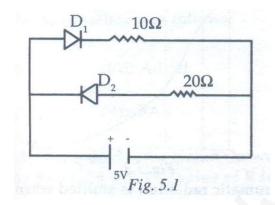


#### **PART A: CLASS XII PHYSICS**

### <u>Q1</u>

Two ideal diodes have been connected to a battery; the circuit depicts the connection lucidly. Refer Fig. 5.1. the current supplied by the battery is:

- (a) 1.75 A
- (b) 0.8 A
- (c) 2.25 A
- (d) 0.5 A



## <u>Q2</u>

An electric dipole of moment p has been placed in an electric field that has an intensity E. the dipole acquires a position so that the axis of the dipole makes an angle  $\hat{a}$  with the direction of the field. Assuming that the potential energy of the zero when  $\theta=90^{\circ}$ , the torque and potential energy of the dipole will be (respectively):

(a) pESin $\theta$ , – pEcos  $\theta$ 

(b) pEsin  $\theta$ , -2pEcos $\theta$ 

(c)pEsin  $\theta$ , 2 pEcos $\theta$ 

(d) pEsin  $\theta$ ,  $-pEsin\theta$ 

#### **Q3**

When drift velocities are comparable with the speed of light, the magnetic forces and electric forces:

- (a)are equal to each other
- (b) are very different from each other
- (c) are comparable with each other
- (d) cannot be calculated



## <u>Q4</u>

At the magnetic pole of the earth, the angle of dip is \_\_\_\_ while at the magnetic equator of the earth, its value is \_\_\_\_ .

- (a)  $70^{\circ},75^{\circ}$
- (b)  $0^{0},90^{0}$
- (c)  $75^{\circ}$ ,  $70^{\circ}$
- (d)  $90^0$ ,  $0^0$

# <u>Q5</u>

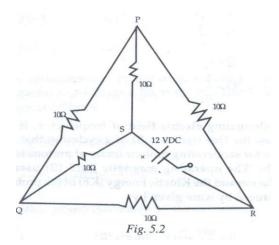
A pure- sin-wave inverter is preferred over a square-wave inverter because of the consideration of:

- (a) price
- (b) Noise
- (c) efficiency
- (d) None of these

## <u>Q6</u>

As has been shown in fig. 5.2, five resistances, each of value  $10\Omega$ , have been completed in a logical arrangement. What is the current flowing through the section SPR?

- (a) 2.1 A
- (b) 3.1 A
- (c) 4.1 A
- (d) 1.2 A





### <u>Q7</u>

Which one of the following statements is true?

- (a) The output of an OR gate is 1 if either or both inputs are 1 each.
- (b) The output of OR gate is never 1
- (c) The OR gate would always deliver on output of 1.
- (d) None of these.

#### **Q8.**

A duo of red and green rays has been made to fall on the face of a glass slab. After coming out of the opposite parallel face, these two would:

- (a) move in non-parallel directions after coming out of the same point.
- (b) move in two different parallel directions after coming out of two different points.
- (c) move in the same direction after coming out of the same point.
- (d) None of these.

#### <u>Q9</u>

A milli-voltmeter of range 25 m V to be converted into an ammeter of range 25 A. The value of the necessary shunt will be:

- (a)  $0.003\Omega$
- (b)  $0.01\Omega$
- (c)  $1.001 \Omega$
- (d)  $0.001\Omega$

#### **Q10**

A mixture comprises two radioactive materials – Cosmo 1 and Cosmo-2. The half-life of Cosmo-1 is 20 s. the half-life of Cosmo-2 is 10s. the mixture has 40 g of Cosmo-1 and 160 g of Cosmo -2. These amounts in the mixture will become equal after a period of:

- (a) 60s
- (b) 80s
- (c) 20s
- (d) 40s



## Q11.

Four point charges – Q,- q, 2q and 2Q have been placed in the concerns of a square. These is only one charge in one corner. The relationship between Q and q for which the potential at the centre of the square is zero is as follows.

(a) 
$$Q=\theta q$$

(b) 
$$Q = -\frac{1}{q}$$

(c) 
$$Q = q$$

(d) Q = 
$$\frac{1}{q}$$

## Q12

An alternating electric field of frequency v, is applied across the Dee (radius = R)of a cyclotron that is being used for accelerating protons (Mass of protons is m units each). The operating magnetic field (B) used in the cyclotron and the Kinetic Energy (KE) of the problem beam produced by it are given by:

(a) 
$$B = \frac{mv}{e}$$
 and  $K = 2m\pi^2 v^2 R^2$ 

(b) 
$$B = \frac{2\pi mv}{e}$$
 and  $K = m^2\pi vR^2$ 

(c) 
$$B = \frac{2\pi mv}{e}$$
 and  $K = 2m\pi^2 v^2 R^2$ 

(d) 
$$B = \frac{mv}{e}$$
 and  $K = 2m^2\pi R^2$ 

#### <u>Q13.</u>

A ray of light is incident at an angle of incidence I on one face of a prism of angle A (it has been assumed to be small). The light ray emerges normally from the opposite face of the prism in question. If the Refractive Index (RI) of the prism is I, the angle of incidence (i) is approximately equal to:

- (a) µA
- (b)  $\frac{\mu A}{2}$
- (c)  $A/\mu$
- (d)  $A/2\mu$

#### Q.14

A concave mirror has focal length  $F_1$ . It has been placed at a distance D from a convex lens of focal length  $F_2$ . A beam of light coming from infinity and falling on this convex-lens-concave-mirror combination goes back to infinity. The distance D must be equal to:

(a) 
$$f_1 + f_2$$

(b) 
$$(a) - f_1 + f_2$$

(c) 
$$2f_1 + f_2$$

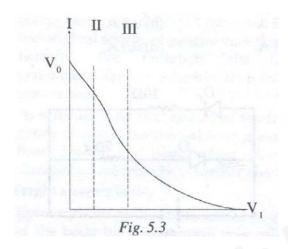
(d) 
$$-2f_1 + f_2$$



## Q15

The transfer characteristic (a plot of output voltage of  $V_0$  versus input voltage  $V_i$ ) for a base-biased transistor in the CE configuration. Refer Fig.5.3. if we want to use this transistor as a switch, we must use it:

- (a) in region III
- (b) in region (I) and (III) both
- (c) in region II
- (d) in region I



## Q16.

A monochromatic radiation is emitted when election on hydrogen atom jumps from the first excited state to the ground state and irradiates a photosensitive material. The stopping potential is 3.57 V. the threshold frequency of the material is:

- (a)  $4 \times 10^{15} \text{ Hz}$
- (b)  $5 \times 10^{15} \text{ Hz}$
- (c)  $1.6 \times 10^{15} \text{ Hz}$
- (d)  $2.5 \times 10^{15} \text{ Hz}$

## <u>Q17.</u>

What is the equation of the flux flowing through a cube of side a if a point charge q is at one of its corners?

(a) 
$$\frac{2q}{\varepsilon_0}$$

(b) 
$$\frac{q}{8\varepsilon_0}$$

(c) 
$$\frac{q}{\varepsilon_0}$$

(d) 
$$\frac{q}{2\varepsilon_0}$$
  $6a^2$ 



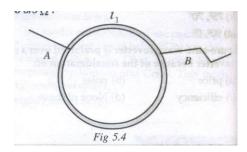
## Q18.

The magnifying power of a telescope is 9. When it is adjusted for parallel rays, the distance between the objective and eyepiece is 20 cm. what is the focal length of lineses?

- (a) 10cm, 10cm
- (b)15cm, 5 cm
- (c) 16 cm, 3.5 cm
- (d) 18 cm, 2 cm

## Q19

A ring is made up of a wire having a resistance  $R_0 = 120\Omega$ . Find the points A and B (as shown in Fig 5.4) at which a current –carrying conductor should be attached so that the rsistance R of the circuit between the points A and B is equal to 8/3  $\Omega$ .



- (a)  $\frac{l_1}{l_2} = \frac{5}{8}$
- (b)  $\frac{l_1}{l_2} = \frac{1}{3}$
- (c)  $\frac{l_1}{l_2} = \frac{3}{8}$
- $(d)\frac{l_1}{l_2} = \frac{1}{2}$

## **Q20**

A parallel-plate capacitor has a uniform electric field E in the space between the plates. If the distance between the plates is d and the area of each plate is A. the energy stored in the capacitor is as follows:

(a)  $\frac{1}{2} \varepsilon_0 E^2$ 

(b)  $\frac{E^2Ad}{\varepsilon_0}$ 

(c)  $1\frac{1}{2}\varepsilon_0 E^2 Ad$ 

(d) $\varepsilon_0 EAd$ 



# **Q21**

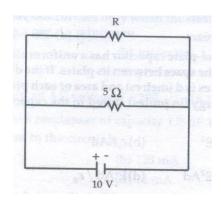
The power din the circuit shown in the figure is 30 watts. Refer Fig. 5.5. the value of R is:

(a)  $18 \Omega$ 

(b)  $10\Omega$ 

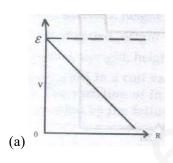
(c)  $11\Omega$ 

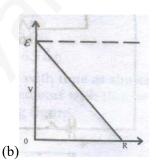
(d) Cannot be determined

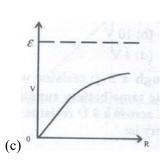


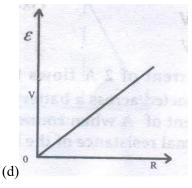
## **Q22.**

A cell having an emf E and internal resistance r has been connected across a variable external resistance R. As the value of R is increased,the plot of potential difference V across R is drawn. That curve is:











## Q23.

A magnetic needle has been suspended parallel to a magnetic field. It needs  $\sqrt{3}$  J of work to turn it through an angle of  $60^{\circ}$ . The value of torque needed for maintaining the needle in this position is:

(a)  $2\sqrt{3} \text{ J}$ 

(b) 3J

(c) √3J

 $(d)^{\frac{3}{2}} J$ 

## Q24.

The instantaneous values of alternating current i (in amperes) and voltage e (in volts) of a circuit have been given as follows.

$$t = \frac{1}{\sqrt{2}} \sin(100\pi t) ampere$$

$$e = \frac{1}{\sqrt{2}}\sin\left(100\pi t + \frac{\pi}{3}\right)volt$$

The average power consumed by the circuit is:

(a)  $\frac{1}{4}$  watts

(b)  $\frac{\sqrt{3}}{4}$  watts

(c)  $\frac{1}{2}$  watts

(d)  $\frac{1}{8}$  watts

## Q25.

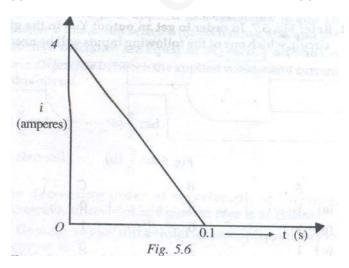
In a coil of resistance  $10\Omega$  the induced current developed by the changing magnetic flux through it has been shown as a function of time. Refer Fig. 5.6.the magnitude of change in flux through the coil is:

(a) 8webers

(b) 7webers

(c) 2webers

(d) 4webers





#### **Q26.**

The ratio of amplitude of a magnetic field to the amplitude of an electric field for an electromagnetic wave propagating in vacuum is equal to:

- (a) the speed of light in any medium
- (b) reciprocal of speed of light in vacuum
- (c)the ratio of magnetic permeability to the electric susceptibility of vacuum
- (d) unity

## **Q27**

For the angle of minimum deviation of a prism to be equal to its reflecting angle, the prism must be made of a material whose refractive index:

(a) lies between  $\sqrt{2}$  and 1

(b) lies between  $\mu_{min} = \sqrt{2}$  and  $\mu^{max} = 2$ 

(c) is less than 1

(d) is greater than 2

#### Q28.

Two radiations of photons energies 1 eV and 2.5 eV successively illuminate a photosensitive metallic surface having a work function 0.5 eV. The ratio of the maximum speed of the emitted electrons is:

(a)1:2

(b) 2: 1

(c) 1:4

(d) 4:1

### **Q29**

The half-life of a radioactive nucles is 50 days.the time interval  $(t_2-t_1)$  between the time  $t_2$  when two third of it had decayed and the time  $t_1$  when one third of it had decayed is:

(a) 30 days

(b) 60 days

(c) 50 days

(d) 15 days

#### Q30

The input resistance of a silicon transistor is  $100~\Omega$ . The base current is changed by  $40\mu$  A. this leads to the change in collector current by 2 mA. This transistor is used as a common Emitter (CE) amplifier with a load resistance of 4 k  $\Omega$ . The voltage gain of the amplifier is:

(a) 2000

(b) 3000

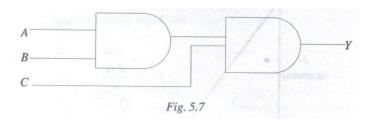
(c)4000

(d) 1000



## **Q31**

Refer Fig. 5.7. In order to get an output Y=1 in the given circuit, which one of the following inputs will be needed?



