For students presently in

Class – 12 & 12 Pass Code: 124272.0

Biology, Physics & Chemistry – PAPER - 2

Time Duration: 3 Hours **Maximum Marks: 720**

Instructions

Caution: Class, Paper, Code as given above MUST be correctly marked in the answer OMR sheet before attempting the paper. Wrong Class, Paper or Code will give wrong results.

1. This Question Paper contains only **3 Sections**. All questions will be Multiple Choice with single correct option out of four choices. The marking scheme is as per the table given below:

Section	Subject	Question No.	Marking Scheme for each questions	
			Correct Answer	Wrong Answer
Section – I	Biology	Q.NO: 1 to 90	+4	-1
Section - II	Physics	Q.NO: 1 to 45	+4	-1
Section - III	Chemistry	Q.NO: 1 to 45	+4	-1

2. Answers have to be marked on the OMR sheet. The Question Paper contains blank spaces for your rough work. No additional sheets will be provided for rough work.
3. Blank papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.
4. Before attempting paper write your Registration Number, Name and Test Centre in the space provided at the bottom of this sheet

Note: Please check this Question Paper contains all **180** questions. If not so, exchange for the correct Question Paper.

Biology Section - I

Straight Objective Type

Biology contains 90 multiple choice questions numbered 1 to 90. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

1. Which of the following statements is not true?
   (A) All members of the kingdom Animalia are multicellular
   (B) Nature of coelom is used as one of the basis of animal classification
   (C) There is no need of classification now as over a million species of animals have been described till now
   (D) The arrangement of cells in the body is one of the classifying feature of the animals

2. The lamprey (Petromyzon) is included in the same taxonomic class as the
   (A) Cephalaspis (B) Ambystoma (C) Neoceratodus (D) Hagfish (Myxine)

3. Which of the following statements is not true for Agnatha members?
   (A) They include hagfishes and lampreys (B) They have notochord throughout their lives
   (C) They are known as cyclostomes (D) They have bony skeletons

4. Plant tissues are divided into meristematic and permanent tissues on which of the following basis?
   (A) Whether the plant is a dicot or a monocot
   (B) Whether the cells being formed are capable of dividing or not
   (C) Position
   (D) Origin

5. The central lumens are obliterated in
   (A) Xylem fibres (B) Phloem parenchyma
   (C) Xylem parenchyma (D) Sieve tubes

6. Which of the following is true for endarch type of primary xylem?
   (A) Protoxylem lies towards the periphery of the organ
   (B) Metaxylem lies towards the periphery of the organ
   (C) Metaxylem lies towards the pith of the organ
   (D) Protophloem lies towards the pith of the organ

7. According to five kingdom system, gymnosperms and angiosperms are grouped under the kingdom
   (A) Monera (C) Protista (C) Fungi (D) Plantae

Space for rough work

8. Which organisms are not included in the five kingdom system of classification?
(A) Protozoans (B) Viruses (C) Lichens (D) Both (2) & (3)

9. Who for the first time classified organisms on the basis of scientific approach?
(A) Aristotle (B) Linnaeus (C) Whittaker (D) Pasteur

10. The Evil Quartet represents the major causes of
(A) Soil pollution (B) Inbreeding depression
(C) Biodiversity losses (D) Air pollution

11. Which of the following is the most important cause driving animals and plants to extinction?
(A) Alien species invasions (B) Co-extinctions
(C) Habitat loss and fragmentation (D) Over-exploitation

12. When a host fish species becomes extinct, its unique assemblage of parasites also meets the same fate. It is an example of
(A) Co-extinction (B) Alien species invasion
(C) Over-exploitation (D) Habitat loss

13. Respiratory organs in aquatic arthropods like cray fish, prawn and molluscs like Unio are
(A) Body wall (B) Lungs (C) Trachea (D) Gills

14. Which structure in human respiratory system is involved in conditioning of air?
(A) Internal nares (B) Nasal chamber (C) Larynx (D) Trachea

15. The volume of air remaining in the lungs even after a forceful expiration is
(A) Tidal volume (B) Residual volume
(C) Inspiratory reserve volume (D) Expiratory reserve volume

16. Which of the following structure is present only in prokaryotic cell?
(A) Plasmid (B) Nucleus (C) Mitochondria (D) Ribosomes

17. The smallest cell of 0.3 μm in length is
(A) Ostrich egg (B) Cyanobacteria (C) Bacteria (D) Mycoplasma

18. The genomic DNA of a bacterium is
(A) Circular (B) Linear (C) Segmented (D) Rod shaped

Space for rough work

19. Which of the following cell organelles is not considered as a part of an endomembrane system?
(A) Mitochondria (B) ER (C) Golgi complex (D) Lysosomes

20. A phase of the cell cycle which lasts more than 95% of the total duration is
(A) Prophase (B) Interphase (C) Anaphase (D) Telophase

21. Most dramatic period of cell cycle is
(A) G1 phase (B) G2 phase (C) S phase (D) M phase

22. Two daughter cells formed after mitosis are
(A) Non-identical to each other (B) Identical to each other
(C) Non-identical to parents (D) Irregular in size

23. A cell division in which a diploid somatic cell divides into two identical daughter cells is called
(A) Meiosis I (B) Meiosis II (C) Mitosis (D) Cytokinesis

24. Which type of cell division is called somatic cell division?
(A) Meiosis I (B) Meiosis II (C) Reduction division (D) Mitosis

25. Mitosis occurs in
(A) Meristematic cells (B) Undifferentiated germ cells
(C) Somatic cells (D) More than one option is correct

26. The first phase of mitosis which follows interphase is
(A) Metaphase (B) Prophase (C) Telophase (D) Anaphase

27. Initiation of condensation of chromatin material occurs in
(A) Prophase (B) Anaphase (C) Telophase (D) Metaphase

28. Mitotic spindle initiates during
(A) Telophase (B) Anaphase (C) Prophase (D) Metaphase

29. Lymph ultimately release the absorbed substances into
(A) Lymphatic capillaries (B) Blood stream (veins)
(C) Lymph node (D) Lymphatic duct

30. Mixing of oxygenated and deoxygenated blood occurs in the heart of
(A) Bird (B) Crocodile (C) Rabbit (D) Frog

Space for rough work

31. Human heart is derived from
(A) Ectoderm (B) Mesoderm (C) Endoderm (D) Both (1) & (3)

32. Pavement epithelium is an alternate name for
(A) Squamous epithelium (B) Cuboidal epithelium
(C) Ciliated epithelium (D) Compound epithelium

