IIITH UGEE 2022 Question Paper PDF

International Institute of Information Technology Undergraduate Entrance Examination (IIITH UGEE)

UGEE 2022 MEMORY BASED PAPER

UGEE 2022 Paper Pattern

PAPER	No. of Que	Time	Marking	Total Marks	Negative Marking
UGEE 2022	100	3 hr		150	
SUPR	50	1 hr	+1	50	-0
REAP	50	2 hr	+2	100	-0.5

TIME : 3 HRS   **TOTAL MARKS : 150**

1. If an object is kept at a distance of 10cm from a concave mirror, find the focal length, given that the image is formed at a distance of 5 cm from the mirror.
   a. 20cm
   b. 5cm
   c. 10cm
   d. 15cm

2. Two trains each of length 40m are travelling towards each other with speeds 10m/s and 15m/s respectively. Find the time taken for them to cross each other.
   a. 2.6 s
   b. 3.6 s
   c. 4.8 s
   d. 1.8 s

3. A block of mass 2 kg is kept on a fixed rough wedge as given in the figure.
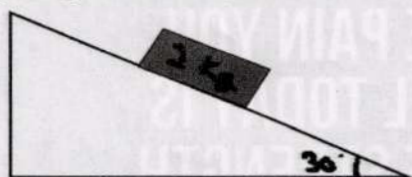
   Find the frictional force acting on the block?
   a. 15N
   b. 10N
   c. $10\sqrt{3}$N
   d. None of these

4. Find the total number of isomers of the complex compound $[Ma_4b_2]$ where M is the metal and a and b are ligands.
   a. 4
   b. 2
   c. 3
   d. 16

5. Find $\int \frac{1}{2a}\left(\frac{a+x}{a-x}\right) dx$.
   a. $-\frac{x}{2a} - 2\ln\sqrt{\frac{a-x}{2a}} + c$
   b. $\frac{x}{2a} - 2\ln\sqrt{\frac{a-x}{2a}} + c$
   c. $-\frac{x}{2a} + 2\ln\sqrt{\frac{a-x}{2a}} + c$
   d. $\frac{x}{2a} + 2\ln\sqrt{\frac{a-x}{2a}} + c$

6. In two thermodynamic processes (at same initial pressure), adiabatic and isothermal, the pressure is halved in each, resulting in expansion of the gases. The final volumes of isothermal and adiabatic processes are respectively V_{iso} and V_{adi}. Find $\frac{V\,(adi)}{V\,(iso)}$. Given both the gases are at same temperature initially and both are monoatomic.
   a. $\frac{1}{4^{1/3}}$
   b. $\frac{1}{2^{1/3}}$
   c. $\frac{1}{4^{1/5}}$
   d. $\frac{1}{2^{1/5}}$

7. Find ebullioscopic constant K_b of a non-ionizable substance, if, given that the elevation in boiling point is 0.1 K when the molality of the solution is 0.51.
   a. 0.182

b. 0.196

c. 0.167

d. 1.55

8. The composition(by mass) of a compound is

Element	C	H	O
Percentage (%)	40	6.7	53.3

Find the possible formula of the compound.

a. $C_{12}H_{24}O_{13}$

b. $C_{10}H_{22}O_{11}$

c. $C_{10}H_{21}O_{10}$

d. $C_6H_{12}O_6$

9. Find the value of $\sum_{n=1}^{24} k^2$

a. 4812

b. 4900

c. 5112

d. 5670

10. Find the value of $\lim_{x \to a} \left(\frac{x^n - a^n}{x - a} \right)$

a. 1

b. na^n

c. na^{n-1}

d. n

11. If A is a 2x2 matric such that A = $\begin{bmatrix} cos\emptyset & sin\emptyset \\ -sin\emptyset & cos\emptyset \end{bmatrix}$, find the value of $|A^n|$.

a. 0

b. -1

c. 1

d. 2

12. If $\frac{d^2y}{dx^2} = -sin\left(\frac{dy}{dx}\right)$, find the order and degree of this differential.

a. 2,1

b. 2,2

c. 1,2

d. 1,1

13. Find $\int \frac{1}{x^2 + a^2} dx$

a. $\frac{1}{2a} \ln \left| \frac{x-a}{x+a} \right| + c$

b. $\frac{1}{2a} \ln \left| \frac{x+a}{x-a} \right| + c$

c. $\frac{1}{a} \tan^{-1} \frac{x}{a} + c$

d. None of these

14. Which one of the following is optically active?

a. 2,3-dimethylbutane

b. 2-methylpentane

c. 2,3,4-trimethylpentane

d. 2,3-dimethylpentane

15. Given that mean of some observations is 10 and mean of their squares in 110, find the variance of these observations.

a. $\sqrt{10}$

b. 10

c. $\sqrt{11}$

d. 11

16. Find $\int \frac{1}{x^2 - a^2} dx$

a. $\frac{1}{a} \tan^{-1} \frac{x}{a} + c$

b. $\frac{1}{2a} \ln \left| \frac{x+a}{x-a} \right| + c$

c. $\frac{1}{2a} \ln \left| \frac{x-a}{x+a} \right| + c$

d. $(x-a) + c$

17. A body of radius R is rolling with radius of gyration K. Find the ratio of rotational and kinetic energy.

a. K^2/R^2

b. $(K^2 + R^2)/R^2$

c. R^2/K^2

d. $K^2/(K^2 + R^2)$

18. Given that $|\overline{a}|=1$, $|\overline{b}|=1$ and $|\overline{a} + \overline{b}|=1$, find the value of $|\overline{a} - \overline{b}|$.

a. 0

b. 1

c. 2

d. $\sqrt{3}$

19. How many of the following out of NH, OF, CN, NO, N_2 become stable on gaining or losing an electron?

a. 2

b. 3

c. 4

d. 1

20. When two capacitors of equal capacitance are connected in series, their equivalent capacitance is-
    a. Harmonic mean of their capacitances
    b. Sum of capacitances
    c. Geometric mean of capacitances
    d. None of these

21. Find the value of $\sin^{-1}\frac{2x}{1+x^2} + \cos^{-1}\frac{1-x^2}{1+x^2}$ for $x \in (1, \infty)$
    a. 0
    b. π
    c. $4\tan^{-1} x$
    d. None of these

22. For the following, the most appropriate length can be given as

    _____

    a. 2.4 mm
    b. 2.5 mm
    c. 2.43 mm
    d. None of these

23. For Z= 3x+4y such that x and y are subjected to following conditions
    $x+y \leq 60$ $x+y \geq 120$
    $x \geq 0$ $y \geq 0$
    there are:
    a. Infinite solutions
    b. One unique solution
    c. Finite but more than one solution
    d. No solution

24. Two equal and opposite forces act on an object, which is in a rotational motion, which if the following cannot be the distance between their point of application?
    A) 0
    B) 5.67
    C) 8.92
    D) 1.25
    E) 0.4

25. If the amplitude of electric field of an electromagnetic wave is 2700 V/m. Find the amplitude of magnetic field component of the electromagnetic field.
    a. 0.003 mT
    b. 0.006 mT
    c. 0.009 mT
    d. None of these

26. If K_b = 0.51 and 10g of a substance is added to 1 litre of water. The boiling temperature was 100.1°C. what is the molecular weight of the substance? (Boiling point of water= 100°C)
    a. 0.051
    b. 0.51
    c. 5.1
    d. 510
    e. 5100

