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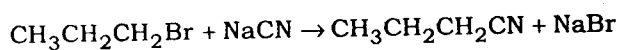
(2) III only

(3) Both I and III

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(4) Both I and II

2. Consider the reaction



This reaction will be the fastest in

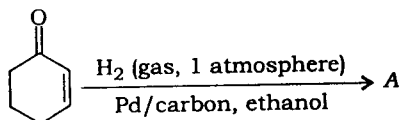
(1) water

(2) ethanol

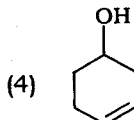
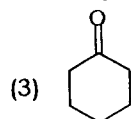
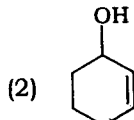
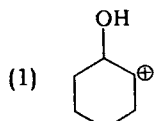
(3) methanol

(4) *N,N'*-dimethylformamide (DMF)

3. The correct structure of the product A formed in the reaction



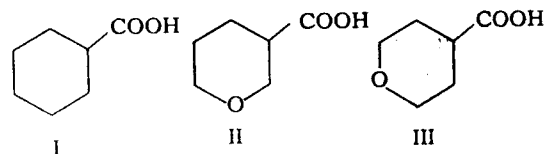
is



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2

5. The correct order of strengths of the carboxylic acids



is

(1) II > I > III

(2) I > II > III

(3) II > III > I

(4) III > II > I

6. The compound that will react most readily with gaseous bromine has the formula

(1)  $\text{C}_2\text{H}_4$

(2)  $\text{C}_3\text{H}_6$

(3)  $\text{C}_2\text{H}_2$

(4)  $\text{C}_4\text{H}_{10}$

conductivity of  $5.76 \times 10^{-3} \text{ S cm}^{-1}$  at 298 K is

- (1)  $28.8 \text{ S cm}^2/\text{mol}$
- (2)  $2.88 \text{ S cm}^2/\text{mol}$
- (3)  $11.52 \text{ S cm}^2/\text{mol}$
- (4)  $0.086 \text{ S cm}^2/\text{mol}$

9. The decomposition of phosphine ( $\text{PH}_3$ ) on tungsten at low pressure is a first-order reaction. It is because the

- (1) rate of decomposition is very slow
- (2) rate is proportional to the surface coverage
- (3) rate is inversely proportional to the surface coverage
- (4) rate is independent of the surface coverage

10. The coagulation values in millimoles per litre of the electrolytes used for the coagulation of  $\text{As}_2\text{S}_3$  are given below :

- I. ( $\text{NaCl}$ ) = 52, II. ( $\text{BaCl}_2$ ) = 0.69,
- III. ( $\text{MgSO}_4$ ) = 0.22

The correct order of their coagulating power is

- (1) III > I > II (2) I > II > III
- (3) II > I > III (4) III > II > I

11. During the electrolysis of molten sodium chloride, the time required to produce 0.10 mol of chlorine gas using a current of 3 amperes is

- (1) 330 minutes
- (2) 55 minutes
- (3) 110 minutes
- (4) 220 minutes

$$(2) \Delta S = nR \ln \left( \frac{P_f}{P_i} \right)$$

$$(3) \Delta S = nR \ln \left( \frac{P_i}{P_f} \right)$$

$$(4) \Delta S = nRT \ln \left( \frac{P_f}{P_i} \right)$$

14. The van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is

- (1) 3 (2) 0
- (3) 1 (4) 2

15. The percentage of pyridine ( $\text{C}_5\text{H}_5\text{N}$ ) that forms pyridinium ion ( $\text{C}_5\text{H}_5\text{N}^+\text{H}$ ) in a 0.10 M aqueous pyridine solution ( $K_b$  for  $\text{C}_5\text{H}_5\text{N} = 1.7 \times 10^{-9}$ ) is

- (1) 1.6%
- (2) 0.0060%
- (3) 0.013%
- (4) 0.77%

16. In calcium fluoride, having the fluorite structure, the coordination numbers for calcium ion ( $\text{Ca}^{2+}$ ) and fluoride ion ( $\text{F}^-$ ) are

- (1) 4 and 8
- (2) 4 and 2
- (3) 6 and 6
- (4) 8 and 4

17. If the  $E^\circ_{\text{cell}}$  for a given reaction has a negative value, which of the following gives the correct relationships for the values of  $\Delta G^\circ$  and  $K_{\text{eq}}$ ?

- (1)  $\Delta G^\circ < 0$ ;  $K_{\text{eq}} < 1$
- (2)  $\Delta G^\circ > 0$ ;  $K_{\text{eq}} < 1$
- (3)  $\Delta G^\circ > 0$ ;  $K_{\text{eq}} > 1$
- (4)  $\Delta G^\circ < 0$ ;  $K_{\text{eq}} > 1$

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3

[ P.T.O. ]

product  $1.6 \times 10^{-11}$  M

(1) zero

(2)  $1.26 \times 10^{-5}$  M

~~(3)  $1.6 \times 10^{-9}$  M~~

(4)  $1.6 \times 10^{-11}$  M

20. Suppose the elements X and Y combine to form two compounds  $XY_2$  and  $X_3Y_2$ . When 0.1 mole of  $XY_2$  weighs 10 g and 0.05 mole of  $X_3Y_2$  weighs 9 g, the atomic weights of X and Y are

(1) 30, 20

(2) 40, 30

(3) 60, 40

(4) 20, 30

21. The number of electrons delivered at the cathode during electrolysis by a current of 1 ampere in 60 seconds is (charge on electron =  $1.60 \times 10^{-19}$  C)