33. Brush bordered columnar epithelial tissue is located in
(A) Fallopian tube (B) Oesophagus (C) Trachea (D) Small intestine

34. Which of the following cells of connective tissue secrete antibodies?
(A) Mast cells (B) Plasma cells (C) Macrophages (D) Fibroblasts

35. The movements which results in change of place or location constitutes
(A) Locomotion (B) Protoplasmic streaming
(C) Vital movement (D) Elasticity

36. Which of the following is not a function of locomotion?
(A) Procurement of food (B) Finding mate
(C) Peristaltic movements (D) Searching and building of shelter

37. The two cells of the body which show pseudopodial movement are
(A) RBC and WBC (B) WBC and macrophages
(C) Liver cell and WBC (D) Macrophages and liver cell

38. The ionic gradients across the resting membrane are maintained by the
(A) Ion channels (B) Sodium-potassium pumps
(C) Electrical synapses (D) Chemical synapses

39. Action potential is also termed as
(A) Nerve impulse (B) Reflex action (C) Repolarisation (D) Polarisation

40. On application of a stimulus on the axonal membrane,
(A) There is a rapid influx of K+ at that site (B) There is a rapid efflux of Na+ at that site
(C) There is a rapid influx of Na+ at that site (D) There is a rapid efflux of K+ at that site

41. Which of the following glands are present in the brain?
(A) Parathyroid gland and thyroid gland (B) Pituitary gland and thymus
(C) Hypophysis and pineal gland (D) Pineal gland and thymus

Space for rough work

42. The two glands located in the neck region are
(A) Thyroid gland and parathyroid gland (B) Pituitary gland and pineal gland
(C) Adrenal gland and thymus (D) Pineal gland and thyroid gland

43. India is mainly an agricultural country. Agriculture accounts for approximately _____ of India's GDP.
(A) 38% (B) 33% (C) 40% (D) 42%

44. Select the variety developed by mutation breeding
(A) Pusa Swarnim (B) Parbhani Kranti (C) Pusa Sadabahar (D) Sharbati Sonora

45. What is the beneficial role of LAB in our stomach?
(A) Causes souring of milk by decreasing nutritional quality
(B) Increases the amount of vitamin-D
(C) Checks disease causing microbes
(D) It produces alkali which coagulate and partially digest the milk proteins

46. The microbe used for making bread is
(A) Saccharomyces cerevisiae (B) Saccharomyces ellipsoidens
(C) Saccharomyces pireformis (D) Saccharomyces sake

47. Male accessory glands include
(A) Paired seminal vesicles (B) A prostate gland
(C) Paired bulbourethral gland (D) All of these

48. The Graafian follicle ruptures to release _____ from the ovary by the process called ovulation.
(A) Primary oocyte
(B) Secondary oocyte after completing meiosis-II
(C) Secondary oocyte after completing meiosis-I and with the release of 1st polar body
(D) Mature ovum

49. Bile is stored and concentrated in
(A) Liver (B) Pancreas (C) Lungs (D) Gall bladder

50. Which organ of the following is present in abdominal cavity, just below diaphragm?
(A) Pharynx (B) Pancreas (C) Liver (D) Tongue

Space for rough work

51. In hydrarch succession, reed swamp stage is preceded by
(A) Forest community (B) Scrub stage (C) Sedge meadow stage (D) Floating stage

52. Ecological succession is _____ and _____ change in species composition.
(A) Orderly and sequential (B) Unpredictable and orderly
(C) Gradual and unsequential (D) Sequential and disorderly

53. Pioneer community established on a bare rock is
(A) Mosses (B) Lichens (C) Phytoplanktons (D) Higher plants

54. Euro-II is emission norms for reducing
(A) O_3 and CO (2) NO_2 and N_2O
(C) Sulphur and aromatic hydrocarbons (4) CO_2 and particulate matter

55. Ecosanitation is
(A) Sustainable system for handling human excreta
(B) Sustainable system for handling agricultural wastes
(C) Sustainable system for handling industrial effluents
(D) Sustainable system for handling biomagnification

56. Hospital wastes are
(A) Hazardous and disposed by incinerator (B) Non-hazardous and disposed by incinerator
(C) Hazardous and disposed into water (D) Non-hazardous and disposed into water

57. Loop of Henle is found in
(A) Green gland (B) Malpighian tubule (C) Neuron (D) Nephron

58. Nitrogenous metabolic wastes in our body are the products of
(A) Carbohydrates (B) Proteins (C) Lipids (D) Vitamins

59. Which of the following is also known as antidiuretic hormone?
(A) Oxytocin (B) Vasopressin (C) Adrenaline (D) Aldosterone

60. Which of the following abnormalities is due to autosomal dominant mutation?
(A) Colour blindness (B) Thalassemia (C) Myotonic dystrophy (D) Haemophilia

61. Absence or excess or abnormal arrangement of one or more chromosomes results in
(A) Point mutation (B) Chromosomal disorders
(C) Mendelian disorders (D) Gene mutation

Space for rough work

62. According to binomial nomenclature, every living organism has
(A) Two scientific names with single component (B) One scientific name with two components
(C) Two names, one Latin and other common (D) One common name with three components

63. Function of leghaemoglobin during N_2-fixation is
(A) To convert N_2 to NH_3 (B) To convert NH_3 to N_2
(3) To supply O_2 for nitrogenase activity (D) To protect nitrogenase from oxygen

64. In lac operon, the regulator gene codes for
(A) Aporepressor (B) Corepressor (C) Inactive repressor (D) Active repressor

65. Mark the correct one (w.r.t. application of DNA fingerprinting)
(A) Forensic science (B) Determining the population diversity
(C) Determining the genetic diversity (D) More than one option is correct

66. Adventitious roots of _____ get swollen and store food.
(A) Carrot (B) Turnip (C) Radish (D) Sweet potato

67. Supporting roots coming out of the lower nodes of the sugarcane stem are called
(A) Prop roots (B) Stilt roots (C) Pneumatophores (D) Fusiform roots

68. Smaller animals tend to lose body heat very fast as compared to larger animals because they have
(A) Higher surface to volume ratio (B) Lower surface to volume ratio
(C) Equal values of surface and volume (D) Very low BMR (basal metabolic rate)

69. Find out the mismatch pair
(A) Carrageen – Red algae (B) Algin – Brown algae
(C) Agar – Chlorella (D) Single celled protein – Spirulina