27. If a bag contains 4 white and 4 black, what is the probability that when 2 balls (without replacement) are chosen both of them are white?
    a. ½
    b. 3/7
    c. 3/14
    d. 2/21

28. If a bag contains equal objects A and B. The probability of having faulty A is 1/10 and probability of having faulty B is 1/20. Then what is the probability the chosen item is faulty A?
    a. 1/10
    b. 1/20
    c. 1/15
    d. None of these

29. What is the angle between the planes 2x+3y+2z=5 and 6x+2y+2z=2?
    a. $\cos^{-1} 12/\sqrt{287}$
    b. $\cos^{-1} 11\sqrt{187}$
    c. $\cos^{-1} 11/\sqrt{748}$
    d. None of these

30. If the adjacent sides of a parallelogram are given by $\bar{a} = 4i + 4j + 4k$ and $\bar{b} = i + j$ then find the area of the parallelogram.

a. 4
b. 2
c. 8
d. $4\sqrt{2}$

31. If a copper wire of radius 'r' is wound carrying current I, has magnetic moment M_1. The wire is then wound 4 times and carries current I/2 having magnetic moment M_2. Find M_2/M_1.
a. 4
b. ¼
c. 8
d. 1/8

32. Given that $|\overline{a}|=4$, $|\overline{b}|=7$ and $|\overline{a}+\overline{b}|=9$, find the value of $|\overline{a}-\overline{b}|$.
a. 5
b. 6
c. 7
d. 8

33. If two springs of $K_1=20$ N/m and $K_2=30$ N/m are attached end-to-end and connected to a mass. A force F is applied on the mass and the compression in the resulting spring is 10cm, find F.
a. 12N
b. 3.6N
c. 1.2N
d. 36N

34. $ax^2+bx+c = 0$ has roots p and q. What equation will have roots as 1+p/q and 1+q/p.
a. $abx^2+c = 0$
b. $acx^2 + bcx + ab = 0$
c. $acx^2 + b^2(1-x) = 0$
d. none of these

35. An object is dipped in 3 different beakers containing different liquids A, B, C of different densities and it is observed that its $\frac{1}{3}rd, \frac{2}{3}rd$ and $\frac{3}{7}$th part is submerged, respectively. Then the increasing order of density of three liquids A, B, C is-
a. $d_B < d_A <d_C$
b. $d_C < d_A < d_B$
c. $d_C < d_B < d_A$
d. $d_B < d_C < d_A$

36. what are possible ways of checking cardinality of two sets A and B are equal or not ?
A) Manually count the elements
B) find bijection in it
C) None of these
D) all of these

37. Find pH of solution made by adding 10^{-8} M HCl in 1 Lit. of water.
a. 4.33
b. 8
c. 6.9
d. None of these

38. If $2\tan^{-1}(cosx) = \tan^{-1}(cosecx)$ then sinx + cosx = ?
a. $2\sqrt{2}$
b. $\sqrt{2}$
c. $\frac{3}{\sqrt{5}}$
d. $\frac{1}{2}$

39. What will be the change in time period of a mass connected to a suspended spring of natural length l which is extended by a distance b ?
a. $2\pi\sqrt{\frac{l}{g}}$
b. $2\pi\sqrt{\frac{b}{g}}$
c. $2\pi\sqrt{\frac{l+b}{g}}$
d. $2\pi\sqrt{g/l}$

40. What is the value of determinant of
$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$
a. 1
b. -1
c. 0
d. None

41. Light coming from a train appears to come in a straight line, them why is it an EM wave?

a. It is perpendicular to electric field and magnetic field
b. It goes up and down
c. It makes the dust particle oscillate.
d. None of these

42. In maxwells equation curve of KTG, which one of the following is false?
a. As temperature increases, the mean position is shifted to the right
b. Molecules of probable speed decreases as temperature is increased
c. Area under the curve remains same as temperature changes
d. Area under the curve gives the number of molecules

43. $A_{(liq)} \rightleftharpoons A_{(gas)}$ is an endothermic process. If temperature is increased,
a. Pressure will increase
b. Pressure will decrease
c. Pressure will remain same
d. Can't say

44. Set A contains 3 elements and set B contains 5 elements. Find the probability that the function A⟶B is one-one.
a. 0.48
b. 0.5
c. 0.6
d. 0.15
e. None

45. And octahedral void is made up of two types of atoms having radius $R_x=1pm$ and R_y. What is the smallest value of R_y to keep the void octahedral?
a. 0.155
b. 0.225
c. 0.414
d. 0.732

46. pK$_a$ of acetic acid and pK$_b$ of ammonium hydroxide is 4.76 and 4.75 respectively. Find the pH of 0.1M ammonium acetate solution.
a. 7.05
b. 7.005
c. 6.995

d. 6.95

47. During crystallization what happens?
a. It is a spontaneous process.
b. It is a non-spontaneous process.
c. Entropy decreases
d. <Missing Option>
e. <Missing Option>

Note: We reconstruct Memory based paper so, In 2022 We were able to recollect 47 out of 50 questions. Few questions or options may have some ambuguity.

REAP Section

1. There are two dice. Find the probability the the sum on them is atleast 9 given that a fixed die among them shows 5.
a. ½
b. 1/3
c. 1
d. 2/5

2. Find the missing term in the following series: 10, 4, 7, ___, 8, 15, 32, 12, 23, 43.
a. 23
b. 25
c. 11
d. 21

3. There is a weighing scale with two pans. In the first case, 2 yellow balls and a pink ball supports a weight of 30 kg. In second case, one yellow and one pink ball supports the weight of 2 green balls. In third case, 2 green and a pink ball support the weight of 2 yellow balls. Find the value of the weight that we will need to support the weight of 3 green balls.

a. 21
b. 30
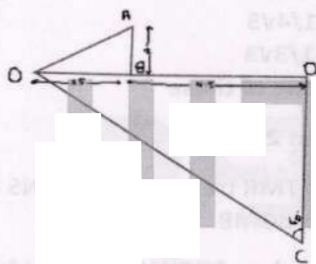c. 27
d. 24

4. Given that A is a 2x2 matrix such that A = $\begin{bmatrix} cos\emptyset & sin\emptyset \\ -sin\emptyset & cos\emptyset \end{bmatrix}$; $A^k \begin{bmatrix} cos\ \emptyset/2 \\ sin\ \emptyset/2 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ then find k.
   a. $(2n-1)\pi/2$
   b. $(2n-1)\pi$
   c. $n\pi$
   d. $n\pi/2$

5. If $f(x) = \int e^x \left(\frac{x^2+x+1}{\sqrt{x^2+1}} \right) dx$ such that the value of the function is 1 when x vanishes, find the value of f(1).
   a. $\sqrt{3}e$ b. $\sqrt{5}e$
      c. $\sqrt{2}e$ d. e

6. In the following figure the lengths(in cm) of some sides are given. Find the length of DC(in cm).


   a. 3
   b. 6
   c. $\sqrt{3}$
   d. $\sqrt{2}$

7. Bag contains 17 balls of 4 different colours. There exists minimum of 2 balls of a particular colour in the bag. Bag contains maximum number of green balls and the number of balls of any two colours aren't the same. If we randomly pick 11 balls from the bag such that there should be at least two balls of the same colour and the remaining balls of another colour. Then the probability of having at least one green ball among those 11 balls picked from the bag?
   a. 2/3
   b. 17/97
   c. 52/53
   d. ½
   e. None of these