(1)  $7.48 \times 10^{23}$

(2)  $6 \times 10^{23}$

(3)  $6 \times 10^{20}$

~~(4)  $3.75 \times 10^{20}$~~

22. Boric acid is an acid because its molecule

(1) combines with proton from water molecule

(2) contains replaceable  $H^+$  ion

(3) gives up a proton

(4) accepts  $OH^-$  from water releasing proton

23.  $AlF_3$  is soluble in HF only in presence of KF. It is due to the formation of

(1)  $K[AlF_3H]$

(2)  $K_3[AlF_3H_3]$

(3)  $K_3[AlF_6]$

(4)  $AlH_3$

25. The suspension of slaked lime in water is known as

(1) aqueous solution of slaked lime

(2) limewater

(3) quicklime

(4) milk of lime

26. The hybridizations of atomic orbitals of nitrogen in  $NO_2^+$ ,  $NO_3^-$  and  $NH_4^+$  respectively are

(1)  $sp^2$ ,  $sp$  and  $sp^3$

~~(2)  $sp$ ,  $sp^3$  and  $sp^2$~~

(3)  $sp^2$ ,  $sp^3$  and  $sp$

(4)  $sp$ ,  $sp^2$  and  $sp^3$

27. Which of the following fluoro-compounds is most likely to behave as a Lewis base?

(1)  $SiF_4$

(2)  $BF_3$

(3)  $PF_3$

(4)  $CF_4$

28. Which of the following pairs of ions is isoelectronic and isostructural?

(1)  $ClO_3^-$ ,  $SO_3^{2-}$

(2)  $CO_3^{2-}$ ,  $NO_3^-$

(3)  $ClO_3^-$ ,  $CO_3^{2-}$

(4)  $SO_3^{2-}$ ,  $NO_3^-$

29. In context with beryllium, which one of the following statements is **incorrect**?

(1) Its hydride is electron-deficient and polymeric.

(2) It is rendered passive by nitric acid.

(3) It forms  $Be_2C$ .

(4) Its salts rarely hydrolyze.

31. Which of the following pairs of d-orbitals will have electron density along the axes?

- (1)  $d_{xy}, d_{x^2-y^2}$
- (2)  $d_{z^2}, d_{xz}$
- (3)  $d_{xz}, d_{yz}$
- (4)  $d_{z^2}, d_{x^2-y^2}$

32. The correct geometry and hybridization for  $\text{XeF}_4$  are

- (1) square planar,  $sp^3d^2$
- (2) octahedral,  $sp^3d^2$
- (3) trigonal bipyramidal,  $sp^3d$
- (4) planar triangle,  $sp^3d^3$

33. Among the following, which one is a wrong statement?

- (1)  $\text{I}_3^+$  has bent geometry.
- (2)  $\text{PH}_5$  and  $\text{BiCl}_5$  do not exist.
- (3)  $\pi$ - $\pi$  bonds are present in  $\text{SO}_2$ .
- (4)  $\text{SeF}_4$  and  $\text{CH}_4$  have same shape.

34. The correct increasing order of trans-effect of the following species is

- (1)  $\text{CN}^- > \text{Br}^- > \text{C}_6\text{H}_5^- > \text{NH}_3$
- (2)  $\text{NH}_3 > \text{CN}^- > \text{Br}^- > \text{C}_6\text{H}_5^-$
- (3)  $\text{CN}^- > \text{C}_6\text{H}_5^- > \text{Br}^- > \text{NH}_3$
- (4)  $\text{Br}^- > \text{CN}^- > \text{NH}_3 > \text{C}_6\text{H}_5^-$

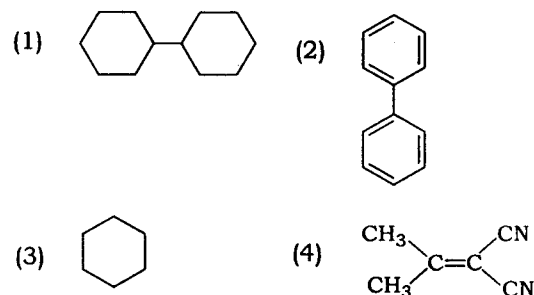
35. Which one of the following statements related to lanthanons is incorrect?

- (1)  $\text{Ce}(+4)$  solutions are widely used as oxidizing agent in volumetric analysis.
- (2) Europium shows +2 oxidation state.
- (3) The basicity decreases as the ionic radius decreases from Pr to Lu.
- (4) All the lanthanons are much more reactive than aluminium.

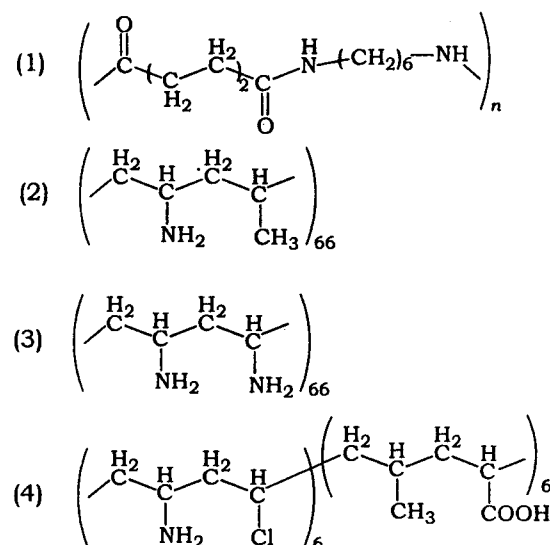
reaction?