	A	В	С
(a)	1	0	0
(b)	1	0	1
(c)	1	1	0
(d)	0	1	0

# Q32.

The symbolic representation of four logic gates can be shown as follows (refer fig 5.8):The correct order for the gate type is as follows:

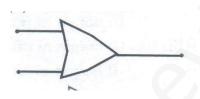
(a) (i) NAND (ii) NOT (iii) OR (iv) NOR

(b) (i) NAND (ii) OR (iii) NOR (iv) AND

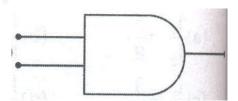
(c) (i) OR (ii) AND (iii) NOT (iv) NAND

(d) None of these

(i)

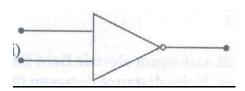


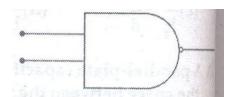
<u>(ii)</u>



<u>(iii)</u>









## Q33.

A radioactive nucleus of mass M emits a photon of frequency v and the nucleus recoils. The recoil energy will be equal to the following:

- (a)  $h^2v^2/2Mc^2$
- (b) zero
- (c) hv
- (d)  $Mc^2 hv$

## Q34.

The half-life of a radioactive isotope Cosmo-1 is 50 years. It decays to another element, Cosmo-2, which is stable. The two elements Cosmo-1 and Cosmo-2 were in the ratio of 1:15 in a sample of a given rock. The age of the rock is likely to be:

(a) 200 Years

(b) 250 Years

(c) 100 Years

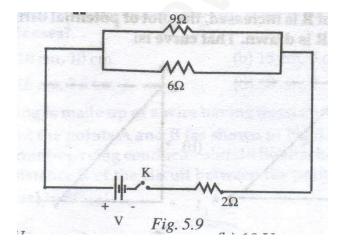
(d) 150 Years

## Q.35

A parallel- plate capacitor has a uniform electric E(V-m<sup>-1</sup>) in the space between its plates. If the distance between the plates is d (metres) and area of each plate is A (metre<sup>2</sup>), the energy (in joules) stored in the capacitor is:

#### Q36.

The power dissipated in a resistor of  $9\Omega$  is 36 W. Refer Fig. 5.9. The potential difference across a resistor of resistance  $2\Omega$  is



(a) 8 V

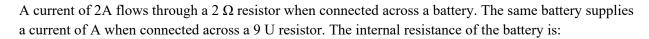
(b)10V

(c) 2V

(d) 4 V



#### Q.37



- (a)  $\frac{1}{3}\Omega$
- $(b)\frac{1}{4}\Omega$
- (c) 1Ω
- (d)  $0.5 \Omega$

#### **Q38.**

According to Lenze's slow, the direction of induced emf is such that it:

- (a) supports the cause that produces it
- (b) opposes the cause that produces it
- (c) remains neutral to the cause that produces it
- (d) None of these

#### Q39.

The fusion reaction takes place at high temperature because:

- (a) atoms get ionized at high temperature
- (b) kinetic energy is high enough to overcome the Coulomb repulsion between nuclei
- (c) molecules break up at high temperature
- (d) nuclei break up at high temperature

#### Q40.

Photoelectric emission occurs only when the incident light has more than a certain minimum

- (a) wavelength
- (b) intensity
- (c) frequency
- (d) power



## Q41.

In an AC circuit, an AC voltage e=200  $\sqrt{2}$  sin 100t (volt) is connected to a condenser of capacity 1.0  $\mu$ F the RMS value of current in the circuit is

(a) 10 mA

(b) 120 mA

(c) 20 mA

(d) 14 mA

## **Q42.**

A biconvex lens has a radius of curvature of magnitude 20 cm. which one of the following options aptly describes the image formed of an object of height 2 cm placed at a distance of 30 cm from the lens?

(a) Virtual, upright, height =0.5 cm

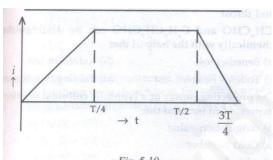
(b) Real, inverted, height =4 cm

(c)Real, inverted, height = 5.5 cm

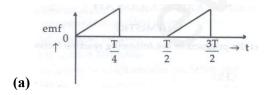
(d) Virtual, upright, height= 6.5 cm

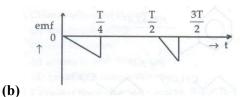
## Q43.

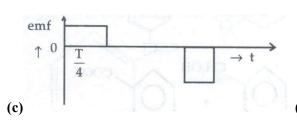
The current I in a coil varies with time as shown in Fig. 5.10. The variation of induced emf with time would be represented by the following figure.

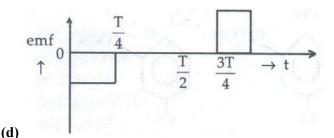














### **Q.44**

An AC voltage is applied to a resistance R and an inductor L that are in series with each other. If R and the inductive reactance are equal to  $3\Omega$  each, find out the phase difference between the applied voltage and current in this circuit.

$$(a)^{\frac{\pi}{4}}$$
rad

(b) 
$$\frac{\pi}{2}$$
 rad

(d) 
$$\frac{\pi}{6}$$
 rad

## Q45.

The decreasing order wavelength of infrared, microwave, ultraviolet and gamma rays is a s follows.

- (a) Gamma rays > ultraviolet rays > infrared rays > microwaves
- (b) Microwaves > gamma rays> infrared rays > ultraviolet rays
- (c) Infrared rays> microwaves> ultraviolet rays > gamma rays
- (d) Microwaves> infrared rays > ultraviolet rays> gamma rays

#### Part B: CLASS XII

## **CHEMITSRY**

## Q46.

Predict the products in the following reaction (refer Fig. 5.11):



## Q47.

Acetone is treated with excess of ethanol on the presence of hydrochloric acid. The product so obtained is:

(b)

$$(CH_3)_2C < OH OC_2H_5$$

(c)

$$(CH_3)_2C < \frac{OC_2H_5}{OC_2H_5}$$

## Q48.

A metal crystallises what a Face Centered Cubic (FCC) lattice .The edge of the unit cell is 408 pm. The diameter of the metal atom is:

- (a) 288 pm
- (b) 408 pm
- (c) 144 pm
- (d) 204 pm

#### Q49.

Which one of the following is not a condensation polymer?

(a) Melamine

(b) Glyptal

(c) Dacron

(d) Neoprene



### Q.50

Which nomenclature is not according to the IUPAC system?

## Q51.

The number of octahedral void (s) per atom present in a cubic close-packed structure is:

- (a) 1
- (b) 3
- (c) 2
- (d)4

## Q52.

Which one of the following statements regarding photochemical smog is not correct?

- (a) Carbon monoxide does not p[lay any role in photochemical smog formation.
- (b) photochemical smog is an oxidising agent in the atmosphere
- (c)photochemical smog is formed through the photochemical reaction involving solar energy
- (d) photochemical smog does not cause irritation in eyes and throat



# Q53.

<u> </u>		
CH <sub>3</sub> CHO and C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> CHO can be distinguish	ed chemically with the help of the:	
(a) Benedict test		
(b) Iodoform test		
(c) Tollen's Reagent test		
(d) Fehling Solution test		
<u>Q54.</u>		
The protecting power of a lyophilic colloidal so	lution is expressed in terms of the:	
(a) coagulation value		
(b) Gold Number		
(c) critical micelle concentration		
(d)oxidation number		
<u>Q55.</u>		
Which one of the following acids does not exhib	bit optical isomerism?	
(a) Maleic acid	(b) α- amino acids	
(c) Lactic acid	(d) Tartaric acid	
<u>Q56.</u>		
Which one of the following statements is false?		
(a) Artificial silk is delivered from cellulose.		
(b) Nylon -66 is an example of elastomers.		
(c) the repeat unit in natural rubber is isoprene.		
(d) Both starch and cellulose are the polymers o	f glucose	
<u>Q57.</u>		
The killer hooch takes lives of several hundred pehind it?	people in india every year? Who is the major culprit	
(a) Phenol derivation	(b) Ethyl alcohol	
(c) Ketone derivative	(d) Acetaldehyde	
	•	



## Q58.

Refer Fig.5.12 Red precipitate is obtained when an ethanol solution of dimethylglyoxime is added to ammonical Ni (II). Which one of the following statements is not true?

- (a) Red complex has a square planar geometry.
- (b) The complex has symmetrical hydrogen bonding.
- (c) Red complex has a tetrahedral geometry.
- (d) Dimethylglyoxime functions as a bidentate ligand

## Q59.

Four diatomic species have been listed here. Identifying the correct order in which the bond order is increasing in them.

(a) NO 
$$< O_2^- < C_2^{2-} < He_2^+$$

(b) 
$$O_2^- < NO < C_2^{2-} < He_2^+$$

(c) 
$$C_2^{2-} < He_2^+ < O_2^- < NO$$

(d) 
$$He_2^+ < O_2^- < NO < C_2^{2-}$$

#### Q60.

Four successive members of the first series of transition metals have been shown here. For which one of them, has the standard potential ( $E^0_{M2+/M}$ ) value a positive sign?

(a) Co 
$$(Z = 27)$$

(b) Ni 
$$(Z = 28)$$

(c) 
$$Cu (Z = 29)$$

(d) Fe 
$$(Z = 26)$$



## Q61.

The catalytic activity of transition metals and their compounds is ascribed mainly to their:

- (a) magnetic behavior
- (b) unfilled d- orbitals
- (c) ability to adopt variable oxidation states
- (d) chemical reactivity

#### Q62.

Chloramphenicol is a/an:

(a) anti- fertility drug

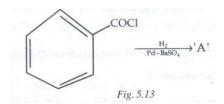
(b) anti- histamine

(c) antiseptic and disinfectant

(d) broad-spectrum antibiotic

## <u>Q63.</u>

Consider the following reaction. Refer Fig. 5.13. the product of this reaction is as follows:



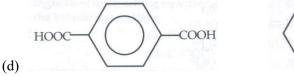
The product 'A' is

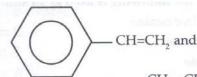
- (a)  $C_6H_5CHO$
- (b) C<sub>6</sub>H<sub>5</sub>OH
- (c) C<sub>6</sub>H<sub>5</sub>COCH<sub>3</sub>
- (d)  $C_6H_5Cl$

#### **Q64.**

Which one of the following sets forms biodegradable polymers?

- (a)  $CH_2 = CH CN$  and  $CH_2 = CH CH = CH_2$
- (b)  $H_2N CH_2 COOH$  and  $H_2N (CH_2)_5 COOH$
- (c)  $HO CH_2 CH_2 OH$  and





 $CH_2 = CH - CH = CH_2$ 



## Q65.

The values of the standard electrode potential of three metals X,Y and Z are -1.2 V, +0.5V and -3.0 V, respectively. The decreasing order of reducing power of these metals is:

- (a) Y > X > Z
- (b) Z > X > Y
- (c) X > Y > Z

## Q66.

What is the basic reaction of Aliminum hydroxide in our stomach?

- (a) It produces OH ions
- (b) It nutrilises HNO<sub>3</sub>
- (c) It nutrilisesHCl
- (d) It reacts with the stomach wall

#### Q67.

If x is amount of adsorbate and m is the amount of adsorbent, which one of the following relations is not related to the adsorption process?

- (a)  $\frac{x}{m}$  = f(T) at cons tan t p
- (b) p = f(T) at cons tan  $t\left(\frac{x}{m}\right)$
- (c)  $\frac{x}{m} = p \times T$
- (d)  $\frac{x}{m} = f(p)$ at cons tan t T

#### Q68.

The van't Hoff factor I for a compound, which undergoes dissociation in one solvent and association in other solvent, is (respectively)

- (a) Less than one and less than one
- (b) Greater than one and less than one
- (c) Greater than one and greater than one
- (d) Less than one and greater than one

#### Q69.

The d-electron configuration of Cr<sup>2+</sup>, Mn<sup>2+</sup>, Fe<sup>2+</sup> and Co2+ are d<sup>4</sup>, d<sup>5</sup> and d<sup>7</sup>, respectively. Which one of the following will exhibit the minimum paramagnetic behavior?

