



Aakash

+ BYJU'S

CUET 2022

Sample Mock Paper

SECTION-I

LANGUAGE: ENGLISH

MM. 200

Time: 45 min.

Instructions:

1. The test is of 45 Minutes duration.
2. The test contains 50 Questions out of which 40 questions need to be attempted.
3. Marking Scheme of the test:
 - a. Correct answer or the most appropriate answer: Five marks (+5).
 - b. Any incorrect option marked will be given minus one mark (-1).
 - c. Unanswered/Marked for Review will be given no mark (0).

Choose the correct answer :

Directions (Q. 1 to Q. 5): Read the passage carefully and answer the given questions.

The issue of road rage requires serious attention. Day by day, it is becoming a great concern. Call it the negligence of the government or the rashness of the drivers, the underlying fact is that at the end of the day, the common man is the one who suffers the most. The commoner driving a two-wheeler who is hit by a speeding SUV, even though the former was following the traffic rules, has nowhere to go in order to seek redressal for his grievances or his injury. A recent case in point is the accident caused by the speeding luxury car owned by a famous actress. A family of four driving a modest Alto was hit by the overspeeding car driven by the actress's driver. It resulted in the death of the youngest child of the family and several injuries to the other family members. To add insult to injury, the actress posted negative comments on a famous social networking website.

Part of the problem lies with the attitude and mentality of the driver behind the steering wheel. The car is a personal vehicle and one possesses the freedom to drive it independently and at one's own will. But one must understand that the road on which one drives is open to the public. This blurring of the dichotomy between the public and the private leads to reckless behaviour on the roads. Respect for the elderly and pedestrians, so common in countries abroad, is a thing of rarity to be found in our land. A little consideration to road rules and adoption of simple safety measures such as fastening of the seat belt can go a long way in reducing this menace.

1. The major impact of the road rage has been observed on the _____.
 - (1) Celebrities
 - (2) Common man
 - (3) Ministers
 - (4) Pedestrians
2. A commoner despite following traffic rules, in case of any accident fails to
 - (1) Get a treatment in hospital
 - (2) Seek remedy for the injustice caused to him
 - (3) Get compensation for the losses he bears
 - (4) Secure justice
3. Although car is a personal vehicle still one must hold the sense of responsibility while
 - (1) Purchasing it from the car showroom
 - (2) Giving it to their friends and relatives
 - (3) Driving it on the road
 - (4) Lending it to strangers
4. "This blurring of the dichotomy" highlights the concern of
 - (1) Racial discrimination amongst people
 - (2) Caste differentiation amongst people
 - (3) Discrimination on the social grounds amongst people
 - (4) All of the above
5. Following "safety measures" can directly minimise the cause of
 - (1) Road mishaps
 - (2) Severe injuries
 - (3) Loss of lives
 - (4) All of the above

Directions (Q. 6 to Q. 10): Read the passage carefully and answer the questions given below.

The art of academic writing is not easy to master. It is a formal skill, which requires precision and accuracy, and is perfected by continuous and dedicated practice. Academic writing is the skilful exposition and explanation of an argument, which the writer has carefully researched and developed over a sustained period of time. It is a time-consuming activity and demands patience and perseverance. But the joy of reading and sharing with others, one's succinctly composed piece of argument, is incomparable. Before beginning to write, the writer must ask himself a few questions - Why am I writing? What is it that I intend to share with others? What purpose will my writing serve? Have I read enough about the topic or theme about which I am going to write? If one is hesitant to answer even one of the aforementioned questions, one better not write at all! Because academic writing is a serious activity - it makes one part of a shared community of readers and writers who wish to disseminate and learn from well-argued pieces of writing.

The structure of an argumentative essay should take the form of - Introduction (which should be around ten percent of the entire essay), Body (it should constitute eighty percent of the piece) and the Conclusion (again, ten per cent of the essay). The introduction should function as the hook which draws the reader in and holds his attention, the body should include cogent and coherently linked paragraphs and the conclusion should re-state the argument and offer a substantial ending to the piece.

6. Academic writing is defined as
- (1) Showing a hierarchical explanation of the judgment researched
 - (2) Showing a hypothetical explanation of the judgment researched
 - (3) Showing a professional explanation of the judgment researched
 - (4) All of the above
7. Academic writing is considered to be a serious activity because
- (1) It unites the people
 - (2) It brings a variety of thoughts together
 - (3) It fetches knowledge from various pieces of skilful writings
 - (4) It is disseminated to learned readers

8. The most engaging aspect of an academic essay is its
- (1) Body
 - (2) Introduction
 - (3) Conclusion
 - (4) Illustrations
9. The convincing power of the writer is best observed in the _____ of the essay.
- (1) Body
 - (2) Conclusion
 - (3) Introduction
 - (4) Illustrations
10. Self-interrogation is required before starting to write an academic essay as it
- (1) Makes one more precise and clear about the ideas
 - (2) Makes one more confident
 - (3) Highlights one's loop holes in the writing area
 - (4) All of the above

Directions (Q. 11 to Q. 20): Fill in the blanks with the most suitable alternatives.

11. The clock has _____ five.
- (1) stricken
 - (2) struck
 - (3) strike
 - (4) stricked
12. I have an aversion to _____.
- (1) fish
 - (2) fishing
 - (3) been fishing
 - (4) be fished
13. Driven by _____, he stole a piece of bread.
- (1) thirst
 - (2) fever
 - (3) hunger
 - (4) cold
14. I am tired _____ waiting.
- (1) to
 - (2) of
 - (3) with
 - (4) by
15. _____ you see Shobha at the party?
- (1) Have
 - (2) Did
 - (3) Had
 - (4) If
16. The Banyan is a kind of _____ fig tree.
- (1) a
 - (2) an
 - (3) the
 - (4) No article
17. These days a pair of scissors _____ you a lot.
- (1) cost
 - (2) costs
 - (3) is to cost
 - (4) has cost

18. I have eaten lunch, so I _____ leave for work.
 (1) will
 (2) can
 (3) may
 (4) shall
19. He must remember to finish the examination _____ time.
 (1) in
 (2) on
 (3) by
 (4) with
20. Having missed the metro, she _____ to take the bus.
 (1) had decided
 (2) decided
 (3) decide
 (4) was deciding

Directions (Q. 21 to Q. 25): Fill in the blanks given in the passage with the most suitable options.

21 honey bee is a very unusual kind of an insect. Unlike other insects which live alone, the honey bee lives as a member 22 a community. These bees live together in what is known as bee colony. The queen bee has a life span of 23 three years. During this period, she would have laid more than half a million eggs. When the queen bee is dying, a new queen 24 be groomed. This new queen would eventually take over the 'duties' of the old queen when the 25 dies.

21. (1) A (2) An
 (3) The (4) This
22. (1) in (2) of
 (3) with (4) after
23. (1) about (2) only
 (3) near (4) some
24. (1) is (2) would
 (3) could (4) may
25. (1) previous (2) former
 (3) latter (4) foremost

Directions (Q. 26 to Q. 28): Sentences of the given paragraph are jumbled. Arrange the sentences in a proper order to form a meaningful paragraph and choose the correct option.

26. P: not only once a week but daily without loss of strength
 Q: and often it is taken shortly before retiring
 R: a heavy meal at night, the so- called "dinner" is the fashion with many
 S: it is unnecessary and could be forgone,
 (1) PQRS (2) RQSP
 (3) QSPR (4) PRQS
27. P: they produce the fruit by which the others profit
 Q: and endure scorching heat
 R: while they themselves stand in the sun
 S: trees give shade for the benefit of others and
 (1) QPRS (2) SRQP
 (3) PQRS (4) SRPQ
28. P: to live for the mere sake of living one's life
 Q: will assuredly dwell forever in a world of bliss
 R: is to live the life of dogs and cows
 S: those who lay down their lives for the sake of someone,
 (1) RQSP (2) PRQS
 (3) PRSQ (4) RSQP

Directions (Q. 29 to Q. 31): Identify the word which is closest in meaning to the underlined word.

29. It is difficult to access remote areas.
 (1) Distant (2) Obsolete
 (3) Marshy (4) Foregone
30. She really did detest her mockery.
 (1) Reveal (2) Discover
 (3) Hate (4) Justify
31. I am saved by her gracious intervention on my behalf.
 (1) Clever (2) Pretty
 (3) Pleasant (4) Cunning

Directions (Q. 32 & Q. 33): Identify the word which is nearly opposite in meaning to the word underlined.

32. I will withdraw my support from your party if you do not behave properly.

- (1) Reduce (2) Introduce
(3) Need (4) Enhance

33. They often refer to him as a secret drinker.

- (1) Covert (2) Overt
(3) Hide (4) Covered

Directions (Q. 34 & Q. 35): Spot the error and choose the correct option.

34. She married to her boss.

- (1) She married with her boss.
(2) She married her boss.
(3) She married the boss.
(4) She married by her boss.

35. There are less pieces of cheese on this plate.

- (1) There are few pieces of cheese on this plate.
(2) There are little pieces of cheese on this plate.
(3) There are a little pieces of cheese on this plate.
(4) There are much pieces of cheese on this plate.

Directions (Q. 36 to Q. 41): Identify the part that carries a grammatical mistake. If there is no error, choose option (4).

36. She has (1)/ got longer (2)/ hair then I have. (3)/ No error (4)

37. Do you know (1)/ anybody whose (2)/ going to the US in the next few days? (3)/ No error (4)

38. The notes (1)/ were pinned up (2)/ to the classroom wall. (3)/ No error (4)

39. Louis Pasteur, the celebrated scientist (1)/ documented that garlic pods has the (2)/ power to kill bacteria (3)/ No error (4)

40. The roots of the trees holds the (1)/ soil together, so the soil is protected (2)/ from being washed off. (3)/ No error (4)

41. In very old parts of the world, (1)/ like the far north of Russia, (2)/ not much animals hibernate (3)/ No error (4)

Directions (Q.42 & Q.43): In the following sentences a part has been underlined. Choose the appropriate option to improve the underlined part. If it requires no correction, then choose option (4).

42. There is a lot of air in loose snow, and this helps to keep the cold off.

- (1) keep the cold on (2) keep the cold out
(3) keep the cold down (4) No improvement

43. Antarctica is crucial for the global weather phenomenon.

- (1) to the global (2) in the global
(3) by the global (4) No improvement

Directions (Q.44 to Q.48): Complete the passage by filling the gaps.

_____ 44 _____ star is a sphere of glowing gas. It has light of its own. The Sun is a medium sized star. Except _____ 45 _____ the Sun, the other stars are not visible from the earth during the day. A group of stars _____ 46 _____ called a constellation. _____ 47 _____ of these constellations are distributed in the sky in such a way that the sun appears to pass through them, one after _____ 48 _____, during the year.

44. (1) A (2) An
(3) The (4) No article
45. (1) from (2) of
(3) for (4) Nothing required
46. (1) are (2) has been
(3) is (4) have been
47. (1) Few (2) Some
(3) Little (4) The few
48. (1) others (2) another
(3) one (4) other

Directions (Q.49 & Q.50): Choose the word closest in meaning to the capitalised word.

49. WITHER

- (1) Perk (2) Perish
(3) Panaroma (4) Perjury

50. GAUDY

- (1) Great (2) Showy
(3) Teetotaller (4) Amateur

SECTION-II**DOMAIN SUBJECT: PHYSICS**

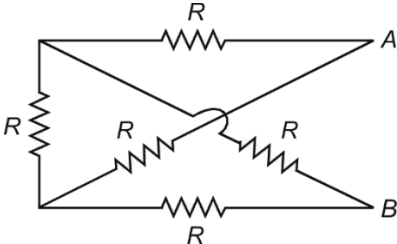
MM. 200

Time: 45 min.

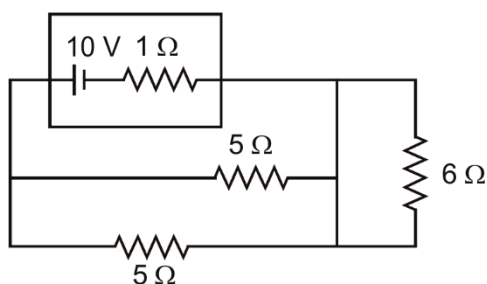
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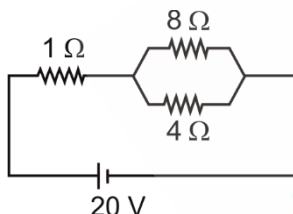
Choose the correct answer :

- An electric charge experience a force F due to a short dipole in its equatorial position. Find the force if the charge is kept a half distance on axial line
 - $\frac{F}{2}$
 - $\frac{F}{16}$
 - $16F$
 - $8F$
- An electron moves from rest from a point at which potential is 30 volt to another point where potential is 50 volt. Its kinetic energy in final state will be (in joule)
 - 3.2×10^{-20}
 - 3.2×10^{-19}
 - 32×10^{-19}
 - 20×10^{-19}
- The three charges q , $2q$ and $8q$ are arranged at the corner of an equilateral triangle side length a then potential energy of system is
 (Where $k = \frac{1}{4\pi\epsilon_0}$)
 - $\frac{6kq^2}{a}$
 - $\frac{3kq^2}{a}$
 - $\frac{26kq^2}{a}$
 - Zero
- For infinite plate, if the surface charge density is σ , then the potential difference between two points at a separation ' d ' perpendicularly away from the plate is given as
 - $\frac{\sigma}{2\epsilon_0}$
 - $\frac{\sigma}{2\epsilon_0} \cdot d$
 - $\frac{\sigma}{\epsilon_0} \cdot d$
 - Zero
- A parallel plate capacitor of capacity $5 \mu\text{F}$ and plate separation 6 cm has plate area 25 cm^2 . If a dielectric of dielectric constant 4 and thickness 4 cm is introduced into the capacitor, then capacity becomes
 - $10 \mu\text{F}$
 - $20 \mu\text{F}$
 - $30 \mu\text{F}$
 - 0
- A cuboid of side a , b , c is placed in a magnetic field directed horizontally. The net flux going inward cuboid if its faces are along horizontal and vertical directions can be
 - $B \frac{abc}{6}$
 - Bab
 - $6Bac$
 - Zero
- Find net resistance between points A and B.
 
 - $\frac{4}{3}R$
 - $\frac{8R}{3}$
 - R
 - $\frac{R}{2}$
- A piece of copper and another of germanium are cooled from room temperature 300 K to 280 K . The resistance of
 - Each of them increases
 - Each of them decreases
 - Copper increases and germanium decreases
 - Copper decreases and germanium increases

9. Find potential difference across terminals of the battery.



- (1) $\frac{25}{6}$ volt (2) $\frac{500}{7}$ volt
(3) $\frac{50}{7}$ volt (4) 25 volt
10. In the circuit shown in figure, power dissipated in 1Ω resistance will be



- (1) 29.75 W (2) 20.00 W
(3) 9.75 W (4) 0 W
11. A charged particle enters a uniform magnetic field with velocity vector at an angle of 45° with magnetic field. The pitch of the helical path followed by the particle is x . The radius of the helix will be
- (1) $\frac{x}{2\pi}$ (2) $\sqrt{2}x$
(3) $\frac{x}{\sqrt{2}\pi}$ (4) $\frac{\sqrt{2}x}{\pi}$
12. A charge particle q moves with velocity 2 m/s along positive x -axis in uniform magnetic field $(2\hat{i} - \hat{j})$ then charge will experience a force along
- (1) y - z plane (2) Negative y -axis
(3) Negative z -axis (4) Positive z -axis
13. Magnetic field at the centre of current i carrying loop of radius R will be

- (1) $\frac{\mu_0 i}{4\pi R}$ (2) $\frac{\mu_0 i}{2\pi R}$
(3) $\frac{\mu_0 i}{2 R}$ (4) Zero

14. A circular loop of radius R carrying current I lies in x - y plane with its centre at origin. The total magnetic flux through x - y plane is

- (1) Directly proportional to I
(2) Directly proportional to R
(3) Inversely proportional to R
(4) Zero

15. A charged particle is thrown perpendicular to parallel magnetic fields, then path of particle is

- (1) Straight line (2) Circle
(3) Helix (4) Cycloid

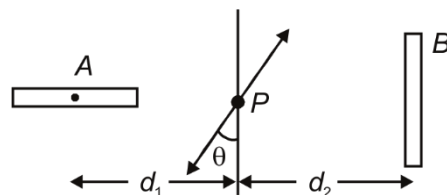
16. A wire of given length is to be bent into a closed figure so that it may have the maximum magnetic moment when it carries a certain current. It should be bent into

- (1) An ellipse (2) Rectangle
(3) Circle (4) Square

17. A material rod, when placed in external magnetic field aligns itself along the magnetic field. The nature of the material is

- (1) Diamagnetic (2) Ferromagnetic
(3) Paramagnetic (4) Either (2) or (3)