70. Chemiosmotic hypothesis for generation of ATP during light reaction was first explained by
(A) Hill (B) Arnold (C) P. Mitchell (D) Van Niel

71. The photosystem connected with splitting of water is
(A) PS II (B) PS I (C) Carotenoid (D) P700

72. Which phase of a sigmoid curve explains the initial phase of growth when growth rate is very slow?
(A) Log phase (B) Lag phase (C) Stationary phase (D) Maturation phase

73. Which of the following pathway was given by Embden, Meyerhof and Parnas?
(A) Glycolysis (B) Acetyl CoA formation step
(C) Krebs cycle (D) Pentose phosphate pathway

Space for rough work

74. Glycolysis occurs in
(A) All living cells (B) Only eukaryotic cells (C) Nerve cells (D) Only muscle cells

75. The two-celled stage of mature pollen grain consists of
(A) Vegetative cell, generative cell (B) Vegetative cell, one male gamete
(C) Two male gametes (D) Generative cell, one male gamete

76. In 40% angiosperms, the pollen grains are shed at
(A) Four-celled stage (B) Three-celled stage
(C) Two-celled stage (D) Five-celled stage

77. Pollen allergy is caused by pollens of
(A) Rose (B) Clematis (C) Parthenium (D) Sunflower

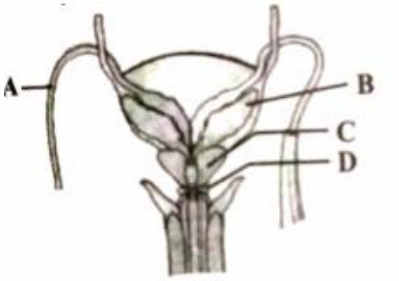
78. Exoskeleton of each segment in cockroach consists of
(A) Dorsal tergum and a ventral sternum (B) Dorsal sternum and a ventral tergum
(C) Sternum only (D) Tergum only

79. A cell is placed in 0.4 M solution of sugar and no change in volume of cell is found. What is the concentration of the cell sap?
(A) 40 M (B) 4 M (C) 0.4 M (D) 0.20 M

80. Select the odd one out w.r.t. porins
(A) Not associated with the inner membrane of plastids
(B) Associated with the outer membrane of mitochondria
(C) Found in outer membrane of gram positive bacteria
(D) Allow movement of low molecular weight hydrophilic substances.

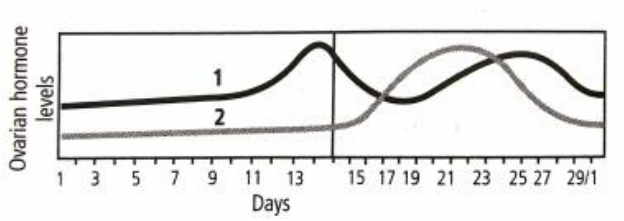
Space for rough work

81. The given figure shows a diagrammatic sketch of a portion of human male reproductive system.



Identify the parts labelled as A, B, C and D and select the correct option.
(A) A-Vas deferens, B-Seminal vesicle, C-Prostate, D-Bulbourethral gland
(B) A- Vas deferens, B-Seminal vesicle, C- Bulbourethral gland, D-Prostate
(C) A-Ureter, B-Seminal vesicle, C-Prostate, D-Bulbourethral gland
(D) A-Ureter, B-Prostate, C-Seminal vesicle, D-Bulbourethral gland

82. The following graph shows the levels of ovarian hormones during a menstrual cycle. What do 1 and 2 represent?



	1	2
(A)	Progesterone	Estrogen
(B)	FSH	LH
(C)	LH	FSH
(D)	Estrogen	Progesterone

83. Which of the following contraceptives are implanted under the skin?

(A) 

(B) 

(C) 

(D) 

Space for rough work

84. Refer to the given figure. What does it represent?

(A) Convergent evolution (B) Adaptive radiation
(C) Divergent evolution (D) Both (B) and (C)

85. Read the following statements carefully and select the correct ones,
(i) Alfred Wallace, a naturalist who worked in Malay Arachipelago had also come to similar conclusions as Darwin around the same time.
(ii) August Weisman by careful experimentation demonstrated that life comes only from pre-existing life.
(iii) The organs which have the same fundamental structure but are different in functions are called homologous organs.
(iv) Rate of appearance of new form is inversely proportional to life span of organism.
(A) (i) and (iii) (B) (i) and (ii) (C) (ii) and (iv) (D) (iii) and (iv)

86. Which of the following cells actively participate during allergy?
(A) B-lymphocytes (B) Liver cells (C) Mast cells (D) Red blood cells

87. Which of the following forms the key tools for recombinant DNA technology?
(i) Restriction endonucleases, ligases, vectors
(ii) Ligases, host organism, polymerase enzymes
(iii) Vectors, Taq polymerase, primers
(iv) Restriction exonucleases, ligases, primers, bioreactors
(A) (i), (ii) and (iii) (B) (i) and (ii) (C) (i), (iii) and (iv) (D) (iii) and (iv)

88. Which of the following is not a genetically modified organism (GMO)?
(A) Golden rice (B) Rosie (C)Ruppy (D) Dolly

89. Which of the following statements is/are correct?
(A) The current interest in the manipulation of microbes, plants and animals has raised serious ethical issues.
(B) One possible risk of genetic engineering is the accidental production of antibiotic resistant microorganisms
(C) Although risks are possible, genetic engineering offers more ofd a contribution to human welfare than threats.
(D) All of these.

90. In meiosis-I, condensation and coiling of chromatin fibres started during
(A) Metaphase (B) Leptotene (C) Diakinesis (D) Diplotene

Space for rough work

Physics Section - II

Straight Objective Type

Physics contains 45 multiple choice questions numbered 1 to 45. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

1. A force *F* is given by $F = at + bt^2$, where t is time. What are the dimensions of *a* and *b*
   (A) MLT^{-3} and ML^2T^{-4} (B) MLT^{-3} and MLT^{-4}
   (C) MLT^{-1} and MLT^{0} (D) MLT^{-4} and MLT^{1}

2. A force of 5 *N* acts on a particle along a direction making an angle of 60° with vertical. Its vertical component be
   (A) 10 *N* (B) 3 *N* (C) 4 *N* (D) 2.5 *N*

3. A body starts from the origin with an acceleration of 6 m/s^2 along the *x*-axis and 8 m/s^2 along the *y*-axis. Its distance from the origin after 4 seconds will be
   (A) 56 *m* (B) 64 *m* (C) 80 *m* (D) 128 *m*

