Class: XII Session: 2020-2021

Subject: Physics

Sample Question Paper (Theory)

Maximum Marks: 70 Marks Time Allowed: 3 hours

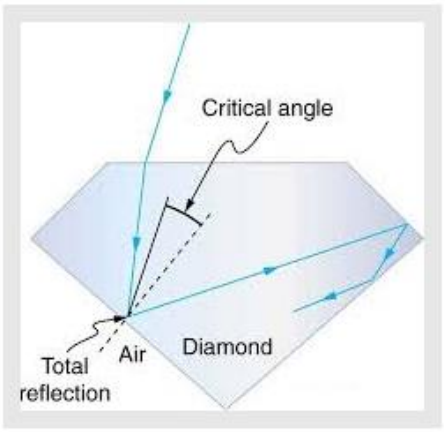
General Instructions:

(1) All questions are compulsory. There are 33 questions in all.
(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
(3) Section A contains ten very short answer questions and four assertion reasoning MCQs of 1 mark each, Section B has two case based questions of 4 marks each, Section C contains nine short answer questions of 2 marks each, Section D contains five short answer questions of 3 marks each and Section E contains three long answer questions of 5 marks each.
(4) There is no overall choice. However internal choice is provided. You have to attempt only one of the choices in such questions.

Sr. No.		Marks
	Section – A **All questions are compulsory. In case of internal choices, attempt any one of them.**	
1	Name the physical quantity having unit J/T.	1
2	Mention one use of part of electromagnetic spectrum to which a wavelength of 21 cm (emitted by hydrogen in interstellar space) belongs. **OR** Give the ratio of velocity of the two light waves of wavelengths 4000Å and 8000Å travelling in vacuum.	1
3	An electron with charge -e and mass m travels at a speed v in a plane perpendicular to a magnetic field of magnitude B. The electron follows a circular path of radius R. In a time, t, the electron travels halfway around the circle. What is the amount of work done by the magnetic field?	1

4	A solenoid with **N** loops of wire tightly wrapped around an iron-core is carrying an electric current **I.** If the current through this solenoid is reduced to half, then what change would you expect in inductance **L** of the solenoid. **OR** An alternating current from a source is given by **i**=10sin314t. What is the effective value of current and frequency of source?	1
5	What is the value of angular momentum of electron in the second orbit of Bohr's model of hydrogen atom?	1
6	In a photoelectric experiment, the potential required to stop the ejection of electrons from cathode is 4V. What is the value of maximum kinetic energy of emitted Photoelectrons?	1
7	In decay of free neutron, name the elementary particle emitted along with proton and electron in nuclear reaction. **OR** In the following nuclear reaction, Identify unknown labelled X. $^{22}_{11}Na + X \rightarrow {}^{22}_{10}Ne + \nu_e$	1
8	How does the width of a depletion region of a pn junction vary if doping concentration is increased? **OR** In half wave rectification, what is the output frequency if input frequency is 25 Hz.	1
9	When a voltage drop across a pn junction diode is increased from 0.70 V to 0.71V, the change in the diode current is 10 mA .What is the dynamic resistance of diode?	1
10	Which specially fabricated pn junction diode is used for detecting light intensity?	1
	For question numbers 11, 12, 13 and 14, two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below. **a) Both A and R are true and R is the correct explanation of A** **b) Both A and R are true but R is NOT the correct explanation of A** **c) A is true but R is false** **d) A is false and R is also false**	

11	**Assertion(A) :** In a nonuniform electric field, a dipole will have translatory as well as rotatory motion. **Reason(R):** In a nonuniform electric field, a dipole experiences a force as well as torque.	1
12	**Assertion(A):** Electric field is always normal to equipotential surfaces and along the direction of decreasing order of potential **Reason(R):** Negative gradient of electric potential is electric field.	1
13	**Assertion (A):** A convex mirror cannot form real images. **Reason (R):** Convex mirror converges the parallel rays that are incident on it.	1
14	**Assertion(A):** A convex lens of focal length 30 cm can't be used as a simple microscope in normal setting. **Reason (R):** For normal setting, the angular magnification of simple microscope is M=D/f	1
	Section – B **Questions 15 and 16 are Case Study based questions and are compulsory. Attempt any 4 sub parts from each question. Each question carries 1 mark.**	
15	**Faraday Cage:** A Faraday cage or Faraday shield is an enclosure made of a conducting material. The fields within a conductor cancel out with any external fields, so the electric field within the enclosure is zero. These Faraday cages act as big hollow conductors you can put things in to shield them from electrical fields. Any electrical shocks the cage receives, pass harmlessly around the outside of the cage. 	4

	1. Which of the following material can be used to make a Faraday cage? a) Plastic b) Glass c) Copper d) Wood 2. Example of a real-world Faraday cage is a) car b) plastic box c) lightning rod d) metal rod 3. What is the electrical force inside a Faraday cage when it is struck by lightning? a) The same as the lightning b) Half that of the lightning c) Zero d) A quarter of the lightning 4. An isolated point charge +q is placed inside the Faraday cage. Its surface must have charge equal to- a) Zero b) +q c) –q d) +2q 5. A point charge of 2C is placed at centre of Faraday cage in the shape of cube with surface of 9 cm edge. The number of electric field lines passing through the cube normally will be- a) 1.9105 Nm^2/C entering the surface b) 1.9105 Nm^2/C leaving the surface c) 2.0105 Nm^2/C leaving the surface d) 2.0105 Nm^2/C entering the surface	
16	**Sparking Brilliance of Diamond:**  	4

The total internal reflection of the light is used in polishing diamonds to create a sparking brilliance. By polishing the diamond with specific cuts, it is adjusted the most of the light rays approaching the surface are incident with an angle of incidence more than critical angle. Hence, they suffer multiple reflections and ultimately come out of diamond from the top. This gives the diamond a sparking brilliance.

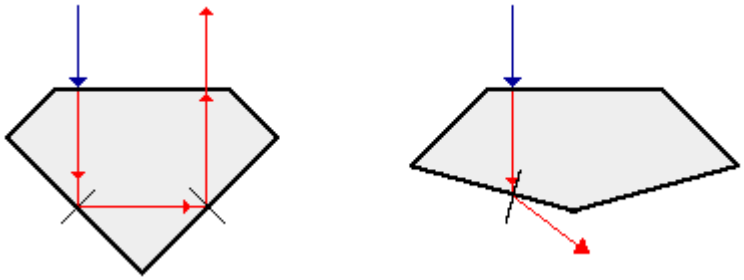
1. Light cannot easily escape a diamond without multiple internal reflections. This is because:
   a) Its critical angle with reference to air is too large
   b) Its critical angle with reference to air is too small
   c) The diamond is transparent
   d) Rays always enter at angle greater than critical angle

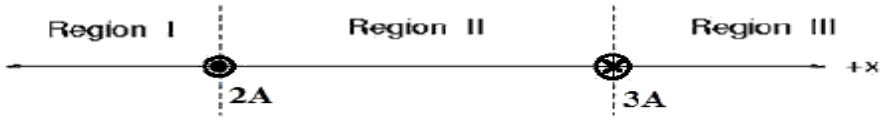
2. The critical angle for a diamond is 24.4^{o}. Then its refractive index is-
   a) 2.42
   b) 0.413
   c) 1
   d) 1.413

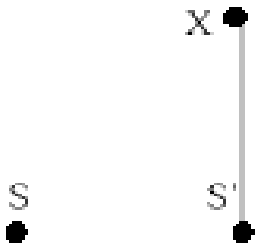
3. The basic reason for the extraordinary sparkle of **suitably cut** diamond is that
   a) It has low refractive index
   b) It has high transparency
   c) It has high refractive index
   d) It is very hard

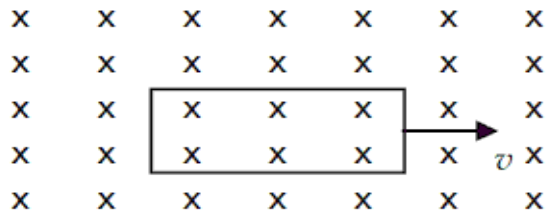
4. A diamond is immersed in a liquid with a refractive index greater than water. Then the critical angle for total internal reflection will
   a) will depend on the nature of the liquid
   b) decrease
   c) remains the same
   d) increase

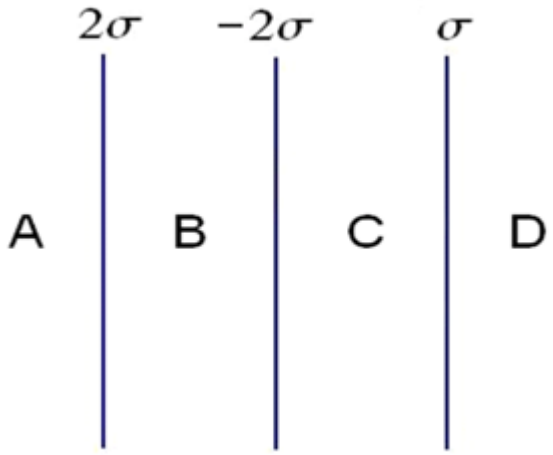
5. The following diagram shows same diamond cut in two different shapes.