18. Two identical short magnet A and B are arranged as shown in figure. A magnetic needle is placed between magnet at point P which gets deflected through an angle θ under the influence of magnets. The ratio of distances d_1 and d_2 respectively, will be

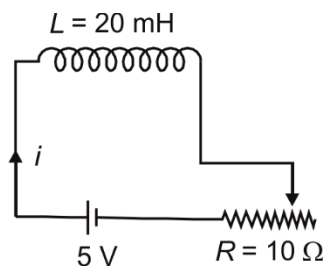


- (1) $(2\tan\theta)^{\frac{1}{3}}$ (2) $(2\tan\theta)^{-\frac{1}{3}}$
(3) $(2\cot\theta)^{\frac{1}{3}}$ (4) $(2\cot\theta)^{-\frac{1}{3}}$

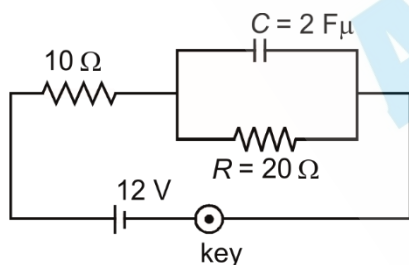
19. The magnetic flux linked with a coil is ϕ and emf induced in it is e , then

- (1) If $\phi = 0$, e must be zero
(2) If $\phi \neq 0$, e must be zero
(3) If $e \neq 0$, ϕ may or may not be zero
(4) Value of induced emf does not depend on change in flux

20. The resistance in the following circuit is gradually increased. At a particular instant its value is $10\ \Omega$. The current in the circuit will be

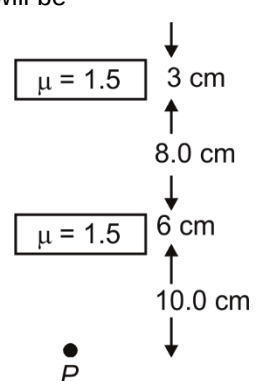


- (1) $i = 0.5\text{ A}$ (2) $i > 0.5\text{ A}$
 (3) $i < 0.5\text{ A}$ (4) $i = 0$
21. The quality factor for series R - L - C circuit is $Q =$
- (1) $\frac{1}{L} \sqrt{\frac{R}{C}}$ (2) $\frac{1}{R} \sqrt{\frac{L}{C}}$
 (3) $\frac{1}{C} \sqrt{\frac{L}{R}}$ (4) $\frac{1}{R} \sqrt{\frac{C}{L}}$
22. Find the current through (Resistor) $20\ \Omega$ as the key is closed (at $t = 0$)



- (1) 10 A (2) 0.4 A
 (3) 0 A (4) 4 mA
23. Choke coil has
- (1) High R and low L (2) Low R and high L
 (3) High R and high L (4) Low R and low L
24. Instantaneous electric field and magnetic field of an EM wave in vacuum are $\vec{E}$ and $\vec{B}$ respectively. Poynting vector of the EM wave is
- (1) $\frac{\vec{E} + \vec{B}}{\mu_0}$ (2) $\frac{\vec{E} \times \vec{B}}{\mu_0}$
 (3) $\vec{E} + \mu_0 \vec{B}$ (4) $\vec{B} + \mu_0 \vec{E}$
25. The X-ray is an example of
- (1) Transverse wave
 (2) Mechanical wave
 (3) Matter wave
 (4) Electro-magnetic wave

26. A γ -ray photon is emitted
- (1) After ionization of an atom
 (2) Due to conversion of neutron into a proton in the nucleus
 (3) After de-excitation of a nucleus
 (4) Due to conversion of a proton into a neutron in the nucleus
27. In a hydrogen atom, the electron is in n^{th} excited state. It comes down to first excited state by emitting ten different wavelength. The value of n is
- (1) 5 (2) 10
 (3) 3 (4) 6
28. In X-ray tube, when the accelerated voltage V is halved, the difference between the wavelength of K_{α} line and minimum wavelength of continuous X-ray spectrum
- (1) Remains constant
 (2) Becomes more than two times
 (3) Becomes half
 (4) Becomes less than two times
29. N_1 atoms of a radioactive element emit N_2 beta particles per second. The decay constant of the element is (in s^{-1})
- (1) $\frac{N_1}{N_2}$ (2) $\frac{N_2}{N_1}$
 (3) $N_2 \log(N_1)$ (4) $\log\left(\frac{N_1}{N_2}\right)$
30. Angular momentum (L) and radius (r) of a hydrogen atom are related as
- (1) $Lr = \text{constant}$ (2) $Lr^2 = \text{constant}$
 (3) $Lr^4 = \text{constant}$ (4) $L^2 r^{-1} = \text{constant}$
31. Fast neutrons can easily be slowed down by
- (1) The use of lead shielding
 (2) Passing them through heavy water
 (3) Elastic collisions with heavy nuclei
 (4) Applying a strong electric field
32. The half-life of At^{215} is $100\ \mu\text{s}$. The time taken for the radioactivity of a sample of At^{215} to decay to $1/16^{\text{th}}$ of its initial value is
- (1) $400\ \mu\text{s}$ (2) $25\ \mu\text{s}$
 (3) $800\ \mu\text{s}$ (4) $600\ \mu\text{s}$

33. Which of the following is a correct statement?
- β -rays are same as cathode rays
 - γ -rays are high energetic neutrons
 - α -particles are singly ionized helium atoms
 - Protons and neutrons have exactly the same mass
34. n - p - n transistors are preferred over p - n - p transistors because of
- p -type base is better
 - n - p - n are good circuit insulation
 - n - p - n transistors contains electrons in emitter which are preferred due to low mobility
 - n - p - n transistors contains electrons in emitter which are preferred due to high mobility
35. An equiconvex lens of glass ($\mu_g = 1.5$) of focal length 10 cm is dipped in a liquid of $\mu = 2$, then it will behave as
- Convex lens of focal length 20 cm
 - Concave lens of focal length 20 cm
 - Convex lens of focal length 5 cm
 - Concave lens of focal length 5 cm
36. The average value of current $i = 25\sin(100\pi t)$ A in 20 ms will be
- 25 A
 - $\frac{25}{\sqrt{2}}$
 - $\frac{50}{\pi}$ A
 - Zero
37. In case of common-base and common emitter configuration the current gains α and β are related as
- $\alpha = \frac{\beta}{1-\beta}$
 - $\beta = \frac{\alpha}{1-\alpha}$
 - $\beta = \frac{1+\alpha}{\alpha}$
 - Zero
38. In absence of potential difference applied to a p - n junction diode, the current through the junction
- Is zero because the number of charge carriers diffusing is equal to drifting
 - Is zero because the charge carriers do not move
 - Is non-zero
 - All of these
39. The main cause of Avalanche breakdown is
- Low doping
 - Production of electron hole pairs due to field emission
 - Collision of electron
 - High potential barrier
40. A real image is formed by a convex lens. When the convex lens is put in contact with a concave lens, again a real image is formed. This image will
- Shift to infinity
 - Remain in its original position
 - Shift away from lens system
 - Shift towards the lens system
41. The image of point P when viewed from top of the slabs will be
- 
- The diagram shows a vertical stack of elements. At the top is a rectangular slab labeled $\mu = 1.5$ with a height of 3 cm. Below this slab is an upward-pointing arrow labeled 8.0 cm. Below the arrow is another rectangular slab labeled $\mu = 1.5$ with a height of 6 cm. Below this second slab is a downward-pointing arrow labeled 10.0 cm. At the bottom of this arrow is a point labeled P .
- 2.0 cm above P
 - 4.0 cm above P
 - 3.0 cm above P
 - 1.0 cm below P
42. A parallel beam of light of width 4 cm falls on a thin convex lens of focal length 10 cm which is kept at separation of 30 cm from other convex lens of focal length 20 cm. Find width of emerging beam.
- 8 cm
 - 18 cm
 - 1 cm
 - 12 cm

43. The deviation produced by a prism of angle 2° and refractive index of material, $\sqrt{3}$ is

- (1) 2.210°
- (2) 1.464°
- (3) 1.656°
- (4) 0.627°

44. When intensities coming from two slits have ratio $\sqrt{2} : \sqrt{3}$, find the ratio of slit widths.

- (1) $\sqrt{2} : \sqrt{3}$
- (2) $2 : 3$
- (3) $4 : 9$
- (4) $\sqrt{3} : \sqrt{2}$

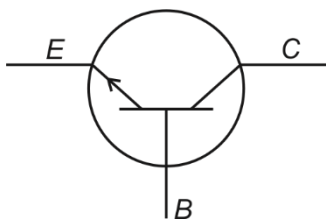
45. Two light waves having displacement $y_1 = 18\sin(\omega t - kx)$ and $y_2 = 9\sin(\omega t - kx + \phi)$ interfere. The ratio of maximum to the minimum intensity of light in the interference pattern is

- (1) $9 : 1$
- (2) $3 : 1$
- (3) $2 : 1$
- (4) $81 : 1$

46. The unit of pole strength is

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

47. The symbol given in figure represents

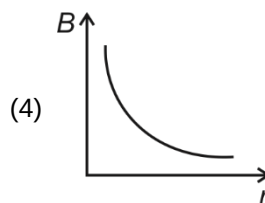
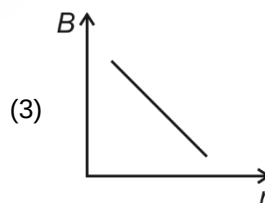
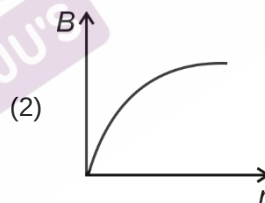
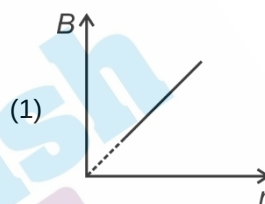


- (1) NPN
- (2) PNP
- (3) Forward biased PN junction diode
- (4) Reverse biased NP junction diode

48. In Young's double-slit experiment, the intensity at a point is $1/4^{\text{th}}$ of the maximum intensity. The angular position of this point is (symbol have their usual meaning)

- (1) $\sin^{-1}\left(\frac{\lambda}{d}\right)$
- (2) $\sin^{-1}\left(\frac{\lambda}{2d}\right)$
- (3) $\sin^{-1}\left(\frac{\lambda}{3d}\right)$
- (4) $\sin^{-1}\left(\frac{\lambda}{4d}\right)$

49. Which of the following graph correctly represents the variation of magnetic field induction with distance due to a long thin wire carrying current?



50. Absolute refractive indexes of glass and water are $\frac{3}{2}$ and $\frac{4}{3}$. The ratio of velocity of light in glass and water will be

- (1) $4 : 3$
- (2) $3 : 4$
- (3) $3 : 2$
- (4) $8 : 9$

SECTION-II**DOMAIN SUBJECT: CHEMISTRY**

MM. 200

Time: 45 min.

Instructions:

1. The test is of 45 Minutes duration.
2. The test contains 50 Questions out of which 40 questions need to be attempted.
3. Marking Scheme of the test:
 - a. Correct answer or the most appropriate answer: Five marks (+5)
 - b. Any incorrect option marked will be given minus one mark (–1).
 - c. Unanswered/Marked for Review will be given no mark (0).

Choose the correct answer :

1. Which of the following statements is correct for binary solution?
 - (1) A solution in which heat is evolved exhibits positive deviations from Raoult's law
 - (2) A solution in which heat is absorbed shows negative deviations from Raoult's law
 - (3) When one component in solution shows negative deviation from Raoult's law, the other exhibits positive deviation
 - (4) ΔS is +ve for the solution which shows deviation from Raoult's law
2. If a solute AB type undergoes 50% dimerization and 50% dissociate, the values of van't Hoff factor is
 - (1) 0.5
 - (2) 1.5
 - (3) 1.25
 - (4) 1
3. If the molality of the solution is 0.70, then find relative lowering of the vapour pressure of an aqueous solution containing non-volatile solute.
 - (1) 0.0125
 - (2) 0.50
 - (3) 0.80
 - (4) 0.40
4. Which of the following oxides behaves as conductor or insulator depending upon temperature?
 - (1) TiO
 - (2) SiO₂
 - (3) TiO₃
 - (4) MgO
5. How many tetrahedral holes are occupied in diamond?
 - (1) 25%
 - (2) 50%
 - (3) 75%
 - (4) 100%
6. Aluminium is extracted from alumina (Al₂O₃) by electrolysis of a molten mixture of
 - (1) Al₂O₃ + HF + NaAlF₄
 - (2) Al₂O₃ + CaF₂ + NaAlF₄
 - (3) Al₂O₃ + Na₃AlF₆ + CaF₂
 - (4) Al₂O₃ + KF + Na₃AlF₆
7. Which of the following set of axial angles and axial length represent maximum number of Bravais lattices?
 - (1) $\alpha = \beta = \gamma = 90^\circ$ and $a = b = c$
 - (2) $\alpha = \beta = \gamma = 90^\circ$ and $a = b \neq c$
 - (3) $\alpha = \beta = \gamma = 90^\circ$ and $a \neq b \neq c$
 - (4) $\alpha = \beta = \gamma \neq 90^\circ$ and $a = b = c$
8. The maximum coagulating power for precipitating arsenious sulphide sol is of
 - (1) 0.1 N Zn(NO₃)₂
 - (2) 0.1 N Na₃PO₄
 - (3) 0.1 N ZnSO₄
 - (4) 0.1 N AlCl₃
9. What will be the emf of the given cell?
Pt | H₂(g, P₁) | H⁺(aq.) | H₂(g, P₂) | Pt
 - (1) $\frac{RT}{F} \ln \frac{P_1}{P_2}$
 - (2) $\frac{RT}{2F} \ln \frac{P_1}{P_2}$
 - (3) $\frac{RT}{F} \ln \frac{P_2}{P_1}$
 - (4) $\frac{RT}{2F} \ln \frac{P_2}{P_1}$
10. Tyndall effect is more effectively shown by
 - (1) Lyophilic colloids
 - (2) Lyophobic colloids
 - (3) Suspensions
 - (4) True solution

11. At high pressure, Langmuir adsorption isotherm takes the form

$$(1) \frac{x}{m} = \frac{ap}{1+bp} \quad (2) \frac{x}{m} = \frac{a}{b}$$

$$(3) \frac{x}{m} = ap \quad (4) \frac{m}{x} = \frac{b}{a} + \frac{1}{ap}$$

12. Arrhenius equation may be termed as rate constant at

- (1) Very low temperature
(2) Very high temperature
(3) High activation energy
(4) At boiling temperature of the reaction mixture

13. The rate constant K_1 and K_2 for two different reactions are $10^{16}e^{-2000/T}$ and $10^{15}e^{-1000/T}$, respectively. The temperature at which $K_1 = K_2$ is

$$(1) 2000 \text{ K} \quad (2) \frac{1000}{2.303} \text{ K}$$

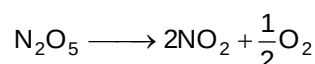
$$(3) 1000 \text{ K} \quad (4) \frac{2000}{2.303} \text{ K}$$

14. Efficiency of a cell with cell reaction under standard conditions, $A(s) + B^+ \longrightarrow A^+ + B(s)$; $\Delta H^\circ = -300 \text{ kJ}$ is 70%. The standard electrode potential of cell is

$$(1) 2.176 \text{ V} \quad (2) 2.876 \text{ V}$$

$$(3) 1.248 \text{ V} \quad (4) 1.648 \text{ V}$$

15. Consider the decomposition of N_2O_5 as



The rate of reaction is given by

$$\frac{-d[N_2O_5]}{dt} = \frac{1}{2} \frac{d[NO_2]}{dt} = 2 \frac{d[O_2]}{dt} = K_1[N_2O_5]$$

Therefore, $\frac{-d[N_2O_5]}{dt} = K_1[N_2O_5]$,

$$\frac{d[NO_2]}{dt} = 2K_1[N_2O_5] = K'_1[N_2O_5],$$

$$\frac{d[O_2]}{dt} = \frac{1}{2}K_1[N_2O_5] = K''_1[N_2O_5]$$

Choose the correct option.

$$(1) K_1 = K'_1 = K''_1 \quad (2) K_1 = 2K'_1 = K''_1$$

$$(3) 2K_1 = 2K'_1 = 4K''_1 \quad (4) 4K_1 = 2K'_1 = K''_1$$

16. Calculate the half-life of the first order reaction $C_2H_4O(g) \longrightarrow CH_4(g) + CO(g)$

If the initial pressure of $C_2H_4O(g)$ is 80 mm and the total pressure at the end of 20 minutes is 120 mm.