- (1) Isopropyl chloride
- (2) Chlorobenzene
- (3) Bromobenzene
- (4) Chloroethene

38. In which of the following molecules, all atoms are coplanar?



39. Which one of the following structures represents nylon 6,6 polymer?

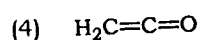
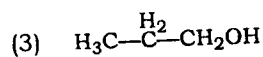
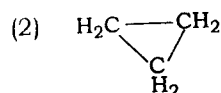
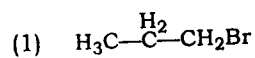


(2) 2 and 3

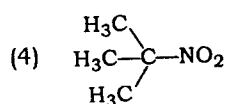
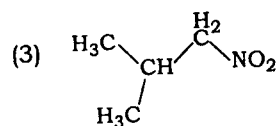
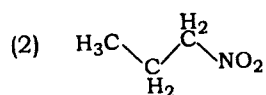
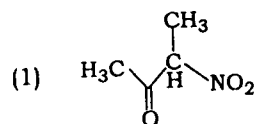
(3) 3 and 4

(4) 2 and 4

41. Which of the following compounds shall **not** produce propene by reaction with HBr followed by elimination or direct only elimination reaction?



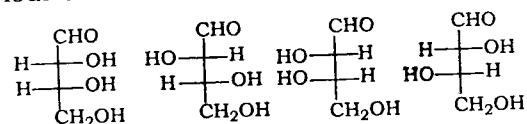
42. Which one of the following nitro-compounds **does not** react with nitrous acid?



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(4) DNA  $\rightarrow$  RNA  $\rightarrow$  Proteins

44. The **correct** of names of four aldoses with configuration given below



respectively, is

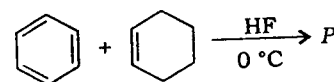
(1) D-erythrose, D-threose, L-erythrose, L-threose

(2) L-erythrose, L-threose, L-erythrose, D-threose

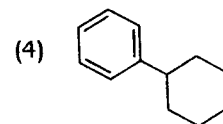
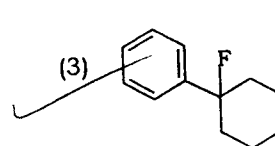
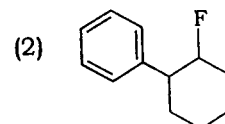
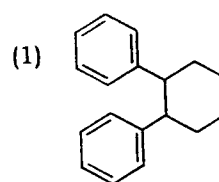
(3) D-threose, D-erythrose, L-threose, L-erythrose

(4) L-erythrose, L-threose, D-erythrose, D-threose

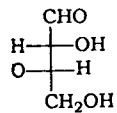
45. In the given reaction



the product P is



of names of  
even below

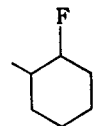


-erythrose,

-erythrose,

L-threose,

-erythrose,



47. Which of the following is **not** a component of downstream processing?

- (1) Expression
- (2) Separation
- (3) Purification
- (4) Preservation

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

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

49. Which kind of therapy was given in 1990 to a four-year-old girl with adenosine deaminase (ADA) deficiency?

- (1) Radiation therapy
- (2) Gene therapy
- (3) Chemotherapy
- (4) Immunotherapy

50. How many hot spots of biodiversity in the world have been identified till date by Norman Myers?

- (1) 43
- (2) 17
- (3) 25
- (4) 34

52. Which of the following is **correct** for r-selected species?

- (1) Small number of progeny with large size
- (2) Large number of progeny with small size
- (3) Large number of progeny with large size
- (4) Small number of progeny with small size

53. If '+' sign is assigned to beneficial interaction, '-' sign to detrimental and '0' sign to neutral interaction, then the population interaction represented by '+' '-' refers to

- (1) parasitism
- (2) mutualism
- (3) amensalism
- (4) commensalism

54. Which of the following is **correctly** matched?

- (1) Stratification—Population
- (2) Aerenchyma—*Opuntia*
- (3) Age pyramid—Biome
- (4) *Parthenium hysterophorus*—Threat to biodiversity

55. Red List contains data or information on

- (1) marine vertebrates only
- (2) all economically important plants
- (3) plants whose products are in international trade
- (4) threatened species

57. Methanogens belong to

- (1) Slime moulds
- (2) Eubacteria
- (3) Archaeobacteria
- (4) Dinoflagellates

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58. Select the **wrong** statement.

- (1) Diatoms are microscopic and float passively in water.
- (2) The walls of diatoms are easily destructible.
- (3) 'Diatomaceous earth' is formed by the cell walls of diatoms.
- (4) Diatoms are chief producers in the oceans.

59. The label of a herbarium sheet **does not** carry information on

- (1) height of the plant
- (2) date of collection
- (3) name of collector
- (4) local names

60. Conifers are adapted to tolerate extreme environmental conditions because of

- (1) presence of vessels
- (2) broad hardy leaves
- (3) superficial stomata
- (4) thick cuticle

61. Which one of the following statements is **wrong** ?

- (1) *Laminaria* and *Sargassum* are used as food.
- (2) Algae increase the level of dissolved oxygen in the immediate environment.
- (3) Algin is obtained from red algae, and carrageenan from brown algae.
- (4) Agar-agar is obtained from *Gelidium* and *Gracilaria*.

Sesbania, Gulmohar, groundnut, radish, gram and turnip have **stamens** with different lengths in their flowers?