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

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

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

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



## Q70.

Which one of the following is used as an anthistamine?

(a) Diphenylhydramine

(b) Noretheindrone

(c) Omeprazole

(d) Chloramphenicol

## Q71.

The correct order of increasing bond length of C-H, C-O, C-C and C=C is

(a) 
$$C-C < C = C < C-O < C-H$$

(b) 
$$C-O < C - H < C - C < C = C$$

(c) 
$$C - H < C - HO < C - C < C = C$$

(d) 
$$C - H < C = C < C - O < C - C$$

### Q72.

Which one of the following has been classified as a polyester polymer?

(a) Bakelite

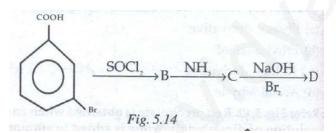
(b) Melamine

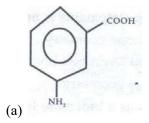
(c) Nylon-66

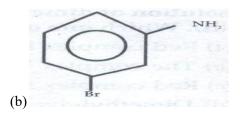
(d) Terylene

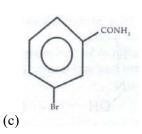
## <u>Q73.</u>

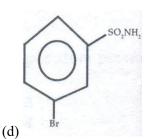
Refer Fig. 5.14. In a set of reactions, m – bromo –benzoic acid yielded a product. identify that product.







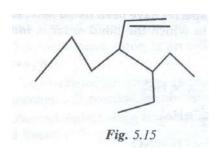






# <u>Q74.</u>

The correct IUPAC name of the compound shown in Fig. 5.15 is as follows.



- (a) 3- ethyl- 4-ethenylheptane
- (b) 3- ethyl-4- propylhex- 5- ene
- (c) 3-(1-ethyl propyl) hex-1-ene
- (d) 4- ethyl -3-propylhex -1- ene

# <u>Q75.</u>

Refer fig. 5.16. What is the product obtained in the following reaction?



## Q76.

The complexes  $[Co(NH_3)_6][Cr(CN)_6]$  and  $[Cr(NH_3)_6][Co(CN)_6]$  are the examples of which tape of isomerism?

(a) Ionisation isomerism

(b) Co- ordination isomerism

(c) Geometrical isomerism

(d) Linkage isomerism

#### **Q77.**

Which one of the following is a nucleophilic substitution reaction?

RCHO + R'MgX 
$$\rightarrow$$
 R—CH—R'

(a)

OH

CH<sub>3</sub>

$$\uparrow$$
)CH<sub>3</sub>—CH<sub>2</sub>—CH—CH<sub>2</sub>Br+NH<sub>3</sub>  $\rightarrow$ 
CH<sub>3</sub>

$$\uparrow$$
CH<sub>3</sub>—CH<sub>2</sub>—CH—CH<sub>2</sub>NH<sub>2</sub>

(c)

$$CH_3-CH=CH_2+H_2O\xrightarrow{H+}$$

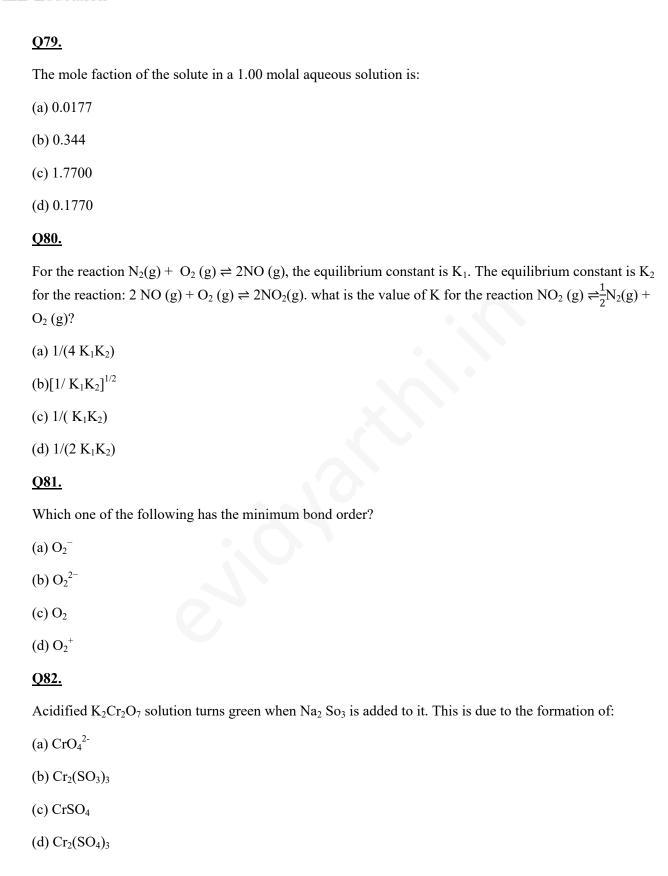
$$CH_3-CH-CH_3$$

$$OH$$

#### <u>Q78.</u>

Which one of the following is most reactive towards an electrophilic reagent?







## **Q83.**

The active ingredient in bleaching powder is as follows (it performs the bleaching reaction):

- (a) Ca(OCl)<sub>2</sub>
- (b) CaO<sub>2</sub>Cl
- (c) CaCl<sub>2</sub>
- (d) CaOCl<sub>2</sub>

## **Q84.**

Which one of the following is not a fat- solute vitamin?

(a) Vitamin B complex

(b) Vitamin D

(c) Vitamin E

(d) Vitamin A

### <u>Q85.</u>

Which ones of the following facts about denaturation are true?

#### **Facts for Consideration**

- (A) Denaturation of proteins causes loss of secondary and tertiary structures of the protein.
- (B) Denaturation leads to the conversion of double strand of DNA into single strand.
- (C) Denaturation affects primary structure which gets distrooyed.
- (a) (B) and (C)

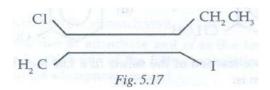
(b) (A) and (C)

(c) (A) and (B)

(d) (A), (B) And (C)

## **Q86.**

The IUPAC name of the compound shown by Fig. 5.17.is



- (a) trans-2-chlorio 3-iodo-2 –pentene
- (b) cis -3 iodo- 4- chloro -3 pentene
- (c) trans 3 –iodo-4- chlro -3 –pentene
- (d) cis -2 chloro -3 –iodo -2- pentene



# <u>Q87.</u>

Match the compounds given in Column A with those in Column B and select the appropriate option by using the code given below the columns:

	Column A	Column A
A.	Benzaldehyde	1. Phenolphthalein
В.	Phthalic anhydride	2.Benzoin condensation
C.	Phenyl benzoate	3. Oil of wintergreen
D.	Methyl Salicylate	4. Fries rearrangement

	A	В	С	D
(a)	4	1	3	2
(b)	4	2	3	1
(c)	2	3	4	1
(d)	2	1	3	4

# **Q88.**

Which one of the following compounds is most basic?

$$O_2N$$
  $NH_2$ 

(a)

(b)

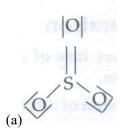
(c)

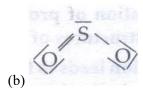
$$NH_2$$



## **Q89.**

Which one of the following structures is the most preferred one and hence carries the lowest amount of energy for SO<sub>3</sub>?





## **Q90.**

Match Column A with Column B for the composition substances and select the correct combination answer from among the option given below the columns:

Column A: Substances	Column B: Composition
A. Plaster of paris	1. CaSo <sub>4</sub> 2H <sub>2</sub> O
B.Epsomite	2. $CaSo_{4}\frac{1}{4}H_{2}O$
C. Kieserite	3.MgSo <sub>4</sub> 7 H <sub>2</sub> O
D. Gypsum	4.MgSO <sub>4</sub> H <sub>2</sub> O
	5.CaSO <sub>4</sub>

(a) A-1, B-2, C-5, D-4

(b) A-2, B-3, C-4, D-1

(c) A-4, B-5, C-3, D-2

(d) A-2, B-4, C-3, D-5



# Part C: CLASS XII

## **BOTANY**

<u>Q91.</u>
Which part would be most suitable for raising virus free plants for micro- propagation?
(a) Bark
(b) vascular tissue
(c) Meristem
(d) Node
<u>Q92.</u>
Edible pollens are produced by:
(a) Magnolia
(b) Rosa
(c) Clematis
(d) All of these
<u>Q93.</u>
Siphonogany is a genre of:
(a) fertilization of male and female gametes
(b) respiration of leaves
(c)sugar formation during photosynthesis
(d) release of pollen unto the air
<u>Q94.</u>
Both autogamy and geitonogamy are prevented in:
(a) papaya
(b) cucumber
(c) castor
(d) maize



# Q95.

<u>V73.</u>
Which one of the following is not a gaseous biogeochemical cycle in an ecosysytem?
(a) Sulphur cycle
(b) Phosphours cycle
(c) Nitrogen cycle
(d) Carbon cycle
<u>Q96.</u>
An organic substance that can withstand environmental extremes and cannot be degraded by any enzyme is:
(a) Cuticle
(b) Sporopollenin
(c) Lignin
(d) Cellulose
<u>Q97.</u>
The natural exchanges between lithosphere and hydrosphere or atmosphere are being upset by:
(a) deforestation
(b) the rising number of marine animals
(c) combustion of fossil fuels
(d) Both (a) and (c)
<u>Q98.</u>
Identify the possible line A in the following food chain
Green plant – Insect – Frog -A-Eagle
(a) rabbit
(b) wolf
(c) cobra
(d) parrot



#### Q99.

T 1	•	C	.1 C 11 '
Identity the	incorrect statement	trom among	the tollowing
identify the	incorrect statement	mom among	me rono wing.

- (a) the reservoir pool is sedimentary nutrient cycling is hydrosphere
- (b) the biogenetic material in gaseous nutrient cycling is basically gaseous.
- (c) Sedimentary nutrient cycling is a slow process
- (d) Gaseous nutrient cycling is nearly perfect

### Q100.

Monascus puepureus is a yeast used on a commercial basis in the production of:

- (a) ethanol
- (b) streptokinase for removing clots from the blood vessels
- (c) citric acid
- (d) blood cholesterol-lowering statins

#### Q101.

What is a Parasitic Food Chain in the parlance of ecosystems?

- (a) It is a food chain starting with a parasite
- (b) It is a food chain ending with a parasite
- (c) It is a food chain starting with a herbivore
- (d) It is a food chain sans parasites of any kind

#### Q102.

The gynoecoum consists of many free pistils in flowers of:

(a) Aloe

(b) tomato

(c) papaver

(d) michelia

#### Q103.

Which one of the following is not a functional unit of an ecosystem?

(a) Energy flow

(b)Decomposition

(c) Productivity

(d) Stratification



# Q104.

(c) Salvia

Which one of the following has been correctly matched?