- (1) 40 minute (2) 120 minute
(3) 20 minute (4) 80 minute

17. On heating, which of the following nitrates gives O_2 under normal condition?

- (1) NH_4NO_3 (2) NH_4NO_2
(3) $NaNO_3$ (4) $LiNO_3$

18. Which of the following statements is correct for the P_4O_{10} molecule?

- (1) There are four $P=O$ bond present
(2) It contains seven $P-O-P$ bonds
(3) It is hydrolysed by water, forming H_3PO_3
(4) It has no structural similarity with As_4O_{10}

19. NH_3 not obtained by

- (1) Heating of NH_4NO_3 or NH_4NO_2
(2) Heating of NH_4Cl or $(NH_4)_2CO_3$
(3) Heating of NH_4NO_3 and $NaOH$
(4) Reaction of AlN or Mg_3N_2 or $CaCN_2$ with H_2O

20. Which compound is used in vulcanisation of rubber?

- (1) SF_6
(2) H_2S
(3) S_2Cl_2
(4) $SOCl_2$

21. Fluorine reacts with water to produce

- (1) HF and H_2O_2
(2) HF , O_2 and F_2O_2
(3) F^- , O_2 and H^+
(4) F_2O and F_2O_2

22. On heating lead (II) nitrate gives a brown gas 'A'. The gas 'A' on cooling changes to colourless solid 'B'. At 250 K solid B with NO changes to a blue solid 'C'. Identity A, B & C.

- (1) NO , NO_2 , N_2O
(2) NO_2 , N_2O_4 , N_2O_3
(3) NO_2 , NO , N_2O_3
(4) N_2O , NO_2 , N_2O_4

23. Which of the following is planar?

- (1) XeOF_4 (2) XeO_3
(3) XeO_2F_2 (4) XeF_4

24. The effective atomic number of Ni in the complex ion $[\text{Ni}(\text{CN})_4]^{2-}$ is

- (1) 36 (2) 86
(3) 34 (4) 18

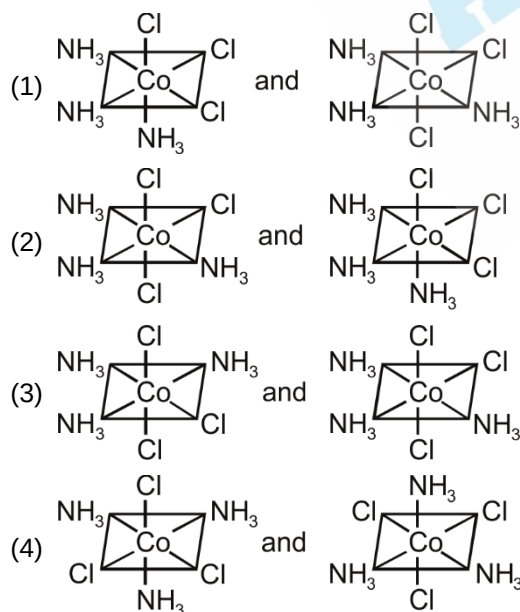
25. Oxidation state of Fe in sodium nitroprusside.

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

26. The IUPAC name for $[\text{Pt}(\text{Py})_4][\text{PtCl}_4]$ is

- (1) Tetrapyridineplatinum (II) tetrachloridoplatinate (II)
(2) Tetrapyridine tetrachlorodiplatinum (IV)
(3) Tetrachlorotetrapyridine diplatinum (II)
(4) Tetrakis pyridine platinum (IV) tetra chloridoplatinum (IV)

27. Which of the following pairs of structures represents facial and meridional isomers respectively?



28. When hard steel is heated to bright redness and then allowed to cool slowly, it gets softened. The process is called

- (1) Annealing
(2) Hardening
(3) Quenching
(4) Tempering

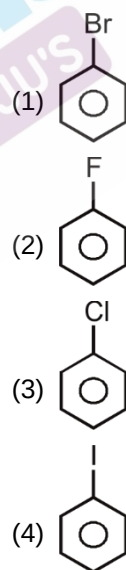
29. MnO_4^{2-} (1 mole) in neutral aqueous medium disproportionates to

- (1) $\frac{2}{3}$ mole of MnO_4^- and $\frac{1}{3}$ mole of MnO_2
(2) $\frac{1}{3}$ mole of MnO_4^- and $\frac{2}{3}$ mole of MnO_2
(3) $\frac{1}{3}$ mole of Mn_2O_7 and $\frac{1}{3}$ mole of MnO_2
(4) $\frac{2}{3}$ mole of Mn_2O_7 and $\frac{1}{3}$ mole of MnO_2

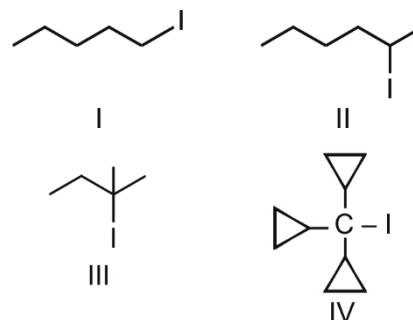
30. Which of the following exhibits only +3 oxidation state?

- (1) Ac (2) Pa
(3) Cl (4) Th

31. Most reactive aryl halide towards nucleophilic substitution reaction



32. Arrange the following compounds towards reaction with $\text{KOH}(\text{aq})$



- (1) $\text{I} < \text{II} < \text{III} < \text{IV}$ (2) $\text{II} < \text{III} < \text{IV} < \text{I}$
(3) $\text{III} < \text{II} < \text{IV} < \text{I}$ (4) $\text{I} < \text{III} < \text{IV} < \text{II}$

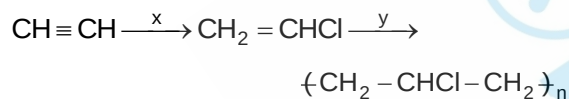
33. Which of the following will not be soluble in sodium hydrogen carbonate?

- (1) 2, 4, 6-Trinitrophenol
- (2) Benzoic acid
- (3) O-nitrophenol
- (4) Benzene sulphonic acid

34. 0.0833 mole of a carbohydrate of empirical formula CH_2O contains 1.00 g of hydrogen. The molecular formula of the carbohydrate is

- (1) $\text{C}_5\text{H}_{10}\text{O}_5$
- (2) $\text{C}_3\text{H}_4\text{O}_3$
- (3) $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
- (4) $\text{C}_6\text{H}_{12}\text{O}_6$

35. Fill up with suitable reagents to show synthesis of polyvinyl chloride.



- (1) $x = \text{HCl, HgCl}_2$; $y = \text{Polymerisation, peroxide}$
- (2) $x = \text{Cl}_2, \text{FeCl}_3$; $y = \text{Polymerisation, heat}$
- (3) $x = \text{HCl, CuCl}$; $y = \text{H}_2\text{O, H}^+$
- (4) $x = \text{HCl, HgCl}_2$; $y = \text{Pt, high pressure}$

36. The fibre obtained by the condensation of hexamethylene diamine and adipic acid is

- (1) Dacron
- (2) Nylon 6, 6
- (3) Rayon
- (4) Teflon

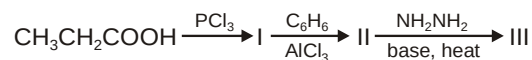
37. The number of HIO_4 molecules required to react with one molecule of glucose is

- (1) 5
- (2) 6
- (3) 4
- (4) 3

38. m-nitrobenzoic acid can be obtained by

- (1) Toluene $\xrightarrow[\text{KMnO}_4]{[\text{O}]}$ A $\xrightarrow[\text{H}_2\text{SO}_4]{\text{HNO}_3}$
- (2) Toluene $\xrightarrow[\text{CrO}_2\text{Cl}_2]{[\text{O}]}$ A $\xrightarrow[\text{H}_2\text{SO}_4]{\text{HNO}_3}$ B $\xrightarrow[\text{KMnO}_4]{[\text{O}]}$
- (3) Toluene $\xrightarrow[\text{HNO}_3 + \text{H}_2\text{SO}_4]{[\text{O}]}$ A $\xrightarrow[\text{KMnO}_4]{[\text{O}]}$
- (4) Both (1) & (2)

39. The final product obtained in the reaction sequence is



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

40. Among the following, which will react most rapidly with HBr ?

- (1) $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
- (2)
- (3)
- (4)

41. Arrange the following in order of decreasing acidic strength

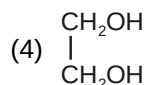
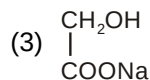
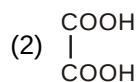
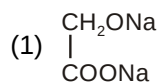
- I. p-nitrophenol
- II. p-cresol
- III. m-cresol
- IV. phenol

- (1) $\text{I} > \text{IV} > \text{III} > \text{II}$
- (2) $\text{IV} > \text{III} > \text{II} > \text{I}$
- (3) $\text{I} > \text{III} > \text{II} > \text{IV}$
- (4) $\text{III} > \text{II} > \text{I} > \text{IV}$

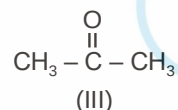
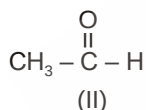
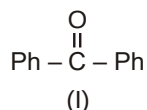
42. An organic compound with the molecular formula $\text{C}_3\text{H}_6\text{O}$ does not respond to the silver mirror test and Tollen's reagent but produces an oxime on reaction with NH_2OH . The compound is

- (1) $\text{CH}_2 = \text{CHCH}_2\text{OH}$
- (2) $\text{CH}_3\text{CH}_2\text{CHO}$
- (3) $\text{CH}_2 = \text{CHOCH}_3$
- (4) CH_3COCH_3

43. $\begin{array}{c} \text{CHO} \\ | \\ \text{CHO} \end{array} \xrightarrow{\text{NaOH}} \text{X}$. The product (X) will be



44. The correct order of reactivity of PhMgBr with following compounds.

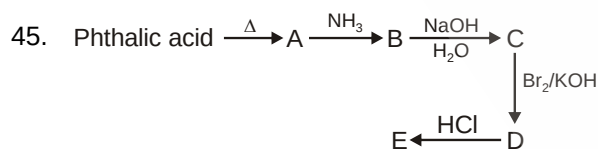


(1) $\text{I} > \text{II} > \text{III}$

(2) $\text{III} > \text{II} > \text{I}$

(3) $\text{II} > \text{III} > \text{I}$

(4) $\text{I} > \text{III} > \text{II}$



In this reaction, the product E is

(1) o-nitrobenzoic acid

(2) Salicylic acid

(3) Anthranilic acid

(4) Crotonic acid

46. ABC ABC type packing gives which type of unit cell?

(1) Body centred cubic packing

(2) Face centre cubic packing

(3) Simple cubic packing

(4) Hexagonal cubic close packing

47. For 0.01 molal aqueous solution of the following compounds, which one will show the highest freezing point?

(1) $[\text{Co}(\text{H}_2\text{O})_6]\text{Cl}_3$

(2) $[\text{Co}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$

(3) $[\text{Co}(\text{H}_2\text{O}_4)\text{Cl}_2]\text{Cl} \cdot 2\text{H}_2\text{O}$

(4) $[\text{Co}(\text{H}_2\text{O})_3\text{Cl}_3] \cdot 3\text{H}_2\text{O}$

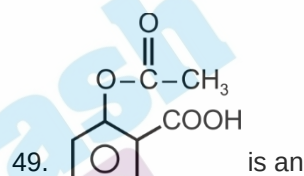
48. Which among the following compound on hydrolysis gives disproportionation reaction?

(1) XeF_6

(2) XeF_4

(3) XeF_2

(4) PCl_3

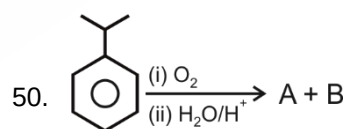


(1) Analgesic

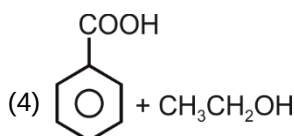
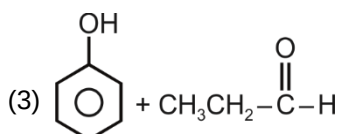
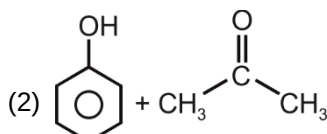
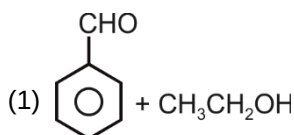
(2) Antibiotic

(3) Antihistamine

(4) Antacid



Products 'A' and 'B' are



SECTION-II

DOMAIN SUBJECT: BIOLOGY

MM. 200

Time: 45 min.

Instructions:

- The test is of 45 Minutes duration.
- The test contains 50 Questions out of which 40 questions need to be attempted.
- Marking Scheme of the test:
 - Correct answer or the most appropriate answer: Five marks (+5)
 - Any incorrect option marked will be given minus one mark (–1).
 - Unanswered/Marked for Review will be given no mark (0).

Choose the correct answer :

- With respect to reproduction in organisms, which among the following is **correct** set of statements?
 - Most of the species of *Chara* are monoecious
 - Most common asexual spore produced by algae are conidia
 - Perennial plants like *Bambusa tulda* live vegetatively for 50-100 years and is monocarpic in nature.
 - Most of the algae like *Spirogyra* show external fertilization.

- All are correct
- Only b is correct
- Only a and c are correct
- Only b, c and d are correct

- Match the Column-I with Column-II and choose the correct option.

Column-I

- Offset
- Rhizome
- Bulbils
- Leaf buds

Column-II

- Ginger
- Bryophyllum*
- Agave*
- Water hyacinth

- a(i), b(ii), c(iii), d(iv)
- a(ii), b(iii), c(i), d(iv)
- a(iv), b(i), c(iii), d(ii)
- a(iii), b(ii), c(iv), d(i)

- Choose the **correct** option w.r.t. sexual reproduction in organisms.

- Slow, elaborate and complex
- Always biparental
- Usually occur even before attaining reproductive maturity
- Does not involve meiosis and fertilization essentially, in the life cycle

- Select the **correctly** matched pair.

(1)	Endothecium	–	Outermost layer of anther
(2)	Sporogenous tissue	–	Protective layer of anther
(3)	Tapetum	–	Helps in dehiscence of anther
(4)	Middle layer	–	Ephemeral in nature

- Mark the **incorrect** statement, regarding the male gametophyte in flowering plants.

- These are generally spherical measuring 25–50 μm in diameter
- Outer wall of it can withstand high temperature, strong acids and alkali
- Inner layer is made up of proteins only
- Outer wall of it has prominent apertures called germ pores

- Read the following statements and choose the correct ones.

- Even in the absence of pollinators, seed setting is assured in *Commelina*, *Viola* and *Oxalis*.
- Hydrophily is quite rare in flowering plants and is limited to about 30 genera of mostly dicots.
- Unisexuality of flowers in dioecious plants prevents autogamy but not geitonogamy.