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- (1) Six
- (2) Three
- (3) Four
- (4) Five

64. Radial symmetry is found in the flowers of

- (1) *Cassia*
- (2) *Brassica*
- (3) *Trifolium*
- (4) *Pisum*

65. Free-central placentation is found in

- (1) *Citrus*
- (2) *Dianthus*
- (3) *Argemone*
- (4) *Brassica*

66. Cortex is the region found between

- (1) endodermis and vascular bundle
- (2) epidermis and stele
- (3) pericycle and endodermis
- (4) endodermis and pith

67. The balloon-shaped structures called tyloses

- (1) are linked to the ascent of sap through xylem vessels
- (2) originate in the lumen of vessels
- (3) characterize the sapwood
- (4) are extensions of xylem parenchyma cells into vessels

(1) ~~Melanogens~~ Prokaryotes

(2) ~~Gas vacuoles~~—Green bacteria

(3) Large central vacuoles—Animal cells

(4) Protists—Eukaryotes

70. Select the **wrong** statement.

(1) ~~Mycoplasma~~ is a wall-less microorganism.

(2) Bacterial cell wall is made up of peptidoglycan.

(3) Pili and fimbriae are mainly involved in motility of bacterial cells.

(4) Cyanobacteria lack flagellated cells.

71. A cell organelle containing hydrolytic enzymes is

(1) mesosome

(2) ~~lysosome~~

(3) microsome

(4) ribosome

72. During cell growth, DNA synthesis takes place in

(1) ~~M phase~~

(2) S phase

(3) G<sub>1</sub> phase

(4) G<sub>2</sub> phase

73. Which of the following biomolecules is common to respiration-mediated breakdown of fats, carbohydrates and proteins?

(1) Acetyl CoA

(2) ~~Glucose-6-phosphate~~

(3) Fructose 1,6-bisphosphate

(4) Pyruvic acid

75. You are given a tissue with its potential for differentiation in an artificial culture. Which of the following pairs of hormones would you add to the medium to secure shoots as well as roots?

(1) Gibberellin and abscisic acid

(2) IAA and gibberellin

(3) Auxin and cytokinin

(4) Auxin and abscisic acid

76. Phytochrome is a

(1) chromoprotein

(2) flavoprotein

(3) glycoprotein

(4) ~~lipoprotein~~

77. Which is essential for the growth of root tip?

(1) ~~Mn~~

(2) Zn

(3) Fe

(4) Ca

78. The process which makes major difference between C<sub>3</sub> and C<sub>4</sub> plants is

(1) respiration

(2) glycolysis

(3) ~~Calvin cycle~~

(4) photorespiration

79. Which one of the following statements is **not** correct?

(1) Water hyacinth, growing in the standing water, drains oxygen from water that leads to the death of fishes.

(2) ~~Offspring produced by the asexual reproduction are called clone.~~

(3) Microscopic, motile asexual reproductive structures are called zoospores.

(4) In potato, banana and ginger, the plantlets arise from the internodes present in the modified stem.



select the correct option using the codes given below :

**Column—I**

- Pistils fused together
- Formation of gametes
- Hyphae of higher Ascomycetes
- Unisexual female flower

**Column—II**

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- Pistillate
- Syncarpous
- Dikaryotic

**Codes :**

- |     | a     | b     | c    | d     |
|-----|-------|-------|------|-------|
| (1) | (iii) | (i)   | (iv) | (ii)  |
| (2) | (iv)  | (iii) | (i)  | (ii)  |
| (3) | (ii)  | (i)   | (iv) | (iii) |
| (4) | (i)   | (ii)  | (iv) | (iii) |

82. In majority of angiosperms

- a small central cell is present in the embryo sac
- egg has a filiform apparatus
- there are numerous antipodal cells
- reduction division occurs in the megaspore mother cells

83. Pollination in water hyacinth and water lily is brought about by the agency of

- bats
- water
- insects or wind
- birds

84. The ovule of an angiosperm is technically equivalent to

- megaspore
- megasporangium
- megasporophyll
- megaspore mother cell

86. The mechanism that causes recombination from one linkage group to another is called

- crossing-over
- inversion
- duplication
- translocation

87. The equivalent of a structural gene is

- recon
- muton
- cistron
- operon

88. A true breeding plant is

- always homozygous recessive in its genetic constitution
- one that is able to breed on its own
- produced due to cross-pollination among unrelated plants
- near homozygous and produces offspring of its own kind

89. Which of the following rRNAs acts as structural RNA as well as ribozyme in bacteria?

- 5-8 S rRNA
- 5 S rRNA
- 18 S rRNA
- 23 S rRNA

90. Stirred-tank bioreactors have been designed for

- ensuring anaerobic conditions in the culture vessel
- purification of product
- addition of preservatives to the product
- availability of oxygen throughout the process

92. DNA-dependent RNA polymerase catalyzes transcription on one strand of the DNA which is called the

- (1) antistrand
- (2) template strand
- (3) coding strand
- (4) alpha strand

93. Interspecific hybridization is the mating of

- (1) more closely related individuals within same breed for 4-6 generations
- (2) animals within same breed without having common ancestors
- (3) two different related species
- (4) superior males and females of different breeds

94. Which of the following is correct regarding AIDS causative agent HIV?

- (1) HIV does not escape but attacks the acquired immune response.
- (2) HIV is enveloped virus containing one molecule of single-stranded RNA and one molecule of reverse transcriptase.
- (3) HIV is enveloped virus that contains two identical molecules of single-stranded RNA and two molecules of reverse transcriptase.
- (4) HIV is unenveloped retrovirus.