8. In the expansion of $(1+x)^{m+n}$,
   a. Coefficient of x^m > coefficient of x^n
   b. Coefficient of x^m < coefficient of x^n
   c. Coefficient of x^m = coefficient of x^n
   d. Nothing can be said for coefficient of x^m and coefficient of x^n

9. Find $\angle CAB$ from the following figure
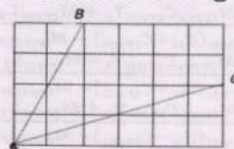
   a. 30 deg
   b. 45 deg
   c. 60 deg
   d. None of these

10. In a series LR circuit the ratio of inductive reactance and resistance is $\sqrt{3}$. In this case the power factor of the circuit is P_1. Now a capacitor is connected to the existing circuit in series such that the circuit resonates. The power factor of the circuit in this case is P_2. Find $\frac{P_1}{P_2}$?
    a. 0
    b. $\sqrt{3}$
    c. ½
    d. 1

11. Two containers of equal volume with gases at different conditions are mixed as shown. Find the final temperature T in terms of the available data.

n_1 moles C_1 heat capacity T_1 initial temperature	+	n_2 moles C_2 heat capacity T_2 initial temperature

    C_1 heat capacity   + C_2 heat capacity

    T_1 initial temperature
    T_2 initial temperature

    a. $\frac{n_1 C_2 T_1 + n_2 C_1 T_2}{n_1 C_1 + n_2 C_2}$
    b. $\frac{n_1 C_1 T_1 + n_2 C_2 T_2}{n_1 C_1 + n_2 C_2}$
    c. $\frac{n_2 C_2 T_1 + n_1 C_1 T_2}{n_1 C_1 + n_2 C_2}$
    d. None of these

12. A mixture of ice at 0°C (mass=M_{iron}) and water (mass=M_{water}) at 0°C was present. An iron ball of mass M_{iron} at $T_1°$ was dropped into the bowl. If the specific heat of water is C_w and latent heat of ice is L_i and specific heat of iron is C_{iron}, find the final temperature of the iron block. (Assume that entire ice melts)

a. $\dfrac{M_{iron}C_{iron}T_1 + M_{iron}L_1}{M_{iron}(C_w + C_{iron}) - M_{water}C_w}$

b. $\dfrac{M_{iron}C_{iron}T_1 - M_{iron}L_1}{M_{iron}(C_w + C_{iron}) + M_{water}C_w}$

c. $\dfrac{M_{iron}C_{iron}T_1 + M_{iron}L_1}{M_{iron}(C_w - C_{iron}) + M_{water}C_w}$

d. $\dfrac{M_{iron}C_{iron}T_1 - M_{iron}L_1}{M_{iron}(C_w + C_{iron}) - M_{water}C_w}$

13. Which of the following statements is correct
   a. The function n! increases faster than n^n
   b. The function $n^{\log n}$ increases faster than n!
   c. The function n! increases slower than $\log_n n$
   d. The function n! increases faster than $(n-e)^n$

Passage for Q 14-15

Following addition is given such that each letter represents a digit

```
    R  Q  Q
 +  S  S  Q
    3  S  R
 Q  8  R
```

14. What can be the value of Q + R + S ?
   a. 4
   b. 5
   c. 7
   d. 10

15. In the above question Q can be
   a. 4
   b. 5
   c. 1
   d. 0

16. Heating of a dicarboxylic acid doesn't give what as a product ?
   a. Cyclic ester
   b. Carbon dioxide
   c. Monocarboxylic acid
   d. Aldehyde

17. What day comes a day after two days after a day that comes immediately after a day that comes after a day after two days after Monday?
   a. Monday
   b. Tuesday
   c. Friday
   d. Thursday

18. What material would you prefer to calculate earth's magnetic field?
   a. Solid iron
   b. Liquid iron
   c. Steel
   d. Magnesium

19. What is the distance of (1,1,1) from nearest point on 2x+2y+2z+3=0
   A) $9/2\sqrt3$
   B) $22/2\sqrt3$
   C) $11/4\sqrt3$
   D) $11/3\sqrt3$
   E) none of these

Passage from 20 to 23

If the word FTMR translates to GUNS and ANLA translates to BOMB

20. What does FORWARD stand for?
   a. XLROUQB
   b. GPSXBSE
   c. ANUSLTP
   d. ZQRTPYL

21. CODE will be encrypted as ?
   a. ANQU
   b. PTYN
   c. PPEF
   d. RWCE

22. What will be the original word of 'AOQRHM'
   a. PARIS
   b. ZNPQGL
   c. TOKYO
   d. MILAN

23. No. of alphabet(s) that didn't changed is? (Incomplete Question -> Skip it)
   a. 0

b. 2
c. 1
d. 5

24. What is day after 2 days before the subsequent day after 2 days after Wednesday?
    a. Saturday
    b. Thursday
    c. Wednesday
    d. Friday
    e. Monday

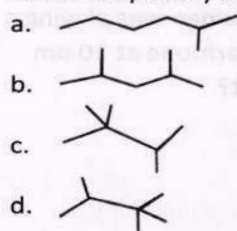25. If earth is taken as centre and Venus, Jupiter and the Sun revolve around earth. What is the order of their radius from earth?
    a. $R_v > R_s > R_j$
    b. $R_j > R_s > R_v$
    c. $R_v > R_j > R_s$
    d. None of these

26. Spin quantum number can take values s=+1/2 and s=-1/2. If s can also take s=0 then the atomic number of the first 3 noble gases are?
    a. 3,12,18
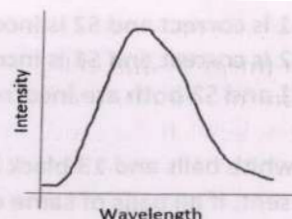   b. 3,15,27
    c. 4,14,21
    d. 3,8,16
    e. None of these

27. A compound with molecular formula C_7H_{16} which is optically active can be ?
    a.
    b.
    c.
    d.
    e. None of these

Passage for Q 28-31

We receive radiations from different sources in the universe like the Sun, some stars etc. The graph of intensity vs wavelength of exposure of radiations to the earth is given below:

28. If the temperature of the sun's surface increases then what will happen to the graph?
    a. Max intensity increases and the graph shifts leftwards
    b. Max intensity increases and the graph shifts rightwards
    c. Max intensity remains same and the graph shifts leftwards
    d. Max intensity remains same and the graph shifts rightwards

29. What is the wavelength of most exposed radiation?
    a. 50nm
    b. 5000nm
    c. 500nm
    d. 50000nm
    e. >50000nm

30. Which is the most harmful exposed radiation to the earth?
    a. 50nm
    b. >500nm
    c. <500nm
    d. None
    e. 1000nm

31. In the black body. What is the meaning of the term 'black' ?
    a. Total absorption of light of all wavelength
    b. Absorption of higher wavelength
    c. Darker than brown
    d. Absorption of lower wavelength of light

32. Ψ_1 and Ψ_2 are two functions such that Ψ_1 is injective and A→B and Ψ_2 is onto and B→A. Statement 1- $\Psi_1 o \Psi_2$ may or may not exist Statement 2- $\Psi_1 o \Psi_2$ exists and $\Psi_2 o \Psi_1$ is not bijective.
    (Where fof = f(f(x)))
    Select the correct option
    a. S1 and S2 both are correct

b. S1 is correct and S2 is incorrect

c. S2 is correct and S1 is incorrect

d. S1 and S2 both are incorrect

33. 13 white balls and 13 black balls are present. If all balls of same colour are different, then no. of ways of choosing 3 white balls and 5 black balls is?