	The brilliance of diamond in the second diamond will be: a) less than the first b) greater than first c) same as first d) will depend on the intensity of light	
	Section – C **All questions are compulsory. In case of internal choices, attempt anyone.**	
17	Two straight infinitely long wires are fixed in space so that the current in the left wire is 2 A and directed out of the plane of the page and the current in the right wire is 3 A and directed into the plane of the page. In which region(s) is/are there a point on the x-axis, at which the magnetic field is equal to zero due to these currents carrying wires? Justify your answer.  	2
18	Draw the graph showing intensity distribution of fringes with phase angle due to diffraction through single slit. **OR** What should be the width of each slit to obtain **n** maxima of double slit pattern within the central maxima of single slit pattern?	2
19	Deduce an expression for the potential energy of a system of two point charges q_1 and q_2 located at positions r_1 and r_2 respectively in an external field $(\vec{E})$ **OR** Establish the relation between electric field and electric potential at a point. Draw the equipotential surface for an electric field pointing in +Z direction with its magnitude increasing at constant rate along –Z direction	2
20	Explain with help of circuit diagram, the action of a forward biased p-n junction diode which emits spontaneous radiation. State the least band gap energy of this diode to have emission in visible region.	2

21	A coil of wire enclosing an area 100 cm^2 is placed with its plane making an angle 60^0 with the magnetic field of strength 10^{-1}T. What is the flux through the coil? If magnetic field is reduced to zero in 10^{-3} s, then find the induced emf?	2
22	Two waves from two coherent sources S and S' superimpose at X as shown in the figure. If X is a point on the second minima and SX – S'X is 4.5 cm. Calculate the wavelength of the waves.  	2
23	Draw the energy band diagram when intrinsic semiconductor (Ge) is doped with impurity atoms of Antimony (Sb). Name the extrinsic semiconductor so obtained and majority charge carriers in it.	2
24	Define the terms magnetic inclination and horizontal component of earth's magnetic field at a place. Establish the relationship between the two with help of a diagram. **OR** Horizontal component of earth's magnetic field at a place is $\sqrt{3}$ times the vertical component. What is the value of inclination at that place?	2
25	Write two characteristics of image formed when an object is placed between the optical centre and focus of a thin convex lens. Draw the graph showing variation of image distance v with object distance u in this case.	2
	Section -D **All questions are compulsory. In case of internal choices, attempt any one.**	
26	A rectangular loop which was initially inside the region of uniform and time - independent magnetic field, is pulled out with constant velocity v as shown in the figure.	3

	 (a) a) Sketch the variation of magnetic flux, the induced current, and power dissipated as Joule heat as function of time. b) If instead of rectangular loop, circular loop is pulled out; do you expect the same value of induced current? Justify your answer. Sketch the variation of flux in this case with time.	
27	A variable resistor R is connected across a cell of emf E and internal resistance r. a) Draw the circuit diagram. b) Plot the graph showing variation of potential drop across R as function of R. c) At what value of R current in circuit will be maximum. **OR** A storage battery is of emf 8V and internal resistance 0.5 ohm is being charged by d.c supply of 120 V using a resistor of 15.5 ohm a) Draw the circuit diagram. b) Calculate the potential difference across the battery. c) What is the purpose of having series resistance in this circuit?	3
28	a) Explain de-Broglie argument to propose his hypothesis. Show that de-Broglie wavelength of photon equals electromagnetic radiation. b) If, deuterons and alpha particle are accelerated through same potential, find the ratio of the associated de-Broglie wavelengths of two. **OR** State the main implications of observations obtained from various photoelectric experiments. Can these implications be explained by wave nature of light? Justify your answer.	3

29	Derive an expression for the frequency of radiation emitted when a hydrogen atom de-excites from level n to level (n – 1). Also show that for large values of n, this frequency equals to classical frequency of revolution of an electron.	3
30	a) Give one point of difference between nuclear fission and nuclear fusion. b) Suppose we consider fission of a $^{56}_{26}Fe$ into two equal fragments of $^{28}_{13}Al$ nucleus. Is the fission energetically possible? Justify your answer by working out Q value of the process. Given $(m)^{56}_{26}Fe$ = 55.93494 u and $(m)^{28}_{13}Al$ = 27.98191	3
	Section – E **All questions are compulsory. In case of internal choices, attempt any one.**	
31	a) State Gauss's law in electrostatics. Show that with help of suitable figure that outward flux due to a point charge Q, in vacuum within gaussian surface, is independent of its size and shape. b) In the figure there are three infinite long thin sheets having surface charge density $+2\sigma$, -2σ and $+\sigma$ respectively. Give the magnitude and direction of electric field at a point to the left of sheet of charge density $+2\sigma$ and to the right of sheet of charge density $+\sigma$.  	5

	OR a) Define an ideal electric dipole. Give an example. b) Derive an expression for the torque experienced by an electric dipole in a uniform electric field. What is net force acting on this dipole. c) An electric dipole of length 2cm is placed with its axis making an angle of 60^0 with respect to uniform electric field of 10^5N/C. If it experiences a torque of $8\sqrt{3}$ Nm, calculate the (i) magnitude of charge on the dipole, and its potential energy.	
32	a) Derive the expression for the current flowing in an ideal capacitor and its reactance when connected to an ac source of voltage V**=V_0sinωt.** b) Draw its phasor diagram. c) If resistance is added in series to capacitor what changes will occur in the current flowing in the circuit and phase angle between voltage and current. **OR** a) State the principle of ac generator. b) Explain with the help of a well labelled diagram, its working and obtain the expression for the emf generated in the coil. c) Is it possible to generate emf without rotating the coil? Explain	5
33	a) Define a wave front. b) Draw the diagram to show the shape of plane wave front as they pass through (i) a thin prism and (ii) a thin convex lens. State the nature of refracted wave front. c) Verify Snell's law of refraction using Huygens's principle. **OR** a) State two main considerations taken into account while choosing the objective of astronomical telescope. b) Draw a ray diagram of reflecting type telescope. State its magnifying power. c) State the advantages of reflecting type telescope over the refracting type?	5

SAMPLE PAPER 1
CHEMISTRY THEORY (043)

MM:70 **Time: 3 Hours**

General Instructions:

Read the following instructions carefully.

a) There are 33 questions in this question paper. All questions are compulsory.

b) Section A: Q. No. 1 to 16 are objective type questions. Q. No. 1 and 2 are passage based questions carrying 4 marks each while Q. No. 3 to 16 carry 1 mark each.

c) Section B: Q. No. 17 to 25 are short answer questions and carry 2 marks each.

d) Section C: Q. No. 26 to 30 are short answer questions and carry 3 marks each.

e) Section D: Q. No. 31 to 33 are long answer questions carrying 5 marks each.

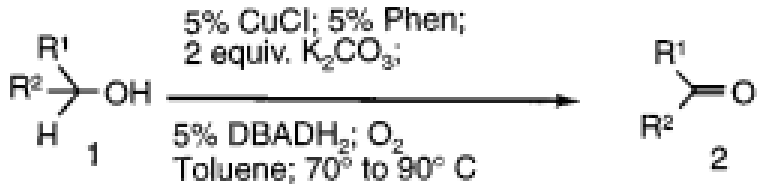
f) There is no overall choice. However, internal choices have been provided.

g) Use of calculators and log tables is not permitted.