- Only (b)
- Only (a)
- Only (c)
- Only (b) and (c)

7. Mark the **incorrect** statement w.r.t. the development of pest resistance in plants
- (1) In wheat, solid stem lead to non-preference by the stem saw fly
 - (2) Necterless cotton varieties do not attract bollworms
 - (3) Low aspartic acid, high nitrogen and sugar content in maize leads to resistance against stem borers
 - (4) Hairy leaves in cotton leads to resistance against jassids
8. Consider the following statements related to biocontrol agents and select the correct option stating which one is true (T) and which one is false (F).
- a. Baculoviruses have species-specific, narrow spectrum insecticidal applications, and are pathogens that attack insects and other arthropods.
 - b. Dragonflies and Ladybirds, are used as biocontrol agents in controlling aphids and mosquitoes respectively.
- | a | b |
|-------|---|
| (1) T | T |
| (2) T | F |
| (3) F | F |
| (4) F | T |
9. Which of the following statements is **incorrect**?
- (1) BOD test measures the rate of uptake of oxygen by micro organism in water sample
 - (2) Once the BOD of sewage water is reduced significantly, activated sludge is prepared as sediment during secondary waste water treatment
 - (3) Aerobic sludge digesters produce mixture of gases such as methane, hydrogen sulphide and carbon dioxide
 - (4) Tertiary treatment is physico-chemical process in which chlorine gas, ozone gas, perchlorate salts are used to remove turbidity in waste water
10. Which one is not a characteristics of a population?
- (1) Birth of an individual
 - (2) Sex ratio
 - (3) Population density
 - (4) Death rate
11. Which of the following statements is **correct**?
- (1) Catalytic converter is the most effective device to remove over 99% of particulate matter present in polluted atmospheric air
 - (2) Planting trees under green muffler scheme is one of the method to reduce water pollution
 - (3) Eutrophication can be both natural and accelerated, caused due to nutrient enrichment of lake due to nitrogen and phosphorus
 - (4) Montreal protocol was concerned with appropriate measure required to reduce overall greenhouse gas emission
12. Select the **incorrect** option w.r.t. population interaction.
- (1) Algae and fungi – Mutualism
 - (2) Barnacles and Whale – Commensalism
 - (3) Clownfish and Sea anemone – Mutualism
 - (4) Sea anemone and Hermit crab – Proto cooperation
13. It is a species which though having a small population but has a major influence on the composition of community. It is known as
- (1) Vulnerable species
 - (2) Key stone species
 - (3) Extinct species
 - (4) Key industry species
14. Mark the **incorrect** statement w.r.t. the decomposition of detritus
- (1) Decomposition of detritus is slow if it contains lignin, chitin, tannin and cellulose
 - (2) At temperature less than 10°C, the rate of decomposition is very slow
 - (3) Reduction in moisture reduces the rate of decomposition
 - (4) Reduced aeration fastens the rate of decomposition
15. Part of photosynthetically active radiation (PAR) which is captured by plants for G.P.P. is
- | | |
|--------------|--------------|
| (1) 1 – 5% | (2) 2 – 10% |
| (3) 0.8 – 4% | (4) 1.6 – 8% |
16. Which one is **not** related to hot spots?
- (1) High level of species richness
 - (2) Initially 94 hot spots were identified globally
 - (3) High degree of endemism
 - (4) *In-situ* conservation of species

17. According to the Rivet-popper hypothesis by Paul Ehrlich, rivets on the wings represent
- (1) Ecosystem
 - (2) Critical link species
 - (3) Endemic species
 - (4) Key species
18. Identify the **incorrectly** matched pair
- (1) $\phi \times 174$ virus – 4886 nucleotides
 - (2) λ virus – 48502 bp
 - (3) *E.coli* – 4.6×10^6 bp
 - (4) Human genome – 3.3×10^9 bp
19. Select the **correct** match w.r.t. specificity of enzyme involved for RNA synthesis.
- | Column I | Column II |
|-----------------------|----------------------|
| a. RNA polymerase I | (i) rRNA synthesis |
| b. RNA polymerase III | (ii) hnRNA synthesis |
| d. RNA polymerase II | (iii) tRNA synthesis |
- | a | b | c |
|-----------|-------|-------|
| (1) (i) | (ii) | (iii) |
| (2) (i) | (iii) | (ii) |
| (3) (ii) | (iii) | (i) |
| (4) (iii) | (ii) | (i) |
20. **Correct** set of statements w.r.t. RNA are
- A. rRNA forms about 80% of total cellular RNA
 - B. In prokaryotes, rRNA present are 28S, 18S and 5S
 - C. tRNA constitutes about 15% of cellular RNA
 - D. Eukaryotic mRNA is monocistronic
- (1) All are correct
 - (2) A, C and D are correct
 - (3) A, B and D are correct
 - (4) A and B are correct
21. Mark the **odd one** out w.r.t. regulation of gene expression.
- (1) In prokaryotes, control of rate of transcriptional initiation is the predominant site for control of gene expression
 - (2) In eukaryotes gene expression is regulated at post transcriptional level also
 - (3) In *lac* operon, structural genes *z*, *y*, *a* are constitutive genes
 - (4) In *lac* operon, repressor protein coded by *i* gene
22. Digested DNA fragments are separated by A and transferred on B in DNA fingerprinting. Identify A and B here.
- | A | B |
|-------------------------|---------------------|
| (1) PCR | Agarose gel |
| (2) Gel electrophoresis | Synthetic membranes |
| (3) Autoradiography | Synthetic membranes |
| (4) Gel electrophoresis | Agarose gel |
23. **Incorrect** statement w.r.t. the human genome project is
- (1) Average gene consists of 3000 bases
 - (2) Chromosome 1 has maximum number of genes (2968)
 - (3) Functions are unknown for over 99% of discovered genes
 - (4) Less than 2% of genome codes for protein
24. If a cross is made between AaBbCCDD and AaBbccdd, what would be the probability of offspring with genotype AaBbCcDd?
- (1) 1/8
 - (2) 1/16
 - (3) 1/4
 - (4) 1/32
25. A chromosomal disorder in which affected individual is short statured, with small round head, furrowed tongue and partially open mouth. Palm is broad with characteristic palm crease. Identify the disorder and related chromosome
- (1) Klinefelter's syndrome – Sex chromosome
 - (2) Turner's syndrome – Sex chromosome
 - (3) Down's syndrome – Chromosome 21
 - (4) Edward's syndrome – Chromosome 18
26. Oblique binary fission is seen in
- (1) *Euglena*
 - (2) *Vorticella*
 - (3) *Gonyaulax*
 - (4) *Paramecium*
27. Sertoli cells are found in seminiferous tubules, about which all statements are correct, **except** one
- (1) They regulate spermatogenesis by releasing inhibin
 - (2) Spermatozoa remain embedded in them till spermiation
 - (3) They function in response to FSH
 - (4) They undergo division to form 4-8 layers of spermatogenic cells

28. Mark the **incorrect** statement.
- (1) Fluids from seminal vesicles and bulbourethral glands gives semen a sticky consistency
 - (2) Cervix has powerful sphincter muscles
 - (3) Labia majora fuse posteriorly to form a membranous fold called fourchette
 - (4) Progesterone like drugs can postpone the menstrual bleeding for few days
29. If infertility is due to impotency of male partner or due to very low sperm count in the ejaculate, then in this case the preferred ART would be
- (1) GIFT (2) AI
 - (3) IUT (4) ZIFT
30. A tetanus toxoid vaccine given to a pregnant female will provide _____ immunity to the mother.
Select the correct option to fill in the blank.
- (1) Artificial passive
 - (2) Natural active
 - (3) Artificial active
 - (4) Natural passive
31. Which factor is responsible for the incomplete switch over and for inadequate blood flow through pulmonary arteries of a newborn after expulsion stage of parturition?
- (1) Low amount of oxytocin
 - (2) Failure to synthesise enough nitric oxide
 - (3) Presence of adrenaline
 - (4) Inadequate amount of prostaglandins
32. Active lactation during pregnancy is inhibited by
- (1) Development of oocytes in ovary
 - (2) High level of oestrogen
 - (3) Immune system of foetus
 - (4) Release of oxytocin
33. Which of the following is not a mechanism of action of IUDs?
- (1) Increase phagocytosis of sperms
 - (2) Make uterus unsuitable for implantation and cervix hostile to sperms
 - (3) Prevent deposition of semen in vagina
 - (4) Suppress sperm motility and fertilising capacity of sperms
34. Transmission of sexually transmitted infections cannot be prevented by
- (1) Avoiding sex with unknown partners
 - (2) Using condoms during coitus
 - (3) Early detection and complete treatment of the diseases, if any
 - (4) Use of injectable contraceptives by the female
35. Symptoms of a disease include fever, chills, cough, headache and in severe cases, lips and fingers nails may turn gray to bluish in colour. The disease is caused by
- (1) *Plasmodium vivax*
 - (2) *Haemophilus influenzae*
 - (3) *Salmonella typhi*
 - (4) Rhino virus
36. A drug commonly called crack that has a potent stimulating action on central nervous system producing a sense of euphoria and increased energy is
- (1) Opium (2) Cocaine
 - (3) Mescaline (4) Benzodiazepines
37. Which of the following statements is not **correct**?
- (1) Formation of coacervates occurs, if a mixture of proteins and polysaccharides is shaken
 - (2) Protenoid microspheres were obtained by Sydney Fox
 - (3) When mixtures of artificially produced organic compounds were mixed with cool water, microspheres formed
 - (4) Coecervates would have been the first step in the evolution of life
38. The theory of evolution, that suggested that the changes occurring in germplasm are inherited by offsprings was proposed by
- (1) Lamarck (2) Weismann
 - (3) deVries (4) Darwin
39. First seed ferns appeared during
- (1) Cambrian period
 - (2) Carboniferous period
 - (3) Triassic period
 - (4) Silurian period

40. At a crime site one hair recovered along with hair follicle, believed to belong to the suspect of crime. For matching the DNA contained in the sample, a chain of suspects. The first step to achieve the objective is to make multiple copies of DNA, which can be carried out
- (1) By hybridising the DNA with a DNA probe
 - (2) By subjecting the DNA to polymerase chain reaction
 - (3) By subjecting the DNA to gel electrophoresis
 - (4) By treating the DNA with restriction endonuclease
41. Phenomenon of industrial melanism does not demonstrate
- (1) Progressive selection
 - (2) Evolution due to anthropogenic action
 - (3) Natural selection
 - (4) Founder's effect
42. Darwin proposed that new species evolved from ancestral forms by the
- (1) Gradual accumulation of useful variations
 - (2) Inheritance of acquired characters
 - (3) Decaying of non-living matter
 - (4) Accumulation of mutations
43. In case of malaria, infective stage for humans is
- (1) Phanerozoites
 - (2) Sporozoites
 - (3) Schizozoites
 - (4) Trophozoites
44. Which of the following is a second generation vaccine consisting of antigenic polypeptides produced by rDNA technology?
- (1) BCG vaccine
 - (2) Tetanus toxoid
 - (3) Diphtheria toxoid
 - (4) Recombivax-HB
45. Bubonic plague is a bacterial disease for which the incorrect statement is
- (1) Its causative agent primarily causes disease in rodents
 - (2) The *Yersinia pestis* is responsible for plague
 - (3) Transmission occurs through *Xenopsylla*
 - (4) We have DPT vaccine against plague
46. Karan-Swiss is a cross-breed of
- (1) Bikaneri ewes × Marino rams
 - (2) Jersey cow × Holstein-Friesian bull
 - (3) Sahiwal cow × Brown Swiss bull
 - (4) Sahiwal cow × Holstein-Friesian bull
47. How many of the following are hallucinogens?
- Opium, Heroin, Charas, Pethidine, LSD, Mescaline, Cocaine, Hashish, Marijuana
- (1) 3
 - (2) 4
 - (3) 5
 - (4) 6
48. Identify the **wrong** statements.
- a. The tumour of haematopoietic cells is called leukemia
 - b. Cancer arising from the epithelial tissues of internal organs and glands is referred to as melanoma
 - c. Sarcoma is a type of cancer where bone and cartilages are involved
 - d. Only benign tumours are called as true cancer or neoplasm
- (1) a & b only
 - (2) b & c only
 - (3) b & d only
 - (4) a & c only
49. Basic steps in genetic modification of an organism include all the following, **except**
- (1) Identification of DNA with desirable genes
 - (2) Introduction of the identified DNA into the vector
 - (3) Maintenance of introduced DNA in the host and transfer of the DNA to its progeny
 - (4) Assessment of the ability of vector to tolerate toxins in the environment
50. Identify the **correctly** matched pair.
- | | |
|-----------------------------------|---------------------------------------|
| (1) <i>Bacillus thuringiensis</i> | – RNA interference gene |
| (2) Cosmid | – Carries 300 – 350 kbp length of DNA |
| (3) <i>Sal I</i> | – Restriction endonuclease |
| (4) Molecular glue | – Alkaline phosphatase |

SECTION-II**DOMAIN SUBJECT: MATHEMATICS**

MM. 200

Time: 45 min.

Instructions:

- The test is of 45 Minutes duration.
- The test contains is divided into two sections.
 - Section A contains 15 questions which will be compulsory for all candidates.
 - Section B will have 35 questions out of which 25 questions need to be attempted.
- Marking Scheme of the test:
 - Correct answer or the most appropriate answer: Five marks (+5)
 - Any incorrect option marked will be given minus one mark (-1).
 - Unanswered/Marked for Review will be given no mark (0).

SECTION - A

Section A will have 15 questions covering both i.e., Mathematics/Applied Mathematics which will be compulsory for all candidates

1. If $A = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$, then $A + A' = I$, then a value of θ is (where A' is transpose matrix of A)

- (1) $\frac{\pi}{6}$ (2) $\frac{\pi}{3}$
 (3) π (4) $\frac{3\pi}{2}$

2. The value of determinant $\begin{vmatrix} a-b & b+c & a \\ b-a & c+a & b \\ c-a & a+b & c \end{vmatrix}$ is

- (1) $a^3 + b^3 + c^3$
 (2) $3abc$
 (3) $a^3 + b^3 + c^3 - 3abc$
 (4) $(a+b+c)(b-c)(b-a)$

3. If $\begin{bmatrix} 1 & -\tan \theta \\ \tan \theta & 1 \end{bmatrix} \begin{bmatrix} 1 & \tan \theta \\ -\tan \theta & 1 \end{bmatrix}^{-1} = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$ then

- (1) $a = 1, b = 1$
 (2) $a = \cos 2\theta, b = \sin 2\theta$
 (3) $a = \sin 2\theta, b = \cos 2\theta$
 (4) $a = b = 0$

4. The system of linear equations $x + ky - z = 0$, $kx - y - z = 0$, $x + y - kz = 0$ has a non-trivial solution for

- (1) Exactly 3 values of k
 (2) Infinitely many values of k
 (3) Exactly 1 value of k
 (4) Exactly 2 values of k

5. The points at which the tangents to the curve $y = x^3 - 12x + 18$ are parallel to x-axis are

- (1) $(2, -2)$ & $(-2, -34)$
 (2) $(2, 34)$ & $(-2, 0)$
 (3) $(0, 34)$ & $(-2, 0)$
 (4) $(2, 2)$ & $(-2, 34)$

6. If $y = \sin 2x \cos 4x$, then $\frac{d^2y}{dx^2}$ at $x = \frac{\pi}{12}$, is equal to

- (1) 0 (2) -17
 (3) 17 (4) -34

7. If $f(x) = \sin x(1 + \cos x)$, then point of local maxima in $x \in (0, \pi/2)$ is

- (1) $\frac{\pi}{6}$ (2) $\frac{\pi}{3}$
 (3) $\frac{\pi}{4}$ (4) $\frac{\pi}{12}$

8. $\int \frac{dx}{e^x + e^{-x}}$ is equal to

- (1) $\tan^{-1}(e^x) + c$ (2) $\tan^{-1}(e^{-x}) + c$
 (3) $\log(e^x - e^{-x}) + c$ (4) $\log(e^x + e^{-x}) + c$

9. $\int_{-\pi/4}^{\pi/4} \frac{dx}{1 + \cos 2x}$ is equal to

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

10. The area of the region bounded by the y -axis, $y = \cos 2x$ and $y = \sin 2x$, $0 \leq x \leq \pi/8$ is

- (1) $\sqrt{2}$ sq. unit (2) $(\sqrt{2} - 1)$ sq. unit
 (3) $\frac{(\sqrt{2} - 1)}{2}$ sq. unit (4) Zero

11. The order and degree of the differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^{3/4} = x^{5/6}$, respectively, are

- (1) 2 and 4 (2) 2 and 1
 (3) 2 and 3 (4) 2 and not define

12. A box has 100 pens of which 10 are defective. What is the probability that out of a sample of 5 pens drawn one by one with replacement at most one is defective?

- (1) $\left(\frac{9}{10}\right)^5$ (2) $\frac{1}{2}\left(\frac{9}{10}\right)^4$
 (3) $\frac{1}{2}\left(\frac{9}{10}\right)^5$ (4) $\left(\frac{9}{10}\right)^5 + \frac{1}{2}\left(\frac{9}{10}\right)^4$

13. The corner points of the feasible region determined by the following system of linear inequalities

$$2x + y \leq 10, x + 3y \leq 15, x, y \geq 0 \text{ are } (0, 0), (5, 0), (3, 4) \text{ and } (0, 5).$$

Let $Z = px + qy$, where $p, q > 0$, condition on p and q , so that the maximum of Z occurs at both $(3, 4)$ and $(0, 5)$ is

- (1) $p = q$ (2) $p = 2q$
 (3) $p = 3q$ (4) $q = 3p$

14. The probability distribution of a discrete random variable X is given below:

X	2	3	4	5
$P(X)$	$\frac{5}{k}$	$\frac{7}{k}$	$\frac{9}{k}$	$\frac{11}{k}$

then value of k is

- (1) 8 (2) 16
 (3) 32 (4) 48

15. For the following probability distribution

X	1	2	3
$P(X)$	$\frac{1}{2}$	$\frac{1}{5}$	$\frac{3}{10}$

$E(X^2)$ is equal to

- (1) $\frac{9}{5}$ (2) $\frac{81}{25}$
 (3) 4 (4) 10

SECTION - B

Section B will have 35 questions from Mathematics out of which 25 questions need to be attempted.