(a) Onion	-Bulb
(b)Ginger	-Sucker
(c)Chlamydomonas	-Conidia
(d)Yeast	-Zoospores

<u>Q105.</u>	
Which statement is correct from amo	ong the following?
(a) Litter is mostly dried plant matte	r
(b) Detritus is mostly dried plant ma	itter
(c) Detritus is of three types	
(d) Litter is below the ground	
<u>Q106.</u>	
Which one of the following microbe nutrition?	es forms symbiotic association with plants and helps them in their
(a) Azotobacter	
(b) Aspergillus	
(c) Glomus	
(d) Trichoderma	
<u>Q107.</u>	
Producers are basically at the(carbohydrates).	_ trophic level and see the radiation to produce food
(a) Fourth; Night	(b)Third; Ultraviolet
(c) First; solar	(d) Second; daylight
<u>Q108.</u>	
Even ion absence of pollinating agen	nts,seed setting is assured in:
(a)Commellina	(b) Zostera

(d) fig



# <u>Q109.</u>

Yeast is used in the production of:	
(a) Critic acid and lactic acid	
(b) Lipase and pectinase	
(c) Bread and beer	
(d) Cheese and butter	
<u>Q110.</u>	
A nitrogen-fixing microbe associated with Azoll	la in rice fields is:
(a) Spirulina	
(b) Anabaena	
(c) Frankia	
(d) Tolypoyhrix	
<u>Q111.</u>	
Water containing cavities in vascular bundles are	e found in:
(a) sunflower	
(b) Maize	
(c) cycas	
(d) pinus	
<u>Q112.</u>	
Coconut water and the edible part of coconut are	e equivalent to:
(a) endosperm	(b) endocarp
(c) mesocarp	(d) embryo
<u>Q113.</u>	
Which one of the following pairs has been wron	gly matched?
(a) Ginkgo – Archegonia	(b) Salvinia – Prothallus
(c) Viroids – RNA	(d) Mustard – Synergids



# Q114.

In a suspension culture, the cells are suspended	in:
(a) a gaseous medium	
(b) a powdery medium	
(c) a liquid medium	
(d) any medium as per the convenience of the ti	ssue culture connoisseur
<u>Q115.</u>	
Which one of the following is not a hormone us	sed in plant tissue culture?
(a) Indole -3 –Acetic acid	
(b) ABA	
(c) Spermidine	
(d) Sucrase	
<u>Q116.</u>	
Which one of the following is a cytokinin?	
(a) ABA	
(b) Putrescine	
(c) 6- Benzylaminopurine	
(d) Indole -3- Butyric acid	
<u>Q117.</u>	
An example of a physical mutagen is the follow	ring.
(a) EMS	(b) Sodium azide
(c)Gamma rays	(d) all of the above are physical mutagens
<u>Q118.</u>	
Somaclonal variation is observed in plants during	ng the course of:
(a) pollination	(b) tissue culture
(c) maturation	(d) decay



<u>Q119.</u>		
Which one of the following statements is wrong?		
(a) When pollen is shed at the two-cell stage, double fertilization does not take place		
(b) Vegetative cell is larger than generative cell		
(c) In some plants, pollen grains remain viable for months		
(d) Intine is made up of cellulose and pectin		
<u>Q120.</u>		
Plants with ovaries having only one or a few ovules are generally pollinated by:		
(a) bees	(b) butterflies	
(c) birds	(d) wind	
<u>Q121.</u>		
Sacred grooves are especially useful in:		
(a) Generating environmental awareness	(b) Preventing soil erosion	
(c) year- round flow of water down the rivers	(d) Conserving rare and threatened species	
<u>Q122.</u>		
Tobacco plants resistant to a Nematode have been developed by the introduction of DNA that produces (In host cells):		
(a) both sense and antisense RNA	(b) a particular hormone	
(c) anantifeedant	(d) a toxic protein	
<u>Q123.</u>		
Which statements out of the following ones are true? I. Single cell spirulina can produce large quantities of food rich in protein, minerals, vitamins etc.		
II. Body weight-wise the microorganism Methy times more proteins than the cows per day.	lophilusmethylotrophus may be able to product several	
III. Common button mushrooms are a very rich	source of vitamin-C.	
IV. A rice variety has been developed which is very rich in calcium.		
(a) Statements (III), (IV)	(b) Statements (I), (III), and (IV)	

(d) Statements (I) and (III)

(c) Statements (II), (III), and (IV)



# Q124.

<u>V124.</u>		
Which one of the following combination is inco	orrect?	
(a) Zinc- Vomitting, cramps, renal damage.		
(b) Copper – uremia, coma, hypertension		
(c) Lead – anaemia, convulsions, liver damage		
(d) Cobalt – Minamata ,Itai – itai.		
<u>Q125.</u>		
Agarose is extracted from seaweeds. It is useful	in:	
(a) tissue culture		
(b) PCR		
(c) gel electrophoresis		
(d) spectrophotometry		
<u>Q126.</u>		
He eyes of the potato tuber are		
(a) flower buds		
(b) shoot buds		
(c) axillary buds		
(d) root buds		
<u>Q127.</u>		
Large woody vines are more commonly found in:		
(a) Mangrover	(b) tropical rainforests	
(c) alpine forests	(d) temperate forests	
<u>Q128.</u>		
The CAM helps plants in their		
(a) secondary growth	(b) disease resistance	
(c) reproduction	(d) conserving water	



# Q129.

The function of leghaemoglobin ion the root nodules of legumes is:		
(a) oxygen removal		
(b) nodule differentiation		
(c) expression of nif gene		
(d) inhibition of nitrogenase activity		
<u>Q130.</u>		
The mass of living matter at a trophic level in an area at	any point of the time is known as:	
(a) Detritus		
(b) Humus		
(c) Standing		
(d) Standing crop		
<u>Q131.</u>		
A collection of plants and seeds having diverse alleles of all the genes of a crop is called:		
(a) germplasm		
(b) gene library		
(c) genome		
(d) herbarium		
<u>Q132.</u>		
Which one of the following is not a source of water pollution?		
(a) Industrial waste	(b) Oil spill	
(c) Slaughter house	(d) Rainwater	
<u>Q133.</u>		
Fly ash is being processed for making:		
(a) industrial chemicals	(b) bricks	
(c) pavements	(d) natural manure	



### Q134.

In land plants, the guard cells differ from other epidermal cells in having:

- (a) mitochondria
- (b) endoplasmic recticulum
- (c) chloroplasts
- (d) cytoskeleton

### Q135.

The pollen tube enters the ovule through the micropyle. This mode of entry is called:

- (a) Mesogamy
- (b) Porogamy
- (c) Chalazagamy
- (d) Syngamy

### **PART D: CLASS XII**

# **ZOOLOGY**

## Q136.

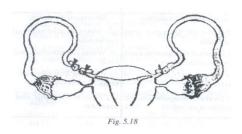
The most abundant prokaryotes helpful to man for making curd from milk and in the production of antibiotics are:

(a) Cyan bacteria

- (b) Archaebacteria
- (c) Chemosynthetic autotrophs
- (d) Hetertrophic bacteria

#### Q137.

What is Fig. 5.18 showing?



(a) Tubectomy

(b) Renal surgery

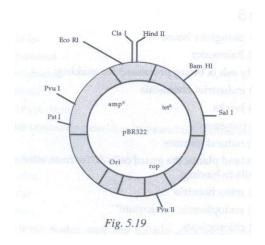
(c) Ovaries

(d) Sperm



# Q138.

Fig.5.19 shows the E.coli vector, PBR identify the recognition sites of restriction endonucleases.



- (a) ori-original restriction enzyme
- (b) rop- reduced osmotic pressure
- (c) Hind III, Eco RI-selectable markers
- (d) amp<sup>R</sup>, tet<sup>R</sup>- antibiotic resistance genes

# Q139

Which one of the following is not part of a transcription unit in DNA?

- (a) The inducer
- (b) A terminator
- (c) A promoter
- (d) A structural

# **Q140**

A single stand of nucleic acid tagged with a radioactive molecule is called:

- (a) vector
- (b) Selection marker
- (c) Plasmid
- (d) Probe



### Q141.

Refer table 5.1. Which one of the following options gives one correct example each of convergent evolution and divergent evolution?

Table 5-1

Convergent Evolution	Divergent Evolution
(a) Eyes of Octopus and mammals	(a) Bones of forelimbs of vertebrates
(b) Thorns of Bougainvillia and tendrils of cucurbita	(b) Wings of butterflies and birds
(c) Bones of forelimbs of vertebrates	(c) Wings of butterfly and birds
(d) thorns of Bougainvillia and tendrils of cucurbita	(d) Eyes of Octopus and mammals

## Q142.

The Ribosomal RNA is activity synthesized in:

- (a) lysosomes
- (b) nucleolus
- (c) nucleoplasm
- (d) ribosomes

### Q143.

During the process of gamete formation, The enzyme recombinase participates during the:

- (a) Metaphase I
- (b) Anaphase -II
- (c) Prophase -I
- (d) Prophase -II

#### Q144.

Which one of the following is not a property of cancerous cells (the remaining three certainly are?)

- (a) They complete with normal cells for vital nutrients
- (b) They do not remain confined in the area of formation.
- (c) They divide in an uncontrolled manner
- (d) They show contact inhibition



### Q145.

In a normal pregnant woman, the amount of total gonadotropin activity was assessed. The result expected was high:

- (a)level of circulating FSH and LH in the uterus for stimulating implanting of the embryo
- (b) level of circulating HCG for simulating endometrial thickening.
- (c) levels of FSH and LH in uterus for simulating endometrial thickening
- (d)level of circulating HCG for simulating oestrogen and progesterone synthesis

## Q146.

Identify the correct statement:

- (a) In linked genes, the dihybrid ratio is 3:1
- (b) In unlinked genes, the dihybrid ratio is 9:3:3:1
- (c) Unlinked genes undergo segregation
- (d) In dihybirds, linked genes show a test cross ratio1:3

## Q147.

Refer Table 5-II. In which one of the following options, are the two examples correctly matched with with their particular type of immunity?

Table 5-II

Examples	Type of Immunity
(a) Polymorphounclear leukocytes and monocytes	(i) Cellular barriers
(b) Anti- tetanus and anti-snake bite injections	(ii) Active immunity
(c) Saliva in mouth and tears in eyes	(iii)Physical barriers
(d) Mucus coating of epithelium lining the	(iv) Physiological barriers
urinogenital tract and HCl in stomach	

# Q148.

The Leydig cells found in the human body are the secretery source of:

- (a) progesterone
- (b) intestinal mucus
- (c) glucagon
- (d) androgens



### Q149.

Which one is a true statement regarding DNA polymerase used in PCR?

- (a) It is used to ligate introduced DNA in recent cells
- (b) It serves as a selectable marker
- (c) It is isolated from a virus
- (d) It remains active at high temperature

## Q150.

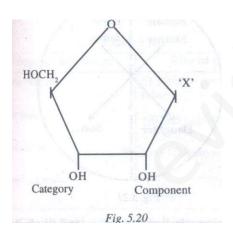
In Fig.5.20, we can observe the categories of small molecular weight organic compounds in living tissues. Identify the category shown and the one blank component X in it.

(a) Cholesterol Guanin

(b) Amino acid NH<sub>2</sub>

(c) Nucleotide Adenine

(d) Nucleoside Uracil



### Q151.

If one stand of DNA has the nitrogenous base sequence as ATCTG, what would be the complementary RNA strand sequence?

- (a) TTAGU
- (b) UAGAC
- (c) AACTG
- (d) ATCGU



### Q152.

The following are the features of sex-linked inheritance:

- (a) A majority of sex-linked traits is recessive
- (b) Females act as carreiers of sex-linked disorders
- (c) Mother passes the alleles of a sex-linked trait to her sons and daughters
- (d) All of these

#### Q153.

Which one of the following is not a stage of crossing over mechanism?

- (a) Synapsis
- (b) Crossing Over
- (c) Tetrad stage
- (d) Double Crossing Over

### Q154.

Gene regulation has the following advantages:

- (a) It enables the cell to adjust metabolism as per the needs of environmental alterations
- (b) It ensures smooth completeion of chain reactions
- (c) It synthesizes enzymes only when it is needed
- (d) All of these

#### Q155.

F<sub>2</sub> generation in a Mendelian cross showed that both genotypic and phenotypic ratios are same as 1:2:1. It represents a case of

- (a) co-dominance
- (b) di-hybrid cross
- (c) monohybrid cross
- (d)monohybrid cross with incomplete dominance



### Q156.

The goals of the Human Genome Project are as follows:

- (a) To determine the sequence and number of all base pairs in the human genome
- (b) To identify all genomes ion the human genome
- (c) To identify the genes that cause genetic disorders
- (d) All of these.

#### Q157.

The number of gens that are causing health hazards among humans are nearly:

- (a) 30,000
- (b) 3,000
- (c) 1,200
- (d) 300

# Q158.

Which one of the following is an example of carrying out biological control of pests/diseases using microbes?

- (a) Trichoderma sp. Against certain white plant pathogens
- (b) Nucleopolyhedrovirus against white rust in brassica
- (c) BT cotton to increases cotton yield
- (d) Lady bird beetle against aphids in mustard

#### Q159.

What is the basic operation of DNA fingerprinting?

- (a) Identifying of killer genes
- (b) Identification of healthy genes
- (c) Identification of nucleotide sequences
- (d) Suppression of genomic DNA sequence



# Q160.

Nearly 90 percent of protoplasm is made from the following:			
(a) C, H, O, N			
b) H,O, Ca, Fe			
(c) O, Fe, Mn, Zn			
(d) Fe, O, H, Ca			
<u>Q161.</u>			
Read the following four statements carefully.			
I. In transcription, adenosine pairs with urecil			
II. Regulation of lac operon by repressor is referred to as positive Regulations			
III. The human genome has approximately 50,000 genes			
IV. Haemophilia is a sex-linked recessive disease			
How many of the aforementioned statements are	e true?		
(a) Two			
(b) Three			
(c) Four			
(d) One			
<u>Q162.</u>			
Human hormones are produced by:			
(a) hypothalamus	(b) ductless glands		
(c) thyroid only	(d) pancreas only		
<u>Q163.</u>			
The rate of formation of new organic matter by rabbit in a grassland, is called:			
(a) Net productivity	(b) Secondary Productivity		
(c) Net Primary Productivity	(d) Gross Primary productivity		



### Q164.

Biolistics (popularly known as Gene Gun) is apt for:

- (a) disarming pathogen vectors
- (b) transformation of plant cells
- (c) Constructing recombinant DNA by joining with vectors
- (d) DNA fingerprinting

#### Q165.

In genetic engineering antibiotics are used:

- (a) as selectable markers
- (b) to select healthy vectors
- (c) as sequences form where replication starts
- (d) for keeping cultures free of infection

### Q166.

What is concept of Neo Lamarckism?