SECTION A (OBJECTIVE TYPE)

1. Read the passage given below and answer the following questions: (1x4=4)

An efficient, aerobic catalytic system for the transformation of alcohols into carbonyl compounds under mild conditions, copper-based catalyst has been discovered. This copper-based catalytic system utilizes oxygen or air as the ultimate, stoichiometric oxidant, producing water as the only by-product



A wide range of primary, secondary, allylic, and benzylic alcohols can be smoothly oxidized to the corresponding aldehydes or ketones in good to excellent yields. Air can be conveniently used instead of oxygen without affecting the efficiency of the process. However, the use of air requires slightly longer reaction times.

This process is not only economically viable and applicable to large-scale reactions, but it is also environmentally friendly.

(*Reference:Ohkuma, T., Ooka, H., Ikariya, T., & Noyori, R. (1995). Preferential hydrogenation of aldehydes and ketones. Journal of the American Chemical Society, 117(41), 10417-10418.)*

The following questions are multiple choice questions. Choose the most appropriate answer:

(i)The Copper based catalyst mention in the study above can be used to convert:

a) propanol to propanonic acid

b) propanone to propanoic acid

c) propanone to propan-2-ol

d) propan-2-ol to propanone

(ii)The carbonyl compound formed when ethanol gets oxidised using this copper-based catalyst can also be obtained by ozonolysis of:

a) But-1-ene

b) But-2-ene

c) Ethene

d) Pent-1-ene

OR

Which of the following is a secondary allylic alcohol?

a) But-3-en-2-ol

b) But-2-en-2-ol

c) Prop-2-enol

d) Butan-2-ol

(iii) Benzyl alcohol on treatment with this copper-based catalyst gives a compound 'A' which on reaction with KOH gives compounds 'B' and 'C'. Compound 'B' on oxidation with $KMnO_4$- KOH gives compound 'C'. Compounds 'A', 'B' and 'C' respectively are :

a) Benzaldehyde, Benzyl alcohol, potassium salt of Benzoic acid

b) Benzaldehyde, potassium salt of Benzoic acid, Benzyl alcohol

c) Benzaldehyde, Benzoic acid, Benzyl alcohol

d) Benzoic acid, Benzyl alcohol, Benzaldehyde

(iv) An organic compound 'X' with molecular formula C_3H_8O on reaction with this copper based catalyst gives compound 'Y' which reduces Tollen's reagent. 'X' on reaction with sodium metal gives 'Z' . What is the product of reaction of 'Z' with 2-chloro-2-methylpropane?

a) $CH_3CH_2CH_2OC(CH_3)_3$

b) $CH_3CH_2OC(CH_3)_3$

c) $CH_2=C(CH_3)_2$

d) $CH_3CH_2CH=C(CH_3)_2$

Read the passage given below and answer the following questions: (1x4=4)

The amount of moisture that leather adsorbs or loses is determined by temperature, relative humidity, degree of porosity, and the size of the pores. Moisture has great practical significance because its amount affects the durability of leather, and in articles such as shoes, gloves and other garments, the comfort of the wearer. High moisture content accelerates deterioration and promotes

mildew action. On the other hand, a minimum amount of moisture is required to keep leather properly lubricated and thus prevent cracking.

The study indicates that adsorption of moisture by leather is a multi-molecular process and is accompanied by low enthalpies of adsorption. Further at 75-percent relative humidity, the adsorption is a function of surface area alone.

Hide is tanned to harden leather. This process of tanning occurs due to mutual coagulation of positively charged hide with negatively charged tanning material. Untanned hide and chrome-tanned leathers have the largest surface areas. The leathers tanned with vegetable tanning materials have smaller surface areas since they are composed of less hide substance and the capillaries are reduced to smaller diameters, in some cases probably completely filled by tanning materials. The result of the study indicated that untanned hide and chrome-tanned leather adsorb the most water vapour.

(Source:Kanagy, J. R. (1947). Adsorption of water vapor by untanned hide and various leathers at 100 F. *Journal of Research of the National Bureau of Standards*, *38*(1), 119-128.)

2. In these questions (Q. No 5-8 , a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

(i) Assertion: Vegetable tanned leather cannot adsorb a large amount of moisture.
Reason: Porous materials have higher surface area.

(ii) Assertion: Animal hide soaked in tannin results in hardening of leather.
Reason: Tanning occurs due to mutual coagulation.

(iii) Assertion: Adsorption of moisture by leather is physisorption.
Reason: It is a multimolecular process and is accompanied by low enthalpies of adsorption

(iv) Assertion: Leathers tanned with vegetable tanning materials have smaller surface areas
Reason: The capillaries present in leather are reduced to smaller diameters

OR

Assertion: Leather absorbs different amount of moisture.
Reason: Some moisture is necessary to prevent cracking of leather.

Following questions (No. 3 -11) are multiple choice questions carrying 1 mark each:

3 Which of the following option will be the limiting molar conductivity of CH_3COOH if the limiting molar conductivity of CH_3COONa is 91 Scm^2mol^{-1}? Limiting molar conductivity for individual ions are given in the following table.

S.No	Ions	limiting molar conductivity / Scm^2mol^{-1}
1	H+	349.6
2	Na+	50.1
3	K+	73.5
4	OH^-	199.1

a) 350 Scm^2mol^{-1}

b) 375.3 Scm^2mol^{-1}

c) 390.5 Scm^2mol^{-1}

d) 340.4 Scm^2mol^{-1}

4. Curdling of milk is an example of:

a) breaking of peptide linkage

b) hydrolysis of lactose

c) breaking of protein into amino acids

d) denauration of proetin

OR

Dissachrides that are reducing in nature are:

a) sucrose and lactose

b) sucrose and maltose

c) lactose and maltose

d) sucrose, lactose and maltose

5.When 1 mole of benzene is mixed with 1 mole of toluene The vapour will contain: (Given : vapour of benzene = 12.8kPa and vapour pressure of toluene = 3.85 kPa).

a) equal amount of benzene and toluene as it forms an ideal solution

b) unequal amount of benzene and toluene as it forms a non ideal solution

c) higher percentage of benzene

d) higher percentage of toluene

6.Which of the following is the reason for Zinc not exhibiting variable oxidation state

a) inert pair effect

b) completely filled 3d subshell

c) completely filled 4s subshell

d) common ion effect

OR

Which of the following is a diamagnetic ion: (Atomic numbers of Sc, V, Mn and Cu are 21, 23, 25 and 29 respectively)

a) V^{2+}

b) Sc^{3+}

c) Cu^{2+}

d) Mn^{3+}

7. Propanamide on reaction with bromine in aqueous NaOH gives:

a) Propanamine

b) Ethanamine

c) N-Methyl ethanamine

d) Propanenitrile

OR

IUPAC name of product formed by reaction of methyl amine with two moles of ethyl chloride

a) N,N-Dimethylethanamine

b) N,N-Diethylmethanamine

c) N-Methyl ethanamine

d) N-Ethyl - N-methylethanamine

8.Ambidentate ligands like NO_2^- and SCN^- are :

a) unidentate

b) didentate

c) polydentate

d) has variable denticity

OR

The formula of the coordination compound Tetraammineaquachloridocobalt(III) chloride is

a) $[Co(NH_3)_4(H_2O)Cl]Cl_2$

b) $[Co(NH_3)_4(H_2O)Cl]Cl_3$

c) $[Co(NH_3)_2(H_2O)Cl]Cl_2$

d) $[Co(NH_3)_4(H_2O)Cl]Cl$

9.Which set of ions exhibit specific colours? (Atomic number of Sc = 21, Ti = 22, V=23, Mn = 25, Fe = 26, Ni = 28 Cu = 29 and Zn =30)

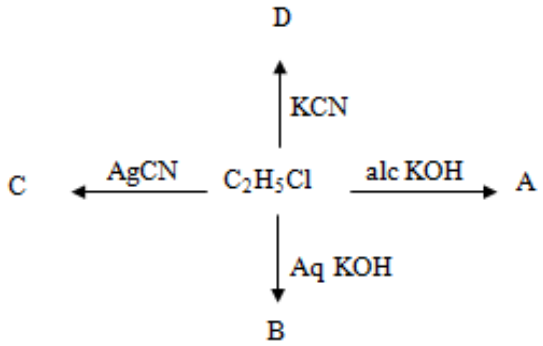
a) Sc^{3+}, Ti^{4+}, Mn^{3+}

b) Sc^{3+}, Zn^{2+}, Ni^{2+}

c) V^{3+}, V^{2+}, Fe^{3+}

d) Ti^{3+}, Ti^{4+}, Ni^{2+}

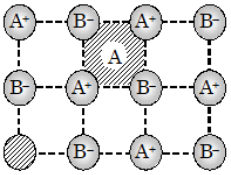
10. Identify A,B,C and D:



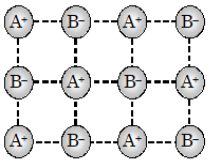
a) A = C_2H_4, B= C_2H_5OH, C= C_2H_5NC, D= C_2H_5CN
b) A= C_2H_5OH, B= C_2H_4, C = C_2H_5CN, D=C_2H_5NC
c) A = C_2H_4, B= C_2H_5OH, C= C_2H_5CN, D= C_2H_5NC
d) A= C_2H_5OH, B= C_2H_4, C= C_2H_5NC, D= C_2H_5CN

11.The crystal showing Frenkel defect is :

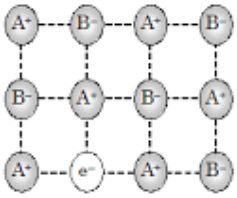
a)



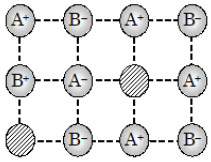
b)



c)



d)



In the following questions (Q. No. 12 - 16) a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
c) Assertion is correct statement but reason is wrong statement.
d) Assertion is wrong statement but reason is correct statement.

12.Assertion: The two strands of DNA are complementary to each other
Reason: The hydrogen bonds are formed between specific pairs of bases.

13.Assertion: Ozone is thermodynamically stable with respect to oxygen.
Reason:Decomposition of ozone into oxygen results in the liberation of heat

14.Assertion: Aquatic species are more comfortable in cold waters rather than in warm waters.
Reason:Different gases have different K_H values at the same temperature

OR

Assertion: Nitric acid and water form maximum boiling azeotrope.

Reason: Azeotropes are binary mixtures having the same composition in liquid and vapour phase.

15. Assertion: Carboxylic acids are more acidic than phenols.
Reason: Phenols are ortho and para directing.

16.Assertion: Methoxy ethane reacts with HI to give ethanol and iodomethane

Reason: Reaction of ether with HI follows S_N2 mechanism

SECTION B

The following questions, Q.No 17 – 25 are short answer type and carry 2 marks each.

17. With the help of resonating structures explain the effect of presence of nitro group at ortho position in chlorobenzene.

OR

Carry out the following conversions in not more than 2 steps:

(i)Aniline to chlorobenzene

(ii)2-bromopropane to 1- bromopropane

18. A glucose solution which boils at 101.04°C at 1 atm. What will be relative lowering of vapour pressure of an aqueous solution of urea which is equimolal to given glucose solution? (Given: K_b for water is 0.52 K kg mol^{-1})

19. (i) Using crystal field theory, write the electronic configuration of iron ion in the following complex ion. Also predict its magnetic behaviour :

$[Fe(H_2O)_6]^{2+}$

(ii)Write the IUPAC name of the coordination complex: $[CoCl_2(en)_2]NO_3$

OR

(i)Predict the geometry of $[Ni(CN)_4]^{2-}$

(ii)Calculate the spin only magnetic moment of $[Cu(NH_3)_4]^{2+}$ ion.

20. For a reaction the rate law expression is represented as follows:

$$Rate = k [A][B]^{1/2}$$

i. Interpret whether the reaction is elementary or complex. Give reason to support your answer.

ii. Write the units of rate constant for this reaction if concentration of A and B is expressed in moles/L.

OR

The following results have been obtained during the kinetic studies of the reaction:

$P + 2Q \rightarrow R + 2S$

Exp.	**Initial P(mol/L)**	**Initial Q (mol/L)**	**Init. Rate of Formation of R (M min^{-1})**
1	0.10	0.10	3.0×10^{-4}
2	0.30	0.30	9.0×10^{-4}
3	0.10	0.30	3.0×10^{-4}
4	0.20	0.40	6.0×10^{-4}

Determine the rate law expression for the reaction.

21. The C-14 content of an ancient piece of wood was found to have three tenths of that in living trees. How old is that piece of wood? (log 3= 0.4771, log 7 = 0.8540 , Half-life of C-14 = 5730 years)

22. When 3-methylbutan-2-ol is treated with HBr, the following reaction takes place:

Give a mechanism for this reaction.

23. Give the formula and describe the structure of a noble gas species which is isostructural with IF_6^-.

24. The following haloalkanes are hydrolysed in presence of aq KOH.

(i) 2- Chlorobutane (ii) 2-chloro-2-methylpropane

Which of the above is most likely to give a racemic mixture? Justify your answer.

25.Atoms of element P form *ccp* lattice and those of the element Q occupy 1/3rd of tetrahedral voids and all octahedral voids. What is the formula of the compound formed by the elements P and Q?

SECTION C

Q.No 26 -30 are Short Answer Type II carrying 3 mark each.

26. Give reasons for the following:

i. Transition elements act as catalysts

ii. It is difficult to obtain oxidation state greater than two for Copper.

iii. $Cr_2O_7^{2-}$ is a strong oxidising agent in acidic medium whereas WO_3 and MoO_3 are not.

OR

Observed and calculated values for the standard electrode potentials of elements from Ti to Zn in the first reactivity series are depicted in figure (1):

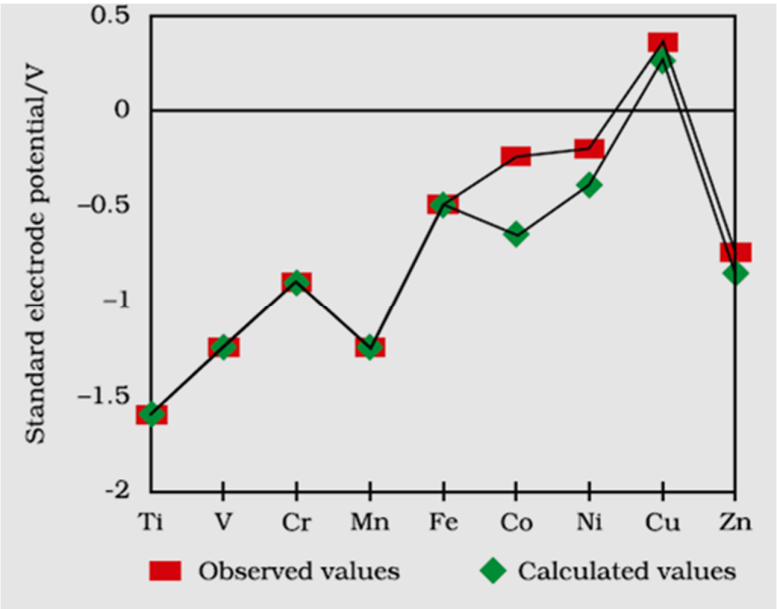


FIGURE 1 (source NCERT)

Explain the following observations:

i. The general trend towards less negative E^o values across the series

ii. The unique behaviour of Copper

iii. More negative E^o values of Mn and Zn

27. Arrange the following in increasing order of property specified:

i. Aniline, ethanamine, 2-ethylethanamine (solubility in water)

ii. Ethanoic acid, ethanamine, ethanol (boiling point)

iii. Methanamine, N, N- dimethylmethanamine and N- methylmethanamine (basic strength in aqueous phase)

OR

i. Give a chemical test to distinguish between N-methylethanamine and N,N-dimethyl ethanamine.

ii. Write the reaction for catalytic reduction of nitrobenzene followed by reaction of product so formed with bromine water.

iii. Out of butan-1-ol and butan-1-amine, which will be more soluble in water and why?

28. A metal crystallizes into two cubic system-face centred cubic (fcc) and body centred cubic (bcc) whose unit cell lengths are 3.5 and 3.0Å respectively. Calculate the ratio of densities of fcc and bcc.

29. Three amino acids are given below:

Alanine $CH_3CH(COOH)(NH_2)$ Aspartic acid $HOOC\text{-}CH_2CH(COOH)(NH_2)$ and Lysine $H_2N\text{-}(CH_2)_4\text{-}CH(COOH)(NH_2)$

i. Make two tripeptides using these amino acids and mark the peptide linkage in both cases.

ii. Represent Alanine in the zwitter ionic form.