4. A stone dropped from the top of the tower touches the ground in 4 *sec.* The height of the tower is about
   (A) 80 *m* (B) 40 *m* (C) 20 *m* (D) 160 *m*

5. A cricketer can throw a ball to a maximum horizontal distance of 100 *m*. With the same effort, he throws the ball vertically upwards. The maximum height attained by the ball is
   (A) 100 *m* (B) 80 *m* (C) 60 *m* (D) 50 *m*

6. A bird is sitting in a wire cage hanging from the spring balance. Let the reading of the spring balance be W_1. If the bird flies about inside the cage, the reading of the spring balance is W_2. Which of the following is true
   (A) $W_1 = W_2$ (B) $W_1 > W_2$
   (C) $W_1 < W_2$ (D) Nothing definite can be predicted

7. On the horizontal surface of a truck (« = 0.6), a block of mass 1 *kg* is placed. If the truck is accelerating at the rate of 5m/sec^2 then frictional force on the block will be
   (A) 5 *N* (B) 6 *N* (C) 5.88 *N* (D) 8 *N*

8. A force $F = (5\hat{i} + 3\hat{j})$ *N* is applied over a particle which displaces it from its origin to the point $r = (2\hat{i} - 1\hat{j})$ *metres*. The work done on the particle is
   (A) –7 *J* (B) +13 *J* (C) +7 *J* (D) +11 *J*

Space for rough work

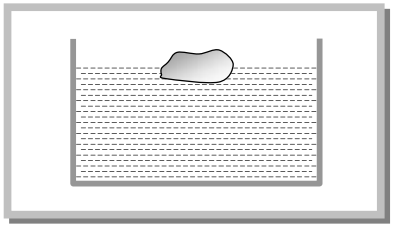
9. A car of mass $400kg$ and travelling at 72 *kmph* crashes into a truck of mass $4000kg$ and travelling at 9 *kmph*, in the same direction. The car bounces back at a speed of 18 *kmph*. The speed of the truck after the impact is(A) 9 *kmph* (B) 18 *kmph* (C) 27 *kmph* (D) None of these

10. The velocities of three particles of masses 20*g*, 30*g* and 50 *g* are $10\vec{i}, 10\vec{j}, \text{and } 10\vec{k}$ respectively. The velocity of the centre of mass of the three particles is
(A) $2\vec{i}+3\vec{j}+5\vec{k}$ (B) $10(\vec{i}+\vec{j}+\vec{k})$ (C) $20\vec{i}+30\vec{j}+5\vec{k}$ (D) $2\vec{i}+30\vec{j}+50\vec{k}$

11. A thin circular ring of mass *M* and radius *R* is rotating about its axis with a constant angular velocity μ. Four objects each of mass *m*, are kept gently to the opposite ends of two perpendicular diameters of the ring. The angular velocity of the ring will be
(A) $\frac{M\mu}{M+4m}$ (B) $\frac{(M+4m)\mu}{M}$ (C) $\frac{(M-4m)\mu}{M+4m}$ (D) $\frac{M\mu}{4m}$

12. The mass of the moon is about 1.2% of the mass of the earth. Compared to the gravitational force the earth exerts on the moon, the gravitational force the moon exerts on earth
(A) Is the same (B) Is smaller
(C) Is greater (D) Varies with its phase

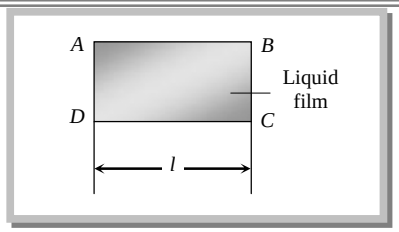
13. A body floats in a liquid contained in a beaker. The whole system as shown falls freely under gravity. The up thrust on the body due to the liquid is
(A) Zero
(B) Equal to the weight of the liquid displaced
(C) Equal to the weight of the body in air
(D) Equal to the weight of the immersed position of the body



14. *A* and *B* are two wires. The radius of *A* is twice that of *B*. they are stretched by the same load. Then the stress on *B* is
(A) Equal to that on *A* (B) Four times that on *A*
(C) Two times that on *A* (D) Half that on *A*

Space for rough work

15. A liquid film is formed over a frame *ABCD* as shown in figure. Wire *CD* can slide without friction. The mass to be hung from *CD* to keep it in equilibrium is



(A) $\frac{Tl}{g}$ (B) $\frac{2Tl}{g}$

(C) $\frac{g}{2Tl}$ (D) $T \times l$

16. A simple harmonic oscillator has an amplitude *A* and time period *T*. The time required by it to travel from $x = A$ to $x = A/2$ is

(A) $T/6$ (B) $T/4$ (C) $T/3$ (D) $T/2$

17. The speed of a wave in a certain medium is 960 *m/sec*. If 3600 waves pass over a certain point of the medium in 1 minute, the wavelength is

(A) 2 *meters* (B) 4 *meters* (C) 8 *meters* (D) 16 *meters*

18. The freezing point on a thermometer is marked as 20° and the boiling point at as 150°. A temperature of 60°*C* on this thermometer will be read as

(A) 40° (B) 65° (C) 98° (D) 110°

19. The root mean square speed of hydrogen molecules of an ideal hydrogen gas kept in a gas chamber at 0°*C* is 3180 *m/s*. The pressure on the hydrogen gas is

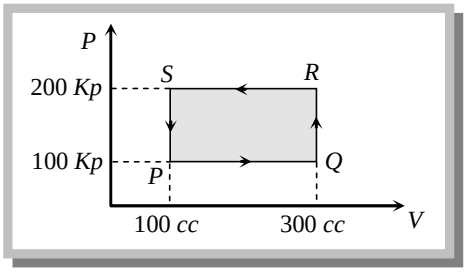
(Density of hydrogen gas is $8.99 \times 10^{-2}\ kg/m^3$, 1 atmosphere $= 1.01 \times 10^5\ N/m^2$)

(A) 0.1 *atm* (B) 1.5 *atm* (C) 2.0 *atm* (D) 3.0 *atm*

20. A thermodynamic system is taken through the cycle *PQRSP* process. The net work done by the system is

(A) 20 *J* (B) – 20 *J*

(C) 400 *J* (D) – 374 *J*



Space for rough work

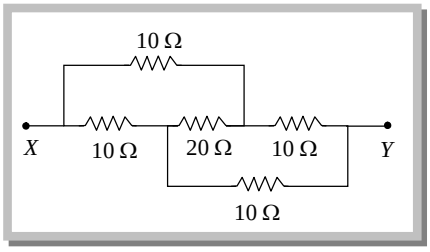
21. For cooking the food, which of the following type of utensil is most suitable
(A) High specific heat and low conductivity (B) High specific heat and high conductivity
(C) Low specific heat and low conductivity (D) Low specific heat and high conductivity