   a. 368000

   b. 368900

   c. 368052

   d. 368082

Question from 34 to 36: In a secret military operation, a certain code was developed to encode different words. A few of them are listed below:

    CODE is written as JVIH

    GOAL is written as FVLA

    SECRET is written as ZHJYHU

    FLAVOUR is written as GALOVTY

    In the same code find the way the following words will be written:

34. MATHS = ?

   a. WLQER

   b. XLQEZ

   c. WLQEN

   d. XLQER

35. SUPR = ?

   a. RPSY

   b. RSRU

   c. RPUS

   d. ZPUY

36. REAP = ?

   a. XLHU

   b. VULA

   c. YHLU

   d. None

37. Some textbooks say that woollen sweaters have some sir pockets. They keep us warm. What is the actual reason?

   a. The air trapped inside acts as an insulator

   b. There is nothing with air, wool is a bad conductor of heat.

   c. Warm air gets trapped

   d. CO_2 trapped in air pockets is insulator.

38. Draw correct conclusions from the following given statements:

   (Consider the meaning of the following sentences as absolute truth for this question)

   All cricketers maintain diet

   All famous sportspersons are cricketers

   a. All famous sport persons maintain diet

   b. All famous person are cricketers

   c. All the people who maintain diet are cricketers

   d. None of these

39. Using quantum mechanics birds have the ability to sense magnetic field of earth and magnet. This cannot be studied by classical physics due to?

   a. Fast-flowing River

   b. High mountains

   c. Molecules in bird's eyes

   d. Forest fires

40. In a class there are four kids Hermone, Dracow, Claire, Lumen. One of them had written "muggles are awesome" on the black board at 10 pm. Professor Snapey wants to find out the culprit. He questions all of them and gets following answers:

   Lumen said   : Claire did it

   Dracow said   : Hermone didn't do it

   Hermone said : Lumen didn't do it

   Claire said   : Lumen was playing Minecraft with Hermone at 10 pm

   Who is the culprit?

   a. Lumen

   b. Hermone

   c. Claire

   d. Dracow

41. Suppose a post office sells only 5rs. and 9rs. stamps, then which one of the following is true?

   a. People can buy stamps of rs.33 or more

   b. People can buy stamps of rs.34 or more

   c. People can buy stamps of rs.25 or more

   d. People can buy stamps of rs.14 or more

Passage for Q 42-48

Tribes in some regions of South Africa speak a language called Zulu. Some sentences are translated from English to Zulu below:

English	Zulu
I speak	ngiyakhuluma
I spoke	ngiyakhulama
I never spoke	ngiyaukhulamasoze
You speak quickly	uzasheshakhuluma
We speak	sakhuluma
You will speak	uzokhuluma
We never spoke	saukhulumasoze
I drive	ngiyashaleya

Translate the following in Zulu language and write the answers in the box given below each question:

42. I ?

43. You ?

44. We will drive?

45. You will drive?

46. We will never drive quickly ?

47. You drive ?

48. I will drive ?

IIITPREP UGEE 2022 PAPER ANSWER KEY

UGEE 2022 Solution – Paper 1 SUPR

1	C	11	C	21	B	31	D	41	A
2	B	12	D	22	A	32	C	42	D
3	B	13	C	23	D	33	C	43	A
4	B	14	D	24	A	34	C	44	A
5	C	15	B	25	C	35	D	45	C
6	C	16	C	26	C	36	-	46	B
7	B	17	A	27	C	37	C	47	-
8	D	18	D	28	B	38	C	-	-
9	B	19	C	29	B	39	C	-	-
10	C	20	D	30	D	40	C	-	-

UGEE 2022 Solution – Paper 2 REAP

1	A	11	B	21	C	31	A	41	D
2	D	12	B	22	B	32	-	42	ngiya
3	C	13	A	23	MissingValue	33	C	43	Uza
4	A	14	C	24	D	34	B	44	Sazoshaleya
5	C	15	B	25	B	35	D	45	Uzo shaleya
6	C	16	D	26	B	36	C	46	Sazosheshaushaleyasoze
7	B	17	B	27	E	37	A	47	Uzashaleya
8	C	18	B	28	A	38	A	48	ngiyazashaleya
9	B	19	A	29	C	39	B	-	-
10	C	20	B	30	C	40	C	-	-

SUPR Solutions – 2022

Q. 1 $\left.\begin{array}{l} u = -10 \text{ cm} \\ v = +5 \text{ cm} \end{array}\right\}$ given

$$\frac{1}{v} + \frac{1}{v} = \frac{1}{f}$$

$$\frac{1}{5} - \frac{1}{10} = \frac{1}{f}$$

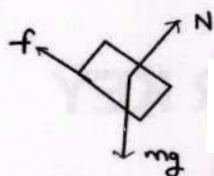$$\frac{1}{10} = \frac{1}{f}$$

$$\therefore f = 10 \text{ cm} \qquad \text{Ans. (c)}$$

Q.2 Relative speeds of their ends = $10 + 15 = 25$ m/s

Distance = $40 + 40 = 80$

$$\therefore \text{time} = \frac{80}{25} = 3.6 \text{ s} \qquad \text{Ans. (b)}$$

Q.3 FBD diagram of block:

On equating forces we get,

$$Mg \cos \theta = N$$

$$Mg \sin \theta = f$$

$$\therefore f = (2)(10) \sin 30° = 10 \text{ N} \qquad \text{Ans. (b)}$$

Q.4 Following isomers are possible
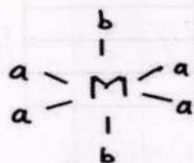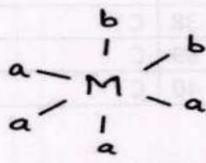
COS & POS   POS

$\therefore$ Optically inactive $\therefore$ Optically inactive

Ans. 2 (b)

Q.5 $\int \frac{1}{2a} \left(\frac{a+x}{a-x}\right) dx$

Let $x = a \cos \theta$

$$\therefore \int \frac{-1}{2a} \left(\frac{a + a\cos\theta}{a - a\cos\theta}\right)(a \sin\theta \, d\theta)$$

$$\int \frac{-1}{2} \left(\frac{1+\cos\theta}{1-\cos\theta}\right) \sin\theta \, d\theta$$

$$\int \frac{-1}{2} \frac{2\cos^2\frac{\theta}{2}}{2\sin^2\frac{\theta}{2}} \, 2\sin\frac{\theta}{2}\cos\frac{\theta}{2} \, d\theta$$

$$-\int \frac{\cos^3\frac{\theta}{2}}{\sin\frac{\theta}{2}} \, d\theta$$

$$-\int \frac{(1-\sin^2\frac{\theta}{2})\cos\frac{\theta}{2}}{\sin\frac{\theta}{2}} \, d\theta$$

$$-\int \frac{\cos\frac{\theta}{2}}{\sin\frac{\theta}{2}} \, d\theta + \int \sin\frac{\theta}{2}\cos\frac{\theta}{2} \, d\theta$$

$$2 \ln \sin\frac{\theta}{2} + \frac{1}{2}(-\cos\theta) + c$$

Now, substituting $\theta = \cos^{-1}\frac{x}{a}$

$$2 \ln \sqrt{\frac{a-x}{2a}} - \frac{x}{2a} + c \qquad \text{Ans. (c)}$$

Q. 6

Isothermal	Adiabatic
P_1	P_1
$P_f = \frac{P_1}{2}$	$P_f = \frac{P_1}{2}$
$P_1 V_1 = P_f V_{iso}$	$P_1 V_1^r = P_f V_f^r$
$2v_1 = V_{iso}$	$2v_1^{5/3} = V_f^{5/3}$
	$V_f = 2^{3/5} V_1$

$$\frac{V_{adi}}{V_{iso}} = \frac{2^{3/5}V_1}{2v_1} = \frac{1}{2^{2/5}} = \frac{1}{4^{1/5}} \qquad \text{Ans. (c)}$$