30. i. Arrange the following in decreasing order of bond dissociation enthalpy

F_2 , Cl_2 , Br_2 , I_2

ii. Bi does not form pπ-pπ bonds. Give reason for the observation.

iii. Electron gain enthalpy of oxygen is less negative than sulphur. Justify

SECTION D

Q.No 31 to 33 are long answer type carrying 5 marks each.

31. (i) Answer the following questions: **(2+3)**

a) Write the balanced chemical reaction for reaction of Cu with dilute HNO_3.

b) Draw the shape of ClF_3

(ii)'X' has a boiling point of 4.2K, lowest for any known substance. It is used as a diluent for oxygen in modern diving apparatus. Identify the gas 'X'. Which property of this gas makes it usable as diluent? Why is the boiling point of the gas 'X' so low?

OR

(i) Answer the following questions: **(2+3)**

a) Arrange the following in the increasing order of thermal stability:

H_2O, H_2S, H_2Se, H_2Te

b) Give the formula of the brown ring formed at the interface during the ring test for nitrate.

(ii) A greenish yellow gas 'A' with pungent and suffocating odour, is a powerful bleaching agent. 'A' on treatment with dry slaked lime it gives bleaching powder. Identify 'A' and explain the reason for its bleaching action. Write the balanced chemical equation for the reaction of 'A' with hot and concentrated NaOH.

32. An organic compound 'A' C_8H_6 on treatment with dilute H_2SO_4 containing mercuric sulphate gives compound 'B'. This compound 'B' can also be obtained from a reaction of benzene with acetyl chloride in presence of anhy $AlCl_3$. 'B' on treatment with I_2 in aq. KOH gives 'C' and a yellow compound 'D'. Identify A, B, C and D. Give the chemical reactions involved. **(5)**

OR

(i) Write the reaction for cross aldol condensation of acetone and ethanal.

(ii) How will you carry out the following conversions:

a) Benzyl alcohol to phenyl ethanoic acid

b) Propanone to propene

c) Benzene to *m*-Nitroacetophenone

33. (i) State Kohlrausch law. **(1+4)**

(ii) Calculate the emf of the following cell at 298 K:

$Al(s)/Al^{3+}(0.15M)//Cu^{2+}(0.025M)/Cu(s)$

(Given $E^o(Al^{3+}/Al) = -1.66$ V, $E^o(Cu^{2+}/Cu) = 0.34$V, log 0.15 = -0.8239, log 0.025 = -1.6020)

OR

(i) On the basis of E^o values identify which amongst the following is the strongest oxidising agent **(1+4)**

$Cl_2(g) + 2\ e^- \rightarrow 2Cl^-$ $E^o = +1.36$ V,

$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$ $E^o = +1.51$ V

$Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$ $E^o = +1.33$ V

(ii) The following figure 2, represents variation of (Λ_m) vs $\sqrt{c}$ for an electrolyte. Here Λ_m is the molar conductivity and c is the concentration of the electrolyte.

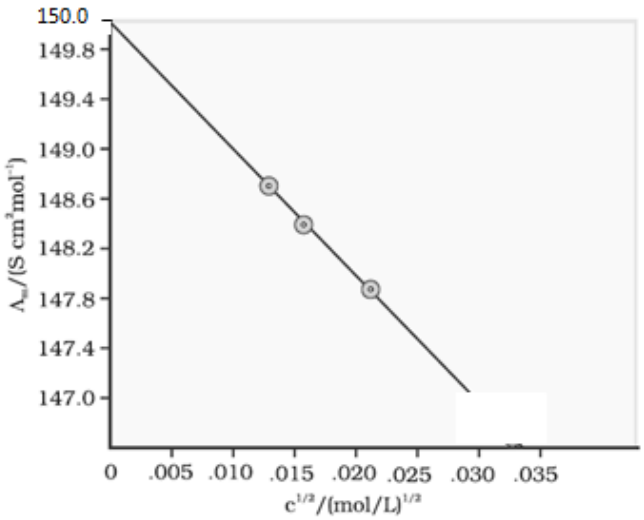


Figure 2

a) Define molar conductivity
b) Identify the nature of electrolyte on the basis of the above plot. Justify your answer.
c) Determine the value of Λ_m^o for the electrolyte.
d) Show how to calculate the value of A for the electrolyte using the above graph.

Class: XII Session: 2020-21

Subject: Mathematics

Sample Question Paper (Theory)

Time Allowed: 3 Hours **Maximum Marks: 80**

General Instructions:

1. This question paper contains two **parts A and B**. Each part is compulsory. Part A carries **24** marks and Part B carries **56** marks
2. **Part-A** has Objective Type Questions and **Part -B** has Descriptive Type Questions
3. Both Part A and Part B have choices.

Part – A:

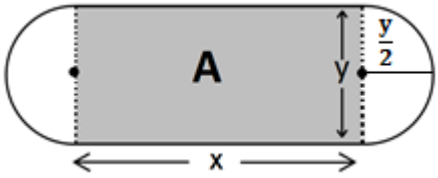
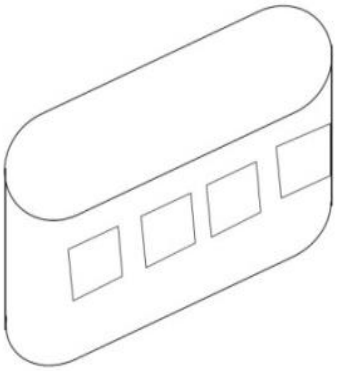
1. It consists of two sections**- I and II**.
2. Section **I** comprises of 16 very short answer type questions.
3. Section **II** contains **2** case studies. Each case study comprises of 5 case-based MCQs. An examinee is to attempt **any 4 out of 5 MCQs**.

Part – B:

1. It consists of three sections**- III, IV and V.**
2. Section **III** comprises of 10 questions of **2 marks** each**.**
3. Section **IV** comprises of 7 questions of **3 marks** each**.**
4. Section **V** comprises of 3 questions of **5 marks** each**.**
5. Internal choice is provided in **3** questions of Section –III, **2** questions of Section-IV and **3** questions of Section-V. You have to attempt only one of the alternatives in all such questions.

Sr. No.	Part – A	Marks
	Section I **All questions are compulsory. In case of internal choices attempt any one.**	
1	Check whether the function $f: R \to R$ defined as $f(x) = x^3$ is one-one or not. **OR**	1

	How many reflexive relations are possible in a set A whose $n(A) = 3$.	1
2	A relation R in $S = \{1,2,3\}$ is defined as $R = \{(1,1),(1,2),(2,2),(3,3)\}$. Which element(s) of relation R be removed to make R an equivalence relation?	1
3	A relation R in the set of real numbers **R** defined as $R = \{(a,b): \sqrt{a} = b\}$ is a function or not. Justify **OR** An equivalence relation R in A divides it into equivalence classes A_1, A_2, A_3. What is the value of $A_1 \cup A_2 \cup A_3$ and $A_1 \cap A_2 \cap A_3$	1 1
4	If A and B are matrices of order $3 \times n$ and $m \times 5$ respectively, then find the order of matrix 5A – 3B, given that it is defined.	1
5	Find the value of A^2, where A is a 2×2 matrix whose elements are given by $a_{ij} = \begin{cases} 1 \ if \ \ i \neq j \\ 0 \ if \ \ i = j \end{cases}$ **OR** Given that A is a square matrix of order 3×3 and |A| = - 4. Find |adj A|	1 1
6	Let A = $[a_{ij}]$ be a square matrix of order 3×3 and |A|= -7. Find the value of $a_{11} A_{21} + a_{12} A_{22} + a_{13} A_{23}$ where A_{ij} is the cofactor of element a_{ij}	1
7	Find $\int e^x (1 - \cot x + cosec^2 x)\, dx$ **OR** Evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} x^2 \sin x \, dx$	1 1
8	Find the area bounded by $y = x^2, the\ x -$ axis and the lines $x = -1$ and $x = 1$.	1
9	How many arbitrary constants are there in the particular solution of the differential equation $\frac{dy}{dx} = -4xy^2$; y (0) = 1 **OR** For what value of n is the following a homogeneous differential equation: $\frac{dy}{dx} = \frac{x^3 - y^n}{x^2 y + xy^2}$	1 1
10	Find a unit vector in the direction opposite to $-\frac{3}{4}\hat{j}$	1
11	Find the area of the triangle whose two sides are represented by the vectors $2\hat{\imath} \ and \ -3\hat{\jmath}$.	1