95. Among the following edible fishes, which one is a marine fish having rich source of omega-3 fatty acids?

- (1) Mackerel
- (2) Mystus
- (3) Mangur
- (4) Mrigala

a b c d  
(1) (iii) (iv) (i) (ii)  
(2) (iii) (i) (ii) (iv)  
(3) (iii) (i) (iv) (ii)  
(4) (i) (iv) (ii) (iii)

97. Biochemical Oxygen Demand (BOD) may not be a good index for pollution for water bodies receiving effluents from

- (1) sugar industry
- (2) domestic sewage
- (3) dairy industry
- (4) petroleum industry

98. The principle of competitive exclusion was stated by

- (1) Verhulst and Pearl
- (2) C. Darwin
- (3) G. F. Gause
- (4) MacArthur

99. Which of the following National Parks is home to the famous musk deer or hangul?

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

100. A lake which is rich in organic waste may result in

- (1) mortality of fish due to lack of oxygen
- (2) increased population of aquatic organisms due to minerals
- (3) drying of the lake due to algal bloom
- (4) increased population of fish due to lots of nutrients

101. The highest DDT concentration in aquatic food chain shall occur in

- (1) eel
- (2) phytoplankton
- (3) seagull
- (4) crab

- a. Family (i) Diptera  
b. Order (ii) Arthropoda  
c. Class (iii) Muscidae  
d. Phylum (iv) Insecta

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**Codes :**

	a	b	c	d
(1)	(iv)	(ii)	(i)	(iii)
(2)	(iii)	(i)	(iv)	(ii)
(3)	(iii)	(ii)	(iv)	(i)
(4)	(iv)	(iii)	(ii)	(i)

**104.** Choose the **correct** statement.

- (1) All Pisces have gills covered by an operculum.  
(2) All mammals are viviparous.  
(3) All cyclostomes do not possess jaws and paired fins.  
(4) All reptiles have a three-chambered heart.

**105.** Study the four statements (A-D) given below and select the two correct ones out of them :

- A. Definition of biological species was given by Ernst Mayr.  
B. Photoperiod does not affect reproduction in plants.  
C. Binomial nomenclature system was given by R. H. Whittaker.  
D. In unicellular organisms, reproduction is synonymous with growth.

The two **correct** statements are

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

**106.** In male cockroaches, sperms are stored in which part of the reproductive system?

- (1) Vas deferens  
(2) Seminal vesicles  
(3) Mushroom glands  
(4) Testes

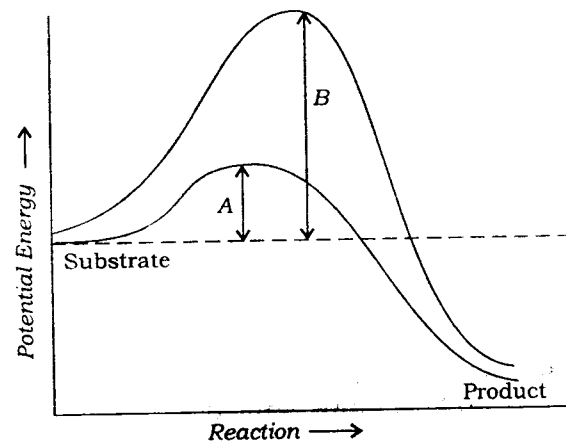
**107.** Smooth muscles are

- (1) voluntary, spindle-shaped, uninucleate  
(2) involuntary, fusiform, non-striated  
(3) voluntary, multinucleate, cylindrical  
(4) involuntary, cylindrical, striated

involved in stabilizing the three-dimensional folding of most proteins?

- (1) Ester bonds  
(2) www.FirstRanker.com  
(3) Electrostatic interaction  
(4) Hydrophobic interaction

**110.** Which of the following describes the given graph **correctly**?



- (1) Exothermic reaction with energy A in absence of enzyme and B in presence of enzyme  
(2) Endothermic reaction with energy A in presence of enzyme and B in absence of enzyme  
(3) Exothermic reaction with energy A in presence of enzyme and B in absence of enzyme  
(4) Endothermic reaction with energy A in absence of enzyme and B in presence of enzyme

**111.** When cell has stalled DNA replication fork, which checkpoint should be predominantly activated?

- (1) Both G<sub>2</sub>/M and M  
(2) G<sub>1</sub>/S  
(3) G<sub>2</sub>/M  
(4) M

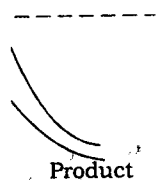
Codes :

	a	b	c	d
(1)	(iv)	(iii)	(ii)	(i)
(2)	(iii)	(iv)	(ii)	(i)
(3)	(i)	(iv)	(ii)	(iii)
(4)	(ii)	(iv)	(iii)	(i)

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is the given



energy A in presence of

energy A in absence of

energy A in absence of

energy A in presence of

lication fork, redominantly

119. Which hormones do stimulate the production of pancreatic juice and bicarbonate?

- (1) Insulin and glucagon
- (2) Angiotensin and epinephrine
- (3) Gastrin and insulin
- (4) Cholecystokinin and secretin

120. The partial pressure of oxygen in the alveoli of the lungs is

- (1) less than that of carbon dioxide
- (2) equal to that in the blood
- (3) more than that in the blood
- (4) less than that in the blood

121. Choose the correct statement.

- (1) Receptors do not produce graded potentials.
- (2) Nociceptors respond to changes in pressure.
- (3) Meissner's corpuscles are thermoreceptors.
- (4) Photoreceptors in the human eye are depolarized during darkness and become hyperpolarized in response to the light stimulus.

122. Graves' disease is caused due to

- (1) hypersecretion of adrenal gland
- (2) hyposecretion of thyroid gland
- (3) hypersecretion of thyroid gland
- (4) hyposecretion of adrenal gland

(2) Erythrocytes

(3) Leucocytes

(4) Neutrophils

119. Name a peptide hormone which acts mainly on hepatocytes, adipocytes and enhances cellular glucose uptake and utilization.