- (a) Environment can change the heredity of an organism
- (b) At least some of the variations acquired by an individual can be passed on to offspring
- (c) Internal vital force does not play any role in evolution
- (d) All of these

#### Q167.

Which one of the following is not a tenet of the Mutation Theory?

- (a) the accumulation of variations produces a new species. Sometimes, a single species is produced from a single mutation
- (b) Mutations become operational all of a sudden
- (c) No mutation is inheritable
- (d) Evolution is a jerky and discontinues procedure



# Q168.

What is hybrid sterility?

- (a) Hybrids may be sterile
- (b) Hybrids may be virile under some conditions
- (c) The offspring of hybrids may not produce offspring further
- (d) None of these

### Q169.

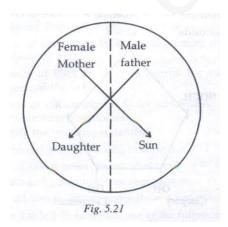
What forms the basis of DNA finger printing?

- (a) The relative proportiona of purines and pyrimidines in
- (b) The relative difference in the DNA occurrence in blood, skin and saliva
- (c) The relative amount of DNA in the ridges and grooves of the fingerprints
- (d) Satellite DNA occurring as highly repeated short DNA segments

### Q170.

Fig.5.21 is the inheritance pattern a certain type of trains in human beings. Which one of the following conditions is an example of this pattern?

- (a) Phenylketonuria
- (b) Sickle cell anaemia
- (c) Haemophilia
- (d) Thalassemia





### Q171.

Stabilising selection favours and eliminates

- (a) Averge-sized individuals; small-sized individuals
- (b) Small-sized individuals; Average-sized individuals
- (c) Small-sized individuals; some individuals
- (d) None of these

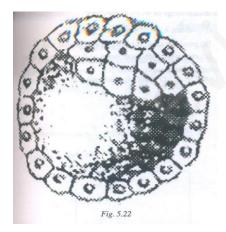
# Q172.

Transient polymorphism occurs when there are:

- (a) difference morphs in a population
- (b) same morphs in a population
- (c) different morphs in a population undergoing a strong selection pressure
- (d) None of these

### Q173.

Identify the human developmental stage shown in Fig8.24 and the related right place of its occurrence in a normal pregnant woman in Table 5-III given below Fig. 5.2. Select the right option for the picture and its correct tabular description.



**TABLE 5-III** 

Developmental Stage	Site of Occurrence	
(a) Late morula	(i) Middle part of fallopian tube	
(b) Blastula	(ii) End part of fallopian tube	
(c) Blastocyst	(iii) Uterine well	
(d) 8-cell morula	(iv) Starting point of fallopian	



## Q174.

In table 5-V, identify the likely organisms (I), (II) (III) and (IV) in the food web shown in Fig.5.23. Table 5-IV has only right option corresponding to Fig.5.23.

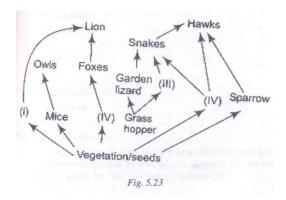


Table 5-V

	<b>(I)</b>	(II)	(III)	(IV)
(a)	Deer	Rabbit	Frog	Rat
(b)	Dog	Squirrel	Bat	Deer
(c)	Rat	Dog	Tortoise	Crow
(d)	squirrel	Cat	rat	Pigeon

# Q175.

Which of the following is a correct match?

(a) Cortisone: Rhumatoid arthritis

(b) Prednisolone: Anti-inflammatory drug

(c) Oestrogen: Antihistamine

(d) Salmeterol and Fluticasone propionate: Asthma attack

### Q176.

Restriction enzymes are of three types. They are:

- (a) Nucleases, endonucleases, restriction nucleases
- (b)exonucleases, nucleases, beta nucleases
- (c) alpha nucleases, endonucleases, restriction nucleases
- (d) exonucleases, endonucleases, restriction nucleases



### Q177.

The main source of Vitamin  $B_{12}$  is the:

- (a) prostrate gland
- (b) kidney
- (c) stomach wall
- (d) liver

### Q178.

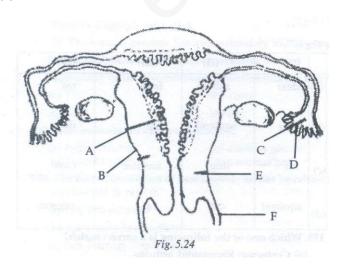
Which one of the following is not a bio-weapon?

- (a) B. anthracis
- (b) Shigella spp.
- (c) V.cholera
- (d) Rhizobium

### Q179.

Fig.5.24 is a sectional view of the female reproductive system of humans. Which one set made from the six parts (designated from A to Fin Fig. 5.24) has been correctly identified?

- (a) C- Infundibulum, D- Fimbriae, E-Cervix
- (b) D-Oviducal funnel, E-Uterus, F-Cervix
- (c) A-Perimetrium, B-Myometrium, C-Fallopain tube
- (d) B-Endometrium, C-Infundibulum, D-Fimbriae





# Q180.

A disadvantage of SCPs is that they:

- (a) produce a variety of bakery food
- (b) produce toxic substances and nucleic acid
- (c) mix well with food items and contaminate them
- (d) All of these



### **ANSWERS WITH EXPLANATIONS**

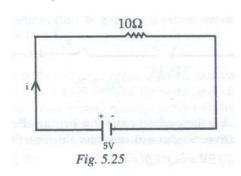
# **PART A: PHYSICS**

### **Sol.1 (d)**

Look at the modified circuit shown in Fig.5.5. Diode  $D_1$  is forward biased and diode  $D_2$  is reverse biased. Current will flow only through diode  $D_1$ . Thus, we have (as per Ohm's law):

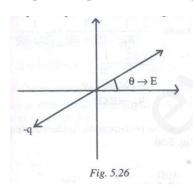
Current = 
$$I = \frac{V}{R}$$
 So, Battery current =  $\frac{5}{10}$  = 0.5 A

# The right choice is (d).



### Sol. 2 (a)

Torque =  $\tau = pEsin\theta$ .look at Fig. 5.26.



P.E of dipole

$$V = -\int \tau \, d\theta$$

$$= \int_{\frac{\pi}{2}}^{0} pE sin\theta d\theta = -pE[cos\theta - 0]$$

$$-pE cos\theta$$

The right choice is (a).



#### **Sol.3 (c)**

According to Coulomb's law,the electric force between two charges q1 and q2 at a distance r from each other is given by the following relationship:

$$Fe = \frac{q1}{4\pi\varepsilon_0 r^2} \qquad \dots (i)$$

Let two parallel current elements  $dI_1$  and  $dI_2$  carry parallel currents  $I_1$  and  $I_2$ , respectively. They are at a distance of r from each other. Magnitude of magnetic forces between  $dI_1$  and  $dI_{2=} F_m \Rightarrow Fm \frac{\mu_0}{4\pi} \times I_1 I_2 \times \frac{dI_1dI_2}{r^2}$  Let  $q_1$  be the total charge on element  $dI_1$  and let  $v_1$  be the drift velocity of free electrons. Similarly, let  $q_2$  be the total charge on element  $dI_2$  and let  $v_2$  be the drift velocity of free electrons. Thus, we have:

$$\Rightarrow I_1 dI_1 = q1v1 \text{ And } I_2 dI_2 = q2v2 \Rightarrow Fm = \frac{\mu_0}{4\pi} \times I_1 I_2 \times \frac{dI_1 dI_2}{r^2} = \frac{\mu_0 \times (q1q2) \times (v1v2)}{4\pi r^2} \qquad .....(ii)$$

Dividing eq. (ii) by Eqn.(i), we get: 
$$\frac{Fm}{F\rho} = v1v2(\mu_0 \varepsilon_0)$$
 .....(iii)

 $\mu_0 \varepsilon_0$  must be the dimensions of (Velocity)<sup>-2</sup>

$$\frac{1}{\sqrt{\mu_0 \varepsilon_0}}$$
 =C, Where, c = velocity of light = 3 × 10 <sup>+8</sup> m -s<sup>-1</sup>

So, 
$$\Rightarrow \mu_0 \varepsilon_0 = c^{-2}$$

$$\frac{1}{c^2} = \frac{1}{(3 \times 10^8)^2}$$

$$\frac{1}{9} \times 10^{-16} \text{m} - \text{sec}^{-2}$$

The electron drift velocities, i.e., v1 and v2 are nearly 10<sup>-5</sup> m-sec<sup>-1</sup> each.

Hence, Fm<<Fe This means that magnetic forces are very small in comparison with electrostatic forces.

Rewrite Eqn (iii):

$$\frac{Fm}{Fe} = (v_1 V_2) \times (\mu_0 \varepsilon_0) \qquad \dots \qquad (iii)$$

When drift velocities are comparable with the speed of light, the magnetic and electric forces are comparable. That is because the product  $(V_1 \ V_2)$  is nearly equal to  $10^{-5} \times 10^{-5} = 10^{-10} \ \text{m-s}^{-1}$ . The value of

$$\mu_0 \varepsilon_0 = c^{-2} = \frac{1}{9} = 10^{-16}$$

Both value are comparable.

Hence, F<sub>m</sub> and F<sub>e</sub> are comparable when drift velocities approach the speed of light.

The right choice is (c).



### **Sol.4 (d)**

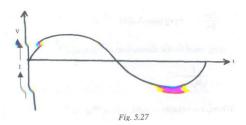
The angle of dip is the angle which the axis of a magnetic needle makes with the horizontal at a place.

At the magnetic pole, its value is  $90^{\circ}$  at the magnetic equator, its value is  $0^{\circ}$ .

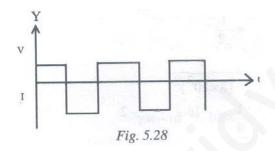
### The right choice is (d)

### Sol. 5 (b)

a pure sine-wave inverter produces AC sinusoidal output by taking DC input. Look at Fig.5.27.



A square-wave inverter produces a square wave output by taking input. Look at Fig.5.28.



It is true that DC energy converted into AC in case of square-wave inverter is also less as compared to the DC energy converted into AC in the case of a sinusoidal inverter. However, the more peculiar nuisance was the noise factor in square-wave generation.

Households were bothered more by the noise of square- wave output than by the poor conversion efficiency.

So, the pure sine-wave inverter replaced the square –wave inverter.

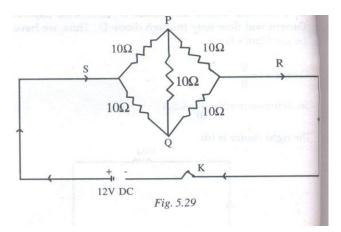
We may be tempted to pick choice (c) but here choice (b) is more accurate.

### The right choice is (b)



# Sol.6 (d)

Let us redraw the circuit. Look at Fig. 5.29.



It is a balanced wheat stone bridge. Its arm PQ is not effective. So, current can flow through PQ.

Net resis tan ce= 
$$\frac{1}{R_n} = \frac{1}{(10+10)} + \frac{1}{(10+10)}$$

$$=\frac{1}{20}+\frac{1}{20}$$

$$= 220 = 1/10$$

$$\Rightarrow R_n = 10\Omega$$

The circuit can be re-drawn for understanding purpose. Look at Fig. 5.30.

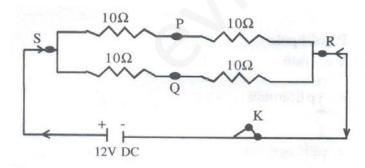


Fig 5.30

According to Ohm's law, we have V = IR So, I = current = V/R

$$=\frac{12}{10}$$
 =1.2 A

The right choice is (d).



### Sol.7 (a)

The truth table of OR Gate has been shown in Table. Its Boolean expression is as follows:

$$A + B = Y$$

Table 5- V: Truth Table of OR Gate

A	В	C
0	0	0
0	1	1
1	0	1
1	1	1

Hence, the output of the OR gate is 1 if either input is 1 or both inputs are 1 each.

