and intracellular digestion and reproduction only by sexual means are the characters of phylum

- (1) Coelenterata
- (2) Ctenophora
- (3) Porifera
- (4) Platyhelminthes

17. Fertilization is internal in :-

- (1) *Rana tigrina*, *Psittacula*, *Scoliodon*
- (2) *Hippocampus*, *Rana tigrina*, *Testudo*
- (3) *Neophron*, *Chameleon*, *Scoliodon*
- (4) *Bufo*, *Clarias*, *Pavo*

18. Silver fish (*Lepisma*) is an insect. Which among the following support the above given statement?

- a) It has 3 pairs of legs
- b) Body has head, thorax, abdomen
- c) It is a uricotelic organism
- d) Wings are absent in it

- (1) a, b, c, d
- (2) a, b
- (3) a, b, c
- (4) b, c, d

19. Blood analysis of a patient reveals an unusually high quantity of carboxy-haemoglobin content. Which of the following conclusions is most likely to be correct? The patient has been inhaling polluted air containing unusually high content of:

- (1) Sulphur di oxide
- (2) Carbon dioxide
- (3) Carbon monoxide
- (4) Nitrous oxide

20. Which one of the following plasma proteins is involved in the coagulation of blood?

- (1) Fibrinogen
- (2) Albumin
- (3) Alpha globulin
- (4) Gamma globulin

21. Inhibition of seed germination is the bio-assay for

- (1) ABA
- (2) GA₃
- (3) IAA
- (4) CK

22. Unrelated to Fabaceae flower is

- (1) Posterior odd petal
- (2) Diadelphous androecium
- (3) Marginal placentation
- (4) Inferior ovary

23. The root vascular bundles in Solanaceae members are

- (1) Collateral
- (2) Bicollateral
- (3) Radial
- (4) Concentric

24. Kinases belong to the major class

- (1) Ligases
- (2) Hydrolases
- (3) Oxido-reductases
- (4) Transferases

25. In Morgan's experiment on linkage, the percentage of red eyed, miniature winged recombinants in F_2 generation is

- (1) 37.2
- (2) 1.3
- (3) 62.8
- (4) 98.7

26. Which vector can clone only a small fragment of DNA?

- (1) Cosmid
- (2) Bacterial artificial chromosome
- (3) Yeast artificial chromosome
- (4) Plasmid

27. Match the terms in Column I with their description in Column II and choose the correct option.

Column I		Column II	
(a)	Dominance	(i)	Many genes govern a single character
(b)	Codominance	(ii)	In a heterozygous organism only one allele expresses itself
(c)	Pleiotropy	(iii)	In a heterozygous organism both alleles express themselves fully.
(d)	Polygenic inheritance	(iv)	A single gene influences many characters

- | | | | |
|----------|-------|------|-------|
| A | B | C | D |
| (1) (ii) | (iii) | (iv) | (i) |
| (2) (iv) | (i) | (ii) | (iii) |
| (3) (iv) | (iii) | (i) | (ii) |
| (4) (ii) | (i) | (iv) | (iii) |

28. Which one of the following is correct ?

- (1) Cyanobacteria exhibit great metabolic diversity
- (2) *Gonyaulax* is an yellow dinoflagellate
- (3) Fructifications of sac fungi produce meiospores endogenously
- (4) Deuteromycetous fungi reproduce sexually through conidia

29. Half-inferior ovary is found in

- (1) Guava
- (2) Potato
- (3) China rose
- (4) Peach

30. Which of the following restriction enzymes produces blunt ends ?

- (1) *Sal I*
- (2) *Eco RV*
- (3) *Xho I*
- (4) *Hind III*

31. In which regard pulmonary artery is different from pulmonary vein:

- (1) Its lumen is wider
- (2) Its wall is thicker
- (3) It has valves
- (4) It does not possess endothelium

32. A fall in glomerular filtration rate (GFR) activates

- (1) Juxta glomerular cells to release renin
- (2) Adrenal cortex to release aldosterone
- (3) Adrenal medulla to release adrenaline
- (4) Posterior pituitary to release vasopressin

33. The ornithine cycle removes two waste products from the blood in liver. These products are:

- (1) CO_2 and ammonia
- (2) Ammonia and uric acid
- (3) CO_2 and urea
- (4) Ammonia and urea

34. Glucose is taken back from glomerular filtrate into the blood through:

- (1) Co-transport
- (2) Primary transport
- (3) Osmosis
- (4) Simple Diffusion

35. ATPase enzyme needed for muscle contraction is located in:

- (1) Troponin
- (2) Myosin
- (3) Actin
- (4) Actinin

36. The deltoid ridge (tuberosity) is a rough, triangular area present on:

- (1) Radius
- (2) Ulna
- (3) Femur
- (4) Humerus

37. Parkinson's disease (characterized by tremors and progressive rigidity of limbs) is due to degeneration of brain neurons involved in movement control and make use of the neurotransmitter:

- (1) Acetylcholine
- (2) Nor epinephrine
- (3) Dopamine
- (4) GABA

38. For each impulse pathway, autonomic nervous system involves

- (1) four neurons and two ganglia
- (2) two neurons and one ganglion
- (3) one neuron and one ganglion
- (4) one neuron and two ganglia

39. According to the accepted concept of hormone action, if receptor molecules are removed from target organs, then the target organ will:

- (1) Continue to respond to the hormone without any difference
- (2) Not respond to the hormone at all
- (3) Continue to respond to only higher concentration of hormone
- (4) Continue to respond to the hormone but in the antagonistic way

40. In human female, the blastocyst:

- (1) begins to embed into the endometrium of the uterine wall, on reaching the uterus.
- (2) Forms placenta prior to implantation
- (3) may enter into a suspended stage called diapause

(4) begin to undergo cell differentiation, and changes into the morula

41. How many of the following plant diseases are caused by fungal pathogens?

- (a) Late blight of potato
- (b) Red rot of sugarcane
- (c) Root knot of tobacco
- (d) Black rot of crucifers
- (e) Rusts

(f) Smuts

(1) 7

(2) 5

(3) 4

(4) 3

42. Which of the following is a root modification?

- (1) Bladder of utricularia
- (2) Fleshy cylindrical structures of Euphorbia
- (3) Hanging structures of Banyan tree
- (4) Spines in cactus

43. Dioecious chlorophyllous gametophytes are found in

- (1) Cycas
- (2) Funaria
- (3) Marchantia
- (4) Cucurbita

44. A wild flowering plant showing stunted growth has fleshy green aerial organs. It looks same even under prolonged drought conditions without the signs of wilting. In which of the following physiological groups would you assign this plant ?
- C_3
 - C_4
 - CAM
 - Nitrogen fixer
45. Which of the following is chemically different from others
- Hind II
 - Ribozyme
 - RNase
 - DNase
46. Which one of the following statements is correct ?
- ATP is a ribonucleotide
 - Rubisco shows more affinity with O_2 than CO_2
 - Thymidine is a sulphur containing vitamin
 - Co. enzymes are proteins
47. All seed bearing plants are
- Heterosporous
 - Siphonogamous
 - 1 and 2
 - Archegoniates
48. Primary endosperm cell (PEC) contains
- Secondary nucleus
 - PEN
 - Polar nuclei
 - Filiform apparatus
49. If the sequence of nucleotides in mRNA is AUG UUU UUC UUC UUU UUU UUC, the number of types of amino acids coded by it is
- 4
 - 3
 - 5
 - 2
50. Wrong match w.r.t taxonomic categorisation of mango
- Order - Dicotyledonae
 - Family - Anacardiaceae
 - Division - Angiospermae
 - Genus - Mangifera