- (1) Gastrin
- (2) Insulin
- (3) Glucagon
- (4) Secretin

120. Osteoporosis, an age-related disease of skeletal system, may occur due to

- (1) accumulation of uric acid leading to inflammation of joints
- (2) immune disorder affecting neuromuscular junction leading to fatigue
- (3) high concentration of  $Ca^{++}$  and  $Na^{+}$
- (4) decreased level of estrogen

121. Serum differs from blood in

- (1) lacking antibodies
- (2) lacking globulins
- (3) lacking albumins
- (4) lacking clotting factors

122. Lungs do not collapse between breaths and some air always remains in the lungs which can never be expelled because

- (1) pressure in the lungs is higher than the atmospheric pressure
- (2) there is a negative pressure in the lungs
- (3) there is a negative intrapleural pressure pulling at the lung walls
- (4) there is a positive intrapleural pressure

123. The posterior pituitary gland is not a 'true' endocrine gland because

- (1) it secretes enzymes
- (2) it is provided with a duct
- (3) it only stores and releases hormones
- (4) it is under the regulation of hypothalamus

- (2) LNG-20  
(3) Multiload 375  
(4) Lippes loop
126. Which of the following is correct regarding vasectomy?  
(1) Irreversible sterility  
(2) No sperm occurs in seminal fluid  
(3) No sperm occurs in epididymis  
(4) Vasa deferentia is cut and tied
127. Embryo with more than 16 blastomeres formed due to *in vitro* fertilization is transferred into  
(1) cervix  
(2) uterus  
(3) fallopian tube  
(4) fimbriae
128. Which of the following depicts the correct pathway of transport of sperms?  
(1) Efferent ductules → Rete testis → Vas deferens → Epididymis  
(2) Rete testis → Efferent ductules → Epididymis → Vas deferens  
(3) Rete testis → Epididymis → Efferent ductules → Vas deferens  
(4) Rete testis → Vas deferens → Efferent ductules → Epididymis
129. Match Column—I with Column—II and select the correct option using the codes given below :
- | Column—I         |                                 | Column—II |  |
|------------------|---------------------------------|-----------|--|
| a. Mons pubis    | (i) Embryo formation            |           |  |
| b. Antrum        | (ii) Sperm                      |           |  |
| c. Trophoctoderm | (iii) Female external genitalia |           |  |
| d. Nebenkern     | (iv) Graafian follicle          |           |  |
- Codes :**
- |     | a     | b    | c     | d    |
|-----|-------|------|-------|------|
| (1) | (i)   | (iv) | (iii) | (ii) |
| (2) | (iii) | (iv) | (ii)  | (i)  |
| (3) | (iii) | (iv) | (i)   | (ii) |
| (4) | (iii) | (i)  | (iv)  | (ii) |

probability of their son being colour-blind

- (1) 1  
(2) 0  
(3)  $\frac{1}{16}$   
(4) 0.75
132. Genetic drift operates in  
(1) slow reproductive population  
(2) small isolated population  
(3) large isolated population  
(4) non-reproductive population
133. In Hardy-Weinberg equation, the frequency of heterozygous individual is represented by  
(1)  $q^2$   
(2)  $p^2$   
(3)  $2pq$   
(4)  $pq$
134. The chronological order of human evolution from early to the recent is  
(1) *Australopithecus* → *Homo habilis* → *Ramapithecus* → *Homo erectus*  
(2) *Australopithecus* → *Ramapithecus* → *Homo habilis* → *Homo erectus*  
(3) *Ramapithecus* → *Australopithecus* → *Homo habilis* → *Homo erectus*  
(4) *Ramapithecus* → *Homo habilis* → *Australopithecus* → *Homo erectus*
135. Which of the following is the correct sequence of events in the origin of life?  
I. Formation of protobionts  
II. Synthesis of organic monomers  
III. Synthesis of organic polymers  
IV. Formation of DNA-based genetic system  
(1) II, III, IV, I  
(2) I, II, III, IV  
(3) I, III, II, IV  
(4) II, III, I, IV

colour vision,  
colour-blind

- (3) concave,  $-0.25$  diopter  
(4) concave,  $-0.2$  diopter

137. A linear aperture whose width is  $0.02$  cm is placed immediately in front of a lens of focal length  $60$  cm. The aperture is illuminated normally by a parallel beam of wavelength  $5 \times 10^{-5}$  cm. The distance of the first dark band of the diffraction pattern from the centre of the screen is

- (1)  $0.15$  cm  
(2)  $0.10$  cm  
(3)  $0.25$  cm  
(4)  $0.20$  cm

138. Electrons of mass  $m$  with de-Broglie wavelength  $\lambda$  fall on the target in an X-ray tube. The cutoff wavelength ( $\lambda_0$ ) of the emitted X-ray is

- (1)  $\lambda_0 = \lambda$   
(2)  $\lambda_0 = \frac{2mc\lambda^2}{h}$   
(3)  $\lambda_0 = \frac{2h}{mc}$   
(4)  $\lambda_0 = \frac{2m^2c^2\lambda^3}{h^2}$

139. Photons with energy  $5$  eV are incident on a cathode  $C$  in a photoelectric cell. The maximum energy of emitted photoelectrons is  $2$  eV. When photons of energy  $6$  eV are incident on  $C$ , no photoelectrons will reach the anode  $A$ , if the stopping potential of  $A$  relative to  $C$  is