Q.7 We know that

$$\Delta T_b = i k_b m$$

Since non-ionizable $\quad \therefore i = 1$

$$\Delta T_b = k_b m$$

$$k_b = \frac{\Delta T_b}{m}$$

Substitute 1

$$k_b = \frac{0.1}{0.51} = 0.196 \qquad \text{Ans. (b)}$$

Q. 8

C	$40 \rightarrow \frac{40}{12} \rightarrow 3.33 \rightarrow 1$
H	$6.7 \rightarrow \frac{6.7}{1} \rightarrow 6.7 \rightarrow 2$
O	$53.3 \rightarrow 53.3/16 \rightarrow 3.33 \rightarrow 1$

$\therefore$ Imperical formula CH_2O

So, from the options, $C_6H_{12}O_6$ can be the answer.

Ans. (d)

Q.9

Q. 10 $\lim\limits_{x \to a} \left(\dfrac{x^n - a^n}{x - a} \right)$

Since $x \to a$, $\therefore x - a = h$

So, $x = a + h$, where $h \to 0$

Substitute

$\lim\limits_{h \to 0} \left(\dfrac{(a+h)^n - a^n}{a - a + h} \right)$

$\lim\limits_{h \to 0} \left(\dfrac{a^n \left(1 + \frac{h}{a}\right)^n - a^n}{h} \right)$

Applying binomial approximation

$\left(\dfrac{a^n + a^n \left(\frac{nh}{a}\right) - a^n}{h} \right) = na^{n-1}$ **Ans. (c)**

Q.11 $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$

$|A^n| = |A|^n$

So, $|A| = \cos^2\theta - (-\sin^2\theta)$

$\qquad = 1$

$\therefore \ |A|^n = 1$ **Ans. (c)**

Q. 12 Since there is second order differential

order $= 2$

and the power is 1, so deg is 1.

$1, 1$ **Ans. (d)**

Q.13 $\int \dfrac{1}{x^2 + a^2} \, dx$

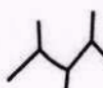$= \dfrac{1}{a} \tan^{-1} \dfrac{x}{a} + c$ (formula based)

Ans. (c)
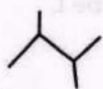
Q. 14 $a \to$ (inactive)
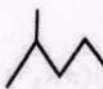
$b \to$ (inactive)

$c \to$ (inactive)
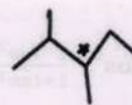
$d \to$ (active) **Ans. (d)**

Q. 15 $\dfrac{\sum x_i}{x} = 10 \qquad \dfrac{\sum x i^2}{n} = 110$

Variance $= 6^2 = \dfrac{\sum x i^2}{x} - \left(\dfrac{\sum x_i}{x} \right)^2$

$\qquad = 110 - (10)^2 = 110 - 100 = 10$

Ans. (b)

Q.16 $\int \dfrac{1}{x^2 - a^2} = \dfrac{1}{2a} \ln \left| \dfrac{x-a}{x+a} \right|$

formula based. **Ans. (c)**

Q. 17 Rotational energy $= \dfrac{1}{2} I\omega^2 =$

$\dfrac{1}{2} (mk^2) \left(\dfrac{v^2}{r^2} \right) = \dfrac{1}{2} mv^2 \left(\dfrac{k^2}{r^2} \right)$

Kinetic $= \dfrac{1}{2} mv^2$

Ratio $= \dfrac{\frac{1}{2} mv^2 \left(k^2/r^2\right)}{\frac{1}{2} mv^2} = \dfrac{k^2}{r^2}$ **Ans. (a)**

Q. 18 $|\bar{a}| = 1 \ |\bar{b}| = 1$

$|\bar{a} + \bar{b}| = 1 = \sqrt{|\bar{a}|^2 + |\bar{b}|^2 + 2\bar{a}.\bar{b}}$

$1 = \sqrt{1 + 1 + 2\bar{a}.\bar{b}}$

$\therefore 2\,\bar{a}.\bar{b} = -1$

Now, $|\bar{a} - \bar{b}| = \sqrt{|\bar{a}|^2 + |\bar{b}|^2 - 2\bar{a}.\bar{b}}$

$\qquad = \sqrt{1 + 1 - (-1)} = \sqrt{3}$

Ans. (d)

Q.19 $NH = 15e^-$:

$\sigma 1s^2 \ \sigma 1s^2 \ \sigma 2s^2 \ \sigma 2s^2 \ \sigma 2pz^2 \ \pi 2px^2 \equiv$
$\pi 2py^2 \ \pi*2px^1 \equiv \pi*2py^0$

$\therefore 1e^-$ removed from ABMO and full filled
achieved,

So, NH^- is stable

Similarly OF^-, CN^-, NO^+ is stable

So, ans. is 4 **Ans. (c)**

Q. 20 $C \, (series) = \dfrac{c_1 c_2}{c_1 + c_2}$ **Ans. (d)**

Q. 21 $\sin^{-1} \dfrac{2x}{1+x^2} + \cos^{-1} \dfrac{1-x^2}{1+x^2} \qquad x \in (1, \infty)$

Let $x = \tan\theta$

$$\sin^{-1}\frac{2\tan\theta}{1+\tan^2\theta} + \cos^{-1}\frac{1-\tan^2\theta}{1+\tan^2\theta}$$

$$\theta \in \left(\frac{\pi}{4}, \frac{\pi}{2}\right)$$

$$\sin^{-1}(\sin 2\theta) + \cos^{-1}(\cos 2\theta)$$

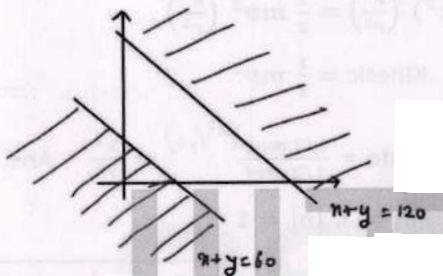$$2\theta \in \left(\frac{\pi}{2}, \pi\right)$$

$$\pi - 2\theta + 2\theta$$

$$= \pi \qquad \text{Ans. (b)}$$

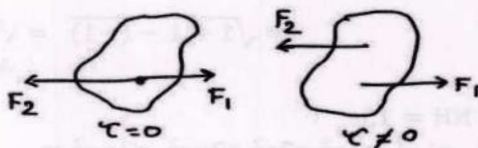**Q. 22** Appropriate count should be $2 + 4(0.1)$ mm
$= 2.4$ mm $\qquad$ Ans. (A)

Q. 23

No common region, so no solutions. Ans. (d)

Q. 24 There should be a net torque on the body for it to rotate. So distance between the forces can't be zero otherwise there would be no net torque.