51. Signals from the fully developed fetus and placenta ultimately lead to parturition, which requires the release of:
- (1) large amounts of estrogens from placenta
 - (2) Oxytocin from foetal pituitary
 - (3) Oxytocin from maternal pituitary
 - (4) Relaxin from maternal pituitary
52. Seminal plasma of humans is rich in:
- (1) Fructose and certain enzymes but poor in Ca^{2+}
 - (2) Fructose, Ca^{2+} and certain enzymes
 - (3) Fructose, Ca^{2+} but contains no enzymes at all
 - (4) Glucose, fructose and certain enzymes but poor in Ca^{2+}
53. Primary action of Cu^{++} ions of Cu containing IUDs is to:
- (1) Increase motility of sperms
 - (2) Act as a spermicide within the uterus
 - (3) Prevent ovulation
 - (4) Render uterus unsuitable for implantation
54. 'Test tube baby' refers to a baby born when:
- (1) It is developed in a test tube
 - (2) It is developed through tissue culture method
 - (3) The ovum is fertilized externally and thereafter implanted in the uterus
 - (4) It develops from a somatic cell
55. Patau syndrome is caused by an extra copy of chromosome number 13. approximately what percentage of offspring produced by an affected mother and a normal father would be affected by this disorder:
- (1) 100%
 - (2) 75 %
 - (3) 50 %
 - (4) 25%
56. In *Drosophila*, the sex is determined by:
- (1) The ratio of number of X-chromosomes to the number of the sets of autosomes
 - (2) X and Y chromosomes only
 - (3) The ratio of pairs of X-chromosomes to the pairs of autosomes
 - (4) Whether the egg is fertilized or develops parthenogenetically
57. Both husband and wife have normal vision though their fathers were colour-blind. The probability of their daughter becoming colour-blind is:
- (1) 0%
 - (2) 25%
 - (3) 50%
 - (4) 75 %

58. Rachel Carson's famous book 'Silent Spring' is related to:

- (1) Population explosion
- (2) Ecosystem management
- (3) Pesticide pollution
- (4) Noise pollution

59. Presence of gills in the tadpole of frog indicates that:

- (1) Fishes evolved from frog like ancestors
- (2) Frogs will have gills in future
- (3) Frogs evolved from gilled ancestors
- (4) Fishes were amphibious in the past

60. Industrial melanism is an example of:

- (1) Drug resistance
- (2) Darkening of skin due to smoke from industries
- (3) Protective resemblance with the surroundings
- (4) Defensive adaptation of skin against ultraviolet radiations

61. Which of the following is not an ecosystem service?

- (1) Crop pollination
- (2) Maintenance of bio. diversity
- (3) Mitigation of drought and floods
- (4) Degeneration of fertile soils

62. Trimerous and pentacyclic flowers are found in

- (1) Fabaceae
- (2) Solanaceae
- (3) Liliaceae
- (4) Brassicaceae

63. The common feature shared by Liver worts, Mosses, Horsetails, Ferns, Cycads, Conifers is the presence of

- (1) Xylem & Phloem
- (2) Seeds
- (3) Archegonia
- (4) Motile male gametes

64. Heavily produced tissue from vascular cambium is

- (1) Secondary phloem
- (2) Secondary xylem
- (3) Primary xylem
- (4) Cork

65. Somatic hybridization involves.

- (1) Both karyogamy and plasmogamy
- (2) Karyogamy but not plasmogamy
- (3) Plasmogamy but not karyogamy
- (4) Both karyokinesis and cytokinesis

66. Identify the wrongly matched in the given table ?

	Microbe	Product	Application
(1)	<i>Monascus purpureus</i>	Statins	Lowering of blood cholesterol
(2)	<i>Streptococcus</i>	Streptokinase	Removal of clot from blood vessel
(3)	<i>Clostridium butylicum</i>	Protease	Removal of oil stains
(4)	<i>Trichoderma polysporum</i>	Cyclosporin A	Immuno suppressive drug

67. A gene showing codominance has

- (1) One allele dominant on the other
- (2) Alleles tightly linked on the same chromosome
- (3) Alleles that are recessive to each other
- (4) Both alleles independently expressed in the heterozygote

68. The process of degradation of waste depositions on soil, using genetically engineered microbes is called

- (1) Molecular farming
- (2) Bio-fortification

(3) Bio-war

(4) Bio-remediation

69. Which of the following statement is not correct ?

- (1) Vascular cambium is all secondary in origin in dicot stem.
- (2) Cork cambium is stelar origin in dicot root.
- (3) Secondary phloem is the vital tissue of bark.
- (4) Conjoint collateral, closed and fibrovascular bundles are found in grass stem.

70. Which of the following are the products of redifferentiation ?

- (1) Guard cells
- (2) Bulliform cells
- (3) Complimentary cells
- (4) Subsidiary cells

71. Homologous organs are:

- (1) Wings of cockroach and wings of bats
- (2) Wings of Insects and wings of birds
- (3) Air bladder of fishes and lungs of frog
- (4) Pectoral fins of fishes and forelimbs of horse

72. Grafted kidney may be rejected in a patient due to:

- (1) Cell-mediated immune response
- (2) Passive immune response
- (3) Innate immune response
- (4) Humoral immune response

73. A lake which is rich in organic waste may result in:

- (1) Increased population of fish due to lots of nutrients
- (2) Mortality of fish due to lack of oxygen
- (3) Increased population of all aquatic organisms due to minerals
- (4) Drying of the lake

74. Widal test is carried out to diagnose:

- (1) Typhoid fever
- (2) Malaria
- (3) Diabetes mellitus
- (4) HIV/AIDS

75. Which one of the following is not a property of cancer cells?

- (1) They show contact inhibition
- (2) They compete with normal cells for vital nutrients
- (3) They do not remain confined to the primary site

(4) They divide in an uncontrolled manner

76. Which endangered animal is the source of the world's finest, lightest, warmest and most expensive wool, *Shahtoosh*:

- (1) Asian antelope (Nilgai)
- (2) Spotted deer (Cheetal)
- (3) Cashmere goat
- (4) Tibetan antelope (Chiru)

77. An example of *ex situ* conservation is:

- (1) Sacred Grove
- (2) National park
- (3) Seed Bank
- (4) Wildlife Sanctuary

78. High milk yielding varieties of cows are obtained by:

- (1) Use of surrogate mothers
- (2) Super ovulation
- (3) Artificial insemination
- (4) All of the above methods

79. The transgenic animals are those which have:

- (1) Foreign RNA in all its somatic cells
- (2) Foreign DNA in some of its germ cells
- (3) Foreign DNA in all of its cells
- (4) Foreign RNA in some of its germ cells

80. The rate of formation of new organic matter by rabbit in a grassland, is called:

- (1) Net productivity
- (2) Secondary productivity
- (3) Net primary productivity
- (4) Gross primary productivity