- (1)  $-3$  V  
(2)  $+3$  V  
(3)  $+4$  V  
(4)  $-1$  V

(3)  $\frac{1}{16}\lambda$

(4)  $\frac{1}{7}\lambda$

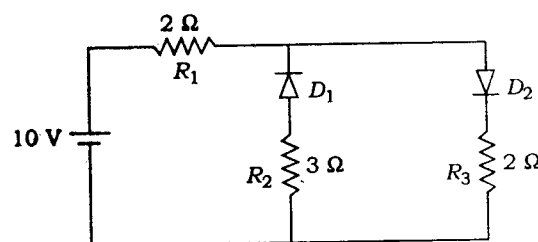
141. The half-life of a radioactive substance is  $30$  minutes. The time between  $40\%$  decay and  $85\%$  decay of the same radioactive substance is

- (1)  $60$   
(2)  $15$   
(3)  $30$   
(4)  $45$

142. For CE transistor amplifier, the audio signal voltage across the collector resistance of  $2$  k $\Omega$  is  $4$  V. If the current amplification factor of the transistor is  $100$  and the base resistance is  $1$  k $\Omega$ , then the input signal voltage is

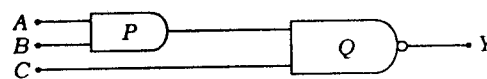
- (1)  $15$  mV  
(2)  $10$  mV  
(3)  $20$  mV  
(4)  $30$  mV

143. The given circuit has two ideal diodes connected as shown in the figure below. The current flowing through the resistance  $R_1$  will be



- (1)  $3.13$  A  
(2)  $2.5$  A  
(3)  $10.0$  A  
(4)  $1.43$  A

144. What is the output  $Y$  in the following circuit, when all the three inputs  $A$ ,  $B$ ,  $C$  are first  $0$  and then  $1$ ?



- (1)  $1, 1$   
(2)  $0, 1$   
(3)  $0, 0$   
(4)  $1, 0$

MD/E2

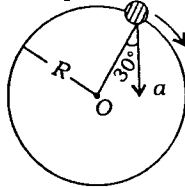
(3)  $\frac{\sqrt{10}}{c^{5/2}}$

(4)  $\sqrt{\frac{10}{G}}$

146. Two cars  $P$  and  $Q$  start from a point at the same time. Their positions are represented by  $x_P(t) = at + bt^2$  and  $x_Q(t) = ft - t^2$ . At what time do the cars have the same velocity?

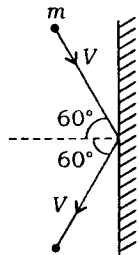
- (1)  $\frac{f-a}{2(1+b)}$  (2)  $\frac{a-f}{1+b}$   
(3)  $\frac{a+f}{2(b-1)}$  (4)  $\frac{a+f}{2(1+b)}$

147. In the given figure,  $a = 15 \text{ m/s}^2$  represents the total acceleration of a particle moving in the clockwise direction in a circle of radius  $R = 2.5 \text{ m}$  at a given instant of time. The speed of the particle is



- (1)  $6.2 \text{ m/s}$  (2)  $4.5 \text{ m/s}$   
(3)  $5.0 \text{ m/s}$  (4)  $5.7 \text{ m/s}$

148. A rigid ball of mass  $m$  strikes a rigid wall at  $60^\circ$  and gets reflected without loss of speed as shown in the figure below. The value of impulse imparted by the wall on the ball will be



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

JMD/E2

16

(2)  $100 \text{ m s}^{-1}$

(3)  $80 \text{ m s}^{-1}$

(4)  $120 \text{ m s}^{-1}$

150. Two identical balls  $A$  and  $B$  having velocities of  $0.5 \text{ m/s}$  and  $-0.3 \text{ m/s}$  respectively collide elastically in one dimension. The velocities of  $B$  and  $A$  after the collision respectively

- (1)  $0.3 \text{ m/s}$  and  $0.5 \text{ m/s}$   
(2)  $-0.5 \text{ m/s}$  and  $0.3 \text{ m/s}$   
(3)  $0.5 \text{ m/s}$  and  $-0.3 \text{ m/s}$   
(4)  $-0.3 \text{ m/s}$  and  $0.5 \text{ m/s}$

151. A particle moves from a point  $(-2\hat{i} + 4\hat{j} + 3\hat{k})$  when a force of  $(4\hat{i} + 3\hat{j} + 3\hat{k})$  is applied. How much work has been done by the force?

- (1)  $2 \text{ J}$   
(2)  $8 \text{ J}$   
(3)  $11 \text{ J}$   
(4)  $5 \text{ J}$

152. Two rotating bodies  $A$  and  $B$  of masses  $m$  and  $2m$  with moments of inertia  $I_A$  and  $I_B$  ( $I_B > I_A$ ) have equal kinetic energy in rotation. If  $L_A$  and  $L_B$  be their angular momenta respectively, then

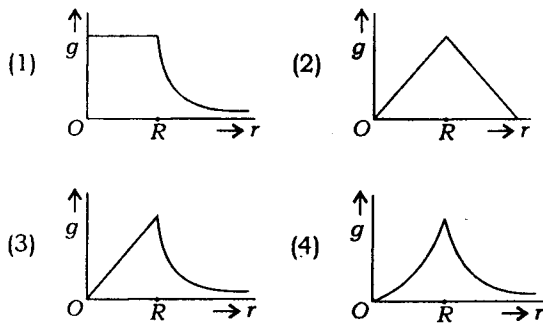
- (1)  $L_A > L_B$   
(2)  $L_A = \frac{L_B}{2}$   
(3)  $L_A = 2L_B$   
(4)  $L_B > L_A$

(4) 1 : 4

14. A light rod of length  $l$  has two masses  $m_1$  and  $m_2$  attached to its two ends. The moment of inertia of the system about an axis perpendicular to the rod and passing through the centre of mass is