$\tau = 0 \qquad \tau \neq 0 \qquad$ Ans. (a)

Q. 25 We know that $c = \frac{E}{B}$

So, $B = \frac{E}{C} = \frac{2700}{3\times 10^6} = 900 \times 10^{-8} = 9 \times 10^{-6} =$
0.009 mT $\qquad$ Ans. (c)

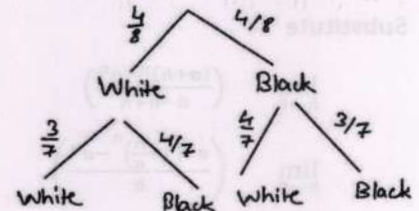**Q. 26** We know $kg = \frac{\Delta T_b}{m} = \frac{0.1}{m} = 0.51$

$$m = \frac{10}{51}$$

molality $= \dfrac{\text{moles of solute}}{\text{mass of solvent (kg)}} = \dfrac{10/M}{10} = \dfrac{1}{M} = \dfrac{10}{51}$

$M = 5^{-1}$ g/mol $\qquad$ Ans. (c)

Q. 27

$$\therefore \frac{4}{8} \cdot \frac{3}{7} = \frac{3}{14} \qquad \text{Ans. (c)}$$

Q. 28 p(faulty A) = p (choosing A) × p (A being faulty)

$$= \frac{1}{2} \times \frac{1}{10} = \frac{1}{20} \qquad \text{Ans. (b)}$$

Q. 29 We know that

$$\vec{n}_1 \cdot \vec{n}_2 = |\vec{n}_1||\vec{n}_2|\cos\theta$$

$$\cos\theta = \frac{(2\hat{\imath}+3\hat{\jmath}+2\hat{k})\cdot(6\hat{\imath}+2\hat{\jmath}+2\hat{k})}{\sqrt{2^2+3^2+2^2}\,\sqrt{6^2+2^2+2^2}}$$

$$\cos\theta = \frac{11}{\sqrt{187}} \qquad \text{Ans. (b)}$$

Q. 30 Area $= |\vec{A} \times \vec{B}|$

$$= 4\sqrt{2}$$

Ans. (d)

Q. 31 Let, length of wire be L

Case I: $2\pi R_1 = L$

$$R_1 = \frac{L}{2\pi}$$

$$M_1 = niA = (1)(I)(\pi R_1^2)$$

Case 2: $4(2\pi R_2) = L$

$$R_2 = \frac{L}{8\pi}$$

$$M_2 = (4)\frac{1}{2}\pi R_2^2 = 2I\,\pi R_2^2$$

$$\therefore \frac{M_2}{M_1} = \frac{2\,I\,\pi R_2^{\,2}}{I\,\pi R_1^{\,2}} = 2\left(\frac{R^2}{R^1}\right)^2 = 2\left(\frac{1}{4}\right)^2 = \frac{2}{16} = \frac{1}{8}$$

Ans. (d)

Q. 32 $|\bar{a}+\bar{b}| = \sqrt{a^2+b^2+2\bar{a}.\bar{b}}$

$9 = \sqrt{16+49+2\bar{a}.\bar{b}}$

$2\bar{a}.\bar{b} = 16$

$[\bar{a}-\bar{b}] = \sqrt{16+49-16}$

$= 7$ Ans. (c)

Q. 33 $k_{eq} = \frac{20\,(30)}{20+30} = \frac{20(30)}{50} = 12\ \frac{N}{m}$

$F = kx$

$= 12\,(0.1) = 1.2\ N$ Ans. (c)

Q. 34 $ax^2+bx+c=0$; p,q

$p+q = \frac{-b}{a}$ $pq = \frac{c}{a}$ ....(i)

Now, let $x^2+Bx+C=0$ have root $1+\frac{p}{q}$ & $1+\frac{q}{p}$

$\therefore \left(1+\frac{p}{q}\right)+\left(1+\frac{q}{p}\right) = -B$

$-B = 2 + \frac{p^2+q^2}{pq}$

$= 2 + \frac{(p+q)^2-2pq}{pq}$

$= 2 + \frac{\left(\frac{-b}{a}\right)^2}{\frac{c}{a}} - 2 = \frac{b^2\,a}{a^2\,.\,c} = \frac{b^2}{ac}$

$\therefore B = -b^2/ac$

$\left(1+\frac{p}{q}\right)\left(1+\frac{q}{p}\right) = C$

$C = 1+\frac{q}{p}+\frac{p}{q}+1 = 2+\frac{p^2+q^2}{pq}$

$\therefore$ Eq. : $x^2 - \frac{b^2}{ac}\ x + \frac{b^2}{ac} = 0$

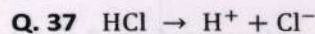$acx^2 + b^2(1-x) = 0$ Ans. (c)

Q. 35 Now, $mg = x\,V\rho g$

Where $x \rightarrow$ part

So, $\rho \propto \frac{1}{x}$

$\rho_B < \rho_C < \rho_A$ Ans. (d)

Q. 36 Standard Statement

Q. 37 $HCl \rightarrow H^+ + Cl^-$

10^{-8}

$H_2O \rightleftharpoons H^+ \qquad + \qquad OH^-$

$\qquad\qquad 10^{-8}+x \qquad\qquad x$

$kw = [H^+][OH^-] = 10^{-14}$

$10^{-14} = x\,(10^{-8}+x)$

$x^2 + 10^{-8}x - 10^{-14} = 0$

$x = \frac{-10^{-8}+\sqrt{10^{-16}+4x10^{-14}}}{2}$

$= \frac{19.02}{2} \times 10^{-8} = 10.01 \times 10^{-8}$ PH

Q. 38 $2\,\tan^{-1}(\cos x) = \tan^{-1}(\csc x)$

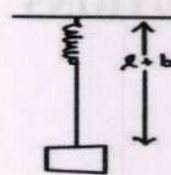$\tan^{-1}\left(\frac{2\cos x}{1-\cos^2 x}\right) = \tan^{-1}\left(\frac{1}{\sin x}\right)$

$\frac{2\cos x}{\sin^2 x} = \frac{1}{\sin x}$

$2\cos x = \sin x$

$\tan x = 2$

$\sin x = \frac{2}{\sqrt{5}}$ $\cos x = \frac{1}{\sqrt{5}}$ Ans. (c)

Q. 39

$2n\sqrt{\frac{l+b}{g}}$ Ans. (c)

Q. 40 $\begin{vmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \end{vmatrix} = 0$

Since these two rows are same, the determinant will be 0. Ans. (c)

Q. 41 (a) .... (fact based)

Q. 42 (d) .... since area under the curve gives 'fraction' of molecules and not the actual number.

Q. 43 Since it is an endothermic process, the rate increases on increasing temperature, thus amount of gas ↑es, so pressure ↑es. **Ans. (a)**

Q. 44 Selecting any three elements from B and its arrangement with element of A.

A   B

(1,2,3)   (1,2,3,4,5)
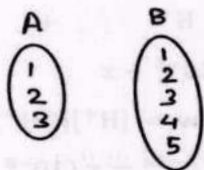
$$\therefore {}^5C_3 \times 3!$$

$$5 \cdot 4 \cdot 3 = 60$$

Total choices $= 5^3$

$$\therefore P(E) = \frac{60}{5 \cdot 5 \cdot 5} = \frac{12}{25} = 0.48$$

Ans. (a)