### The right choice is (a)

#### **Sol.8 (b)**

A glass slab is a medium other than air and vacuum. So, green and red waves would be refracted through different angles. They would emerge from two different points on the other (opposite) force of the glass slab. Then, they would move in two different parallel directions.

### The right choice is (b).

### Sol.9 (d)

Full-scale deflection current

$$=ig=\frac{25}{G}mV$$

$$\Rightarrow ig \times G = 25mV$$

Here, G is the resistance of the meter.

The value of the shunt needed to convert it into an ammeter of range 25 A is:

$$S = \frac{i_g G}{i - i_g}$$

$$\Rightarrow$$
 S  $\frac{25mV}{25A}$ 

$$=\frac{25^-10^{-3}V}{25A}$$

$$=10^{-3}$$

$$=\frac{1}{1000}=0.001~\Omega$$
 Thus, the right option is (d).



### Sol.10 (d)

(i) for mixture Cosmo-1

$$\underbrace{40g \xrightarrow{20S} T_{1/2}}_{} 20g \xrightarrow{20S} T_{1/2}_{1/2} 10g$$

(ii)For mixture Cosmo -2

$$160g \xrightarrow{10S} \xrightarrow{T_{1/2}} 80g \xrightarrow{10S} \xrightarrow{T_{1/2}} 40g$$

$$\xrightarrow{10S \qquad T_{1/2}} 20g \xrightarrow{10S \qquad T_{1/2}} 10g$$

Thus, after 40 seconds, the quantities of Cosmo-1 and Cosmo-2 would remain the same. That is because the quantity of Cosmo -2 Cosmo-1 in the beginning of the decay reaction.

### The right choice is (d).

### Sol.11 (a)

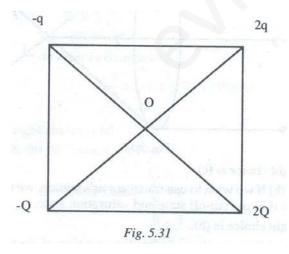
Look at Fig. 5.31. The potential at the centre of the square is zero. Thus, we have:

$$V_1 + V_2 + V_3 + V_4 = 0$$

$$-\frac{kQ}{r} - \frac{kq}{r} + \frac{k2Q}{r} + \frac{k2q}{r} = 0 \setminus$$

$$-Q-q+2q+2Q=0$$

$$Q = -q$$



The right choice is (a).



# Sol.12 (c)

Frequency 
$$v = \frac{eB}{2\pi m}$$

$$KE = \frac{1}{2}mv^2$$
 and radius  $= R = \frac{mv}{eB}$ 

Here, velocity = 
$$v = \frac{\pi R}{T/2} = \frac{2\pi R}{T} = 2\pi v$$

$$\therefore \text{ Radius } = \text{R} = \frac{m(2\pi Rv)}{e}$$

Kinetic Energy = 
$$\frac{1}{2}m(2\pi Rv)^2 = 2m\pi^2v^2R^2$$

# The right choice is (c).

### Sol. 13 (a)

Look at Fig. 5.32.

If the angle is too small, we have

$$\mu = \frac{\sin i}{\sin r}$$

$$\mu = \frac{\sin i}{\sin A}$$

$$\mu = \frac{i}{A}$$

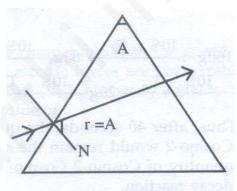


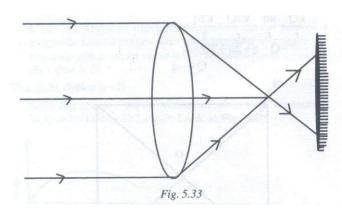
Fig. 5.32

# The right choice is (a)

# Sol. 14 (c)

Refer Fig 5.33.

$$d = 2f_1 + f_2$$



The right choice is (c).



### Sol. 15 (b)

If we wish to use transistor as a switch, we ought to use it in the cut- off state and saturation state.

The right choice is (b).

### Sol. 16 (c)

Energy released from the emission of electron = E

$$E=(-3.4)-(-13.6)=10.2 \text{ eV}=10.2 \text{ eV}$$

From photo electric equation. Work function  $\Phi = E - eV = hv$ 

$$v = \frac{E - eV}{h} = \frac{(10.2 - 3.57)_e}{6.67 \times 10^{-34}}$$

$$v = \frac{6.63 \times 1.6 \times 10^{-19}}{6.67 \times 10^{-34}} = 1.6 \times 10^{15}$$

The right choice is (c).

#### Sol.17 (b)

Charge enclosed = q/8

Therefore, flux 
$$\Phi = \frac{qenclosed}{\varepsilon_0}$$

$$\Phi = \frac{q}{8\varepsilon_0}$$

The right choice is (b).

#### **Sol.18 (d)**

Let the focal length of the objective be =  $f_1$  Let the focal length of the eye piece be =  $f_2$ 

We have been given that:

Also, 
$$f_1 + f_2 = 20$$

So, 
$$f_1 = 9f_2$$

So, 
$$9f_2 + f_2 = 20$$

So, 
$$f_2 = 2$$
 cm

$$f_1 = 9f_2$$

so, 
$$f_1 = 9 \times 2 = 18$$
 cm.

The right option is (d).



# Sol.19 (d)

Here, 
$$R_1 + R_2 = 12\Omega$$

And 
$$\frac{R_1 \times R_2}{R_1 + R_2} = \frac{8}{3} \Omega$$

$$\Rightarrow R_1R_2 = 32\Omega$$

We get 
$$R_1 = 8$$
 and  $R_2 = 4$ 

Again, 
$$R_1 = \frac{121_1}{1_1 + 1_2}$$

And 
$$R_2 = \frac{121_2}{1_1 + 1_2}$$

## The right choice is (d).

### Sol. 20 (c)

Energy density for a parallel plate capacitor  $=\frac{1}{2}\varepsilon_0 E^2$  and volume = Ad

Total Energy = Energy Density  $\times$  Volume

$$= \left(\frac{1}{2}\varepsilon_0 E^2\right) \times (Ad)$$

$$=\frac{1}{2}\varepsilon_0 E^2 A d$$

# Here, the right option is (a).

# Sol.21 (b)

Here, 
$$R_1 = R = ?$$

$$R_2 = 5\Omega, V = 10V$$

Hence 
$$P = \frac{V^2}{R_1} + \frac{V^2}{R_2}$$

$$\frac{10^2}{R} = 30 - \frac{10^2}{5}$$

$$\frac{100}{R} = 30 - 20$$

$$R = 10\Omega$$

### Thus, the right choice is (b).



### **Sol.22**

Here, 
$$E = 1(R + r) \Rightarrow E = IR + Ir$$

And 
$$E = V + Ir$$
  $E = V + \frac{Er}{R+r}V = E - \frac{E}{R+r} \times r$   $y = c - \frac{1}{x}$ 

The curve in option (c) represents this equations

Thus, the right choice is (c).

#### Sol.23 (b)

In this case, work Done

$$W = MB(\cos \theta_1 - \cos \theta_2) = MB(\cos 0^0 - \cos 60^0) = MB\left(1 - \frac{1}{2}\right) = \frac{MB}{2}$$

$$MB = 2\sqrt{3J}$$
 (: given W =  $\sqrt{3J}$ )

$$\tau = MB\sin 60^0 = \left(2\sqrt{3}\right) \left(\frac{\sqrt{3}}{2}\right) J = 3J$$

The right option is (b).

#### Sol.24 (d)

Given equations are

$$i = \frac{1}{\sqrt{2}}\sin(100\pi t)$$

And 
$$e = \frac{1}{\sqrt{2}\sin\left(100\pi t + \frac{\pi}{3}\right)}$$

$$\therefore i_0 = \frac{1}{\sqrt{2}} \text{and} V_0 = \frac{1}{\sqrt{2}}$$

Average power is given by:

$$P_{av} = V_{rms} \times i_{rms} \cos \Phi$$

$$= \frac{1}{2} \times \frac{1}{2} \times \cos 60^{0}$$

$$: [i_{rms} = \frac{i_0}{\sqrt{2}} and V_{rms} = \frac{V_0}{\sqrt{2}}]$$

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{8} W$$

The right option is (d).



### Sol.25 (c)

$$I = \left[ \frac{1}{R} \frac{d\Phi}{dt} \right]$$

$$|d\Phi| = |IRdt|$$

 $d\Phi = (area of triangle) \times R$ 

$$= \left(\frac{1}{2} \times 4 \times 0.1\right) \times 10 = 2Weber$$

The right choice is (c).

# Sol.26 (b)

We have: E=cB

So required ratio  $\frac{E}{B} = c$ 

$$\frac{E}{B} = \frac{1}{c}$$

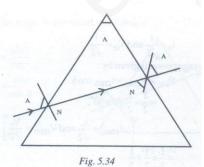
Therefore, the ratio of amptitude of magnetic field to the amplitude of electric field for an electromagnetic wave propagating in vacuum is equal to reciprocal of speed of light.

Thus, the right choice is (b).

## Sol. 27 (b)

Refer Fig. 5.34

$$\mu = \frac{\sin(\frac{A + \delta m}{2})}{\sin A/2}$$



$$= \frac{\sin{(\frac{A+A}{2})}}{\sin{A/2}}$$

The value of A can be 90 degrees maximum; its minimum value is 0 degrees. The value would vary between  $\mu_{min} = \sqrt{2}$  and  $\mu_{max} = 2$ .

The right option is (b).



# Sol.28 (a)

We have

$$\frac{1}{2}mv^2max = E - \Phi$$

Case (i) here case (i)

$$\frac{1}{2}mv_{1max}^2 = (1 - 0.5)eV$$

$$\frac{1}{2}mv_{2_{\rm m}}^2 = (2.5 - 0.5)eV$$

Case (ii)

Hence, 
$$\frac{v_{1max}^2}{v_2^2 max} = \frac{1}{4}$$

$$\frac{v_{1max}}{v_{2max}} = \frac{1}{2}$$

The right option is (a).

### Sol.29 (b)

Active fraction at instant t<sub>2</sub>

$$\frac{1}{2^{t^2}/T1/2} = \frac{1}{3}$$

Active fraction at instant t<sub>1</sub>

$$\frac{1}{2^{t1}/T1/2} = \frac{2}{3}$$

$$\frac{2^{t_2}/t_1}{2^{t_2}/t_1} \frac{/2}{/2} = 2$$

$$\frac{t_2}{2_{1/2}^T = 2^1}$$

$$\Rightarrow^{t_2-t_1}_{\frac{T_1}{2}}=1$$

$$\Rightarrow$$
  $t_2 - t_1 = T_{1/2} = 50 days$ 

The right option is (b).



### Sol.30 (b)

$$V_g = \beta \, \frac{R_L}{R_i}$$

$$V_g = \frac{\Delta I_c}{\Delta I_B} \times \frac{R_L}{R_i}$$

$$=\frac{2\times10^{-3}}{40+10^{-6}}\times\frac{4\times10^3}{100}$$

$$=2000$$

The right choice is (a).

# Sol.31 (b)

Refer Table again. Now, refer to given ahead.

$$Y = (A + B) - C$$

Table-5-VI

A	В	C	Y=(A+B).C
0	0	0	0
1	0	0	0
0	1	0	0
0	1	0	0
0	1	1	1
1	0	1	1
1	1	1	1

C shoud be 1. Either A or B or A and B taken together must be 1. The right combination is A=1, B=0, C=1.

Thus, the right choice is (b).

### Sol.32(c)

The gates shown are:

- (i)OR
- (ii) AND gate
- (iii) NOT gate and
- (iv) NAND gate

The right option is (c).



### Sol.33 (a)

Momentum of a photon

$$p = \frac{hv}{c}$$

Hence, Recoil energy

$$E = \frac{p^2}{2M}$$

$$\therefore E = \frac{\left(\frac{hv}{c}\right)^2}{2M}$$

Or 
$$E = \frac{h^2 v^2}{2Mc^2}$$

The right option is (a).

### Sol.34 (a)

We know that the half-life of Cosomo-1 is 50 years and it decays into Cosmo-2

$$\frac{N}{N_0} = \left(\frac{1}{2}\right)^{t/t_1/2}$$

$$\frac{1}{16} = \left(\frac{1}{2}\right)^{t/50}$$

$$t = 4 \times 50$$

t = 200 years

The right choice is (a)

### sol. 35 (c)

The energy stored in the condenser

$$U = \frac{1}{2}CV^2$$

$$U = \frac{1}{2} \left( \frac{A \varepsilon_0}{d} \right) (Ed)^2$$

$$\left(\because C = \frac{A\varepsilon_0}{d} \text{ and } V = Ed\right)$$

$$U = \frac{1}{2}\varepsilon_0 E^2 A d$$

The right choice is(c).