22. What is the magnitude of a point charge due to which the electric field 30 cm away has the magnitude 2 *newton/coulomb* $[1/4\pi\varepsilon_0 = 9\times10^9\ Nm^2]$
(A) $2\times10^{-11}\ coulomb$ (B) $3\times10^{-11}\ coulomb$ (C) $5\times10^{-11}\ coulomb$ (D) $9\times10^{-11}\ coulomb$

23. Two insulated metallic spheres of $3\mu F$ and $5\mu F$ capacitances are charged to $300\,V$ and $500\,V$ respectively. The energy loss, when they are connected by wire, is
(A) $0.012\ J$ (B) $0.0218\ J$ (C) $0.0375\ J$ (D) $3.75\ J$

24. A heater coil is cut into two parts of equal length and one of them is used in the heater. The ratio of the heat produced by this half coil to that by the original coil is
(A) 2 : 1 (B) 1 : 2 (C) 1 : 4 (D) 4 : 1

25. Five resistances are combined according to the figure. The equivalent resistance between the point *X* and *Y* will be
(A) 10 Ω (B) 22 Ω
(C) 20 Ω (D) 50 Ω



26. At a place the earth's horizontal component of magnetic field is $0.38\times10^{-4} weber/m^2$. If the angle of dip at that place is 60°, then the vertical component of earth's field at that place in *weber*/m^2 will be approximately
(A) 0.12×10^{-4} (B) 0.24×10^{-4} (C) 0.40×10^{-4} (D) 0.62×10^{-4}

27. Two solenoids having lengths *L* and 2*L* and the number of loops *N* and 4*N*, both have the same current, then the ratio of the magnetic field will be
(A) 1 : 2 (B) 2 : 1 (C) 1 : 4 (D) 4 : 1

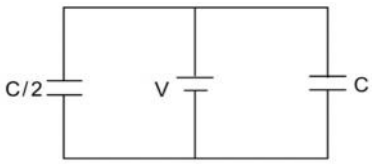
28. The coil of a galvanometer consists of 100 *turns* and effective area of 1 *square cm*. The restoring couple is 10^{-8} *N-m rad*. The magnetic field between the pole pieces is 5 *T*. The current sensitivity of this galvanometer will be
(A) 5×10^4 *rad/amp* (B) 5×10^{-6} *per amp*
(C) 2×10^{-7} *per amp* (D) 5 *rad./amp*

Space for rough work

29. The two rails of a railway track, insulated from each other and the ground, are connected to a *millivoltmeter*. What is the reading of the *millivoltmeter* when a train travels at a speed of 20 *m/sec* along the track, given that the vertical component of earth's magnetic field is 0.2×10^{-4} *wb*/m^2 and the rails are separated by 1 *metre*
(A) 4 *mV* (B) 0.4 *mV* (C) 80 *mV* (D) 10 *mV*

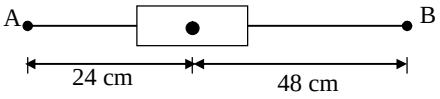
30. An alternating voltage $E = 200\sqrt{2}\sin(100\ t)$ is connected to a 1 *microfaracd* capacitor through an ac ammeter. The reading of the ammeter shall be
(A) 10 *mA* (B) 20 *mA* (C) 40 *mA* (D) 80 *mA*

31. Two capacitors having C and $\frac{c}{2}$ are connected to a V volt battery, as shown in figure. Then work done in charging both the capacitors fully is



(A) $\frac{3}{4}CV^2$ (B) $\frac{1}{4}CV^2$
(C) $2\ CV^2$ (D) $\frac{1}{2}CV^2$

32. A bar magnet of length 3 cm has points A and B along its axis at distances of 24 cm and 48 cm on the opposite sides as shown in figure. Ratio of magnetic fields at these points will be



(A) 8 (B) 1/2
(C) 3 (D) 4

33. When a charged particle moving with velocity V is subjected to a magnetic field of induction B, the force on it is non-zero. This implies that
(A) Angle between them is either zero or 180°
(B) Angle between them can have any value other than zero or 180°
(C) Angle between them is necessary 90°
(D) Angle between them can have any value other than 90°

34. If an α particle is moving in a magnetic field of $\left(3\hat{i}+2\hat{j}\right)T$ with a velocity of $5\times10^5\hat{i}\ m/S$. The magnetic force acting on the particle will be
(A) $3.2\times10^{-13}N$ in Z – direction (B) $3.2\times10^{-12}N$ dyne Z-direction
(C) $3.2\times10^{-13}N$ in negative Z-direction (D) None of these

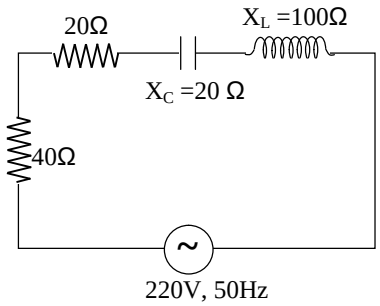
Space for rough work

35. If the magnetic dipole moment of an atom of diamagnetic material, paramagnetic material and ferromagnetic Material of denoted by M_d, M_p and M_f respectively, then
(A) $M_d = 0, M_p \neq 0$ (B) $M_p = 0, M_f \neq 0$ (C) $M_d = 0, M_p = 0$ (D) $M_d = 0, M_f = 0$

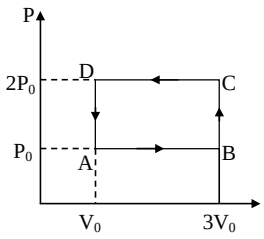
36. A charge q is enclosed by a Gaussian spherical surface of radius R. If the radius is doubled then outward Electric flux is
(A) Be reduced to half (B) increase four times
(C) Remain same (D) Be doubled

37. Two wires of same metal have the same length but their cross sections are in the ratio 3 : 1. They are joined in series. The resistance of the thicker wire is 10Ω. The total resistance of the combination is
(A) $\frac{5}{2}\Omega$ (B) $\frac{40}{3}\Omega$ (C) 40 Ω (D) 100 Ω