81. The fleshy storage leaves are found in

- (1) Pitcher plant
- (2) Cacti
- (3) Onion
- (4) Pea plant

82. Infectious RNA molecules of low molecular weight, lacking protein coat were discovered by

- (1) Pruisiner
- (2) Diener
- (3) Iwanowsky
- (4) Leeuwenhoek

83. Highest values of B.O.D₅ can be recorded in

- (1) Drinking water pond
- (2) Flowing river water
- (3) Well water in the plain regions
- (4) Sewage water drains

84. In an angiospermic plant body, free nuclear divisions take place during

(1) Development of female gametophyte

(2) Development of male gametophyte

(3) Embryogenesis

(4) Sporogenesis

85. In complementary genes, the dihybrid ratio of 9 : 3 : 3 : 1 is modified to

- (1) 9 : 7
- (2) 12 : 3 : 1
- (3) 15 : 1
- (4) 13 : 3

86. The upright pyramid of number is absent in:

- (1) Grassland ecosystem
- (2) Pond ecosystem
- (3) Tree ecosystem
- (4) Lake ecosystem

87. The species confined to a particular region and not found elsewhere is termed as:

- (1) Alien
- (2) Endemic
- (3) Rare
- (4) Keystone

88. In which one of the following habitats does the diurnal temperature of soil surface vary most?

- (1) Forest
- (2) Desert
- (3) Grassland
- (4) Shrub land

89. Which of the following ecosystems has the highest net primary productivity per unit area?

- (1) Mangroves
- (2) Savanna
- (3) Grassland
- (4) Estuaries

90. Which of the following National Parks is home to the famous Kashmir Stag (Hangul)?

- (1) Eaglenest Wildlife Sanctuary, Arunachal Pradesh
- (2) Dachigam National Park, Jammu & Kashmir
- (3) Keibul Lamjao National Park, Manipur
- (4) Bandhavgarh National Park, Madhya Pradesh

PHYSICS

91. A mass of 10 kg is suspended vertically by a rope from the roof. When a horizontal force is applied on the rope at some point, the rope deviated at an angle of 45° at the roof point. If the suspended mass is at equilibrium, the

magnitude of the force applied is
($g = 10 \text{ ms}^{-2}$)

- (1) 200 N
- (2) 100 N
- (3) 140 N
- (4) 70 N

92. A man of mass m stands on a long flat car of mass M , moving with velocity V . If he now begins to run with velocity u , with respect to the car, in the same direction as V , the velocity of the car will be

- (1) $V - mu/M$
- (2) $V - mu/(m + M)$
- (3) $V + mu/(m + M)$
- (4) $V - u(M - m)/(M + m)$

93. A spring of force constant k rests on a smooth floor, with one end fixed to a wall. A block of mass m hits the free end of the spring with velocity v . The maximum force exerted by the spring on the wall is

- (1) $v\sqrt{mk}$
- (2) $mv\sqrt{k}$
- (3) $m\sqrt{vk}$
- (4) $k\sqrt{mv}$

94. A variable force F acts on a body which is free to move. The displacement of the body is proportional to t^3 , where t = time. The power delivered by F to the body will be proportional to

- (1) t
- (2) t^2
- (3) t^3
- (4) t^4

95. A cannon shell lands 2 km away from the cannon. A second shell, fired identically, breaks into two equal parts at the highest point. One part falls vertically. How far from the cannon will the other land?

- (1) 2 km
- (2) 3 km
- (3) 4 km
- (4) 5 km

96. A uniform heavy chain is placed on table with a part of it hanging over the edge. It just begins to slide when this part is one-third of its length. The coefficient of friction between the table and the chain is

- (1) $\frac{1}{2}$
- (2) $\frac{1}{3}$
- (3) $\frac{2}{3}$
- (4) $\frac{3}{4}$

97. A proton of mass m collides elastically with a particle of unknown mass at rest. After the collision, the proton and the unknown particle are seen moving at an angle of 90° with respect to each other. The mass of unknown particle is

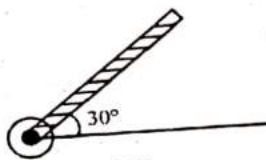
- (1) $\frac{m}{\sqrt{3}}$
- (2) $\frac{m}{2}$
- (3) $2m$
- (4) m

98. A flywheel rotates with uniform angular acceleration. Its angular

velocity increases from 20π rad/s to 40π rad/s in 10 seconds. How many rotations did it make in this period?

- (1) 80
- (2) 100
- (3) 120
- (4) 150

99. A rod of length 50 cm is pivoted at one end. It is raised such that it makes an angle of 30° from the horizontal as shown and released from rest. Its angular speed when it passes through the horizontal (in rad s^{-1}) will be ($g = 10\text{ms}^{-2}$)



- (1) $\sqrt{30}$
- (2) $\sqrt{\frac{30}{2}}$
- (3) $\frac{\sqrt{30}}{2}$
- (4) $\frac{\sqrt{20}}{3}$

100. Three identical solid sphere move down three inclines A, B and C- all of the same dimensions. A is without friction, the friction between B and a sphere is sufficient to cause rolling without slipping, the friction between C and a sphere causes rolling with slipping. The kinetic energies of A, B, C at the bottom of the inclines are E_A, E_B, E_C .

- (1) $E_A = E_B = E_C$
- (2) $E_A = E_B > E_C$

(3) $E_A > E_B > E_C$

(4) $E_A > E_B = E_C$

101. A particle executes linear SHM with an amplitude of 2 cm. When the particle is at 1 cm from the mean position the magnitude of its velocity is equal to that of its acceleration. Then its time period in seconds is

(1) $\frac{1}{2\pi\sqrt{3}}$

(2) $2\pi\sqrt{3}$

(3) $\frac{2\pi}{\sqrt{3}}$

(4) $\frac{\sqrt{3}}{2\pi}$

102. The rotation of the earth about its axis speeds up such that a man on the equator becomes weightless. In such a situation, what would be the duration of one day?

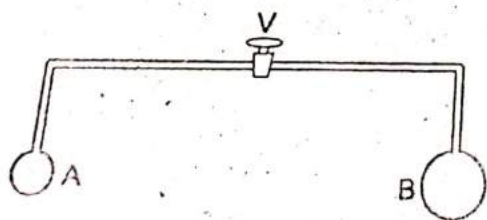
(1) $2\pi\sqrt{R/g}$

(2) $\frac{1}{2\pi}\sqrt{R/g}$

(3) $2\pi\sqrt{Rg}$

(4) $\frac{1}{2\pi}\sqrt{Rg}$

103.



The valve V in the bent tube is initially kept closed. Two soap bubbles A (smaller) and B (larger) are formed at the two open ends of the tube. V is now opened, and air can flow freely between the bubbles.

(1) There will be no change in the sizes of the bubbles

(2) The bubbles will become of equal size

(3) A will become smaller and B will become larger.

(4) The sizes of the two bubbles will become interchanged.

104. A pipe ABCD of uniform cross-section is bent into three sections, viz., a horizontal section AB, a vertical section BC with C below B, and a horizontal section CD. Liquid flowing through the pipe has speed v_1 and pressure p_1 in section AB, and speed v_2 and pressure p_2 in section CD.