12	Find the angle between the unit vectors $\hat{a}\ and\ \hat{b}$, given that $\left\|\hat{a}+\hat{b}\right\|=1$	1
13	Find the direction cosines of the normal to YZ plane?	1
14	Find the coordinates of the point where the line $\frac{x+3}{3}=\frac{y-1}{-1}=\frac{z-5}{-5}$ cuts the XY plane.	1
15	The probabilities of A and B solving a problem independently are $\frac{1}{3}\ and\ \frac{1}{4}$ respectively. If both of them try to solve the problem independently, what is the probability that the problem is solved?	1
16	The probability that it will rain on any particular day is 50%. Find the probability that it rains only on first 4 days of the week.	1
	Section II **Both the Case study based questions are compulsory. Attempt any 4 sub parts from each question (17-21) and (22-26). Each question carries 1 mark**	
17	An architect designs a building for a multi-national company. The floor consists of a rectangular region with semicircular ends having a perimeter of 200m as shown below: **Design of Floor**   **Building** Based on the above information answer the following:	
	(i) If x and y represents the length and breadth of the rectangular region, then the relation between the variables is a) x + π y = 100 b) 2x + π y = 200 c) π x + y = 50 d) x + y = 100	

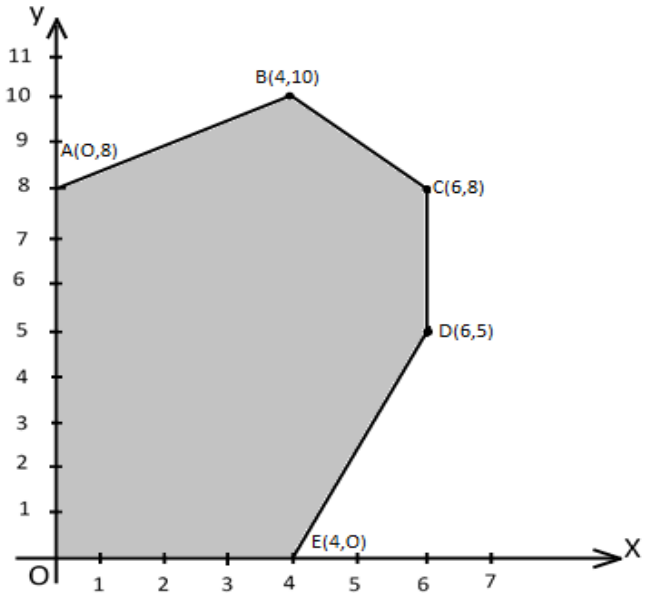
	(ii)The area of the rectangular region A expressed as a function of x is a) $\frac{2}{\pi}\left(100\,x - x^2\right)$ b) $\frac{1}{\pi}\left(100\,x - x^2\right)$ c) $\frac{x}{\pi}\left(100 - x\right)$ d) $\pi y^2 + \frac{2}{\pi}\left(100\,x - x^2\right)$	1
	(iii) The maximum value of area A is a) $\frac{\pi}{3200}m^2$ b) $\frac{3200}{\pi}m^2$ c) $\frac{5000}{\pi}m^2$ d) $\frac{1000}{\pi}m^2$	1
	(iv) The CEO of the multi-national company is interested in maximizing the area of the whole floor including the semi-circular ends. For this to happen the valve of x should be a) 0 m b) 30 m c) 50 m d) 80 m	1
	(v) The extra area generated if the area of the whole floor is maximized is : a) $\frac{3000}{\pi}m^2$ b) $\frac{5000}{\pi}m^2$ c) $\frac{7000}{\pi}m^2$ d) No change Both areas are equal	1

18	In an office three employees Vinay, Sonia and Iqbal process incoming copies of a certain form. Vinay process 50% of the forms. Sonia processes 20% and Iqbal the remaining 30% of the forms. Vinay has an error rate of 0.06, Sonia has an error rate of 0.04 and Iqbal has an error rate of 0.03  Based on the above information answer the following:	
	(i) The conditional probability that an error is committed in processing given that Sonia processed the form is : a) 0.0210 b) 0.04 c) 0.47 d) 0.06	1
	(ii)The probability that Sonia processed the form and committed an error is : a) 0.005 b) 0.006 c) 0.008 d) 0.68	1
	(iii)The total probability of committing an error in processing the form is a) 0 b) 0.047 c) 0.234	1

	d) 1	
	(iv)The manager of the company wants to do a quality check. During inspection he selects a form at random from the days output of processed forms. If the form selected at random has an error, the probability that the form is **NOT** processed by Vinay is : a) 1 b) 30/47 c) 20/47 d) 17/47	1
	(v)Let A be the event of committing an error in processing the form and let E_1, E_2 and E_3 be the events that Vinay, Sonia and Iqbal processed the form. The value of $\sum_{i=1}^{3} P\ (E_i \mid \mathrm{A})$ is a) 0 b) 0.03 c) 0.06 d) 1	1
	Part – B **Section III**	
19	Express $tan^{-1}\left(\frac{cosx}{1-sinx}\right)$, $\frac{-3\pi}{2} < x < \frac{\pi}{2}$ in the simplest form.	2
20	If A is a square matrix of order 3 such that $A^2 = 2A$, then find the value of |A|. **OR** If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $\mathrm{A}^2 - 5\mathrm{A} + 7\mathrm{I} = 0$. Hence find A^{-1}.	2 2
21	Find the value(s) of k so that the following function is continuous at $x = 0$	2

	$f(x) = \begin{cases} \frac{1-\cos kx}{x \sin x} & if\ x \neq 0 \\ \frac{1}{2} & if\ x = 0 \end{cases}$	
22	Find the equation of the normal to the curve y = $x + \frac{1}{x}$, $x > 0$ perpendicular to the line $3x - 4y = 7$.	2
23	Find $\int \frac{1}{cos^2 x(1-tanx)^2} dx$ **OR** Evaluate $\int_0^1 x(1-x)^n \, dx$	2 2
24	Find the area of the region bounded by the parabola $y^2 = 8x$ and the line $x = 2$.	2
25	Solve the following differential equation: $\frac{dy}{dx} = x^3 \, cosec\, y, given\ that\ y(0) = 0.$	2
26	Find the area of the parallelogram whose one side and a diagonal are represented by coinitial vectors $\hat{\imath}$ - $\hat{\jmath}$ + $\hat{k}$ and $4\hat{\imath} + 5\hat{k}$ respectively	2
27	Find the vector equation of the plane that passes through the point (1,0,0) and contains the line $\vec{r}$ = λ $\hat{\jmath}$.	2
28	A refrigerator box contains 2 milk chocolates and 4 dark chocolates. Two chocolates are drawn at random. Find the probability distribution of the number of milk chocolates. What is the most likely outcome? **OR** Given that E and F are events such that P(E) = 0.8, P(F) = 0.7, P (E∩F) = 0.6. Find P ($\bar{E}$ | $\bar{F}$)	2 2
	Section IV **All questions are compulsory. In case of internal choices attempt any one.**	
29	Check whether the relation R in the set Z of integers defined as R = $\{(a,b) : a + b$ is "divisible by 2"$\}$ is reflexive, symmetric or transitive. Write the equivalence class containing 0 i.e. $[0]$.	3
30	If y = $e^{x \sin^2 x} + (\sin x)^x$, find $\frac{dy}{dx}$.	3
31	Prove that the greatest integer function defined by $f(x) = [x], 0 < x < 2$ is not differentiable at $x = 1$	3

	OR If $x = a\ sec\,\theta\,, y = b\ tan\theta\ find\ \frac{d^2y}{dx^2}\ at\ x = \frac{\pi}{6}$	3
32	Find the intervals in which the function f given by $f(x) = \tan x - 4x, \quad x \in \left(0, \frac{\pi}{2}\right)$ is a) strictly increasing b) strictly decreasing	3
33	Find $\int \frac{x^2+1}{(x^2+2)(x^2+3)}\,dx$.	3
34	Find the area of the region bounded by the curves $x^2 + y^2 = 4, \mathrm{y} = \sqrt{3}x\ and\ x - axis\ in\ the\ first\ quadrant$ **OR** Find the area of the ellipse $x^2 + 9\,y^2 = 36$ using integration	3 3
35	Find the general solution of the following differential equation: $x\,dy - (y + 2x^2)dx = 0$	3
	Section V **All questions are compulsory. In case of internal choices attempt any one.**	
36	If $A = \begin{bmatrix} 1 & 2 & 0 \\ -2 & -1 & -2 \\ 0 & -1 & 1 \end{bmatrix}$, find A^{-1}. Hence Solve the system of equations; $x - 2y = 10$ $2x - y - z = 8$ $-2y + z = 7$ **OR** Evaluate the product AB, where $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}\ and\ B = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$ $Hence\ solve\ the\ system\ of\ linear\ equations$ $x - y = 3$	5 5