38. The power factor of the circuit shown in figure is
(A) 0.2 (B) 0.8
(C) 0.4 (D) 0.6

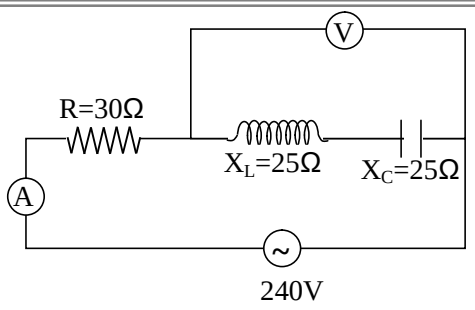


39. An ideal gas undergoes cyclic process ABCDA as shown in given P - V diagram. The amount of work done by the gas is
(A) $6P_0V_0$ (B) $-2P_0V_0$
(C) $2P_0V_0$ (D) $4P_0V_0$



Space for rough work

40. In the given circuit (as shown in figure) neglecting source resistance, than voltmeter and ammeter reading will be
(A) 120V, 3A (B) 120V, 6A
(C) 0V, 8A (D) 0V, 3A



41. A metallic block of density 5 *gm* cm^{-3} and having dimensions 5 *cm* × 5 *cm* × 5 *cm* is weighed in water. Its apparent weight will be
(A) 5 × 5 × 5 × 5 *gf* (B) 4 × 4 × 4 × 4 *gf* (C) 5 × 4 × 4 × 4 *gf* (D) 4 × 5 × 5 × 5 *gf*

42. Two water pipes of diameters 2 *cm* and 4 *cm* are connected with the main supply line. The velocity of flow of water in the pipe of 2 *cm* diameter is
(A) 4 times that in the other pipe (B) $\frac{1}{4}$ times that in the other pipe
(C) 2 times that in the other pipe (D) $\frac{1}{2}$ times that in the other pipe

43. A ring of radius 0.5 *m* and mass 10 *kg* is rotating about its diameter with an angular velocity of 20 *rad/s*. Its kinetic energy is
(A) 10 *J* (B) 100 *J* (C) 500 *J* (D) 250 *J*

44. Water boils in an electric kettle in 15 *minutes* after switching on. If the length of the heating wire is decreased to 2/3 of its initial value, then the same amount of water will boil with the same supply voltage in
(A) 15 *minutes* (B) 12 *minutes* (C) 10 *minutes* (D) 8 *minutes*

45. A boy aims a gun at a bird from a point, at a horizontal distance of 100 *m*. If the gun can impart a velocity of 500 ms^{-1} to the bullet. At what height above the bird must he aim his gun in order to hit it (take $g = 10\ ms^{-2}$)
(A) 20 *cm* (B) 10 *cm* (C) 50 *cm* (D) 100 *cm*

Space for rough work

Chemistry Section - III

Straight Objective Type

Chemistry contains 45 multiple choice questions numbered 1 to 45. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

1. The weight of one molecule of a compound $C_{60}H_{122}$ is
   (A) 1.2×10^{-20} g (B) 5.025×10^{-23} g (C) 1.4×10^{-21} g (D) 6.023×10^{-23} g

2. 25.3 g of sodium carbonate, Na_2CO_3 is dissolved in enough water to make 250 mL of solution. If sodium carbonate dissociates completely, molar concentration of sodium ion, Na^+ and carbonate ions, respectively (Molar mass of Na_2CO_3 = 106 g mol^{-1}
   (A) 0.477 M and 0.477 M (B) 0.955 M and 1.910 M
   (C) 1.910 M and 0.955 M (D) 1.90 M and 1.910 M

3. Which of the following has the smallest size?
   (A) Al^{3+} (B) F^- (C) Na^+ (D) Mg^{2+}

4. Which of the following is not permissible arrangement of electrons in an atom?
   (A) n = 5, l = 3, m = 0, s = + 1/2 (B) n = 3, l = 2, m = -3, s = -1/2
   (C) n = 3, l = 2, m = -2, s = - 1/2 (D) n = 4, l = 0, m = 0, s = -1/2

5. Threshold frequency of a metal is 5×10^{13} s^{-1} upon which 1×10^{14} s^{-1} frequency light is focused. Then maximum kinetic energy of emitted electron is
   (A) 3.3×10^{-21} (B) 3.3×10^{-20} (C) 6.6×10^{-21} (D) 6.6×10^{-20}

6. The stability of + 1 oxidation state increases in the sequence:
   (A) Tl < In < Ga < Al (B) In < Tl < Ga < Al (C) Ga < In < Al < Tl (D) Al < Ga < In < Tl

7. Four diatomic species are listed below. Identify the correct order in which the bond order is increasing in them –
   (A) $O_2^- < NO < C_2^{2-} < He_2^+$ (B) $C_2^{2-} < He_2^+ < O_2^- < NO$
   (C) $He_2^+ < O_2^- < NO < C_2^{2-}$ (D) $NO < O_2^- < C_2^{2-} < He_2^+$

8. Which of the following species contains three bond pairs and lone pair around the central atoms?
   (A) NH_2^- (B) PCl_3 (C) H_2O (D) BF_3

Space for rough work

9. XeF_2 is isostructural with-
(A) TeF_2 (B) ICl_2^- (C) $SbCl_3$ (D) $BaCl_2$

10. Pressure in a mixture of 4 g of O_2 and 2 g of H_2 confined in a bulb of 1 litre at 0^oC is
(A) 45.215 atm (B) 31.205 atm (C) 25.215 atm (D) 15.210 atm

11. The equilibrium constant for the reaction $N_2 + 3H_2 \rightleftharpoons 2NH_3$ is K, then the equilibrium constant for the equilibrium $2NH_3 \rightleftharpoons N_2 + 3H_2$ is
(A) $\sqrt{K}$ (B) $\sqrt{\frac{1}{K}}$ (C) $\frac{1}{K}$ (D) $\frac{1}{K^2}$

12. The number of moles of hydroxide (OH^-) ion in 0.3 litre of 0.005 M solution of $Ba(OH)_2$ is
(A) 0.0050 (B) 0.0030 (C) 0.0015 (D) 0.0075

13. Bond dissociation enthalpy of H_2, Cl_2 and HCl are 434, 242 and 431 $kJmol^{-1}$ respectively. Enthalpy of formation of HCl is
(A) 245 $kJmol^{-1}$ (B) 93 $kJmol^{-1}$ (C) -245 $kJmol^{-1}$ (D) -93 $kJmol^{-1}$