(1) $v_1 = v_2, p_1 = p_2$

(2) $v_1 = v_2, p_2 > p_1$

(3) $v_2 > v_1, p_2 > p_1$

(4) $v_2 > v_1, p_1 = p_2$

105. A uniform rod of mass m , length L , area of cross-section A and Young's modulus Y hangs from the ceiling. Its elongation under its own weight will be

(1) Zero

(2) $\frac{mgL}{2AY}$

(3) $\frac{mgL}{AY}$

(4) $\frac{2mgL}{AY}$

106. The root-mean-square (rms) speed of oxygen molecules (O_2) at a certain absolute temperature is v . If the temperature is doubled and the

(4) t^4

SEC : SR ELITE, AIIMS SUPER60, NEET NPLA MEDICINE
 oxygen gas dissociate into atomic oxygen, the rms speed would be

- (1) v
- (2) $\sqrt{2}v$
- (3) $2v$
- (4) $2\sqrt{2}v$

107. When an air bubble rises from the bottom to the surface of a lake, its radius becomes double. Find the depth of the lake, given that the atmospheric pressure is equal to the pressure due to a column of water 10 m high. Assume constant temperature and disregard surface tension.

- (1) 30 m
- (2) 40 m
- (3) 70 m
- (4) 80 m

108. A 15g mass of nitrogen gas is enclosed in a vessel at a temperature 27°C . Amount of heat transferred to the gas, so that rms velocity of molecules is doubled, is about: [Take $R = 8.3 \text{ J/K mole}$]

- (1) 10 KJ
- (2) 0.9 kJ
- (3) 6 kJ
- (4) 14 kJ

109. A spherical black body with a radius of 12 cm radiates 450 W power at 500 K. If the radius were halved and the temperature doubled, the power radiated in watts would be

- (1) 225
- (2) 450
- (3) 900
- (4) 1800

110. Two Carnot engines A and B are operated in series. The first one, A receives heat at $T_1 (= 600\text{K})$ and rejects to a reservoir at temperature T_2 . The second engine B receives heat rejected by the first engine and, in turn, rejects to a heat reservoir at $T_3 (= 400\text{K})$. Calculate the temperature T_2 if the work outputs of the two engines are equal:

- (1) 400 K
- (2) 600 K
- (3) 500 K
- (4) 300 K

111. An organ pipe filled with oxygen gas at 47°C resonates in its fundamental mode at a frequency 300 Hz. If it is now filled with nitrogen gas, at what temperature will it resonate at the same frequency, in the fundamental mode?

- (1) 7°C
- (2) 27°C
- (3) 87°C
- (4) 107°C

112. A capacitor of capacitance C is given charge Q and then connected in parallel to a coil of inductance L . There is no resistance in the circuit. When the charge on the capacitor becomes zero, the current in the coil will be

- (1) $Q\sqrt{\frac{L}{C}}$
- (2) $\frac{Q}{\sqrt{LC}}$
- (3) $Q\sqrt{\frac{C}{L}}$
- (4) Zero

113. A coil with resistance R is placed in a magnetic field. The flux linked with the coil is ϕ . If the magnetic field suddenly reverses in direction, how much charge will circulate in the coil?

(1) $\frac{\phi}{2R}$

(2) $\frac{\phi}{R}$

(3) $\frac{2\phi}{R}$

(4) Zero

114. In a uniform magnetic field of $10^{-5} T$ in free space, the energy density is u . The electric field which will produce the same energy density in free space is

(1) $10^5 V/m$

(2) $3 \times 10^3 V/m$

(3) $10 V/m$

(4) $9 \times 10^{-3} V/m$

115. When beats are formed between sound waves of slightly different frequencies, the intensity of the sound heard changes from maximum to minimum in 0.2 s. The difference in frequencies of the two sound waves is

(1) 5 Hz

(2) 4 Hz

(3) 2.5 Hz

(4) 2 Hz

116. In a Young's double-slit experiment using slits of unequal widths, the intensities on the screen due to the slits are in the ratio 4 : 9 when the slits are used separately. When they are

used together, the ratio of the intensity at a dark fringe to the intensity at a bright fringe on the screen will be

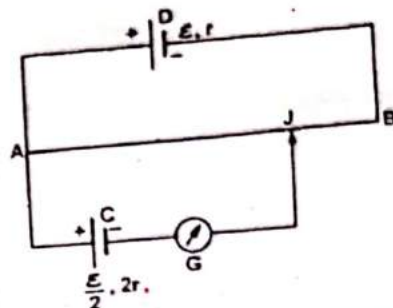
(1) 4 : 9

(2) 1 : 9

(3) 9 : 16

(4) 1 : 25

117.



In the figure, the potentiometer wire AB of length L and resistance $9r$ is joined to the cell of emf ε and internal resistance r . The emf of cell c is $\varepsilon/2$ and its internal resistance is $2r$. The galvanometer G will show no deflection when the length AJ is

(1) $\frac{4L}{9}$

(2) $\frac{5L}{9}$

(3) $\frac{7L}{18}$

(4) $\frac{11L}{18}$

118. A boy of height 1 m stands in front of a convex mirror. His distance from the mirror is equal to its focal length. The height of his image is

(1) 0.25 m

(2) 0.33 m

(3) 0.5 m

(4) 0.67 m

SEC
119. An insulated sphere of radius R have a uniform volume charge density ρ . The electric field at a point inside the sphere at a distance r from centre is

(1) $\frac{R\rho}{3\epsilon_0}$

(2) $\frac{r\rho}{3\epsilon_0}$

(3) $\frac{2}{3}\left(\frac{r\rho}{\epsilon_0}\right)$

(4) Zero

120. In a moving-coil instrument, the coil is suspended in a radial magnetic field instead of a uniform magnetic field. This is done to

(1) Increase the sensitivity of the instrument

(2) Increase the accuracy of the instrument

(3) Make the instrument compact and portable

(4) Make its deflection proportional to the current through it

121. A milliammeter of range 10 mA has a coil of resistance 1Ω . To use it as ammeter of range 1 A, the required shunt must have a resistance of

(1) $\frac{1}{101}\Omega$

(2) $\frac{1}{100}\Omega$

(3) $\frac{1}{99}\Omega$

(4) $\frac{1}{9}\Omega$

122. A 100-W bulb and a 25-W bulb are designed for the same voltage. They have filaments of the same length and

material. The ratio of the diameter of the 100 - W bulb to that of the 25-W bulb is

(1) 4 : 1

(2) 2 : 1

(3) $\sqrt{2} : 1$

(4) 1 : 2

123. A charged particle moves undeflected in a region of crossed electric and magnetic fields. If the electric field is switched off, the particle has an initial acceleration a . If the magnetic field is switched off, instead of the electric field, the particle will have an initial acceleration

(1) Equal to 0

(2) $> a$

(3) Equal to a

(4) $< a$

124. One of the two identical conducting wires of length L is bent in the form of a circular loop and the other one into a circular coil of N identical turns. If the same current is passed in both, the ratio of the magnetic field at the centre of the loop (B_L) to that at the centre of the coil (B_C), i.e. $\frac{B_L}{B_C}$ will be :

(1) $\frac{1}{N}$

(2) N^2

(3) $\frac{1}{N^2}$

(4) N

125. A bar magnet is demagnetized by inserting it inside a solenoid of length 0.2 m, 100 turns, and carrying a current of 5.2 A. The coercivity of the bar magnet is:

(1) 1200 A/m

(2) 2600 A/m

(3) 520 A/m

(4) 285 A/m

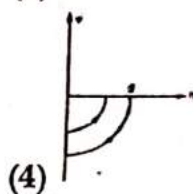
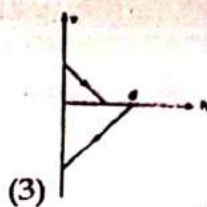
(1) $1/\sqrt{2}$ (2) $1/\sqrt{5}$
(3) $1/\sqrt{3}$ (4) $1/2$

(1) $2T$ (2) $\frac{1}{2}(\ln 2)T$
(3) $4T$ (4) $2(\ln 2)T$

- (1) $E = 6.8\text{eV}, \lambda \sim 6.6 \times 10^{-10}\text{m}$
- (2) $E = 3.4\text{eV}, \lambda \sim 6.6 \times 10^{-10}\text{m}$
- (3) $E = 3.4\text{eV}, \lambda \sim 6.6 \times 10^{-11}\text{m}$
- (4) $E = 6.8\text{eV}, \lambda \sim 6.6 \times 10^{-11}\text{m}$

(1)

(2)



(1) 25 A (2) 50 A
(3) 35 A (4) 45 A

(1) 0.02 mm (2) 0.05 mm
(3) 0.1 mm (4) 0.2 mm

(1) 2.4 eV
(2) 1.78 eV
(3) 4.2 eV (4) 3.6 eV

133. If 50% of energy released during fission would be converted into electrical energy, then the number of fission in a second in a nuclear reactor of 6.4 MW output is (Energy per fission is 200 MeV)

- (1) 4×10^{15}
- (2) 4×10^{16}
- (3) 4×10^{17}
- (4) 4×10^{18}

134. The input signal given to CE-amplifier having a voltage gain of 150 is

$$V_i = 2 \cos\left(15t + \frac{\pi}{3}\right).$$

The corresponding output signal will be

- (1) $300 \cos\left(15t + \frac{4\pi}{3}\right)$
- (2) $300 \cos\left(15t + \frac{\pi}{3}\right)$
- (3) $75 \cos\left(15t + \frac{2\pi}{3}\right)$
- (4) $2 \cos\left(15t + \frac{5\pi}{6}\right)$

135. A magnetic dipole in a constant magnetic field has

- (1) Maximum potential energy when the torque is maximum
- (2) Zero potential energy when the torque is minimum
- (3) Zero potential energy when the torque is maximum
- (4) Minimum potential energy when the torque is maximum

CHEMITSRY

136. The correct match between item I and item II is :-

Item - I		Item - II	
A)	Allosteric effect	P)	Molecule binding to the active site of enzyme
B)	Competitive inhibitor	Q)	Molecule crucial for communication in the body
C)	Receptor	R)	Molecule binding to a site other than the active site of enzyme
D)	Poison	S)	Molecule binding to the enzyme covalently

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

137. The correct order of metallic character is

- (1) $P < Si < Be < Mg < Na$
- (2) $Si < P < Mg < Be < Na$
- (3) $Na < Mg < Be < Si < P$
- (4) $Na < Be < Mg < P < Si$

138. Na_2CO_3 can be manufactured by Solvay's process but K_2CO_3 cannot be prepared because.

- (1) K_2CO_3 is more soluble than Na_2CO_3
- (2) K_2CO_3 is less soluble than Na_2CO_3
- (3) KHCO_3 is more soluble than NaHCO_3
- (4) KHCO_3 is less soluble than NaHCO_3

139. Regarding schottky defect, correct statement is:

- (1) density of the crystal is increased
- (2) unequal number of cations and anions are missing from the lattice
- (3) an ion leaves its normal site and occupies an interstitial site
- (4) equal number of cations and anions are missing from the lattice

140. XeF_2 is isostructural with

- (1) BaCl_2
- (2) TeF_2
- (3) ICl_2^-
- (4) SbCl_3

141. 10 grams of a metal oxide on strong heating gave 1.6 grams of oxygen, then the gram equivalent weight of metal is:

- (1) 48g
- (2) 42 g
- (3) 12g
- (4) 24g

142. Which one of the following statements regarding Henry's law is not correct?

- (1) The value of K_H increases with function of the nature of the gas
- (2) Higher the value of K_H at a given pressure, higher is the solubility of the gas in the liquids.

(3) The partial pressure of the gas in vapour phase is proportional to the mole fraction of the gas in the solution

(4) Different gases have different K_H (Henry's law constant) values at the same temperature.

143. In O_2 molecule the correct order of energy of molecular orbitals is

- (1) $\pi 2p_x > \pi 2p_y$
- (2) $\pi^* 2p_x > \pi^* 2p_y$
- (3) $\sigma 2s > \sigma^* 2s$
- (4) $\sigma^* 2p_z > \sigma 2p_z$

144. 20 mL of 0.1 MH_2SO_4 solution is added to 30 mL of 0.2 M NH_4OH solution. The pH of the resultant mixture is : [pK_b of $\text{NH}_4\text{OH} = 4.7$].

- (1) 9.4
- (2) 5.0
- (3) 9.0
- (4) 5.2

145. Gold number is least for:

- (1) Starch
- (2) Gelatin
- (3) Gum Arabic
- (4) Haemoglobin

146. The ore that contains both iron and copper is :

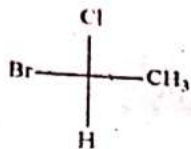
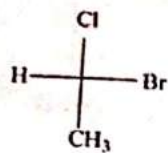
- (1) Malachite
- (2) Dolomite
- (3) Azurite
- (4) Copper pyrites

147. Wrong match of the following is

- (1) SO_3 - turns acidified $\text{K}_2\text{Cr}_2\text{O}_7$ green
- (2) Cl_2 - disproportionates in KOH solution
- (3) Tailing or mercury - test for ozone
- (4) Sulphuric acid - dibasic

148. The ground state energy of hydrogen atom is -13.6 eV. The energy of second excited state He^+ ion in eV is :
- -6.04
 - -27.2
 - -54.4
 - -3.4
149. SiO_2 does not react with
- HF
 - H_2SO_4
 - Na_2CO_3
 - NaOH
150. The correct match between Item (I) and Item (II) is :
- | Item - I | Item - II |
|------------------|-------------------|
| A) Nortehindrone | P) Anti-biotic |
| B) Ofloxacin | Q) Anti-fertility |
| C) Equanil | R) Hypertension |
| | S) Analgesics |
- A-R, B-P, C-S
 - A-Q, B-P, C-R
 - A-R, B-P, C-R
 - A-Q, B-R, C-S
151. The temperature coefficient for reaction in which food deteriorates is '2'. Then food deteriorates is ----- times as rapidly at $25^\circ C$ as it does at $5^\circ C$.
- 8
 - 2
 - 1
 - 4
152. The eclipsed and staggered forms of ethane can not be isolated because
- Both the conformers are equally stable
 - They interconvert rapidly
 - There is a large energy barrier of rotation about the bond
 - The energy difference between the conformers is large
153. SO_2 and He are kept in a container at partial pressure P_1 and P_2 . A thin perforation is made in the wall of the container and it is observed that gases effuse at the same rate. The ratio of P_1 and P_2 will be
- 4 : 1
 - 1 : 4
 - 1 : 16
 - 16 : 1
154. The correct order of reactivity towards electrophilic substitution reaction for the following
- Benzene
 - Toluene
 - Chloro benzene
 - Phenol
- $II > IV > I > III$
 - $IV > II > I > III$
 - $IV > III > II > I$
 - $I > II > III > IV$
155. The enthalpy of vaporization of liquid is 30 kJmol^{-1} and entropy of vaporization is $75 \text{ JK}^{-1}\text{mol}^{-1}$. The boiling point of the liquid at 1 atm is
- 250 K
 - 400 K
 - 450 K
 - 600 K
156. A certain weak acid has a dissociation constant of 10^{-4} , then the equilibrium constant for its reaction with strong base is
- 10^{-6}
 - 10^3
 - 10^{-4}
 - 10^{10}