	$2x + 3y + 4z = 17$ $y + 2z = 7$	
37	Find the shortest distance between the lines $\vec{r} = 3\hat{\imath} + 2\hat{\jmath} - 4\hat{k} + \lambda(\hat{\imath} + 2\hat{\jmath} + 2\hat{k})$ $and\ \vec{r} = 5\hat{\imath} - 2\hat{\jmath} + \mu\,(3\hat{\imath} + 2\hat{\jmath} + 6\hat{k})$ If the lines intersect find their point of intersection **OR** Find the foot of the perpendicular drawn from the point (-1, 3, -6) to the plane $2x + y - 2z + 5 = 0$. Also find the equation and length of the perpendicular.	5 5
38	Solve the following linear programming problem (L.P.P) graphically. Maximize $Z = x + 2y$ subject to constraints ; $x + 2y \geq 100$ $2x - y \leq 0$ $2x + y \leq 200$ $x, y \geq 0$ **OR** The corner points of the feasible region determined by the system of linear constraints are as shown below:  Answer each of the following: (i) Let $Z = 3x - 4y$ be the objective function. Find the maximum and minimum value of Z and also the corresponding points at which the maximum and minimum value occurs.	5 5

	(ii) Let $Z = px + qy$, where $p, q > o$ be the objective function. Find the condition on p and q so that the maximum value of Z occurs at $\mathrm{B}(4,10) and\ \mathrm{C}(6,8)$. Also mention the number of optimal solutions in this case.	

Sample Question Paper 2020-21

Class XII

Biology (044) Theory

Time: 3 Hours **Maximum Marks: 70**

General Instructions:

(i) All questions are compulsory.

(ii) The question paper has four sections: Section A, Section B, Section C and Section D. There are 33 questions in the question paper.

(iii) Section–A has 14 questions of 1 mark each and 02 case-based questions. Section–B has 9 questions of 2 marks each. Section–C has 5 questions of 3 marks each and Section–D has 3 questions of 5 marks each.

(iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

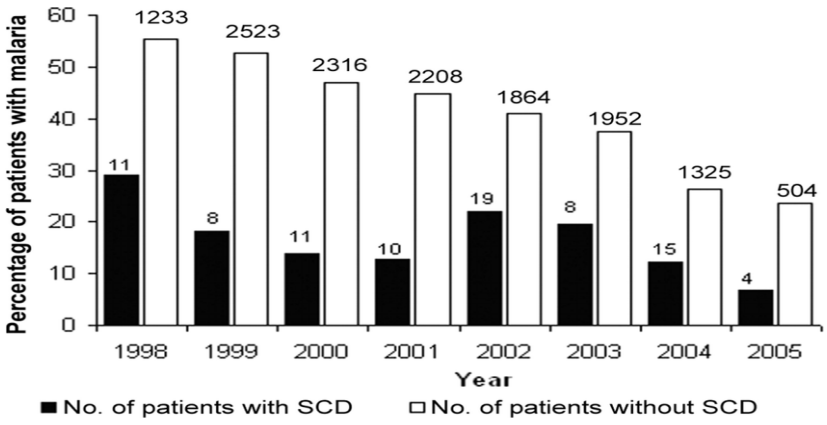
(v) Wherever necessary, neat and properly labeled diagrams should be drawn.

SECTION A		
	Questions	Marks
1.	Why does endosperm development precede embryo development?	1
2.	How many meiotic divisions are required to produce 76 seeds in a Guava fruit?	1
3.	How does pollination take place in water hyacinth and water lily?	1
4.	Name the glands that contribute to human seminal plasma.	1
5.	A snapdragon plant with violet flowers was crossed with another such plant with white flowers. The F1 progeny obtained had pink flowers. Explain, in brief, the inheritance pattern seen in offsprings of F1 generation?	1
6.	Differentiate between aneuploidy and polyploidy.	1
7.	Predict the effect if, the codon UAU coding for an amino acid at the 25^{th} position of a polypeptide of 50 amino acids, is mutated to UAA.	1
8.	Differentiate between pro-insulin and mature insulin.	1
9.	Name the commonly used vector for cloning genes into higher organisms.	1
10.	Which of the three forests- Temperate, Mangroves and Tropical Evergreen is more vulnerable to invasion by outside animals and plants?	1

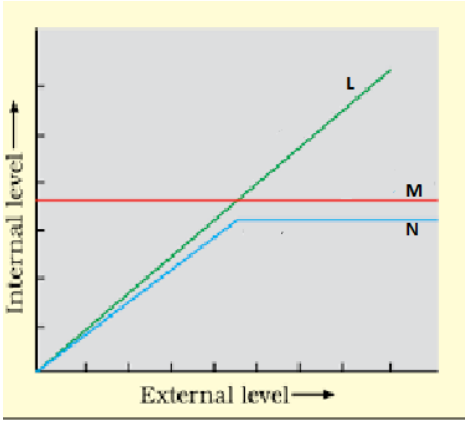
11.	**Assertion:** Primary transcripts in eukaryotes are nonfunctional. **Reason:** Methyl guanosine triphosphate is attached to 5' – end of hnRNA. a. Both assertion and reason are true, and reason is the correct explanation of assertion. b. Both assertion and reason are true, but reason is not the correct explanation of assertion. c. Assertion is true but reason is false. d. Both assertion and reason are false. **OR** **Assertion:** An organism with lethal mutation may not even develop beyond the zygote stage. **Reason:** All types of gene mutations are lethal. a. Both assertion and reason are true, and the reason is the correct explanation of the assertion. b. Both assertion and reason are true, but the reason is not the correct explanation of the assertion. c. Assertion is true but reason is false. d. Both assertion and reason are false	1
12.	**Assertion:** *E. coli* having pBR322 with DNA insert at BamHI site cannot grow in medium containing tetracycline. **Reason:** Recognition site for Bam HI is present in tet^R region of pBR322. a. Both assertion and reason are true, and the reason is the correct explanation of the assertion. b. Both assertion and reason are true, but the reason is not the correct explanation of the assertion. c. Assertion is true but reason is false. d. Both assertion and reason are false	1
13.	**Assertion:** A community with more species is more stable than that with less species. **Reason:** More the number of species, lesser the variation in the total biomass production year after year. a. Both assertion and reason are true, and the reason is the correct explanation of the assertion. b. Both assertion and reason are true, but the reason is not the correct explanation of the assertion. c. Assertion is true but reason is false. d. Both assertion and reason are false	1

14.	**Assertion:** In *Ophrys* one petal of the flower bears an uncanny resemblance to the female bee. **Reason:** Two closely related species competing for the same resource can coexist simultaneously. a. Both assertion and reason are true, and the reason is the correct explanation of the assertion. b. Both assertion and reason are true, but the reason is not the correct explanation of the assertion. c. Assertion is true but reason is false. d. Both assertion and reason are false	1
15.	*Read the following and answer any **four** questions from 15(i) to 15(v) given below:* **Ecological Indicators** The presence of dragonflies can reveal changes in the water ecosystems more quickly than studying other animals or plants. In fact, from the nymph to the adult stage, the dragonfly has a significant, positive ecological impact. Dragonfly eggs are laid and hatched in or near water, so their lives impact both water and land ecosystems. Once hatched, dragonfly nymphs can breathe underwater which enables them to eat mosquito larvae, other aquatic insects and worms, and even small aquatic vertebrates like tadpoles and small fish and in the air. Adult dragonflies capture and eat adult mosquitoes. Community wide mosquito control programs that spray insecticides to kill adult mosquitoes also kill dragonflies.	4
i.	The approach to biological control includes: a. Import and release of an insect pest to a new area to provide hosts for natural enemies b. Import and release of natural enemies from the native home of an alien insect pest that has invaded a new area c. Preservation of natural enemies (predators & parasitoids) that are already established in an area d. Use of insecticides to reduce alien insect pests to establish new equilibrium position.	
ii.	Two diseases less likely to occur in a region with plenty of dragonflies are_____ a. Yellow fever and amoebic dysentery b. Malaria and Yellow fever c. Anthrax and typhoid d. Cholera and typhoid	