# Sol.36.(c)

Electric power, p=i<sup>2R</sup>

$$\therefore$$
 Current,  $I = \sqrt{\frac{P}{R}}$ 

For a resis tan ce of  $9\Omega$  we have

$$I_1 = \sqrt{\frac{36}{6}} = \sqrt{4} = 2A$$

$$I_2 = \frac{I_1 \times R}{6} = \frac{2 \times 9}{6} 3A$$

$$I - I_1 + I_2 = 2 + 3 = 5A$$

$$V_2 = IR_2 = 5 \times 2 = 10V$$

The right choice is (b)

# Sol.37 (a)

Current I= 
$$\frac{E}{R+r}$$

Case (i) 
$$2 = \frac{E}{2+r}$$

Case (ii) 
$$0.5 = \frac{E}{9+r}$$
.... (ii)

From eqn. (i) and Eqn. (ii), we have

$$\frac{2}{0.5} = \frac{9+r}{2+r}$$

$$4 = \frac{9+r}{2+r}$$

$$3r = 1$$

$$r = \frac{1}{3}\Omega$$

The right choice is (a).

### Sol. 38 (b)

According to leng's law, the direction of induced emf is such that it opposes the cause that produces it. This is the basic tenet of electromagnetic induction. The right choice is (b).



### Sol.40(c)

By the concept of threshold minimum frequency needed for photoelectric emission.

$$\frac{1}{2}mv^2 = h(v - v_0)$$

$$v \leq V_0$$

### The right choice is (c)

# Sol.41 (c)

Given,  $e = 200\sqrt{2} \sin 100t$ 

$$C = 1\mu F$$

$$E_{rmf} = 200V$$

$$X_c = \frac{1}{\omega C} = \frac{1}{1 \times 10^{-6} \times 100} = 10^4 \Omega$$

$$i_{rms} = \frac{E_{rms}}{X_c}$$

$$i_{rms} = \frac{200}{X_c}$$

$$i_{rms} = \frac{200}{10^4} = 2 \times 10^{-2} A = 20 mA$$

# The right choice is (c).

# Sol. 42 (b)

In general we have assumed that  $\mu=1.5$ 

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

$$\frac{1}{20} = \frac{1}{v} + \frac{1}{30}$$

$$\frac{1}{v} = \frac{1}{20} - \frac{1}{30} = \frac{10}{600} v = 60cm$$

$$\frac{h_i}{h_0} = 2$$

$$h_i = 2 \times |h_0|$$
  $h_i = 4$  cm The right choice is (b).



## Sol.43 (d)

We know that:

$$e = -L\frac{dt}{dt}$$

During 0 to 
$$\frac{T}{4}$$
,  $\frac{di}{dt} = constan t$ 

So, e= negative

For 
$$\frac{T}{4} to \frac{T}{2}, \frac{di}{dt} = 0$$

For 
$$\frac{T}{2}$$
 to  $\frac{3T}{4}$ ,  $\frac{di}{dt} = constan t$ 

$$e = positive$$

the curve in option (d) apply shows these conditions.

The right choice is (d).

### Sol. 44(a)

$$\tan \Phi = \frac{X_L}{RR} = \underline{L}\underline{\omega}$$

$$\tan \Phi = \frac{3\Omega}{3\Omega}$$

$$\tan \Phi = 1$$

$$\Phi = \tan^{-1}(1)$$

$$\Phi = 45^0 \Rightarrow \qquad \Phi = \frac{\pi}{4} \text{rad}$$

The right choice is (a).

### Sol. 45(d)

Decreasing order of wavelength of various rays Microwave > Infrared > Ultraviolet > Gamma

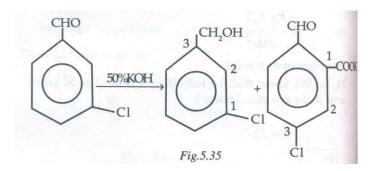
The right choice is (d).



#### **PART B: CHEMISTRY**

#### Sol.46 (a)

When benzaldehyde is treated with 50percent alkali, it undergoes oxidation to give an acid salt as wall as well as reduction to give an alcohol. This reaction is called **Cannizzaro'sReaction**.



#### The right option is (a).

### Sol. 47 (d)

When carbonyl compounds are treated with alcohol, they form hemiacetal (hemiketal and acetal/ketal). Refer Fig5.36.

When this product is treated with ethyl alcohol in the presence of excess HCl (both being catalysts), the product so formed is  $(CH_3)_2$  C  $(OC_2H_5)_2$ . The formation of hemiketal is a nuclephilicadition reaction.

#### The right option is (d).

# Sol.48 (a)

For the FCC lattice, we have 
$$4r = \sqrt{2a} \ r = \frac{\sqrt{2}}{4} a = \frac{a}{2\sqrt{2}} = \frac{408}{2\sqrt{2}} = 144 \text{pm}$$

Diameterd =  $2r=2\times144 \text{ pm} = 288\text{pm}$ 

### The right option is (a).



#### Sol.49 (d)

Condensation polymers are obtained by bifunctional molecules (monomers) with the elimination of smaller molecules whereas additional polymers are obtained from multiple bond containing monomers. Neoprene is a polymer of chloroprene

(CH<sub>2</sub>=C (Cl)-CH=CH<sub>2</sub>). So, it an addition polymer, not a condensation polymer.

The right option is (d).

#### Sol.50 (a)

In IUPAC system of nomenclature, halogen substituent, so the correct name of:

$$Br - CH_2 - CH = CH_2 \text{ is}$$

$$3-bromoprop-1-ene$$

IUPAC Name: 3-bromo prop-1-ene. In the question given to us, it is 3-bromo prop-2-ene (which is incorrect). Thus, the right option is (a).

### Sol. 51 (a)

Number of octahedral voids = number of atoms in the closely packed structure. Since, number of atoms = 1 So, number of octahedral voids = 1 So

Thus, the right option is (a).

#### Sol.52 (c)

Photochemical smog is formed in warm and sunny climates during day time due to the action of sunlight on primary pollutants. It contains nitrogen oxides, ozone, PAN, etc. they all are oxidizing agents. This causes irritation in eyes and throat.

Thus, the right option is (c).

#### Sol. 53 (b)

CH<sub>3</sub>CHO and C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>CHO both being aliphatic aldehydes, they react with Tollen's reagents, Fehling solution and Benedict solution. So, these reagents cannot be used to distinguish these chemicals. CH<sub>3</sub>CHO reacts with NaOH and I<sub>2</sub> to give yellow crystals of iodoform while C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>CHO does not react with it.

 $CH_3CHO + 3I_2 + 4NaOH \rightarrow CHI_3 + HCOONA + 3NaI + 3H_2O C_6H_5CH_2CHO + I_2 + NaOH \rightarrow Ni$  reaction Thus,  $CH_3CHO$  and  $C_6H_5CH_2CHO$  can be distinguished with the help of the Iodoform Test.

Thus, the right option is (b).



### Sol. 54 (b)

Lyophobic sols are unstable, so they are stabilized by adding some lyophilic colloides which protect them from precipitation. thus, lyophilic colloides which protect them from precipitation. Thus, lyophilic colloids are called **Protecting Colloids.** Their protecting power is expressed in terms of **Gold Number**. Lesser the Gold Number, the higher the protecting power will be.

### The right option is (b).

#### Sol.55 (a)

Only those compounds exhibit optical isomerism which have chiral centre and / or absence of symmetry elements. (Chrial carbon is the carbon whose all the four valencies are satisfied by four different groups)Maleic acid does not exhibit optical isomerism.

#### The right option is (a).

#### Sol.56(b)

Nylon -66 is a fibre as the forces of attraction in it are due to H- bonding. It is not an elastomer. All other given statements are true. **The right option is (d).** 

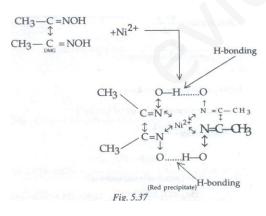
### Sol.57 (d)

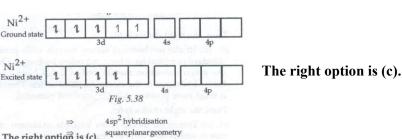
Acetaldehyde is the major culprit in hooch.

#### The right option is (d).

#### Sol.58 (c)

Refer Fig 5.37 and Fig. 5.38.







# Sol.59 (d)

Bond order= 
$$\frac{N_b - N_a}{2}$$

In NO, total electrons = 7+8=15

: Configuration of NO

KK, 
$$\sigma(2s^2)$$
,  $\sigma(2s^2)$ ,  $\sigma(2p^2_z)$ ,  $\pi(2p^2_x)$ 

$$=\pi(2p_{v}^{2})\pi(2p_{x}^{1})$$

: Bond order = 
$$\frac{8-3}{2} = \frac{5}{2} = 2.5$$

In  $O_2$ , total electrons = 16 + 1 = 17

∴ Configuration of O<sub>2</sub>

= KK, 
$$\sigma(2s^2)$$
,  $\sigma(2s^2)$ ,  $\sigma(2p^2_z)$ ,  $\pi(2p^2_x) \approx \pi(2p^2_y) \pi(2p^2_x)$ 

$$\approx \pi (2p^1_y)$$

: Bond order = 
$$\frac{8-5}{2} = \frac{3}{2} = 1.5$$

In 
$$C^{2-}_{2}$$
, total electrons = 12+2=14

 $\therefore$  Configuration of  $C^{2-}_{2}$ 

$$KK,\,\sigma(2s^2),\!\sigma(2s^2),\,\sigma(2p^2_{\ z})\approx\!\!\pi(2p^2_{\ x}),\!\pi(2p^2_{\ y})$$

$$\therefore$$
 Bond order= $\frac{8-2}{2}$ 

In He<sup>+</sup><sub>2,</sub> total electrons= 4-1=3

$$\therefore$$
 Configuration of He<sup>+</sup><sub>2</sub>= $\sigma(1s^2)$ , $\sigma(1s^2)$ 

∴ Bond order 
$$=\frac{2-1}{2}$$

$$=\frac{1}{2}=0.5$$

Hence, correct order of bond orders is:

$$He^{+}_{2} < O^{-}_{2} < NO < C^{2-}_{2}$$

Thus, the right choice is (d).



#### Sol.60 (c)

In electrochemical series, metals with positive standard potential have been put below hydrogen. Out of given transition metals, only Cu has been placed below hydrogen in the electrochemical series. Therefore, it must have positive sign for standard potential.

### Thus, the right choice is (c.)

### Sol. 61 (c)

Transition metals show variable oxidation states due to which they can perform as catalysts.

E.g., 
$$2SO_2 + O_2 \xrightarrow{V_2O_5} 2SO_3$$

$$SO_2 + V_2^{+5} O_5 \rightarrow SO_3 + V_2^{+4} O_4$$

$$V_2^{+4}O_4 + O_2 \rightarrow V_2^{+5}O_5$$

### Thus, the right choice is (c).

### Sol. 62 (d)

- (a) Antifertility drugs are used to control pregnancy. These drugs prevent conception or fertilization. Examples: Mifepristone, narethindrone, mestranol etc.
- (b) Antihistamines are used for the relief of allergies. Examples: diphenlhydramine, chlorpheniramine, prometaxzine etc.
- (c) Antiseptics are the used to reduce the number growth of microorganism e.g., dettol soap etc, whereas disinfectants kill bacteria and are for sterilization of inanimate objects like instruments utensils, cloths, floors etc. Examples: phenol, H2O2,So2, dettol, iodol, etc.
- (d) Broad spectrum antibiotics are such antibiotics that acts against a wide range of disease causing bacteria. They act against both gram-positive and gram-negative bacteria. Examples: ampicllin, chloramphenicol etc.

#### The right choice is (d).

#### Sol. 63 (a)

In Rosenmund reaction, acid chloride reacts with  $H_2$  in the presence of Pd/BaSO<sub>4</sub> to yield aldehyde (C<sub>6</sub>H<sub>5</sub>CHO).Refer Fig. 5.39

$$\begin{array}{c} \text{COCI} \\ \hline \\ \text{Pd/BaSO}_4 \end{array} \begin{array}{c} \text{CHO} \\ \text{'A'} \end{array}$$

The right option is (a).