14. The reaction $H_2S + H_2O_2 \rightarrow 2H_2O + S$ shows
(A) Oxidizing action of H_2O_2 (B) Reducing action of H_2O_2
(C) Alkaline nature of H_2O_2 (D) Acidic nature of H_2O_2

15. The ease of adsorption of the hydrated alkali metal ions on an ion-exchange resins follows the order:
(A) $K^+ < Na^+ < Rb^+ < Li^+$ (B) $Na^+ < Li^+ < K^+ < Rb^+$
(C) $Li^+ < K^+ < Na^+ < Rb^+$ (D) $Rb^+ < K^+ < Na^+ < Li^+$

16. Strong reducing behavior of H_3PO_2 is due to:
(A) High oxidation state of phosphorus
(B) Presence of two – OH groups and one P – H bond
(C) Presence of one – OH group and two P – H bonds
(D) High electron gain enthalpy of phosphorus

17. Oxygen is always divalent whereas sulphur can form 2,4 and 6 bonds. This is because.
(A) Oxygen is more electronegative than sulphur
(B) Sulphur contains d – orbitals whereas oxygen does not
(C) Sulphur has larger atomic radius than oxygen
(D) Sulphur is more electronegative than oxygen

Space for rough work

18. The IUPAC name of the compound having the formula $CH \equiv C - CH = CH2$ is:
(A) 1-butyn-3-ene (B) but-1-yne-3-ene (C) 1-butene-3-yne (D) 3-butene-1-yne

19. Number of structural isomers possible for C_5H_{12}
(A) 2 (B) 3 (C) 4 (D) 5

20. In which of the following $p\pi - d\pi$ bonding is possible?
(A) CO_3^{2-} (B) PO_4^{3-} (C) NO_3^- (D) NO_2^-

21. In the reaction
$H - C \equiv CH \xrightarrow[(2)CH_3CH_2Br]{(1)NaNH_2 / liq.NH_3} X \xrightarrow[(2)CH_3CH_2Br]{(1)NaNH_2 / liq.NH_3} Y,$
X and Y are:
(A) X = 1 – Butyne ; Y = 3 – Hexyne (B) X = 2 – Butyne ; Y = 3 – Hexyne
(C) X = 2 – Butyne ; Y = 2 – Hexyne (D) X = 1 – Butyne ; Y = 2 – Hexyne

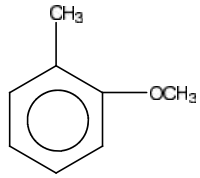
22. If the r.m.s. speed of a gas molecule at 27^oC is $100\sqrt{2}ms^{-1}$ the r.m.s. speed at 327^oC would be
(A) $100ms^{-1}$ (B) $200ms^{-1}$ (C) $300ms^{-1}$ (D) $400ms^{-1}$

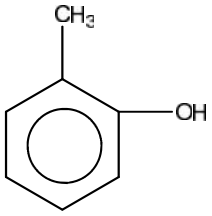
23. Addition of water to alkynes occurs in acidic medium and in the presence of Hg^{2+} ions as a catalyst. Which of the following products will be formed on addition of water to but-1-yne under these conditions?
(A) $CH_3CH_2CH_2CHO$ (B) $CH_3CH_2COCH_3$
(C) $CH_3CH_2cOOH + CO_2$ (D) $CH_3COOH + HCHO$

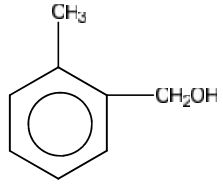
24. Which one of the following is not a common component of Photochemical Smog?
(A) Ozone (B) Acrolein
(C) Peroxyacetyl nitrate (D) Chloroflurocarbons

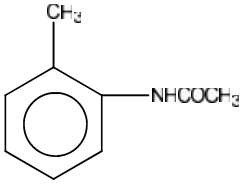
Space for rough work

25. Which one is most reactive towards electrophilic reagent?

(A) 

(B) 

(C) 

(D) 

26. A reaction is always spontaneous if
(A) $T\Delta S < \Delta H$ and both ΔH and ΔS are + ve
(B) $T\Delta S > \Delta H$ and both ΔH and ΔS are + ve
(C) $T\Delta S = \Delta H$ and both ΔH and ΔS are + ve
(D) $T\Delta S > \Delta H$ and both ΔH is + ve and ΔS is – ve

27. Structure of a mixed oxide is cubic close-packed (c.c.p). The cubic unit cell of mixed oxide is composed of oxide ions. One fourth of the tetrahedral voids are occupied by divalent metal A and all the octahedral voids are occupied by a monovalent metal B. The formula of the oxide is-
(A) A_2BO_2 (B) $A_2B_3O_4$ (C) AB_2O_2 (D) ABO_2

28. Vapour pressure of chloroform ($CHCl_3$) and dichloromethane (CH_2Cl_2) at 25°C are 200 mmHg and 415 mmHg respectively Vapour pressure of the solution obtained by mixing 25.5 g of $CHCl_3$ and 40 g of CH_2Cl_2 at the same temperature will be
(Molecular mass of $CHCl_3$ = 119.5 u and molecular mass of CH_2Cl_2 = 85 u)
(A) 615.0 mm Hg (B) 347.9 mm Hg (C) 285.5 mm Hg (D) 173.9 mm Hg

29. In a zero-order reaction for every 10° rise of temperature, the rate is doubled. If the temperature is increased from 10°C to 100°C, the rate of the reaction will become
(A) 64 times (B) 128 times (C) 256 times (D) 512 times

30. Which property of colloids is not dependent on the charge on colloidal particles?
(A) coagulation (B) Electrophoresis (C) Electro – osmosis (D) Tyndall effect

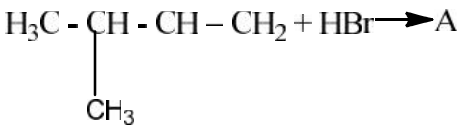
Space for rough work

31. Given:
(i) $Cu^{2+} + 2e^- \rightarrow Cu,\ E^o = 0.337V$ (ii) $Cu^{2+} + e^- \rightarrow Cu^+,\ E^o = 0.153V$
Electrode potential, E^o for the reaction, $Cu^+ + e^- \rightarrow Cu$, will be:
(A) 0.90 V (B) 0.30 V (C) 0.38 V (D) 0.52 V

32. For the adsorption of a gas on a solid, the plot of log (x/m) versus log P is linear with slope equal to
(A) n (B) 1/n (C) k (D) log k