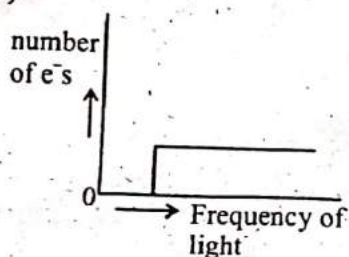
157. What is the relationship between the structures shown below?



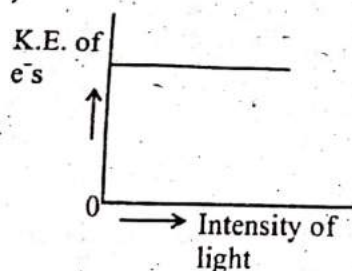
- (1) Enantiomers
- (2) Identical compounds
- (3) Structural isomers
- (4) Conformational isomers

158. Which of the graphs shown below does not represent the relationship between incident light and the electron ejected from metal surface?

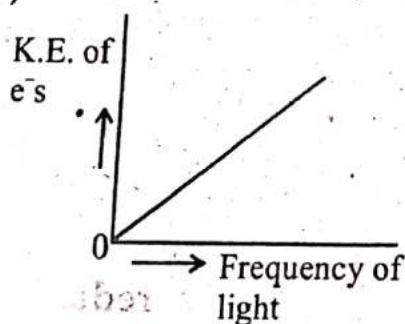
(1)



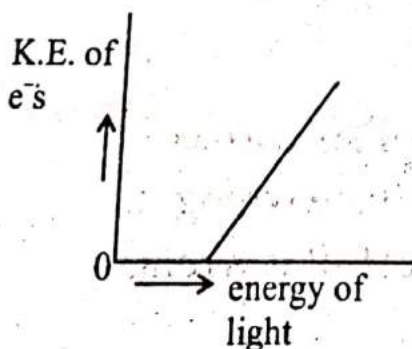
(2)



(3)



(4)

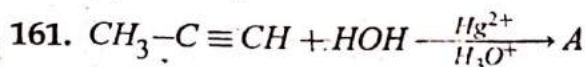


159. The concentration of SO_4^{2-} in water that causes Laxative effect?

- (1) 100 PPM
- (2) 9 PPM
- (3) > 500 PPM
- (4) 70.01 PPM

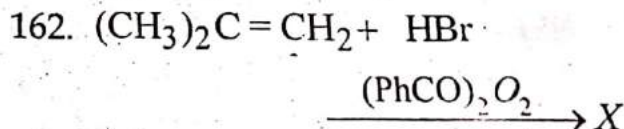
160. In the reaction of oxalate with permanganate in acidic medium, the number of electrons involved in producing one molecule of CO_2 is:

- (1) 10
- (2) 2
- (3) 1
- (4) 5



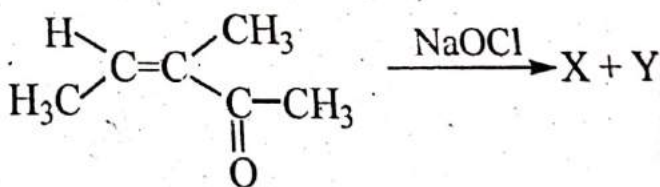
The number of sigma and pi bonds that are present in the molecule 'A'?

- (1) 9 sigma and 1 pi
- (2) 8 sigma and 2 pi
- (3) 8 sigma and 1 pi
- (4) 9 sigma and 2 pi

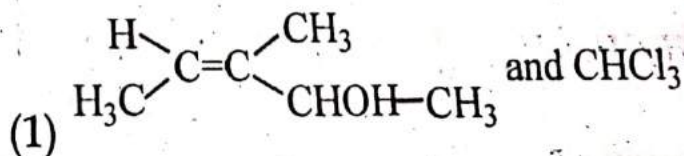


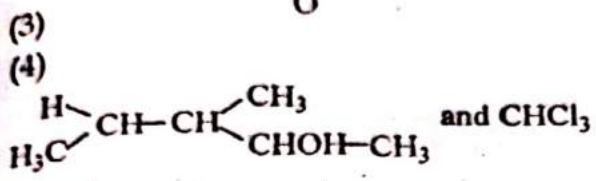
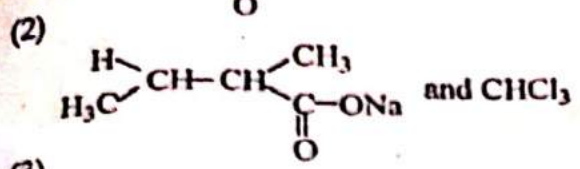
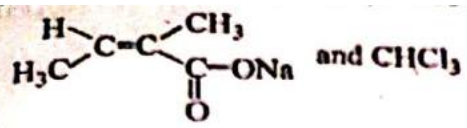
The product 'X' is

- (1) $(\text{CH}_3)_2\text{CH} - \text{CH}_2\text{Br}$
- (2) $(\text{CH}_3)_2\text{CBr} - \text{CH}_3$
- (3) $\text{CH}_3\text{CHBr} - \text{CH}_2\text{CH}_3$
- (4) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$



In this reaction X and Y are





164. Which of the following anion has $d\pi - p\pi$ bonding?

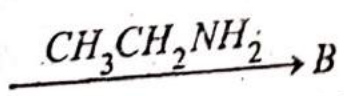
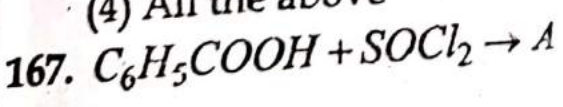
- (1) SO_3^{2-} (2) CO_3^{2-}
 (3) BO_3^{3-} (4) NO_3^-

165. The electrolytes usually used in the electroplating of gold and silver, respectively, are:

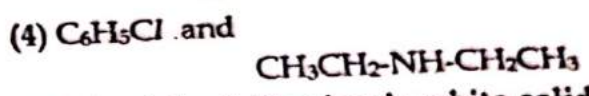
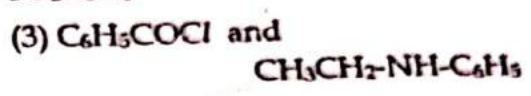
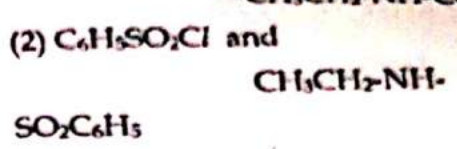
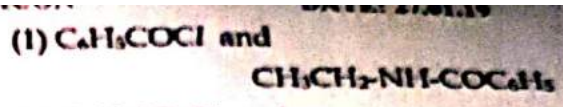
- (1) $[\text{Au}(\text{OH})_4]^-$ and $[\text{Ag}(\text{OH})_2]^-$
 (2) $[\text{Au}(\text{CN})_2]^-$ and $[\text{Ag}(\text{Cl}_2)]^-$
 (3) $[\text{Au}(\text{NH}_3)_2]^+$ and $[\text{Ag}(\text{CN})_2]^-$
 (4) $[\text{Au}(\text{CN})_2]^-$ and $[\text{Ag}(\text{CN})_2]^-$