16. Let us define a relation R on R as aRb if $a \geq b$. Then R is

- (1) An equivalence relation
 (2) Reflexive, transitive but not symmetric
 (3) Symmetric, transitive but not reflexive
 (4) Neither transitive nor reflexive but symmetric

17. Which of the following function from Z to Z is a bijection?

- (1) $f(x) = x^3$
 (2) $f(x) = x + 2$
 (3) $f(x) = 2x + 1$
 (4) $f(x) = x^2 + 1$

18. The value of $\sin^{-1}\left(\cos\frac{2\pi}{5}\right)$ is
- (1) $\frac{\pi}{10}$ (2) $\frac{2\pi}{5}$
 (3) $\frac{-\pi}{10}$ (4) $\frac{-2\pi}{5}$
19. The domain of the function $\cos^{-1}(2x^2 - 1)$ is
- (1) $[0, 1]$ (2) $[-1, 1]$
 (3) $(-1, 1)$ (4) $[0, \pi]$
20. The value of $\cos^{-1}\left(\cos\frac{3\pi}{2}\right)$ is
- (1) $\frac{\pi}{2}$ (2) $\frac{3\pi}{2}$
 (3) $\frac{5\pi}{2}$ (4) $\frac{7\pi}{2}$
21. If $A = [2 \ -3 \ 4]$, $B = \begin{bmatrix} 3 \\ 2 \\ 2 \end{bmatrix}$, $X = [1 \ 2 \ 3]$ and $Y = \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix}$, then $AB + XY$ equals
- (1) $[28]$ (2) $[24]$
 (3) 28 (4) 24
22. If for a square matrix $A = [a_{ij}]$, $a_{ij} = i^2 - j^2$ then A is
- (1) Unit matrix
 (2) Zero matrix
 (3) Symmetric matrix
 (4) Skew symmetric matrix
23. If A and B are two square matrix of order 3×3 such that $AB = A$; $BA = B$, then $(A + B)^6$ is
- (1) $6(A + B)$
 (2) $6I$
 (3) $32(A + B)$
 (4) $64(A + B)$
24. If A is a 3×3 matrix such that $|A| = 8$, then $|2A|$ equals
- (1) 16 (2) 32
 (3) 64 (4) 4
25. If A is a square matrix of order 3, such that $A(\text{adj } A) = 10I$, then $|\text{adj } A|$ is equal to
- (1) 1 (2) 10
 (3) 100 (4) 101
26. If $f(x) = \begin{cases} mx+1 & \text{if } x \leq \frac{\pi}{2} \\ \sin x + n & \text{if } x > \frac{\pi}{2} \end{cases}$, is continuous at $x = \frac{\pi}{2}$, then relation between m & n is
- (1) $m = 1, n = 0$
 (2) $m = \frac{n\pi}{2} + 1$
 (3) $n = \frac{m\pi}{2}$
 (4) $m = n = \frac{\pi}{2}$
27. If $y = \log_e\left(\frac{x^2}{e^2}\right)$, then $\frac{d^2y}{dx^2}$ equals
- (1) $\frac{-1}{x}$ (2) $\frac{-1}{x^2}$
 (3) $\frac{2}{x^2}$ (4) $\frac{-2}{x^2}$
28. Let $f(x) = |\sin x|$, then
- (1) f is everywhere differentiable
 (2) f is everywhere continuous but not differentiable at $x = n\pi, n \in \mathbb{Z}$
 (3) f is everywhere continuous but not differentiable at $x = (2n+1)\frac{\pi}{2}, n \in \mathbb{Z}$
 (4) f is discontinuous at $x = n\pi, n \in \mathbb{Z}$

29. If $x = t^2$ and $y = t^3$ then $\frac{d^2y}{dx^2}$ is
- (1) $\frac{3}{2}$ (2) $\frac{3}{4t}$
 (3) $\frac{3}{2t}$ (4) $\frac{3}{4}$
30. For the curve $y = 5x - 2x^3$, if x increases at the rate of 2 units/sec, then at $x = 3$ the rate by which slope of curve is changing is (units/sec)
- (1) -72 (2) -36
 (3) 24 (4) 48
31. The function $f(x) = 4\sin^3x - 6\sin^2x + 12\sin x + 100$ is
- (1) Increasing in $\left(\pi, \frac{3\pi}{2}\right)$
 (2) Decreasing in $\left(\frac{\pi}{2}, \pi\right)$
 (3) Decreasing in $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$
 (4) Decreasing in $\left(0, \frac{\pi}{2}\right)$
32. The equation to tangent to the curve, $y(1 + x^2) = 2 - x$, where it crosses x -axis is
- (1) $x + 5y = 2$ (2) $x - 5y = 2$
 (3) $5x - y = 2$ (4) $5x + y = 2$
33. $\int \frac{\cos 2x - \cos 2\theta}{\cos x - \cos \theta} dx$ is equal to
- (1) $2(\sin x + x \cos \theta) + c$
 (2) $2(\sin x - x \cos \theta) + c$
 (3) $2(\sin x + 2x \cos \theta) + c$
 (4) $2(\sin x - 2x \cos \theta) + c$
34. $\int_{-\pi/2}^{\pi/2} (x^3 + x^2 \tan^3 x + x \cos x + 1) dx$ is equal to
- (1) 0 (2) π
 (3) $\frac{\pi}{2}$ (4) $\frac{\pi}{4}$
35. If $f(a + b - x) = f(x)$, then $\int_a^b xf(x) dx$ is equal to (where a & b are arbitrary constants)
- (1) $\frac{a+b}{2} \int_a^b f(b-x) dx$ (2) $\frac{a+b}{2} \int_a^b f(b+x) dx$
 (3) $\frac{b-a}{2} \int_a^b f(x) dx$ (4) $\frac{a+b}{2} \int_a^b f(x) dx$
36. If $I = \int_{-1}^3 [x] dx$, where $[\cdot]$ represents the greatest integer function, then I equals
- (1) 2 (2) 4
 (3) 3 (4) 0
37. $\int \tan^{-1} \sqrt{x} dx$ is equal to
- (1) $(x+1) \tan^{-1} \sqrt{x} - \sqrt{x} + c$
 (2) $x \tan^{-1} \sqrt{x} - \sqrt{x} + c$
 (3) $\sqrt{x} - x \tan^{-1} \sqrt{x} + c$
 (4) $\sqrt{x} - \tan^{-1} \sqrt{x} + c$
38. $\int_{-\pi}^{\pi} x(\sin^2(\sin x) + \cos^2(\cos x)) dx$ is equal to
- (1) $\frac{\pi^2}{4}$ (2) 0
 (3) $\frac{\pi^2}{8}$ (4) π^2
39. The area of the region bounded by the curve $y^2 = 8x$ and its latus rectum is (in sq. units)
- (1) $\frac{32}{3}$ (2) $\frac{16}{3}$
 (3) $\frac{8}{3}$ (4) $\frac{64}{3}$
40. The area of the region bounded by the circle $x^2 + y^2 = 2$ and $y^2 = x$ (inner part of parabola) is (in sq. units)
- (1) $\frac{\pi}{4}$ (2) $\frac{\pi}{4} + \frac{1}{6}$
 (3) $\frac{\pi}{2}$ (4) $-\frac{\pi}{4}$

41. The integrating factor of differential equation $(1+x^2)\frac{dy}{dx} + xy = x^2 \sin x + \sin x$, is
- (1) $\sqrt{1+x^2}$ (2) $1+x^2$
 (3) $(1+x^2)^2$ (4) $\sqrt{1-x^2}$
42. The general solution of the differential equation $(x+y)dx + xdy = 0$ is
- (1) $x^2 + y^2 = c$ (2) $2x^2 - y^2 = c$
 (3) $x^2 + 2xy = c$ (4) $y^2 + 2xy = c$
43. Let $\vec{a}$ and $\vec{b}$ be two unit vectors and θ is the angle between them. Then $(\vec{a} + \vec{b})$ is a unit vector if
- (1) $\theta = \frac{\pi}{4}$
 (2) $\theta = \frac{\pi}{3}$
 (3) $\theta = \frac{\pi}{2}$
 (4) $\theta = \frac{2\pi}{3}$
44. The vector in the direction of the vector $\hat{i} + 3\hat{j} + \sqrt{6}\hat{k}$ that has magnitude 8 is
- (1) $2\hat{i} + 6\hat{j} + 2\sqrt{6}\hat{k}$
 (2) $2\hat{i} - 3\hat{j} + 2\sqrt{6}\hat{k}$
 (3) $\sqrt{2}\hat{i} + 3\sqrt{2}\hat{j} + 2\sqrt{3}\hat{k}$
 (4) $\hat{i} - \hat{j} + \sqrt{14}\hat{k}$
45. The foot of the perpendicular from $(2, 4, -1)$ to the line $x+5 = \frac{(y+3)}{4} = \frac{(z-6)}{-9}$ is
- (1) $(-4, 1, -3)$ (2) $(4, -1, -3)$
 (3) $(-4, -1, 3)$ (4) $(-4, -1, -3)$
46. The equation of a plane which passes through $(2, -3, 1)$ and is normal to the line joining to the points $(3, 4, -1)$ and $(2, -1, 5)$ is given by
- (1) $x + 5y - 6z + 19 = 0$
 (2) $x - 5y + 6z - 19 = 0$
 (3) $x + 5y + 6z + 19 = 0$
 (4) $x - 5y - 6z - 19 = 0$
47. Two events E and F are independent. If $P(E) = 0.3$, $P(E \cup F) = 0.5$, then $P(E|F) - P(F|E)$ equals
- (1) $\frac{2}{7}$ (2) $\frac{3}{35}$
 (3) $\frac{1}{70}$ (4) $\frac{1}{7}$
48. A bag 'A' contains 3 white and 4 red balls and bag 'B' contains 4 white and 5 red balls. One ball is drawn at random from a randomly chosen bag and is found to be red. The probability that it was drawn from bag 'B' was
- (1) $\frac{35}{71}$ (2) $\frac{35}{57}$
 (3) $\frac{5}{14}$ (4) $\frac{5}{16}$
49. For the following probability distribution:
- | | | | | | |
|------|-----|-----|-----|-----|-----|
| X | -4 | -3 | -2 | -1 | 0 |
| P(X) | 0.1 | 0.2 | 0.3 | 0.2 | 0.2 |
- $E(X)$ is equal to
- (1) 0 (2) -1
 (3) -1.2 (4) -1.8
50. For the constraints of a L.P. problem given by $x_1 + 2x_2 \leq 2000$, $x_1 + x_2 \leq 1500$, $x_2 \leq 600$ and $x_1, x_2 \geq 0$, which one of the following points does not lie in the feasible region
- (1) (900, 600) (2) (0, 500)
 (3) (800, 600) (4) (1500, 0)



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SAMPLE PAPER CUET-2022

ANSWER KEY

English	42. (2)	32. (1)	24. (3)	16. (2)	8. (1)
1. (2)	43. (1)	33. (1)	25. (2)	17. (4)	9. (1)
2. (2)	44. (1)	34. (4)	26. (1)	18. (1)	10. (3)
3. (3)	45. (4)	35. (2)	27. (1)	19. (2)	11. (1)
4. (3)	46. (3)	36. (4)	28. (1)	20. (2)	12. (4)
5. (4)	47. (2)	37. (2)	29. (1)	21. (3)	13. (4)
6. (3)	48. (2)	38. (1)	30. (1)	22. (2)	14. (3)
7. (3)	49. (2)	39. (3)	31. (2)	23. (3)	15. (3)
8. (2)	50. (2)	40. (3)	32. (1)	24. (3)	16. (2)
9. (1)	Physics	41. (3)	33. (3)	25. (3)	17. (2)
10. (4)	1. (3)	42. (1)	34. (4)	26. (3)	18. (1)
11. (2)	2. (3)	43. (2)	35. (1)	27. (4)	19. (2)
12. (2)	3. (3)	44. (1)	36. (2)	28. (3)	20. (1)
13. (3)	4. (2)	45. (1)	37. (1)	29. (2)	21. (1)
14. (2)	5. (1)	46. (2)	38. (4)	30. (3)	22. (4)
15. (2)	6. (2)	47. (1)	39. (1)	31. (2)	23. (3)
16. (1)	7. (3)	48. (3)	40. (2)	32. (2)	24. (3)
17. (2)	8. (4)	49. (4)	41. (1)	33. (3)	25. (3)
18. (2)	9. (3)	50. (4)	42. (4)	34. (4)	26. (3)
19. (1)	10. (1)	Chemistry	43. (3)	35. (2)	27. (4)
20. (2)	11. (1)	1. (4)	44. (3)	36. (2)	28. (2)
21. (3)	12. (3)	2. (3)	45. (3)	37. (4)	29. (2)
22. (2)	13. (3)	3. (1)	46. (2)	38. (2)	30. (1)
23. (1)	14. (4)	4. (3)	47. (4)	39. (2)	31. (2)
24. (2)	15. (2)	5. (2)	48. (2)	40. (2)	32. (1)
25. (3)	16. (3)	6. (3)	49. (1)	41. (4)	33. (1)
26. (2)	17. (4)	7. (3)	50. (2)	42. (1)	34. (2)
27. (2)	18. (3)	8. (4)	Biology	43. (2)	35. (4)
28. (3)	19. (3)	9. (2)	1. (3)	44. (4)	36. (1)
29. (1)	20. (2)	10. (2)	2. (3)	45. (4)	37. (1)
30. (3)	21. (2)	11. (2)	3. (1)	46. (3)	38. (2)
31. (3)	22. (3)	12. (2)	4. (4)	47. (3)	39. (1)
32. (2)	23. (2)	13. (2)	5. (3)	48. (3)	40. (2)
33. (2)	24. (2)	14. (1)	6. (2)	49. (4)	41. (1)
34. (2)	25. (4)	15. (3)	7. (3)	50. (3)	42. (3)
35. (1)	26. (3)	16. (3)	8. (2)	Mathematics	43. (4)
36. (3)	27. (1)	17. (3)	9. (3)	1. (2)	44. (1)
37. (2)	28. (4)	18. (1)	10. (1)	2. (4)	45. (1)
38. (2)	29. (2)	19. (1)	11. (3)	3. (2)	46. (1)
39. (2)	30. (4)	20. (3)	12. (3)	4. (1)	47. (3)
40. (1)	31. (2)	21. (3)	13. (2)	5. (4)	48. (1)
41. (3)		22. (2)	14. (4)	6. (2)	49. (4)
		23. (4)	15. (2)	7. (2)	50. (1)



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SAMPLE PAPER CUET-2022

SOLUTIONS

SECTION-I

LANGUAGE: ENGLISH

- | | |
|----------------|---|
| 1. Answer (2) | 29. Answer (1) |
| 2. Answer (2) | 30. Answer (3) |
| 3. Answer (3) | 31. Answer (3) |
| 4. Answer (3) | 32. Answer (2) |
| 5. Answer (4) | 33. Answer (2) |
| 6. Answer (3) | 34. Answer (2) |
| 7. Answer (3) | 35. Answer (1) |
| 8. Answer (2) | 36. Answer (3) |
| 9. Answer (1) | 'than' is required in place of 'then' |
| 10. Answer (4) | 37. Answer (2) |
| 11. Answer (2) | 'who's' is required in place of 'whose' |
| 12. Answer (2) | 38. Answer (2) |
| 13. Answer (3) | 'up' should be removed |
| 14. Answer (2) | 39. Answer (2) |
| 15. Answer (2) | Replace 'has' by 'had' |
| 16. Answer (1) | 40. Answer (1) |
| 17. Answer (2) | Replace 'holds' by 'hold' |
| 18. Answer (2) | 41. Answer (3) |
| 19. Answer (1) | Replace 'much' by 'many' |
| 20. Answer (2) | 42. Answer (2) |
| 21. Answer (3) | 43. Answer (1) |
| 22. Answer (2) | 44. Answer (1) |
| 23. Answer (1) | 45. Answer (4) |
| 24. Answer (2) | 46. Answer (3) |
| 25. Answer (3) | 47. Answer (2) |
| 26. Answer (2) | 48. Answer (2) |
| 27. Answer (2) | 49. Answer (2) |
| 28. Answer (3) | 50. Answer (2) |



SECTION-II

DOMAIN SUBJECT: PHYSICS

1. Answer (3)

$$E_1 = \frac{kp}{r^3}$$

$$E_2 = \frac{2kp}{\left(\frac{r}{2}\right)^3} = 16\left(\frac{kp}{r^3}\right) = 16E_1$$

$$\therefore F_1 = F$$

$$\Rightarrow F_2 = 16F$$

2. Answer (3)

$$W = q(V_2 - V_1) = 1.6 \times 10^{-19} (50 - 30) \\ = 32 \times 10^{-19} \text{ joule}$$

3. Answer (3)

$$\text{For system } U = U_1 + U_2 + U_3$$

$$U = \frac{Kq(2q)}{a} + \frac{K(2q)(8q)}{a} + \frac{K(8q)(q)}{a} \\ = \frac{Kq^2(2+16+8)}{a} = \frac{Kq^2(26)}{a}$$

4. Answer (2)

$$\Delta V = \frac{\sigma d}{2\epsilon_0}$$

5. Answer (1)

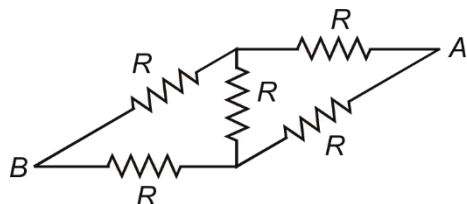
$$C_{\text{air}} = \frac{\epsilon_0 A}{d}, C_{\text{med}} = \frac{\epsilon_0 A}{d - t + \frac{t}{k}}$$

$$\therefore C_{\text{med}} = \frac{d}{d - t + \frac{t}{k}} C_{\text{air}} = \frac{6 \times C_{\text{air}}}{6 - 4 + \frac{4}{4}} = 2 \times C_{\text{air}} = 10 \mu\text{F}$$

6. Answer (2)

$$\text{Incoming flux} = \text{length} \times \text{width} \\ = (a \times b) \times B \\ = Bab$$

7. Answer (3)



This is balanced wheat stone bridge circuit

$$R_{eq|_{AB}} = R$$

8. Answer (4)

On decreasing the temperature the resistance of copper decreases and germanium increases.