Q. 45 $0.414 \leq \frac{R_y}{R_x} < 0.732$ for octahedral void

$$\therefore R_y \geq 0.414 \, pm$$

Ans. (c)

Q.46 for WA-WB salt $pH = 7 + \frac{p\,k_a - pk_b}{2} = 7 +$

$\frac{4.76 - 4.75}{2} = 7 + 0.005$ **Ans. (b)**

Q. 47 Standard Statement

REAP – 2022 SOLUTIONS

Q. 1 $5 + x \geq 9$

This die has 6 choices

$$\therefore x \geq 4$$

$$\therefore x = 4, 5, 6 \quad \text{(favourable)}$$

Total outcomes $x = 1, 2, 3, 4, 5, 6$

$$\therefore P(E) = \frac{favourable}{total} = \frac{3}{6} = \frac{1}{2} \quad \therefore \text{Ans. (a)}$$

Q.2

$10, 4, 7, \ldots\ldots, 8, 15, 32, 12, 23, 43$

On observation, there are three sets of A.P.s in the above series.

$10, \ldots\ldots, 32, 43 \quad \rightarrow$

$\therefore$ missing term $= 10 + \frac{(32-10)}{2} = 21$ and $4, 8, 12$

and $7, 15, 23$ **Ans. (d)**

Q.3 If we assume variable Y weight of yellow ball, G for green & P for pink then, we can write the equations.

$$2Y + P = 30 \quad \ldots\ldots\ldots\ldots \text{ i)}$$

$$Y + P = 2G \quad \ldots\ldots\ldots\ldots \text{ii)}$$

$$2G + P = 2Y \quad \ldots\ldots\ldots\ldots \text{iii)}$$

$$3G = x \quad \ldots\ldots\ldots\ldots \text{iv)}$$

We have to find x.

On solving these we get $x = 27$

$$\therefore \text{ Ans. (c)}$$

Q. 4 $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$

$A^2 = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$

$= \begin{bmatrix} \cos^2\theta - \sin^2\theta & 2\sin\theta\cos\theta \\ -2\sin\theta\cos\theta & \cos^2\theta - \sin^2\theta \end{bmatrix}$

$= \begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$

Similarly we can say that,

$A^k = \begin{bmatrix} \cos k\theta & \sin k\theta \\ -\sin k\theta & \cos k\theta \end{bmatrix}$

Now, $A^k = \begin{bmatrix} \cos\theta/2 \\ \sin\theta/2 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

$\therefore \begin{bmatrix} \cos k\theta & \sin k\theta \\ -\sin k\theta & \cos k\theta \end{bmatrix} \begin{bmatrix} \cos\theta/2 \\ \sin\theta/2 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

$\begin{bmatrix} \cos k\theta \cos\frac{\theta}{2} + \sin k\theta \sin\frac{\theta}{2} \\ -\sin k\theta \cos\frac{\theta}{2} + \cos k\theta \sin\frac{\theta}{2} \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

$\begin{bmatrix} \cos(k\theta - \frac{\theta}{2}) \\ \sin(\frac{\theta}{2} - k\theta) \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$

$$\theta\left(\frac{1}{2} - k\right) = 2\pi T_1 + \frac{T_1}{2}$$

Q. 5 $f(x) = \int e^x \left(\frac{x^2 + x + 1}{\sqrt{x^2+1}}\right) dx$

$$= \int e^x \left(\frac{x^2+1}{\sqrt{x^2+1}} + \frac{x}{\sqrt{x^2+1}}\right) dx$$

$$= \int e^x \left(\sqrt{x^2 + 1} + \frac{2x}{2\sqrt{x^2+1}} \right) dx$$

$$= \int d(e^x \sqrt{x^2 + 1})$$

$$f(x) = e^x \sqrt{x^2 + 1} + c$$

Given that, $f(0) = 1$

$$\therefore 1 = 1 + c$$

$$\therefore c = 0$$

So, $f(x) = e^x \sqrt{x^2 + 1}$

$$\therefore f(1) = e^1 \sqrt{2} = \sqrt{2}e \qquad \text{Ans. (c)}$$

Q. 6 In the $\triangle ODC$,

$$\tan c = \frac{OD}{DC}$$

$$\therefore \tan 60° = \frac{2.5 + 0.5}{DC}$$

$$\sqrt{3} = \frac{3}{DC}$$

$$\therefore DC = \sqrt{3} \qquad \text{Ans. (c)}$$

Q. 7 If you are not able to solve question, Revise probability Chapter from your notes/ Practice Probability & PnC from SUPR Guide. Every Year question comes from Probability
Ans (B)

Q. 8 Coefficient of $x^m = {}^{m+n}C_m$

Coefficient of $x^n = {}^{m+n}C_n$

We know that ${}^{m+n}C_m = {}^{m+n}C_{(m+n)-m} = {}^{m+n}C_n$

$$\therefore \text{Coeff. Of } x^m = \text{Coeff Of } x^n \qquad \text{Ans. (c)}$$

Q.9 Let one box be of 1 unit^2 area

$$\therefore \text{side} = 1$$

To find $\angle x$.

$$\therefore \tan \theta = \frac{2}{4} = \frac{1}{2}$$

$$\tan \alpha = \frac{2}{6} = \frac{1}{3}$$

We know that $x + (\theta + \alpha) = \frac{\pi}{2}$

$$\therefore (\theta + \alpha) = \frac{\pi}{2} - x$$

Taking tan on both sides

$$\tan \left(\frac{\pi}{2} - x \right) = \tan(\theta + \alpha)$$

$$\cot x = \frac{\tan \theta + \tan \alpha}{1 - \tan \theta \tan \alpha}$$

Substituting values

$$\cot x = \frac{\frac{1}{2} + \frac{1}{3}}{1 - \frac{1}{6}} = \frac{5}{5} = 1$$

$$\therefore x = 45° \qquad \text{Ans. (b)}$$

Q. 10 Let resistance be R, $\therefore X_L = \sqrt{3} R$

$$\therefore \tan \theta = \frac{X_L}{R} = \sqrt{3}$$

$$P_1 = \cos \theta = \frac{1}{2}$$

Now, as circuit is in resonance, $\tan \theta = 0$

$$\therefore P_2 = \cos \theta = 1$$

$$\text{So,} \frac{P_1}{P_2} = \frac{1}{2} \qquad \text{Ans. (c)}$$

Q. 11 Let heat exchanged = 0

$$\therefore n_1 C_1 (T - T_1) + n_2 C_2 (T - T_2) = 0$$

$$\therefore T = \frac{n_1 C_1 T_1 + n_2 C_2 T_2}{n_1 C_1 + n_2 C_2} \qquad \text{Ans. (b)}$$

Q. 12 First step : ice melts

Let temp. of iron after melting be T_1^1

$$\therefore (M_{iron})L_1 = (M_{iron}) C_{iron} (T_1 - T_1^1)$$

$$\therefore T_1 - \frac{L_1}{C_{iron}} = T_1^1 \qquad \ldots\ldots\ldots(i)$$

Now, we have water at 0°C and iron at T_1^1.

$$(M_{iron} + M_{water}) \qquad (M_{iron})$$

Let final temperature of the system be T

$$\rightarrow \therefore (M_{iron} + M_{water}) C_w (T - 0) = (M_{iron}) C_{iron} (T_1^1 - T)$$

$$\rightarrow T[(M_{iron} + M_{water}) C_w + M_{iron} \ C_{iron}] = M_{iron} \ C_{iron} \left(T_1 - \frac{L_1}{C_{iron}} \right)$$

$$\rightarrow \quad \therefore T = \frac{M_{iron} \ C_{iron} \ T_1 - M_{iron} \ L_1}{M_{iron} \ (C_w + C_{iron}) + M_{water} \ C_w} \qquad \text{Ans. (b)}$$

Q. 13 a) $n! = n.(n-1).(n-2)\ldots\ldots\ldots.3.2.1$

$$n^n = n.n.n. \ n \ldots\ldots\ldots\ldots.n.n$$

$$\therefore n^n \text{ grows faster than } n!$$

So option A is incorrect.