166. Which of the following reactions is used to detect the presence of carboxylic group in an organic compound?

- (1) $\text{RCOOH} + \text{Na} \rightarrow \text{RCOONa} + 1/2 \text{H}_2$
 (2) $\text{RCOOH} + \text{NaOH} \rightarrow \text{RCOONa} + \text{H}_2\text{O}$
 (3) $\text{RCOOH} + \text{NaHCO}_3 \rightarrow \text{RCOONa} + \text{H}_2\text{O} + \text{CO}_2$
 (4) All the above



compounds A and B are respectively



168. Which of the following is white solid and liberate CO_2 on thermal decomposition?

- (1) Na_2CO_3
 (2) $\text{Ca}(\text{HCO}_3)_2$
 (3) MgCO_3
 (4) LiHCO_3

169. Which of the following is incorrect with respect of property indicated?

- (1) Electronegativity : $\text{F} > \text{Cl} > \text{Br}$
 (2) Electron affinity : $\text{Cl} > \text{F} > \text{Br}$
 (3) Oxidising power : $\text{F}_2 > \text{Cl}_2 > \text{Br}_2$
 (4) Bond energy : $\text{F}_2 > \text{Cl}_2 > \text{Br}_2$

170. What is the change in internal energy when a gas contracts from 377mL to 177mL under a pressure of 1520mm of Hg, while at the same time 124 J of heat is released?

- (1) 40.52 J (2) -248 J
 (3) +275.3 J (4) -83.48 J

171. Statement -I: Fructose is a reducing sugar

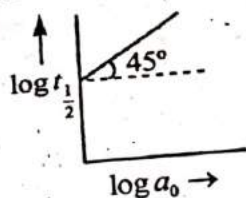
Statement - II : Fructose contain a keto group

- (1) Both S-I and S-II are correct
 (2) Both S-I and S-II are wrong
 (3) S-I is correct but S-II is wrong
 (4) S-I is wrong but S-II is correct

172. Which of the following group show +M and -I effects

- (1) -CHO
(2) -COOR
(3) -NO₂
(4) -OH

173. For a reaction $A \rightarrow$ products, a plot of $\log t_{1/2}$ versus $\log a_0$ is shown in the figure. If the initial concentration of A is represented by a_0 , the order of the reaction is :



- (1) One
(2) Two
(3) Three
(4) Zero

174. The amine that cannot be prepared by Gabriel phthalimide synthesis is

- (1)
(2)
(3) $\text{CH}_3\text{-CH}_2\text{-NH}_2$
(4)

175. Which of the following statements about the interstitial compounds is incorrect?

- (1) They retain metallic conductivity
(2) They are chemically reactive
(3) They are much harder than the pure metal
(4) They have higher melting points than the pure metal

176. If the de-Broglie wavelength of a particle of mass m is 100 times its velocity then its value in terms of its mass (m) and Planck's constant (h) is

- (1) $\frac{1}{10} \sqrt{\frac{m}{h}}$
(2) $10 \sqrt{\frac{h}{m}}$
(3) $\frac{1}{10} \sqrt{\frac{h}{m}}$
(4) $10 \sqrt{\frac{m}{h}}$

177. Monobasic acids of the following are

- (1) Phosphinic acid and Phosphonic acid
(2) Orthoboric acid and phosphinic acid
(3) Orthoboric acid and orthophosphoric acid
(4) Sulphurous acid and sulphuric acid

178. Statement -A: $\text{C}_2\text{H}_5\text{OH}$ is more acidic than $\text{C}_6\text{H}_5\text{OH}$

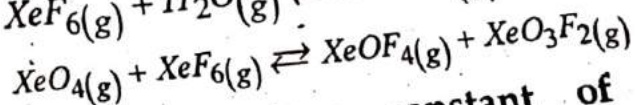
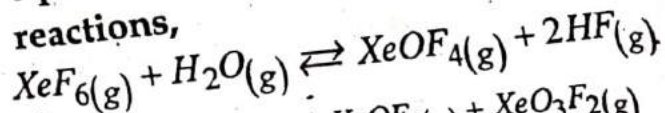
Statement - B : $\text{C}_2\text{H}_5\text{O}^-$ is stabilised by resonance but $\text{C}_6\text{H}_5\text{O}^-$ is not

- (1) Both A and B are true
(2) Both A and B are false
(3) A is true but B is false
(4) A is false but B is true

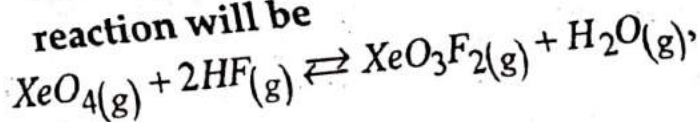
179. Outer orbital complex and diamagnetic is

- (1) $[\text{Ni}(\text{CO})_4]$
(2) $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$
(3) $\text{K}_3[\text{Fe}(\text{CN})_6]$
(4) $\text{K}_2[\text{NiCl}_4]$

180. If K_1 and K_2 are the respective equilibrium constants for the two reactions,



the equilibrium constant of the reaction will be



- (1) K_1 / K_2
(2) $K_1 \cdot K_2$
(3) $K_1 / (K_2)^2$
(4) K_2 / K_1

BIOLOGY

1) 2	2) 4	3) 1	4) 3	5) 4	6) 2	7) 4	8) 4	9) 4	10) 1
11) 2	12) 2	13) 3	14) 1	15) 3	16) 2	17) 3	18) 2	19) 3	20) 1
21) 1	22) 4	23) 3	24) 4	25) 1	26) 4	27) 1	28) 3	29) 4	30) 2
31) 2	32) 1	33) 1	34) 1	35) 2	36) 4	37) 3	38) 2	39) 2	40) 1
41) 3	42) 3	43) 3	44) 3	45) 2	46) 1	47) 3	48) 2	49) 4	50) 1
51) 3	52) 2	53) 2	54) 3	55) 3	56) 1	57) 1	58) 3	59) 3	60) 3
61) 4	62) 3	63) 3	64) 2	65) 1	66) 3	67) 4	68) 4	69) 1	70) 3
71) 4	72) 1	73) 2	74) 1	75) 1	76) 4	77) 3	78) 4	79) 3	80) 2
81) 3	82) 2	83) 4	84) 1	85) 1	86) 3	87) 2	88) 2	89) 4	90) 2

PHYSICS

91) 2	92) 2	93) 1	94) 3	95) 2	96) 1	97) 4	98) 4	99) 1	100) 2
101) 3	102) 1	103) 3	104) 2	105) 2	106) 3	107) 3	108) 1	109) 4	110) 3
111) 1	112) 2	113) 3	114) 2	115) 3	116) 4	117) 2	118) 3	119) 2	120) 4
121) 3	122) 2	123) 3	124) 3	125) 2	126) 2	127) 4	128) 2	129) 1	130) 4
131) 4	132) 2	133) 3	134) 1	135) 3					