9. Answer (3)

$$i = \frac{10}{\frac{5}{2} + 1} = \frac{20}{7} \text{ A}$$

$$V = \epsilon - ir = 10 - \frac{20}{7} \times 1 = \frac{50}{7} \text{ V}$$

10. Answer (1)

$$i = \frac{20}{1 + \frac{4 \times 8}{12}} = \frac{20 \times 12}{44} = \frac{60}{11} \text{ A}$$

$$\text{Power dissipated in } 1 \Omega \text{ resistance} = \left(\frac{60}{11}\right)^2 \times 1 \\ = 29.75 \text{ W}$$

11. Answer (1)

$$\text{Pitch} = v \cos 45^\circ \times \frac{2\pi m}{qB} = \frac{1}{\sqrt{2}} \times 2\pi \frac{mv}{qB}$$

$$\therefore x = \sqrt{2} \pi \sqrt{2} r \quad \left(r = \frac{mv}{\sqrt{2} qB} \right)$$

$$r = \frac{x}{2\pi}$$

12. Answer (3)

$$\vec{F} = q(\vec{v} \times \vec{B}) \\ = q \times 2\hat{i} \times (2\hat{i} - \hat{j}) = q \times (-2\hat{k}) = -2q\hat{k}$$

13. Answer (3)

$$B = \frac{\mu_0 i}{2R}$$

14. Answer (4)

Because magnetic lines form a closed loop. So as many lines will move in $-z$ direction same will return to $+z$ direction from the $x-y$ plane.

15. Answer (2)

Magnetic field will cause circular motion.

16. Answer (3)

Magnetic moment $M \propto A$

For given length of wire circle will be having maximum area.

17. Answer (4)

Both ferromagnetic and paramagnetic materials get attracted by external field.

18. Answer (3)

$$\tan \theta = \frac{(B_{\text{axial}})A}{(B_{\text{equatorial}})B} = \frac{\mu_0 2M 4\pi d_2^3}{4\pi d_1^3 \mu_0 M} = 2 \left(\frac{d_2}{d_1} \right)^3$$

$$\therefore \frac{d_1}{d_2} = (2 \cot \theta)^{\frac{1}{3}}$$

19. Answer (3)

$$\text{Induced emf } \varepsilon = \left| \frac{d\phi}{dt} \right|$$

ϕ may or may not be zero at any instant.

20. Answer (2)

$$5 + L \left| \frac{di}{dt} \right| = i \times 10$$

$$\therefore i > \frac{5}{10}$$

21. Answer (2)

$$Q = \frac{\omega_r L}{R} = \frac{1}{\sqrt{LC}} \times \frac{L}{R} = \frac{1}{R} \sqrt{\frac{L}{C}}$$

22. Answer (3)

When the key is closed capacitor will be discharged initially and thus all the current will pass through capacitor and current passing through $R = 20 \Omega$ will be zero.

23. Answer (2)

Choke coil has high inductance (L) and low resistance (R).

24. Answer (2)

$$\text{Poynting vector} = \frac{\vec{E} \times \vec{B}}{\mu_0}$$

25. Answer (4)

X-rays are example of electro-magnetic wave.

26. Answer (3)

A γ -ray photon is emitted due to de-excitation of a nucleus.

27. Answer (1)

$$\frac{(n-2)(n-1)}{2} = 10 \quad \therefore n^2 - 3n - 18 = 0$$

$$n^2 - 3n + 2 = 20 \quad (n-6)(n+3) = 0$$

$$\therefore n = 6$$

28. Answer (4)

$\Delta\lambda = \lambda_{K_\alpha} - \lambda_{\min}$. When V is halved

$$\Delta\lambda' = \lambda_{K_\alpha} - 2\lambda_{\min}$$

$$= \lambda_{K_\alpha} - 2(\lambda_{K_\alpha} - \Delta\lambda) = -\lambda_{K_\alpha} + 2\Delta\lambda$$

$$\Delta\lambda' = 2(\Delta\lambda) - \lambda_{K_\alpha}$$

29. Answer (2)

Rate of disintegration

$$R = \lambda N \quad (R = N_2)$$

$$N_2 = \lambda N_1$$

30. Answer (4)

Radius of orbit

$$r \propto (nh)^2 \quad \dots(i)$$

Angular momentum

$$L = mvr = \quad \dots(ii)$$

From (i) & (ii),

$$r \propto L^2$$

$$\therefore L^2 r^{-1} = \text{Constant}$$

31. Answer (2)

Heavy water used as moderator.

32. Answer (1)

$$N = N_0 \left(\frac{1}{2} \right)^n$$

$$\frac{N_0}{16} = N_0 \left(\frac{1}{2} \right)^{\frac{t}{100}}$$

$$t = 400 \mu\text{s}$$

33. Answer (1)

β -rays are same as cathode rays.

34. Answer (4)

Electrons have high mobility.

35. Answer (2)

$$\frac{1}{f} = (\mu - 1) \left(\frac{2}{R} \right)$$

$$\Rightarrow \frac{1}{10} = (0.5) \times \frac{2}{R}$$

$$\Rightarrow R = 10 \text{ cm}$$

$$\frac{1}{f'} = \left(\frac{1.5}{2} - 1 \right) \left(\frac{2}{R} \right) = -\frac{1}{4} \times \frac{2}{10} = -\frac{1}{20}$$

$$\Rightarrow f' = -20 \text{ cm}$$

36. Answer (4)

$$\omega = 100\pi$$

$$\Rightarrow T = 20 \text{ ms}$$

$$i_{\text{avg}} = 0 \text{ in } 20 \text{ ms}$$

37. Answer (2)

$$\beta = \frac{\alpha}{1 - \alpha}$$

38. Answer (1)

At zero bias, the charge carriers do not move due to depletion layer.

39. Answer (3)

Avalanche breakdown occurs due to collision of electrons to the bonded electrons resulting in ejection of large number of electrons free to move.

40. Answer (3)

Net focal length will increase

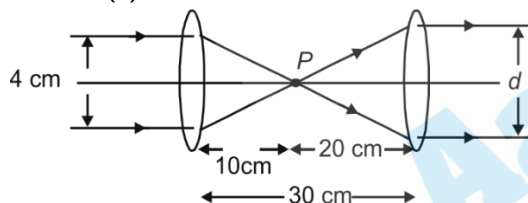
$$\therefore \frac{1}{v} - \frac{1}{-u} = \frac{1}{f} \text{ or } \frac{1}{v} = \frac{1}{f} - \frac{1}{u}$$

Since u constant, f is increasing. So v will also increase.

41. Answer (3)

$$\begin{aligned} \text{Shift} &= (3 + 8 + 6 + 10) - \left(\frac{3}{1.5} + \frac{6}{1.5} + 8 + 10 \right) \\ &= 27 - 24 = 3 \text{ cm} \end{aligned}$$

42. Answer (1)



43. Answer (2)

$$\begin{aligned} \delta &= (\mu - 1)A = (\sqrt{3} - 1)2^\circ \\ &= (1.732 - 1) \times 2^\circ = 0.732 \times 2^\circ = 1.464^\circ \end{aligned}$$

44. Answer (1)

$$\frac{W_1}{W_2} = \frac{I_1}{I_2} = \frac{\sqrt{2}}{\sqrt{3}}$$

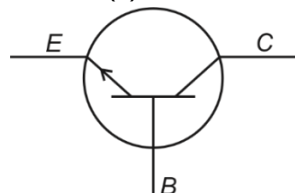
45. Answer (1)

$$\frac{I_{\max}}{I_{\min}} = \left(\frac{18+9}{18-9} \right)^2 = \frac{9}{1}$$

46. Answer (2)

$$\begin{aligned} \text{Unit of pole strength} &= \frac{Am^2}{m} \\ &= A m \end{aligned}$$

47. Answer (1)



The symbol represents npn transistor.

48. Answer (3)

$$I = I_0 + I_0 + 2\sqrt{I_0} \cdot \sqrt{I_0} \cos \Delta\phi$$

$$I = \frac{4I_0}{4} = I_0$$

$$I_0 = 2I_0 + 2I_0 \cos \Delta\phi$$

$$\cos \Delta\phi = -\frac{1}{2}$$

$$\cos \Delta\phi = \cos(120^\circ)$$

$$\Delta\phi = 120^\circ$$

$$\Delta\phi = \frac{2\pi}{3} = \frac{2\pi}{\lambda} (\Delta x)$$

$$\Delta x = \frac{\lambda}{3}$$

$$d \sin \theta = \frac{\lambda}{3}$$

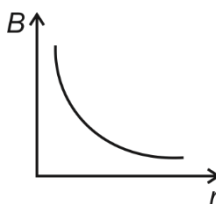
$$\sin \theta = \frac{\lambda}{3d}$$

$$\theta = \sin^{-1} \left(\frac{\lambda}{3d} \right)$$

49. Answer (4)

Due to thin wire

$$B \propto \frac{1}{r}$$



50. Answer (4)

$$\frac{v_1}{v_2} = \left(\frac{\frac{C}{\mu_1}}{\frac{C}{\mu_2}} \right)$$

$$\frac{v_1}{v_2} = \frac{\mu_2}{\mu_1} = \frac{\left(\frac{4}{3} \right)}{\left(\frac{3}{2} \right)} = \frac{8}{9}$$

SECTION-II

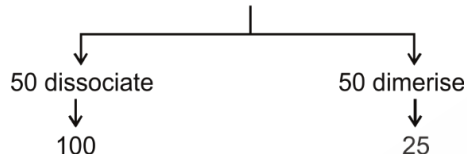
DOMAIN SUBJECT: CHEMISTRY

1. Answer (4)

In binary solutions ΔS is always positive ΔH may be zero, positive or negative depends on type of solution (ideal, positive deviation or negative deviation).

2. Answer (3)

Number of particle = 100



Total number of particle = 125

After dissociation or association

$$i = \frac{125}{100} = 1.25$$

3. Answer (1)

$m = 0.7$

$$m = \frac{1000X_A}{(1 - X_A) \times \text{Molar mass of solute}}$$

$X_A = 0.0125$

$$\therefore \frac{P_0 - P_s}{P_0} = X_A$$

$\therefore$ Relative lowering in vapour pressure is 0.0125.

4. Answer (3)

TiO₃ behaves as conductor or insulator depending on temperature.

5. Answer (2)

In Diamond, alternative tetrahedral voids are filled with 'C'. So overall 50% site are filled.

6. Answer (3)

Fluorspar (CaF₂) and Cryolite (Na₃AlF₆) are also added in Alumina to increase the conductivity and decreasing melting point.

7. Answer (3)

Orthorhombic – simple cubic, body centre cubic, face centre cubic and end centre.

8. Answer (4)

More the valency of the coagulating ion, more is its coagulating power.

9. Answer (2)

Net reaction: $H_2(P_1) \longrightarrow H_2(P_2)$

$$E_{\text{cell}} = \frac{-RT}{2F} \ln \frac{P_2}{P_1} = \frac{RT}{2F} \ln \frac{P_1}{P_2}$$

10. Answer (2)

Tyndall effect is shown by Lyophobic colloids.

11. Answer (2)

Langmuir adsorption isotherm is, $\frac{x}{m} = \frac{ap}{1 + bp}$ at

high pressure, $1 + bp \approx bp$

$$\frac{x}{m} = \frac{ap}{bp} = \frac{a}{b}$$

12. Answer (2)

$$K = Ae^{-E_a/RT}$$

13. Answer (2)

$$K_1 = K_2$$

$$\Rightarrow 10^{16}e^{-2000/T} = 10^{15}e^{-1000/T}$$

$$\frac{e^{-2000/T}}{e^{-1000/T}} = \frac{10^{15}}{10^{16}} = 10^{-1}$$

$$2.303 \log e^{-1000/T} = 2.303 \log 10^{-1}$$

$$\frac{-1000}{T} \times \log e = -1$$

$$T = \frac{1000}{2.303} \text{ K}$$

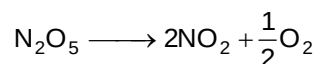
14. Answer (1)

$$\text{Efficiency} = \frac{\Delta G^0}{\Delta H^0} = \frac{-nF\varepsilon^0}{\Delta H^0}$$

$$\Rightarrow \varepsilon^0 = \frac{\text{efficiency} \times \Delta H^0}{-nF}$$

$$\Rightarrow \varepsilon^0 = \frac{70 \times (-300 \times 10^3)}{100 \times (-1) \times 96500} = 2.176 \text{ V}$$

15. Answer (3)



$$\text{Rate} = \frac{-d[N_2O_5]}{dt} = \frac{1}{2} \frac{d[NO_2]}{dt} = \frac{2d[O_2]}{dt}$$

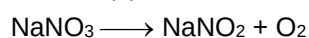
$$K_1[N_2O_5] = \frac{1}{2}K'_1[NO_2]^2 = 2K''_1[N_2O_5]$$

$$K_1 = \frac{1}{2}K'_1 = 2K''_1 \text{ or } \boxed{2K_1 = K'_1 = 4K''_1}$$

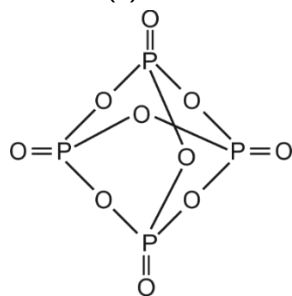
16. Answer (3)

$$K = \frac{2.303}{t} \log \frac{P_0}{P}, t_{1/2} = \frac{0.693}{K}$$

17. Answer (3)

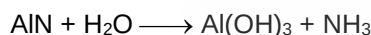
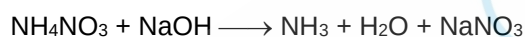
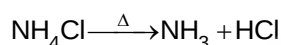
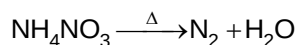
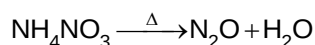


18. Answer (1)



- It is isostructural with As_4O_{10} .
- It has 6 P–O–P bonds and 4.

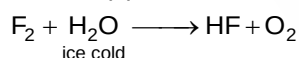
19. Answer (1)



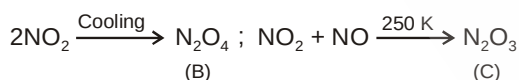
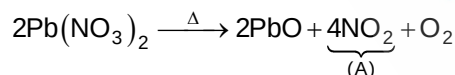
20. Answer (3)

Vulcanisation of rubber is done by S_2Cl_2 .

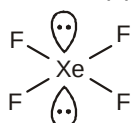
21. Answer (3)



22. Answer (2)



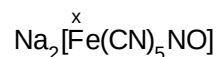
23. Answer (4)



24. Answer (3)

$$\begin{aligned} \text{EAN} &= 28 - 2 + 2 \times 4 \\ &= 26 + 8 \\ &= 34 \end{aligned}$$

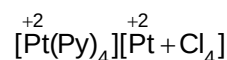
25. Answer (2)



$$2(+1) + x + 5(-1) + 1 = 0$$

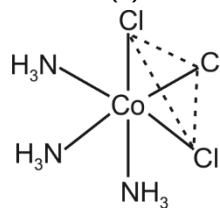
$$\boxed{x = +2}$$

26. Answer (1)

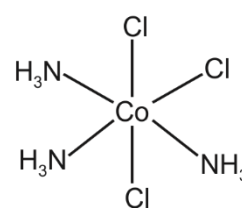


Tetra pyridine platinum(II) tetrachloride platinate(II).

27. Answer (1)



Facial

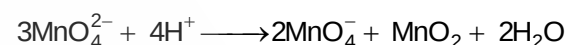


Meridional

28. Answer (1)

Annealing: Hard steel is heated upto red hot and then cooled slowly at room temperature to obtain soft and elastic variety of steel.

29. Answer (1)



30. Answer (1)

Actinium shows only +3 oxidation state.

31. Answer (2)

Maximum polarity in C–F bond activates the attack of nucleophile at carbon atom.