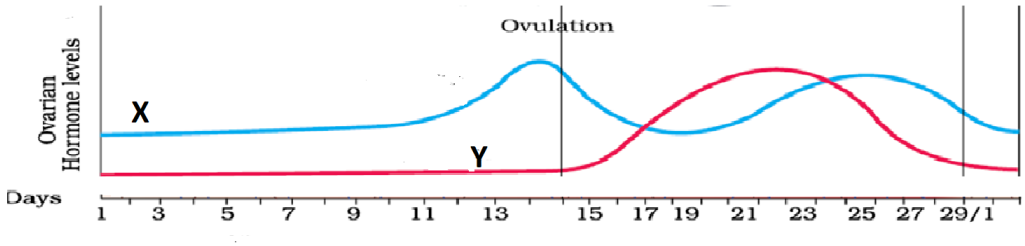
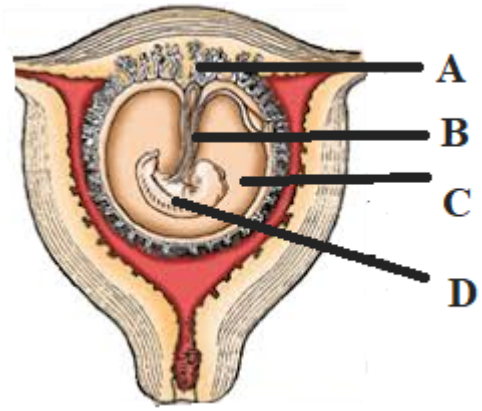
iii.	Dragonflies indicate positive ecological impact as- a. The presence of dragonflies indicates polluted water. b. Dragonfly nymphs selectively eat mosquito larvae. c. They help to decrease the probability of diseases spread by vectors. d. Dragonfly do not cause any harm to beneficial species.	
iv.	The most effective stages in the life cycle of dragonfly that eradicate mosquitoes are- a. Larvae and Adult b. Caterpillar and Adult c. Nymph and Adult d. Pupa and Adult	
v.	**Assertion:** Releasing dragonflies in areas where there is an outbreak of malarial diseases can be an environment friendly method of control. **Reason:** Dragon flies are dominant species and will not allow mosquitoes to reproduce a. Both assertion and reason are true, and the reason is the correct explanation of the assertion. b. Both assertion and reason are true, but the reason is not the correct explanation of the assertion. c. Assertion is true but reason is false. d. Both assertion and reason are false	
16.	*Read the following and answer any **four** questions from 16(i) to 16(v) given below:* Sickle cell anemia is a genetic disorder where the body produces an abnormal hemoglobin called hemoglobin S. Red blood cells are normally flexible and round, but when the hemoglobin is defective, blood cells take on a "sickle" or crescent shape. Sickle cell anemia is caused by mutations in a gene called HBB. It is an inherited blood disorder that occurs if both the maternal and paternal copies of the HBB gene are defective. In other words, if an individual receives just one copy of the defective HBB gene, either from mother or father, then the individual has no sickle cell anemia but has what is called "sickle cell trait". People with sickle cell trait usually do not have any symptoms or problems but they can pass the mutated gene onto their children. There are three inheritance scenarios that can lead to a child having sickle cell anemia: - Both parents have sickle cell trait - One parent has sickle cell anemia and the other has sickle cell trait - Both parents have sickle cell anemia	4

i.	Sickle cell anemia is a/ an _____ disease. a. X linked b. autosomal dominant c. autosomal recessive d. Y linked	
ii.	If both parents have sickle cell trait, then there is _____of the child having sickle cell anemia. a. 25 % risk b. 50 % risk c. 75% risk d. No risk	
iii.	If both parents have sickle cell trait, then there is _____of the child having sickle cell trait. a. 25 % risk b. 50 % risk c. 75% risk d. No risk	
iv.	If one parent has sickle cell anemia and the other has sickle cell trait, there is _____that their children will have sickle cell anemia and _____will have sickle cell trait. a. 25 % risk, 75% risk b. 50 % risk, 50% risk c. 75% risk, 25% risk d. No risk	
v.	 The following statements are drawn as conclusions from the above data (Kenya). I. Patients with SCD (Sickle Cell Disease) are less likely to be infected with malaria.	

	II. Patients with SCD (Sickle Cell Disease) are more likely to be infected with malaria. III. Over the years the percentage of people infected with malaria has been decreasing. IV. Year 2000 saw the largest percentage difference between malaria patients with and without SCD. Choose from below the correct alternative. a. only I is true b. I and IV are true c. III and II are true d. I and III are true	
	SECTION – B	
17.	State the composition and principle of oral pills as a contraceptive measure taking the example of Saheli.	2
18.	Karyotype of a child shows trisomy of chromosome number 21. Identify the disorder and state the symptoms which are likely to be exhibited in this case.	2
19.	Explain four advantages of mycorrhizal association to plants.	2
20.	Explain the method to increase the competency of the bacterial cell membrane to take up recombinant DNA? **OR** What are bioreactors? How are large volumes of cultures maintained and processed in them?	2
21.	Explain the role of enzymes in the extraction of DNA from *Rhizopus* in its purest form.	2
22.	What are sticky ends? State their significance in recombination DNA technology. **OR** Explain the procedure by which PCR aids in early detection of cancer.	2
23.	Explain how advanced ex-situ conservation techniques assist in preserving threatened species of plants and animals.	2
24.	Define interference competition. Give one example that supports competitive exclusion occurring in nature.	2
25.	The Tropical regions are likely to have more biological diversity than the Temperate ones. Give two reasons to justify the statement.	2

SECTION – C		
26.	A fully developed foetus initiates its delivery from the mother's womb. Justify the statement.	3
27.	How would you find out the genotype of a pea plant with violet flowers? Explain with the help of Punnets' square showing crosses.	3
28.	Define flocs and state their importance in biological treatment of waste water.	3
29.	A farmer noticed that nematode infection in tobacco plants has resulted in the reduction in the yield. Suggest a strategy which provides cellular defense for providing resistance to this pest. Explain the technique.	3
30.	The graph given below represents three categories of organismic responses - L, M and N to cope with stressful conditions. Identify the categories L and M.  Given below are examples of some of the activities performed by animals. Categorise these activities into the appropriate kind of the organismic response (L, M or N) as shown in the graph with reasons. i. In summers we sweat profusely. ii. Sometimes desert lizards bask in the sun and sometimes they move into shade. **OR** Give reasons for the following: a. Very small animals are rarely found in polar regions. b. Mammals from colder climate generally have shorter ear and limbs. c. Initially we feel nausea and fatigue when we reach a high altitude such as Rohtang Pass and then, gradually, we feel normal.	3

SECTION - D

31.	Study the graph given below related with menstrual cycle in females: a. Identify ovarian hormones X and Y mentioned in the graph and specify their source.  b. Corelate and describe the uterine events that take place according to the ovarian hormone levels X and Y mentioned in the graph on - i. 6 – 15 days ii. 16 – 25 days iii. 26 – 28 days (when ovum is not fertilized) **OR** The following figure shows a foetus within the uterus. On the basis of the given figure, answer the questions that follow:  (a) In the above figure, choose and name the correct part (A, B, C or D) that act as a temporary endocrine gland and substantiate your answer. Why is it also called the *functional junction*? (b) Mention the role of B in the development of the embryo. (c) Name the fluid surrounding the developing embryo. How is it misused for sex-determination?	5

32.	Evaluate the suitability of DNA and RNA as genetic material and justify the suitability of the one that is preferred as an ideal genetic material. **OR** Explain the mechanism of DNA replication as suggested by Watson and Crick.	5
33.	Identify and name the disease in which the patient's cells lose the property of contact inhibition. State its possible causes and explain any three methods to accurately detect the pathological and physiological changes that take place due to the disease in living tissues. **OR** A patient had tested positive to ELISA Test. Identify the disease and the pathogen responsible, give reasons for the reduced/ weak immunity of the patient and trace the path, spread and effects of this pathogen in the human body.	5

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