CHEMISTRY

136) 4	137) 1	138) 3	139) 4	140) 3	141) 2	142) 2	143) 4	144) 3	145) 2
146) 4	147) 1	148) 1	149) 2	150) 2	151) 4	152) 2	153) 1	154) 2	155) 2
156) 4	157) 2	158) 3	159) 3	160) 3	161) 1	162) 1	163) 2	164) 1	165) 4
166) 3	167) 1	168) 3	169) 4	170) 4	171) 1	172) 4	173) 4	174) 2	175) 2
176) 2	177) 2	178) 2	179) 1	180) 4					

GRAND TEST-2(27.01.19)

Physics Solutions :

91. If T is the tension in string $T \cos 45 = mg$

$$T \sin \theta = F$$

$$F = mg \tan \theta$$

92. Velocity of man wrt the car $= u = V_m - V_c$

$$(m + M)V = mV_m + MV_c$$

$$V_c = V - \frac{mu}{M + m}$$

93. Let x be the maximum compression of

$$\text{spring } \frac{1}{2}kx^2 = \frac{1}{2}mv^2 \text{ or } x = V\sqrt{m/k}$$

$$\text{Spring force} = kx$$

94. $S \propto t^3$

$$V \propto t^2$$

$$a \propto t$$

$$F \propto t$$

$$P = FV$$

$$\text{Hence } P \propto t^3$$

95. $R = \frac{\frac{m}{2}R + \frac{m}{2}x}{m}$

96. $l = L \left(\frac{\mu}{\mu + 1} \right)$

97. $mu = mv_1 \cos \theta + mv_2 \sin \theta$ and

$$mv_1 \sin \theta = mv_2 \cos \theta \text{ and}$$

$$\frac{1}{2}mu^2 = \frac{1}{2}mv_1^2 + \frac{1}{2}mv_2^2$$

98. $\alpha = \frac{40\pi - 20\pi}{10}$ and $\omega^2 - \omega_0^2 = 2\alpha\theta$

$$\text{Number of rotations} = \frac{\theta}{2\pi}$$

99. $mg \frac{l}{2} \sin \theta = \frac{1}{2}I\omega^2$ where $I = \frac{ml^2}{3}$

100. In sliding without friction and in rolling without slipping, no work is done against friction. Hence KE is equal to loss in P.E. But in rolling with slipping some energy is lost in doing work against friction.

101. $\omega \sqrt{A^2 - y^2} = \omega^2 y$

102. $g - R\omega^2 = 0$

103. $\Delta P \propto 1/r$

104. From equation of continuity $V_1 = V_2$

$$\frac{V_1^2}{2} + gh + \frac{P_1}{\rho} = \frac{V_2^2}{2} + 0 + \frac{P_2}{\rho}$$

$$P_2 - P_1 = \rho gh$$

$$\Rightarrow P_2 > P_1$$

105. Tension at a depth y from ceiling

$$= T = \frac{m}{L}(L - y)g$$

$$\text{Elongation } dx = dy \cdot \frac{T}{Ay}$$

$$\text{Total elongation} = \int_0^L dy \cdot \frac{T}{Ay}$$

$$= \int_0^L \frac{m}{LAy}(L - y)g dy$$

106. $V = \sqrt{\frac{3RT}{M}}$

$$T \rightarrow 2T$$

$$M \rightarrow M/2$$

107. $(H + h)r^3 = H(2r)^3$

108. $V \rightarrow 2V$

$$T \rightarrow 4T$$

$$dQ = nC_V dT$$

109. $P \propto r^2 T^4$

110. $W = Q_1 - Q_2 \propto T_1 - T_2$

$$600 - T_2 = T_2 - 400$$

$$T_2 = 500K$$

111. $n = \frac{V}{2l}$ and $V = \sqrt{\frac{\gamma RT}{M}}$

112. $\frac{Q^2}{2C} = \frac{1}{2}LI^2$ (By conservation of energy)

113. Current $I = \frac{dq}{dt} = -\frac{N}{R} \frac{dQ}{dt}$

114. $U = \frac{1}{2} \epsilon_0 E^2 = \frac{B^2}{2\mu_0}$ and $C = \frac{1}{\sqrt{\epsilon_0 \mu_0}}$

$$\Rightarrow E = CB$$

115. $\frac{T}{2} = 0.2 \Rightarrow T = 0.4S$

$$\text{Number beats} = \frac{1}{T} = 2.5S^{-1}$$

$$116. \frac{I_1}{I_2} = \frac{4}{9} \Rightarrow \frac{A_1}{A_2} = \frac{2}{3}$$

$$\frac{I_{\max}}{I_{\min}} = \frac{(3+2)^2}{(3-2)^2} = \frac{25}{1}$$

$$117. I_P = \frac{\epsilon}{9r+r}$$

$$V_{AB} = \frac{\epsilon}{10r} \times 9r$$

$$\frac{\epsilon}{2} = I \times \frac{V_{AB}}{L}$$

$$118. \frac{1}{f} = \frac{1}{V} + \frac{1}{u}$$

$$m = -\frac{V}{u} = \frac{h_i}{h_o}$$

$$119. \text{ For all inside points } E = \frac{1}{4\pi\epsilon_0} \cdot \frac{Qr}{R^3}$$

120. In radial fields the torque is maximum.

$$NIAB = C\theta$$

$$121. S = \frac{G}{n-1} \text{ where } n = \frac{I}{I_s}$$

$$122. P = \frac{V^2}{R} \text{ and } R \propto \frac{1}{r^2}$$

$$123. q[\vec{E} + \vec{V} \times \vec{B}] = 0$$

$$124. L = n \times 2\pi r$$

$$B = \frac{\mu_0 n I}{2r}$$

$$\Rightarrow B \propto n^2$$

$$125. B = \mu_0 n I$$

$$H = n I$$

$$126. \cos \phi = \frac{1}{\sqrt{2}}$$

$$\Rightarrow R = X_L$$

If frequency is doubled X_L becomes $2R$.

$$z = \sqrt{5}R$$

$$\cos \phi = \frac{1}{\sqrt{5}}$$

$$127. \text{ Time} = 2 \text{ half lives}$$

$$= 2 \times \frac{\log 2}{\lambda}$$

$$= 2T \log 2$$

$$128. KE = -TE \text{ and } n = 2$$

$$\lambda = n \times 2\pi r_0$$

$$129. V^2 = 2gh$$

$$130. \text{ Efficiency} = \frac{V_s I_s}{V_p I_p}$$

$$131. L.C = \text{IMSD} - \text{IVSD}$$

$$\text{Here } 20 \text{ VSD} = 16 \text{ MSD}$$

$$\text{IVSD} = \frac{16}{20} \text{ MSD}$$

$$\text{Hence } L.C = \frac{1}{5} \text{ MSD}$$

$$132. E - \phi = K$$

$$133. 1 \text{ MW} \rightarrow 2 \times 3.125 \times 10^{14} \text{ S}^{-1}$$

134. Input and output signals differ by 180° .

$$135. \text{ Torque} = MB \sin \theta$$

$$PE = -MB \cos \theta$$