32. Answer (1)

Rate $\propto$ stability of carbocation

33. Answer (3)

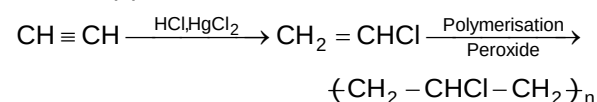
Except O-nitrophenol, all of the species are acidic $\therefore$ can react with base NaHCO_3 .

34. Answer (4)

$$0.0833 \text{ mol} \longrightarrow 1 \text{ g H}_2$$

$$1 \text{ mol} \longrightarrow \frac{1}{0.0833} \text{ g Hydrogen} \\ = 12 \text{ g Hydrogen}$$

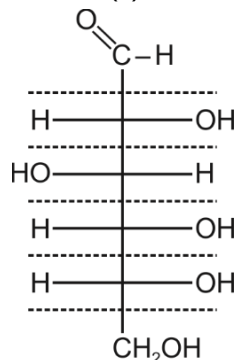
35. Answer (1)



36. Answer (2)

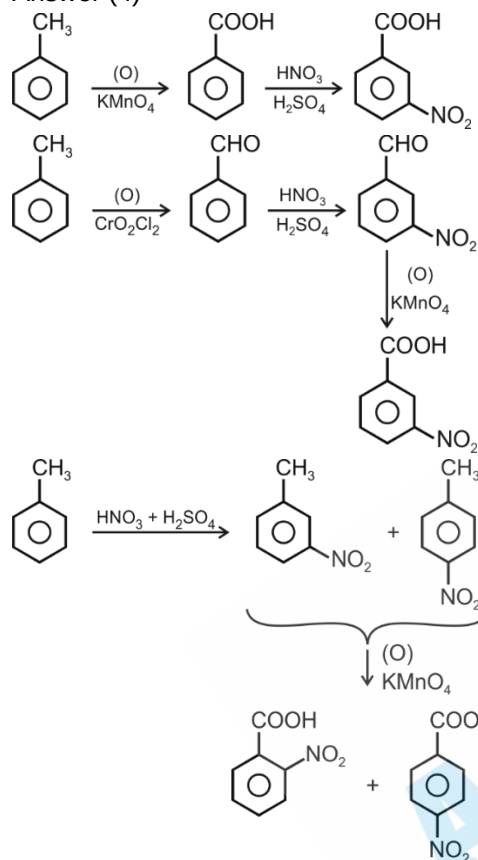
Nylon 6, 6

37. Answer (1)

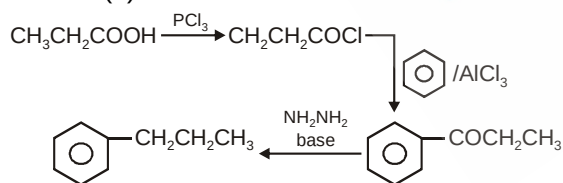


5 moles of HIO_4 used to react with 1 mole of glucose.

38. Answer (4)



39. Answer (1)

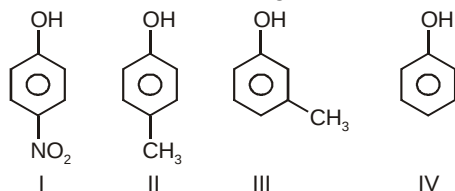


40. Answer (2)

Benzyl carbocation is most stable.

41. Answer (1)

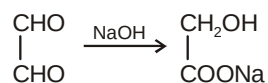
EWG increases acidic strength while EDG decreases acidic strength.



42. Answer (4)

 CH_3COCH_3 does not respond positive to the silver mirror test but produces oxime.

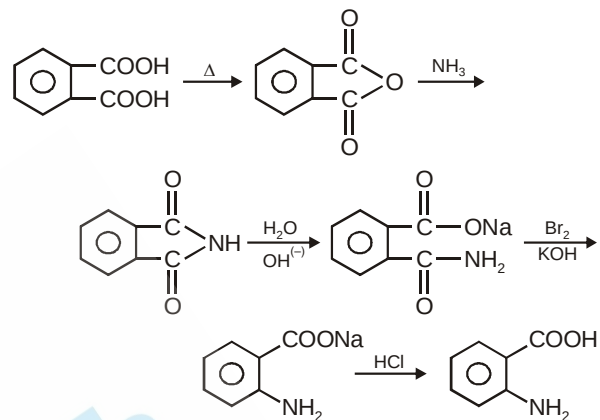
43. Answer (3)

Cannizzaro reaction:

44. Answer (3)

Aldehydes are more reactive than ketones towards nucleophilic addition reactions.

45. Answer (3)



46. Answer (2)

ABC ABC type of close packing exists in face centre cubic packing (FCC).

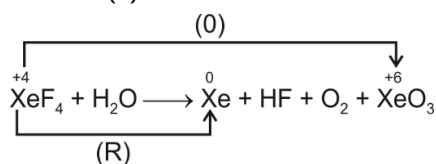
47. Answer (4)

$$\Delta T_f \propto i$$

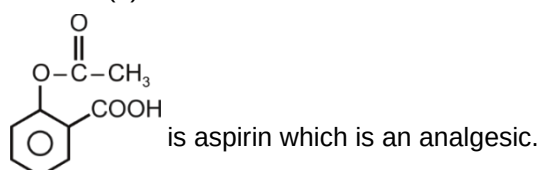
More the van't Hoff factor, more will be the depression in freezing point.

	i
$[\text{Co}(\text{H}_2\text{O})_6]\text{Cl}_3$	4
$[\text{Co}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$	3
$[\text{Co}(\text{H}_2\text{O}_4)\text{Cl}_2]\text{Cl} \cdot 2\text{H}_2\text{O}$	2
$[\text{Co}(\text{H}_2\text{O})_3\text{Cl}_3] \cdot 3\text{H}_2\text{O}$	1

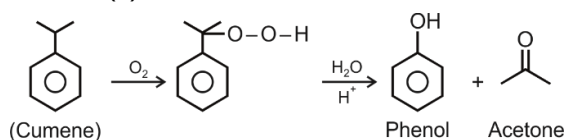
48. Answer (2)

 XeF_4 is reduced as well as oxidized.

49. Answer (1)



50. Answer (2)



SECTION-II

DOMAIN SUBJECT: BIOLOGY

- | | |
|--|--|
| <p>1. Answer (3)
Most common asexual spore produced by algae are zoospores. <i>Spirogyra</i> shows internal fertilization.</p> <p>2. Answer (3)
Offset – Water hyacinth
Rhizome – Ginger
Bulbil – Agave
Leaf buds – <i>Bryophyllum</i></p> <p>3. Answer (1)
Sexual reproduction essentially involves meiosis and fertilisation. It can also be uniparental.</p> <p>4. Answer (4)
Endothecium – Helps in dehiscence of anther. Tapetum is nutritive layer in anther. Sporogenous tissue forms pollen mother cells.</p> <p>5. Answer (3)
Inner layer is made up of pectin and cellulose.</p> <p>6. Answer (2)
Hydrophily is limited up to 30 genera of flowering plants mostly monocots.
Unisexuality of flower in dioecious plant prevents both autogamy and geitonogamy.</p> <p>7. Answer (3)
High aspartic acid and low nitrogen content in maize leads to resistance to stem borers.</p> <p>8. Answer (2)
Dragonflies control mosquitoes while ladybird control aphids.</p> <p>9. Answer (3)
Anaerobic sludge digester produces mixture of gases such as methane, hydrogen sulphide and carbon dioxide.</p> <p>10. Answer (1)
Birth is character of an individual not of a population.</p> <p>11. Answer (3)
Catalytic converters convert hydrocarbon into $\text{CO}_2 + \text{H}_2\text{O}$. Green muffler scheme is to reduce noise pollution. Montreal protocol was signed to control ODS (ozone depleting substances).</p> <p>12. Answer (3)
Clownfish shows commensalism as interspecific interaction with sea anemone.</p> | <p>13. Answer (2)
These determine the ecosystems characteristics irrespective of their population.</p> <p>14. Answer (4)
Reduced aeration, reduces the rate of decomposition.</p> <p>15. Answer (2)
2–10% of PAR is captured by plants during photosynthesis for GPP.</p> <p>16. Answer (2)
Initially, 25 hot spots were identified globally.</p> <p>17. Answer (4)
Rivets on the wings, represent important key stone species.</p> <p>18. Answer (1)
In $\phi \times 174$ virus there is ssDNA with 5386 bases.</p> <p>19. Answer (2)
RNA polymerase I, II and III code for rRNA, hnRNA and tRNA respectively.</p> <p>20. Answer (2)
In prokaryotes, rRNA present are – 16S, 23S, 5S.</p> <p>21. Answer (3)
In <i>lac</i> operon, <i>i</i> gene act as constitutive gene while structural gene, <i>z</i>, <i>y</i>, <i>a</i> act as luxury gene or non-constitutive gene.</p> <p>22. Answer (2)
DNA fingerprinting involves RFLP and southern blotting</p> <p>23. Answer (3)
Functions unknown for over 50% of discovered genes.</p> <p>24. Answer (3)
$\text{AaBbCCDD} \times \text{AaBbccdd}$
Total number of heterozygotes in parental generation = 2 (each parent)
Hence, it is representing dihybrid cross.
Probability of progeny with <i>AaBbCcDd</i> according to dihybrid Mendelian cross can be calculated by multiplicative rule</p> |
|--|--|

Aa × Aa

↓

Offspring → AA Aa aa, = $\frac{1}{2}$

probability of Bb = Bb × Bb

↓

Offspring → BB Bb bb, = $\frac{1}{2}$

probability of Cc = CC × cc

Offspring → Cc Cc Cc Cc, = 1

probability of Dd = DD × dd

Offspring → Dd Dd Dd Dd, = 1

Probability of offspring with AaBbCcDd
 $= \frac{1}{2} \times \frac{1}{2} \times 1 \times 1 = \frac{1}{4}$

25. Answer (3)

Down's syndrome is trisomy of chromosome 21.

26. Answer (3)

Longitudinal binary fission is seen in *Euglena* and *Vorticella*.

Oblique binary fission is seen in *Ceratium* and *Gonyaulax*.

27. Answer (4)

Spermatogenic cells are produced by germinal epithelium and not by Sertoli cells.

28. Answer (3)

Labia minora fuses posteriorly to form a membranous fold called fourchette.

29. Answer (2)

AI - Artificial insemination

GIFT-Gamete intrafallopian transfer

ZIFT-Zygote intrafallopian transfer

30. Answer (3)

Mother receives antigen, hence will acquire active immunity.

31. Answer (2)

Nitric oxide (NO) is responsible for the dilation of blood vessels.

32. Answer (2)

Abundant secretion of milk by mammary glands remains inhibited during pregnancy due to high levels of oestrogen and progesterone till the end of pregnancy.

33. Answer (3)

Condoms prevent deposition of semen in vagina.

34. Answer (4)

Injectable contraceptives can prevent conception but cannot provide protection against STIs.

35. Answer (2)

The disease is pneumonia caused by bacteria like *Streptococcus pneumoniae* and *Haemophilus influenzae*.

36. Answer (2)

Benzodiazepines and opium are depressants.

37. Answer (4)

Coecervates may not have been the first step in the evolution of life.

38. Answer (2)

Weismann's 'Theory of Germplasm' rejected Darwin's theory of Pangenesis.

39. Answer (2)

Vascular plants, originated in Silurian period. Dinosaurs were dominant in Jurassic period.

40. Answer (2)

PCR enables the production of multiple copies of an original piece of DNA.

41. Answer (4)

Founders effect is a ramification of genetic drift.

42. Answer (1)

Selection of favourable variations over many generations may eventually results in speciation.

43. Answer (2)

Sporozoite is the infective stage of *Plasmodium* for human beings.

44. Answer (4)

BCG → 1st generation vaccine

Tetanus and Diphtheria toxoid → 2nd generation vaccine consisting of neutralized toxins

45. Answer (4)

DPT vaccine is against diphtheria, pertussis and tetanus.

46. Answer (3)

Frieswal:- Crossbreed of Sahiwal cows and Holstein-Friesian bull

Hisardale:- Bikaneri ewes and Marino rams

47. Answer (3)

Charas, LSD, Mescaline, Hashish, Marijuana are hallucinogens.

48. Answer (3)

Cancer of epithelial cells is called carcinoma.

49. Answer (4)

Isolation of DNA and ligation of DNA fragment into vector are steps of RDT.

50. Answer (3)

Cosmid carries 30-40 kb length of DNA. DNA ligases are called molecular glue.



SECTION-II

DOMAIN SUBJECT: MATHEMATICS

1. Answer (2)

$$A + A' = I \Rightarrow \begin{bmatrix} 2\cos\theta & 0 \\ 0 & 2\cos\theta \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\Rightarrow 2\cos\theta = 1 \Rightarrow \cos\theta = \frac{1}{2}$$

$$\Rightarrow \theta = \frac{\pi}{3}$$

2. Answer (4)

$$\begin{vmatrix} a-b & b+c & a \\ b-a & c+a & b \\ c-a & a+b & c \end{vmatrix}$$

$$= \begin{vmatrix} a+c & a+b+c & a \\ b+c & a+b+c & b \\ c+b & a+b+c & c \end{vmatrix} \begin{matrix} C_1 \rightarrow C_1 + C_2 \\ C_2 \rightarrow C_2 + C_3 \end{matrix}$$

$$(a+b+c) \begin{vmatrix} a+c & 1 & a \\ b+c & 1 & b \\ c+b & 1 & c \end{vmatrix} = -(a+b+c)(a-b)(b-c)$$

3. Answer (2)

$$\begin{bmatrix} 1 & \tan\theta \\ -\tan\theta & 1 \end{bmatrix}^{-1} = \frac{1}{\sec^2\theta} \begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix}$$

$$\therefore \text{L.H.S.} : \cos^2\theta \begin{bmatrix} 1-\tan^2\theta & -2\tan\theta \\ 2\tan\theta & 1-\tan^2\theta \end{bmatrix} = \begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$$

$$\therefore a = \cos 2\theta, \quad b = \sin 2\theta$$

4. Answer (1)

$$\text{For non-trivial solution } \begin{vmatrix} 1 & k & -1 \\ k & -1 & -1 \\ 1 & 1 & -k \end{vmatrix} = 0$$

$$\Rightarrow 1(k+1) - k(-k^2+1) - 1(k+1) = 0$$

$$\Rightarrow k^3 - k = 0 \Rightarrow k = 0, -1, 1$$

5. Answer (4)

$$\therefore \text{slope} = 0 \Rightarrow 3x^2 - 12x = 0$$

$$x = \pm 2$$

$$\Rightarrow x = 2, y = 2$$

$$\text{and } x = -2, y = 34$$

6. Answer (2)

$$y = \frac{1}{2}[\sin 6x - \sin 2x]$$

then

$$\frac{dy}{dx} = \frac{1}{2}[6\cos 6x - 2\cos 2x] = 3\cos 6x - \cos 2x$$

$$\frac{d^2y}{dx^2} = -18\sin 6x + 2\sin 2x$$

$$\text{at } x = \frac{\pi}{12} = -18 + 1 = -17$$

7. Answer (2)

For maxima and minima

$$f'(x) = \cos x + \frac{1}{2} \cdot 2\cos 2x = 0$$

$$\Rightarrow \cos 2x + \cos x = 0$$

$$\Rightarrow 2\cos \frac{3x}{2} \cdot \cos \frac{x}{2} = 0 \Rightarrow x = \frac{\pi}{3}$$

$$\text{Now, } f''(x) = -2\sin 2x - \sin x$$

$$\text{at } x = \frac{\pi}{3}, f''(x) = -2 \times \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2} < 0$$

$$\therefore x = \frac{\pi}{3} \text{ is the point of local maximum.}$$

8. Answer (1)

$$\int \frac{e^x}{1+e^{2x}} dx = \int \frac{e^x}{1+(e^x)^2} dx = \tan^{-1}(e^x) + c$$

9. Answer (1)

$$I = \int_{-\pi/4}^{\pi/4} \frac{dx}{2\cos^2 x} = \frac{1}{2} \times 2 \int_0^{\pi/4} \sec^2 x dx = [\tan x]_0^{\pi/4} = 1 - 0 = 1$$

10. Answer (3)

$$\therefore \sin 2x = \cos 2x \Rightarrow x = \frac{\pi}{8}$$

$$\therefore A = \int_0^{\pi/8} (\cos 2x - \sin 2x) dx$$

$$= \frac{1}{2} [\sin 2x + \cos 2x]_0^{\pi/8}$$

$$= \frac{1}{2} [(\sqrt{2} - 1)] = \frac{(\sqrt{2} - 1)}{2}$$

11. Answer (1)

$$\left(\frac{dy}{dx}\right)^{1/4} = x^{1/5} - \frac{d^2y}{dx^2}$$

$$\Rightarrow \left(\frac{dy}{dx}\right) = \left(x^{1/5} - \frac{d^2y}{dx^2}\right)^4 \Rightarrow \text{order} = 2$$

$$\text{degree} = 4$$

12. Answer (4)

$$\text{Here, } n = 5, p = \frac{10}{100} = \frac{1}{10}, q = \frac{9}{10}$$

$$r \leq 1 \Rightarrow = 0, 1$$

$$\therefore P(X=0) + P(X=1) = {}^5C_0 \left(\frac{1}{10}\right)^0 \left(\frac{9}{10}\right)^5$$

$$+ {}^5C_1 \left(\frac{1}{10}\right)^1 \left(\frac{9}{10}\right)^5$$

13. Answer (4)

Value of z at $(3, 4)$ = value of z at $(0, 5)$

$$3p + 4q = 5q$$

$$\Rightarrow \boxed{q = 3p}$$

14. Answer (3)

$$\frac{5}{k} + \frac{7}{k} + \frac{9}{k} + \frac{11}{k} = 1 \Rightarrow k = 32$$

15. Answer (3)

$$E(X^2) = 1^2 \cdot \frac{1}{2} + 2^2 \cdot \frac{1}{5} + 3^2 \cdot \frac{3}{10} = \frac{5+8+27}{10} = 4$$

16. Answer (2)

Given that aRb if $a \geq b$

$$\therefore a \geq a \Rightarrow aRa \text{ (Reflexive)}$$

$\therefore$ If $a \geq b$, then $b \geq a$, which is not true. (Not symmetric)

If $a \geq b$ and $b \geq c \Rightarrow a \geq c$,Hence R is transitive.