33. In the extraction of copper from its sulphide ore, the metal is finally obtained by the reduction of cuprous oxide with:
(A) Iron sulphide (FeS) (B) Carbon monoxide (CO)
(C) Copper (I) Sulphide (Cu_2S) (D) Sulphur dioxide (SO_2)

34. Which among the following is a paramagnetic complex?
(At. No. Mo = 42, Pt = 78)
(A) $\left[Co(NH_3)_6\right]^{3+}$ (B) $\left[Pt(en)Cl_2\right]$ (C) $\left[CoBr_4\right]^{2-}$ (D) $Mo(CO)_6$

35. 
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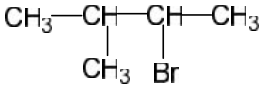
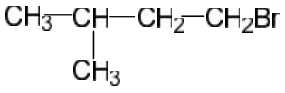
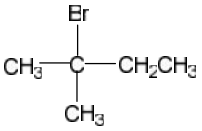
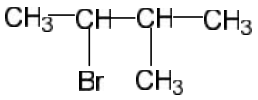
(A) 
(B) 
(C) 
(D) 

36. The heating of phenyl – methyl ethers with HI produces.
(A) ethyl chlorides (B) Iodobenzene (C) Phenol (D) benzene

37. When phenol is treated with excess bromine water at room temperature. It gives
(A) m - bromophenol (B) o – and p – bromophenols
(C) 2, 4 - dibromophenol (D) 2, 4, 6 - tribromophenol

Space for rough work

38. The correct order of strengths of the carboxylic acids

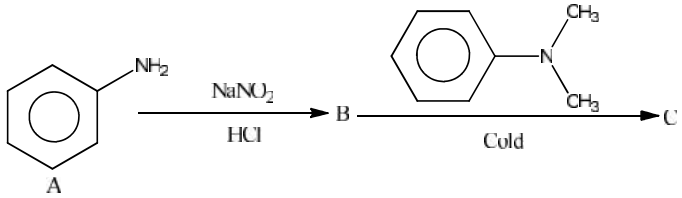
CH_2FCOOH $CH_2ClCOOH$ $CH_2BrCOOH$

I II III

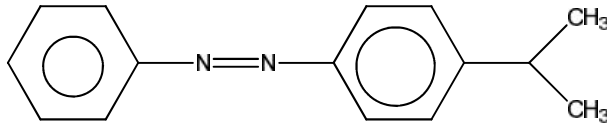
Is

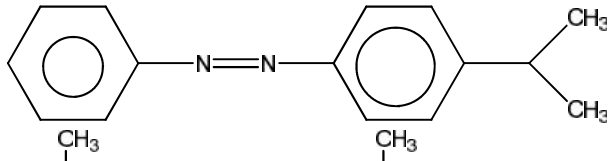
(A) I > II > III (B) II > III > I (C) III > II > I (D) II > I > III

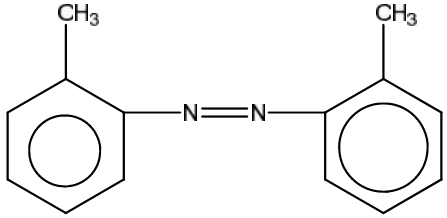
39. In a reaction of aniline a coloured product C was obtained

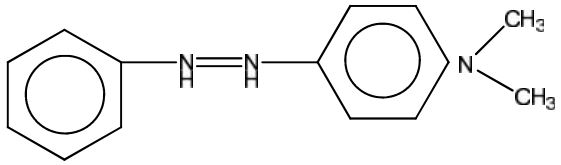


The structure of C would be

(A) 

(B) 

(C) 

(D) 

40. If a the length of a side of a cube, the distance between the body centered atom one corner atom in the cube will be

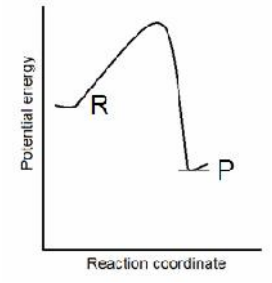
(A) $\frac{2}{\sqrt{3}}a$ (B) $\frac{4}{\sqrt{3}}a$ (C) $\frac{\sqrt{3}}{4}a$ (D) $\frac{\sqrt{3}}{2}a$

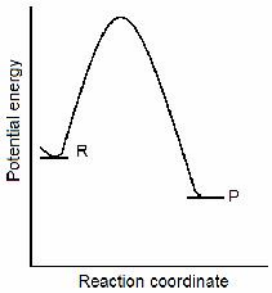
Space for rough work

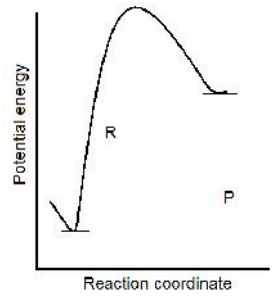
41. Natural rubber has:
(A) All cis – configuration (B) All trans – configuration
(C) Alternate cis – and trans – configuration (D) Random cis – and trans – configuration

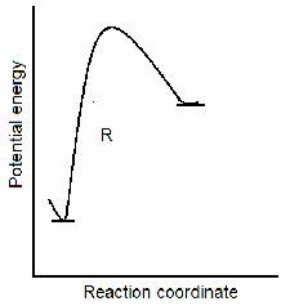
42. Which one of the following is employed as a Tranquilizer drug?
(A) Mifepristone (B) Promethazine (C) Valium (D) Naproxen

43. An endothermic reaction with high activation energy for the forward reaction is given by the diagram

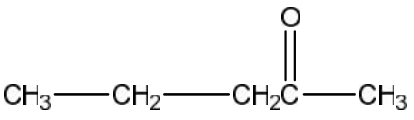
(A) 

(B) 

(C) 

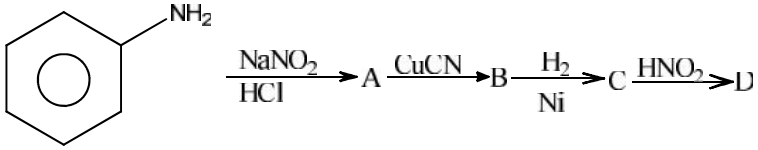
(D) 

44. Nucleophilic addition reaction will be most favoured in

(A) CH_3CHO (B) 

(C) $(CH_3)_2 C = O$ (D) CH_3CH_2CHO

45. Anline in a set of reactions yielded a product D.



The structure of the product D would be
(A) C_6H_5NHOH (B) $C_6H_5NHCH_2CH_2$ (C) $C_6H_5CH_2NH_2$ (D) $C_6H_5CH_2OH$

Space for rough work