(1)  $\sqrt{m_1 m_2} l^2$  (2)  $\frac{m_1 m_2}{m_1 + m_2} l^2$   
(3)  $\frac{m_1 + m_2}{m_1 m_2} l^2$  (4)  $(m_1 + m_2) l^2$

15. Starting from the centre of the earth having radius  $R$ , the variation of  $g$  (acceleration due to gravity) is shown by



16. A satellite of mass  $m$  is orbiting the earth (of radius  $R$ ) at a height  $h$  from its surface. The total energy of the satellite in terms of  $g_0$ , the value of acceleration due to gravity at the earth's surface, is

(1)  $-\frac{2mg_0 R^2}{R+h}$   
(2)  $\frac{mg_0 R^2}{2(R+h)}$   
(3)  $-\frac{mg_0 R^2}{2(R+h)}$   
(4)  $\frac{2mg_0 R^2}{R+h}$

in three identical capillaries. The angles of contact  $\theta_1$ ,  $\theta_2$  and  $\theta_3$  obey

(1)  $\pi > \theta_1 > \theta_2 > \theta_3 > \frac{\pi}{2}$   
(2)  $\frac{\pi}{2} > \theta_1 > \theta_2 > \theta_3 \geq 0$   
(3)  $0 \leq \theta_1 < \theta_2 < \theta_3 < \frac{\pi}{2}$   
(4)  $\frac{\pi}{2} < \theta_1 < \theta_2 < \theta_3 < \pi$

159. Two identical bodies are made of a material for which the heat capacity increases with temperature. One of these is at  $100^\circ\text{C}$ , while the other one is at  $0^\circ\text{C}$ . If the two bodies are brought into contact, then, assuming no heat loss, the final common temperature is

(1)  $0^\circ\text{C}$   
(2)  $50^\circ\text{C}$   
(3) more than  $50^\circ\text{C}$   
(4) less than  $50^\circ\text{C}$  but greater than  $0^\circ\text{C}$

160. A body cools from a temperature  $3T$  to  $2T$  in 10 minutes. The room temperature is  $T$ . Assume that Newton's law of cooling is applicable. The temperature of the body at the end of next 10 minutes will be

(1)  $T$  (2)  $\frac{7}{4}T$   
(3)  $\frac{3}{2}T$  (4)  $\frac{4}{3}T$

161. One mole of an ideal monatomic gas undergoes a process described by the equation  $PV^3 = \text{constant}$ . The heat capacity of the gas during this process is

(1)  $R$  (2)  $\frac{3}{2}R$   
(3)  $\frac{5}{2}R$  (4)  $2R$

D/E2

17

[ P.T.O.



163. A given sample of an ideal gas occupies a volume  $V$  at a pressure  $P$  and absolute temperature  $T$ . The mass of each molecule of the gas is  $m$ . Which of the following gives the density of the gas?

- (1)  $mkT$  (2)  $P/(kT)$   
(3)  $Pm/(kT)$  (4)  $P/(kTV)$

164. A body of mass  $m$  is attached to the lower end of a spring whose upper end is fixed. The spring has negligible mass. When the mass  $m$  is slightly pulled down and released, it oscillates with a time period of 3 s. When the mass  $m$  is increased by 1 kg, the time period of oscillations becomes 5 s. The value of  $m$  in kg is

- (1)  $\frac{9}{16}$  (2)  $\frac{3}{4}$   
(3)  $\frac{4}{3}$  (4)  $\frac{16}{9}$

165. The second overtone of an open organ pipe has the same frequency as the first overtone of a closed pipe  $L$  metre long. The length of the open pipe will be

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

166. Three sound waves of equal amplitudes have frequencies  $(n-1)$ ,  $n$ ,  $(n+1)$ . They superimpose to give beats. The number of beats produced per second will be

- (1) 2 (2) 1  
(3) 4 (4) 3

167. An electric dipole is placed at an angle of  $30^\circ$  with an electric field intensity  $2 \times 10^5$  N/C. It experiences a torque equal to 4 N m. The charge on the dipole, if the dipole length is 2 cm, is

- (1) 7  $\mu$ C  
(2) 8 mC  
(3) 2 mC  
(4) 5 mC

JMD/E2

$$R = 330$$



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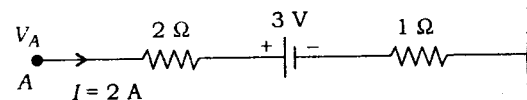
$$(1) \frac{1}{k} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3} + \frac{3}{2k_4}$$

$$(2) k = k_1 + k_2 + k_3 + 3k_4$$

$$(3) k = \frac{2}{3}(k_1 + k_2 + k_3) + 2k_4$$

$$(4) \frac{2}{k} = \frac{3}{k_1 + k_2 + k_3} + \frac{1}{k_4}$$

169. The potential difference ( $V_A - V_B$ ) between the points A and B in the given figure is



- (1) +9 V (2) -3 V  
(3) +3 V (4) +6 V

170. A filament bulb (500 W, 100 V) is to be used in a 230 V main supply. When a resistor is connected in series, it works perfectly. The bulb consumes 500 W. The value of  $R$  is

- (1) 13  $\Omega$  (2) 230  $\Omega$   
(3) 46  $\Omega$  (4) 26  $\Omega$

171. A long wire carrying a steady current is bent into a circular loop of one turn. The magnetic field at the centre of the loop is  $B$ . It is then bent into a circular coil of  $n$  turns. The magnetic field at the centre of this coil of  $n$  turns will be

- (1)  $2n^2B$  (2)  $nB$   
(3)  $n^2B$  (4)  $2nB$

500W, 100V, 230V