17. Answer (2)

(1) $f(x) = x^3$ is not onto ($\because$ Range $\subseteq \mathbb{Z}$)(2) $f(x) = x + 2$ is one-one and onto. Hence bijective(3) $f(x) = 2x + 1$ is not onto ($\because R_f = \{\dots, -3, -1, 1, 3, \dots\}$)(4) $f(x) = x^2 + 1$ is not one-one and onto also

$$\therefore f(-1) = f(1) = 2$$

18. Answer (1)

$$\sin^{-1}\left(\cos\left(\frac{\pi}{2} - \frac{\pi}{10}\right)\right) = \sin^{-1}\sin\frac{\pi}{10} = \frac{\pi}{10}$$

19. Answer (2)

$$\therefore -1 \leq 2x^2 - 1 \leq 1$$

$$0 \leq x^2 \leq 1 \Rightarrow x \in [-1, 1]$$

20. Answer (1)

$$\therefore \frac{3\pi}{2} \notin [0, \pi] \quad \therefore \cos^{-1}\left(\cos\left(2\pi - \frac{3\pi}{2}\right)\right)$$

$$= \frac{\pi}{2}$$

21. Answer (1)

$$AB = [B], \quad XY = [20]$$

$$AB + XY = [28]$$

22. Answer (4)

$$A = \begin{bmatrix} 0 & -3 & -8 & \dots \\ 3 & 0 & \dots & \dots \\ 8 & \vdots & 0 & \dots \\ \vdots & \vdots & \vdots & \ddots \end{bmatrix} \text{ Hence } A \text{ is skew}$$

symmetric

matrix.

23. Answer (3)

$$(A + B)^2 = (A + B)(A + B) = A^2 + AB + BA + B^2$$

$$(\because AB = A)$$

$$ABA = A^2 \Rightarrow AB = A^2$$

$$\text{Similarly: } BA = B^2$$

$$= AB + AB + BA + BA$$

$$= 2(AB + BA)$$

$$= 2(A + B)$$

$$\therefore \text{ Similarly, } (A + B)^3 = 2(A + B)(A + B) = 2 \cdot 2$$

$$(A + B) = 2^2(A + B)$$

$$\therefore (A + B)^6 = 2^5(A + B) = 32(A + B)$$

24. Answer (3)

$$|2A| = 2^3 |A| = 64$$

25. Answer (3)

$$\therefore A(\text{adj } A) = |A|I$$

$$\therefore |A| = 10$$

$$\text{and } |\text{Adj}(A)| = |A|^{n-1} \quad (n = 3)$$

$$= 10^2 = 100$$

26. Answer (3)

$$\therefore f(x) \text{ is continuous at } x = \frac{\pi}{2}, \text{ then}$$

$$\lim_{x \rightarrow \frac{\pi}{2}^-} f(x) = \lim_{x \rightarrow \frac{\pi}{2}^+} f(x)$$

$$\Rightarrow \lim_{h \rightarrow 0} m \left(\frac{\pi}{2} - h \right) + 1 = \lim_{h \rightarrow 0} \sin \left(\frac{\pi}{2} + h \right) + n$$

$$\frac{m\pi}{2} + 1 = 1 + n \Rightarrow n = \frac{m\pi}{2}$$

27. Answer (4)

$$y = \log_e \left(\frac{x^2}{e^2} \right) = \log_e x^2 - \log_e e^2$$

$$y = 2 \log_e x - 2$$

$$\frac{dy}{dx} = 2 \cdot \frac{1}{x} \Rightarrow \frac{d^2y}{dx^2} = \frac{-2}{x^2}$$

28. Answer (2)

$f(x) = |\sin x|$, $\therefore |x|$ and $\sin x$ both are continuous function

$\therefore |\sin x|$ is continuous in R

and $|x|$ is not differentiable at $x = 0$

$\therefore |\sin x|$ is not differentiable at $\sin x = 0$

$$x = n\pi, n \in Z$$

29. Answer (2)

$$\frac{dx}{dt} = 2t, \frac{dy}{dt} = 3t^2$$

$$\therefore \frac{dy}{dx} = \frac{3t}{2} \Rightarrow \frac{d^2y}{dx^2} = \frac{3}{2} \cdot 1 \cdot \frac{dt}{dx}$$

$$= \frac{3}{2} \cdot \frac{1}{2t} = \frac{3}{4t}$$

30. Answer (1)

$$y = 5x - 2x^3$$

$$\frac{dy}{dx} = 5 - 6x^2 \Rightarrow m = 5 - 6x^2$$

$$\frac{dm}{dt} = -12x \cdot \frac{dx}{dt}$$

$$= -24x \left(\because \frac{dx}{dt} = 2 \right)$$

$\therefore$ at $x = 3$

$$\frac{dm}{dt} = -24 \times 3 = -72$$

31. Answer (2)

$$f'(x) = (12 \sin^2 x - 12 \sin x + 12) \cos x$$

$$= 12 \cos x \left[\left(\sin x - \frac{1}{2} \right)^2 + \frac{3}{4} \right]$$

$$f'(x) > 0 \Rightarrow \cos x > 0, x \in \left(-\frac{\pi}{2}, \frac{\pi}{2} \right)$$

$$f'(x) < 0 \Rightarrow \cos x < 0, x \in \left(\frac{\pi}{2}, \frac{3\pi}{2} \right)$$

32. Answer (1)

When it crosses to x-axis, $y = 0 \Rightarrow x = 2$

(2, 0)

$$\text{Now, } y[2x] + (1+x^2) \frac{dy}{dx} = -1$$

$$\Rightarrow m = -\frac{1}{5}$$

$$\therefore \text{equation of tangent: } y - 0 = -\frac{1}{5}(x - 2)$$

$$x + 5y = 2$$

33. Answer (1)

$$I = \int \frac{2 \cos^2 x - 1 - (2 \cos^2 \theta - 1)}{(\cos x - \cos \theta)} dx$$

$$= 2 \int (\cos x + \cos \theta) dx$$

$$= 2(\sin x + x \cos \theta) + c$$

34. Answer (2)

$$\int_{-\pi/2}^{\pi/2} (x^3 + x^2 \tan^3 x + x \cos x + 1) dx = 2 \int_0^{\pi/2} 1 dx$$

$$= 2 \left[x \right]_0^{\pi/2} = \pi$$

35. Answer (4)

$$I = \int_a^b x f(x) dx \quad \dots (i)$$

$$I = \int_a^b (a+b-x) f(a+b-x) dx$$

$$= \int_a^b (a+b-x) f(x) dx \quad \dots (ii)$$

(i) + (ii)

$$2I = \int_a^b (a+b) f(x) dx \Rightarrow I = \frac{a+b}{2} \int_a^b f(x) dx$$

36. Answer (1)

$$\begin{aligned}
 I &= \int_{-1}^0 -1 dx + \int_0^1 0 dx + \int_1^2 1 dx + \int_2^3 2 dx \\
 &= -1[0 - (-1)] + 0 + 1[2 - 1] + 2[3 - 2] \\
 &= -1 + 1 + 2 = 2
 \end{aligned}$$

37. Answer (1)

$$\begin{aligned}
 I &= \int 1 \cdot \tan^{-1} \sqrt{x} dx \\
 &= \tan^{-1} \sqrt{x} \cdot x - \int \frac{1}{1+x} \cdot \frac{1}{2\sqrt{x}} \cdot x dx \\
 &= x \cdot \tan^{-1} \sqrt{x} - \frac{1}{2} \int \frac{\sqrt{x}}{1+x} dx
 \end{aligned}$$

$$\text{Now, Put } x = t^2 \Rightarrow dx = 2t dt$$

$$\begin{aligned}
 I &= x \tan^{-1} \sqrt{x} - \frac{1}{2} \int \frac{t}{1+t^2} 2t dt \\
 &= x \tan^{-1} \sqrt{x} - \int \frac{1}{1+t^2} dt \\
 &= x \tan^{-1} \sqrt{x} - \tan^{-1} \sqrt{x} + c
 \end{aligned}$$

38. Answer (2)

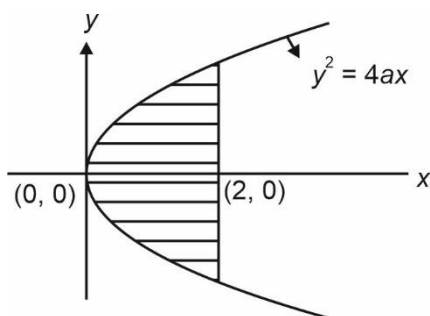
$$I = \int_{-\pi}^{\pi} x (\sin^2(\sin x) + \cos^2(\cos x)) dx \dots (i)$$

$$\therefore f(x) = x(\sin^2(\sin x) + \cos^2(\cos x)) \text{ is odd function}$$

$$\therefore I = 0 \dots (ii)$$

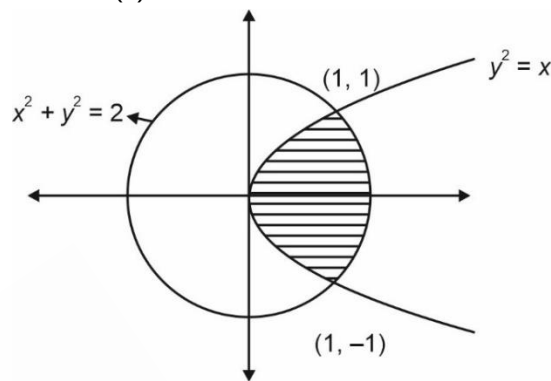
$$\Rightarrow I = 0$$

39. Answer (1)



$$\begin{aligned}
 A &= 2 \int_0^2 \sqrt{8x} dx \\
 &= 2 \times 2\sqrt{2} \left[\frac{x^{3/2}}{3/2} \right]_0^2 \\
 &= \frac{8\sqrt{2}}{3} [2^{3/2}] = \frac{32}{3}
 \end{aligned}$$

40. Answer (2)



$$\begin{aligned}
 A &= \int_0^1 [(\sqrt{2-y^2}) - y^2] dy \\
 &= \left[\frac{y}{2} \sqrt{2-y^2} + \frac{2}{2} \sin^{-1} \left(\frac{y}{\sqrt{2}} \right) - \frac{y^3}{3} \right]_0^1 \\
 &= \frac{\pi}{4} + \frac{1}{6}
 \end{aligned}$$

41. Answer (1)

$$(1+x^2) \frac{dy}{dx} + xy = (1+x^2) \sin x$$

$$\Rightarrow \frac{dy}{dx} + \frac{x}{1+x^2} y = \sin x$$

$$\therefore \text{I.F.} = e^{\int \frac{x}{1+x^2} dx} = e^{\frac{1}{2} \ln(1+x^2)} = \sqrt{1+x^2}$$

42. Answer (3)

$$\frac{dy}{dx} = -\frac{x+y}{x}, \text{ put } y = vx \Rightarrow \frac{dy}{dx} = v + x \frac{dv}{dx}$$

$$v + x \frac{dv}{dx} = -(1+v) \Rightarrow \int \frac{1}{1+2v} dv = \frac{-1}{x} dx$$

$$\Rightarrow \frac{\ln(1+2v)}{2} = -\ln x + \ln c$$

$$\Rightarrow 1+2v = \left(\frac{c}{x} \right)^2$$

$$\Rightarrow x^2 + 2xy = C$$

43. Answer (4)

$$\therefore |\vec{a}| = |\vec{b}| = 1$$

$$\text{and } |\vec{a} + \vec{b}| = 1 \Rightarrow (\vec{a} + \vec{b}) \cdot (\vec{a} + \vec{b}) = 1$$

$$\Rightarrow 1 + 2|\vec{a}||\vec{b}|\cos\theta + 1 = 1$$

$$\cos\theta = \frac{-1}{2}$$

$$\theta = \frac{2\pi}{3}$$

44. Answer (1)

Unit vector in the direction of $\hat{i} + 3\hat{j} + \sqrt{6}\hat{k}$

$$= \frac{1}{4}(\hat{i} + 3\hat{j} + \sqrt{6}\hat{k})$$

 $\therefore$ Vector in the direction of given vector

$$= 2(\hat{i} + 3\hat{j} + \sqrt{6}\hat{k})$$

45. Answer (1)

$$L: \frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9} = k$$

$$x = k - 5, \quad y = 4k - 3, \quad z = 6 - 9k$$

Let it is foot of perpendicular, then

$$1(k-7) + 4(4k-7) - 9(7-9k) = 0$$

$$98k = 98 \quad \boxed{k=1}$$

Point will be $(-4, 1, -3)$

46. Answer (1)

Let equation of plane be $a(x-2) + b(y+3) + c(z-1) = 0$

$$\text{When } \frac{a}{1} = \frac{b}{5} = \frac{c}{-6}$$

 $\therefore$ equation becomes

$$(x-2) + 5(y+3) - 6(z-1) = 0$$

$$x + 5y - 6z + 19 = 0$$

47. Answer (3)

 $\therefore E$ and F are independent, then

$$P(E|F) = P(E) \text{ and } P(F|E) = P(F)$$

$$\text{Also } P(E \cap F) = P(E)P(F)$$

$$\text{Now } P(E \cup F) = 0.3 + P(F) - 0.3P(F)$$

$$\therefore P(F) = \frac{2}{7}$$

$$\therefore P(E|F) - P(F|E) = P(E) - P(F) = \frac{3}{10} - \frac{2}{7} = \frac{1}{70}$$

48. Answer (1)

Let E_1 : event that the ball is drawn from bag A E_2 : event that the ball is drawn from bag B E : The ball is red

Then,

$$P(E_1) = P(E_2) = \frac{1}{2}, \quad P(E/E_1) = \frac{4}{7}, \quad P(E/E_2) = \frac{5}{9}$$

Then

$$P(E_2/E) = \frac{P(E_2) \cdot P(E/E_2)}{P(E_2) \cdot P(E/E_2) + P(E_1)P(E/E_1)}$$

$$= \frac{\frac{1}{2} \cdot \frac{5}{9}}{\frac{1}{2} \cdot \frac{5}{9} + \frac{1}{2} \cdot \frac{4}{7}} = \frac{35}{71}$$

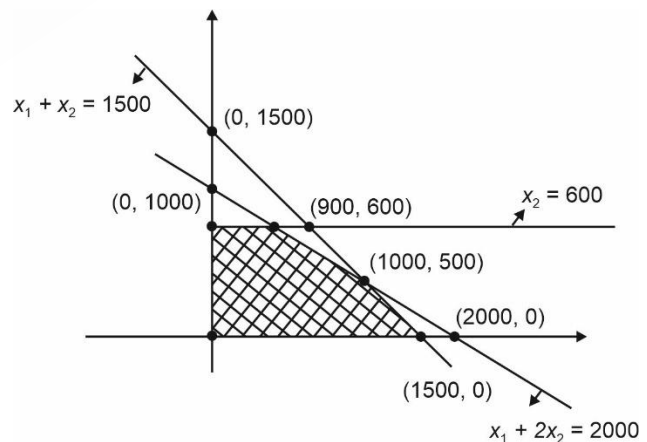
49. Answer (4)

$$E(X) = -4 \times 0.1 + (-3) \times 0.2 + (-2) \times 0.3$$

$$+ (-1) \times 0.2 + 0 \times 0.2$$

$$= -0.4 - 0.6 - 0.6 - 0.2 = -1.8$$

50. Answer (1)

Clearly, $(900, 600)$ lie outside the feasible region

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