Q. 14 Since in the once place, we are getting the same digit R after carry over, therefore $\theta + \theta$ should be 10

So $\theta = 5$ And $\theta + 5 + 5 + (1) = 8$

From carry over

$\therefore 5 + 25 = 7$

$5 = 1$

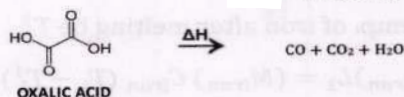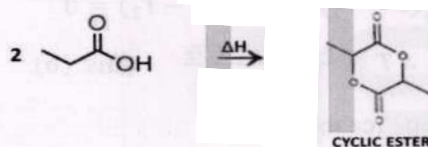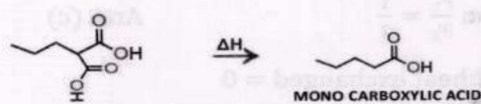And $R + S + 3 = \theta$ $\therefore R + 1 + 3 = 5$

$R = 1$

$\therefore Q + R + S = 5 + 1 + 1 = 7$ **Ans. (c)**

Q. 15 $\theta = 5$ **Ans. (b)**

Q. 16

MONO CARBOXYLIC ACID

CYCLIC ESTER

OXALIC ACID

SO, OPTION D IS CORRECT

Q. 17 Start from the end of the question.

⇒ two days after Monday → Wednesday

⇒ a day after (two days after → Thursday Monday)

⇒ a day that comes after (a day → Friday after two days after Monday)

⇒ a day that comes immd. After → Saturday (a day that comes after a day)

After two days after Monday)

⇒ two days after (a day that → Monday comes immd. After a day that) comes after a day after two days after Monday.

⇒ day that comes a day after → Tuesday (two days after a day that comes Immd. After a day that comes After a day after two days after Monday) **Ans. (b)**

Q. 18 Deep within Earth, swirling liquid iron generates our planet's protective magnetic field.

Q. 19 ⊥ distance:

$\frac{|2(1)+2(1)+2(1)+3|}{\sqrt{2^2+2^2+2^2}} = \frac{9}{\sqrt{12}} = \frac{9}{2\sqrt{3}}$ **Ans. (a)**

Q. 20 Alphabet Increase by 1

Eg, A -> B, B -> C, C -> D

Q. 21 Same logic as 20

Q. 22 Decrease Alphabet by 1 else refer Practice some questions from REAP Guide

Q. 23 Ambiguity in Que, This que is added here just to give idea to you like which type of question and how it can be asked

Q. 24 Start from end

Use the same method as Q. 17

Ans. (d)

Q. 25 According to Kepler's third law or law of harmonics, the ratio of orbital period to orbital distance for each planet is 1. Thus, from the formula for the law of harmonics,

$1 = \frac{T^2}{R^3}$ where, T = orbital period and R = orbital distance.

$\therefore \frac{T_e^2}{R_e^3} = \frac{T_p^2}{R_p^3}$

Mean Orbital Radius

In case of orbital motion as $v = \sqrt{\left(\frac{GM}{r}\right)}$ so $T = \frac{2\pi r}{v} = 2\pi r\sqrt{\frac{r}{GM}}$, i.e, $M = \frac{4\pi^2 r^3}{GT^2}$

Q. 26 First noble gas $1S^3$ → 3

2nd $1S^3 2s^3 2p^9$ → 15

3rd $1S^3 2s^3 2p^9 3s^3 3p^9$ → 27 **Ans. (b)**

Q.27 Among the given none of the compound have a chiral centre, so all are optically inactive.

Ans. (e)

Q.28 Since power $= 6 AT^4$ and intensity $= \frac{power}{area}$

And we know that $\lambda T = b$

So, $\lambda \uparrow$ if $T \downarrow$ & $\lambda \downarrow$ if $T \uparrow$

So intensity increases & graph shifts leftwards.

Ans. (a)

Q. 29. The skin and eyes are most sensitive to damage by UV at 265–275 nm, which is in the lower UV-C band. At still shorter wavelengths of UV, damage continues to happen, but the overt effects are not as great with so little penetrating the atmosphere.

Q. 30

Q. 31 Black body is a body that absorbs all radiation falling on it. Ans. (a)

Q. 32

Q. 33 Answer $^{13}C_3 \times {}^{13}C_5 = 368052$ Ans. (c)

Q.34 As we can see

```
C O D E       G O A L       S E C R E T       F L A V O U R
↓ ↓ ↓ ↓       ↓ ↓ ↓ ↓       ↓ ↓ ↓ ↓ ↓ ↓       ↓ ↓ ↓ ↓ ↓ ↓
J V I H       F V L A       Z H J S H U       G A L O V T Y
```

From this we can deduce the following pattern:

A ↔ L	M ↔ X	(Y) ↔ Z
B ↔ K	N ↔ W	S
C ↔ J	O ↔ V	
D ↔ I	P ↔ U	
E ↔ H	Q ↔ T	
F ↔ G	R ↔ (S)	∴ R ≡ Y & Z ≡ S

∴
```
M A T H S
↓ ↓ ↓ ↓ ↓
X L Q E Z            ∴ Ans. (b)
```

Q. 35
```
S U P R
↓ ↓ ↓ ↓
Z P U Y            ∴ Ans. (d)
```

Q. 36
```
R E A P
↓ ↓ ↓ ↓
Y H L U            ∴ Ans. (c)
```

Q. 37 Ans. (a)   [Fact based]

Q. 38 Ans. (a)

Q. 39 By observing the apparent nighttime rotation of the stars around the North Star, the birds learn to locate north before they embark on their first migration.

Ambiguity in Question so, you can skip ∴ Ans (B)

Q. 40 Lumen and Hermone were playing and this got confirmed also because dracow said hermon didn't did this.

Practice This type of Question from Our IIITprep REAP Guide for Best Performance.

Q. 41 Equation will be $9x + 5y = $ Amount

Where x, y are whole numbers only

So, at $x = 1$ & $y = 1$ gives 14 . ∴Ans (D)

Q. 42 I – ngiya

Speak – khuluma

Spoke – khulama

Never : ending (soze) , starting (u)

Quickly : Shesha

You : uza

You will : uzo

We : sa

Drive : Shaleya

Q. 43 Uza

Q. 44 Sazoshaleya

Q. 45 Uzo shaleya

Q. 46 Sazosheshaushaleyasoze

Q. 47 Uzashaleya

Q. 48 ngiyazashaleya

----------------------X----------------------