## Sol. 64 (b)

Biodegradable polymers have the tendency to break down and lose their initial integrity.

$$H_2N - CH_2 - COOH + HNH(CH_2)_5COOH \Delta \downarrow -H_2O$$

$$[HN-CH_2-CO-NH-(CH_2)_5-CO]n$$

# The right option is (b).

## Sol. 65 (b)

$$E_x^0 = -1.2V \ E_y^0 = +0.5V \ E_z^0 = -3.0V$$

 $\therefore$  Z > X > Y Higher the reduction potential, lesser the reducing power.

### The right option is (b).

## Sol.66 (c)

Aliminum hydroxide reacts with HCl present in stomach to make Aliminum chloride (salt) and water. Thus, as an antacid, it neutralizes the acid inside the stomach.

## The right option is (a).

### Sol.67 (c)

 $\frac{x}{m} = p \times T$  is the incorrect relationship. The correct relation is  $\frac{x}{m} = \frac{p}{T}$ .

# The right option is (c).

### Sol.68 (b)

$Cr^{2+}:d^4$	1	1	1	1	es l
$Cn^{2+} + :d^{5}$	1	1	1	1	1
Fe <sup>2+</sup> + :d <sup>6</sup>	1	1	1	1	1
C o 2+ : d 7	1	1	1	1	1

Refer Fig. 5. Fig. 5.40 40

 $\div \ \left[ \text{Co} \ (H_2O_6) \right]^{2^+} \text{has minimum number of unpaired electrons and thus, minimum paramagnetic behavior.}$ 

### The right option is (b).

### Sol.70 (a)



Diphenylhydramine (Benadryl) is used as an antihistamine.

The right option is (a).

## Sol. 71 (d)

C-H:0.109 nm

C = C: 0.134 nm

C - O: 0.143 nm

C - C: 0.154 nm

The correct bond length order is

$$C-H < C = C-O < C-C$$

The right option is (d).

### Sol.72 (d)

Terylene is a polyesterbecause it is formed by the monomer units terephthalic acid and ethylene glyco.

The right option is (d).

## **Sol.73 (b)**

The right option is (b).

# Sol.74 (d)

The compound is 3 ethyl-3 propyl hex -1 -ene.

The right option is (d).

## Sol.75 (d)

Reduction of nitrobenzene with Zn/NH<sub>4</sub>Cl(neutral medium) gives Phenyl hydroxylamine. Refer Fig. 5.41.

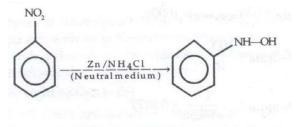


Fig. 5.41



## **Sol.76 (b)**

The complexes  $[Co(NH_3)_6[Cr(CN)_6]]$  and  $[Cr(NH_3)_6[Co(CN)_6]]$  are the examples of co-ordination isomerism. This isomerism occurs only in those complexes in which both cation and anion are complex. It occurs due to exchange of ligands between cation and anion.

# The right option is (b).

## **Sol.77 (b)**

RCHO+R'MgX 
$$\xrightarrow{\text{(Nucleophilic addition)}}$$
 R-CH-ROH

CH<sub>3</sub>—CH<sub>2</sub>—CH-CH<sub>2</sub>Br+NH<sub>3</sub>  $\xrightarrow{\text{(Nucleophilic substitution)}}$  CH<sub>3</sub>—CH<sub>2</sub>—CH-CH<sub>2</sub>NH<sub>2</sub>

CH<sub>3</sub>—CH<sub>2</sub>—CH-CH<sub>2</sub>NH<sub>2</sub>

CH<sub>3</sub>CHO+HCN  $\xrightarrow{\text{(Nucleophilic addition)}}$  CH<sub>3</sub>CH(OH)CN

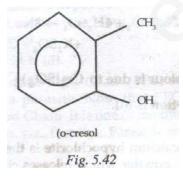
Ch<sub>3</sub>—CH=CH<sub>2</sub>+H<sub>2</sub>O  $\xrightarrow{\text{H'}}$  (electrophilic addition)

CH<sub>3</sub>—CH-CH<sub>3</sub>  $\xrightarrow{\text{total addition)}}$ 

## The right option is (b).

### Sol.78 (a)

# Refer Fig.5.42.



Due to +M effect of – OH group and hyperconjugation of –Ch<sub>3</sub> group, the benzene of o-cresol is a highly reactive ring towards electrophilic substitution.



## Sol.79 (a)

1.00 molal aqueous solution = 1.0 mole in 1000 g water

$$n_{solute} = 1$$
;  $W_{solvent} = 1000$ g.

$$n_{\text{solute}} = \frac{1000}{18} = 55.56$$

$$x_{\text{solute}} = \frac{1}{1 + 55.56} = 0.0177$$

The right option is (a).

# Sol.80 (b)

$$x_{\text{solute}} = \frac{1}{1 + 55.56} = 0.0177$$

$$\frac{2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g); K_2}{N_2(g) + 2O_2(g) \rightleftharpoons 2NO_2(g); K = K_1 \times K_2} \qquad \dots \text{ (ii)}$$

.. For 
$$No_2(g) \rightleftharpoons \frac{1}{2}N_2(g) + O_2(g)$$
;

$$K = \left[\frac{1}{K_1 K_2}\right]^{1/2}$$

The right option is (b).

## Sol.81 (b)

Bond order of 
$$O_2^+ = \frac{10-5}{2} = 2.5$$

Bond order of 
$$O_2^- = \frac{10-7}{2} = 1.5$$

Bond order 
$$O_2^{2-} = \frac{10-8}{2} = 1$$
 (Lowest) Bond order of  $O_2 = \frac{10-6}{2} = 2$ 

The right option is (b).

## Sol. 82(d)

$$k_2Cr_2O_7 + 3Na_2CO_3 + 4H_2SO_4 \rightarrow 3Na_2SO_4 + K_2SO_4 + Cr(SO_4)_3 + 4H_2O$$
 The green colour is due to  $Cr_2(SO_4)_3$ 



### Sol.83 (a)

Ca(OCl)<sub>2</sub> or calcium hypochlorite is the ative ingredient in bleaching powder which which releases chlorine.

The right option is (a).

### Sol.84 (a)

Vitamins A, D and E are fat-soluble vitamins, whereas vitamins B-complex is a water-soluble vitamin.

The right option is (a).

## Sol.85 (c)

During denaturation, secondary and tertiary structures of proteins are destroyed but the primary structure remains intact.

Heat, acid and alkali denature DNA molecule and double strand of DNA converts into single strand.

The right option is (c).

#### Sol.86 (a)

The structure is trans -2-chloro-3-iodo-2- protein. The right option is (a).

### Sol.87 (d)

A-2, B-1, C-3, D-4

The right option is (d).

### Sol.88 (b)

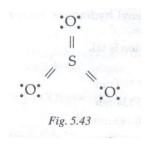
Compound shown in option (b) is most basic due to localised lone pair of electrons on nitrogen atom while in other compounds,

as a result of resonance, the lone pair of electrons of nitrogen gets delocalised over benzene ring and thus is less easily available for donation.



### Sol.89 (d)

Formal charges help in the selection of the lowest energy structure form a number of possible lewis structures for a given species. The lowest energy structure is the one with the smallest formal chargeson atoms. Formal charge on a atom: = Total no. of valance electrons – non- bonding electrons –  $\frac{1}{2}$  ×bonding electrons. For Lewis structure of SO<sub>3</sub>(refer Fig. 5.43), we have:



Formal charge on S atom =  $6 - 0 - \frac{1}{2} \times 12 = 0$ 

The right option is (d).

### Sol. 90 (b)

- (A) Plaster of Paris =  $CaSO_4 \cdot \frac{1}{4}H_20$ 
  - (B) Epsomite =  $MgSO_4$ .  $7H_2O$
  - (C) Kieserite =  $MgSO_4H_2O$
  - (D) Gypsum =  $CaSO_4$ .  $2H_2O$

The right option is (b).

**PART C: BOTANY** 

## Sol.91 (c)

It is believed that activity growing regions of plants (i.e., shoot apex and root apex) do not have viruses. Due to this big advantage, these regions are used in the production of virus free plants in through meristem culture technique.in meristem culture explants are taken from shott apex of shoot apical meristem. These explants more cytokinin than auxin containing more cytokininthanauxin hormone. Thus, meristem culture involves the development of an already existing shoot apical meristem and subsequently, the regeneration of adventitious root from the develop shoots.

The right option is (c).

#### Sol.92 (d)

Edible pollens are produced by all three plants mentioned in options (a),(b) and (c). Hence, all these three options are correct. The right option is (d).



### Sol.93 (a)

The fusion of male and female gametes is known as **Fertilisation.** In plants with seeds, male gametes are bought to the egg having female gametophyte through a pollen tube. This process is called **Siphonogamy**. In this process, many pollen grains come to germinate over the stigma; their number is much larger than that of ovules. The pollen grain does not go down the stigma. Rather, its pollen tube goess down. This pollen tube eats up the solid part of the stigma and style. It does so by releasing pectinases and hydrolytic enzymes. The pollen tube travels intercellularly and chemotrophically along the concentration gradient of Ca-B- Inositol sugar complex. The concept of siphonogamy was put forth by Strasburger (1884).

The right option is (a).

### Sol. 94 (a)

Autogamy involes pollination within the same flower, while geitonogamy involves transfer of pollen grains from the another of one flower to the stigma of another flower of the same plant. Both processes are prevented in papaya because it is a dioecious plant (i.e., male and female sex organs are born on separate plants) and it always needs cross-pollination.

The right option is (a).

# Sol.95 (b)

Phosphorus cycle is a sedimentary biogeochemical cycle. It describes the movement of phosphorus through the lithosphere, hydrosphere and biosphere and the main reservoir pool is lithosphere. Atmosphere does not play any significant role in the movement of phosphorus because phosphorus and phosphorus based compounds are usually solids at the typical ranges of temperature and pressure found on Earth. The production of phosphine gas occurs only in specialized, local conditions.

The right option is (b).

### Sol.96 (b)

Sporopolleninis a fatty substance present in the exine of pollen grains. It is resistant to microbial and chemical decomposition and microbial decomposition and can withstand the extreme environmental condition. Due to presence of sporopollenin, pollen grains are well preserved during fossilization.



### Sol.97 (c)

There are natural exchanges between lithosphere and hydrosphere or atmosphere. These processes are painfully slow. The major exchange is through the carbon cycle in which producers absorb carbon and all living organisms release carbon dioxide into the atmosphere through respiration. The exchange of carbon dioxide is taking place incessantly between atmosphere and hydrosphere; in fact, oceans are acting as **Global Sinks**, for they helpin the absorption of carbon dioxide produced during the course of combustion. This cycling is self-regulated. However, deforestation and the combustion of fossil fuels have upset this self-regulated feedback system. These two activities are adding more than  $6 \times 10^{12}$  kilograms of carbon into the atmosphere on an annual basis. Thus, the carbon content of atmosphere is rising. It would melt polar ice caps and Alpine-region ice reserves. This can lead to a rise in the Mean Sea Level (MSL) by nearly 20 metres in the times to come.

The right option is (c).

### Sol. 98 (c)

Green  $\rightarrow$  Insect  $\rightarrow$  Frog  $\rightarrow$  Cobra  $\rightarrow$  Eagle The animal at pint A should be Cobra.

The right option is (c).

## Sol. 99 (a)

All option are correct statements, except (a). In the case of sedimentary nutrient cycling, the reservoir pool is lithosphere, not hydrosphere. Note that in the case of gaseous nutrient cycling, the reservoir pool is atmosphere/hydrosphere. Thus, option (a) is not a correct statement.

The right option is (a).

### Sol.100 (d)

Monasuspurpureus is a yeast used in the production of statins which are the agents for lowering blood cholesterol. The right option is (d).

### **Sol. 101 (b)**

A parasitic Food chain (PFC) starts with a host and ends in a parasite. Note that PFC is also termed **Auxiliary Food Chain.**It is one of the three food chains of the ecosystems, viz., **Detritus, parasitic** and **Grazing**. Refer **Fig5.44** 

Producer → Parasite

Herbivore → Parasite

Carnivore → Parasite

Fig 5.44 Parasitic food chain in ecosystems



### Sol.102 (d)

The Apocarpous condition arises when the number of carpels is two or more and they are free from each other. Examples: Clematis, Michelia (Magnoliaceae), Aconitum, Ranunculus (Buttercup). Etc.

The right option is (d).

### Sol. 103 (d)

The vertical distribution of different species occupying different levels is called **Stratification.**Itrepresents the structural unit of an ecosystem. For example, trees occupy top vertical strata or layer of a forest, shrubs the secons and herbs and grasses occupy the bottom layers.

The right option is (d).

### Sol.104 (a)

Onion is a simple tunicated layered bulb while ginger is a straggling rhizome having uniparous cyme braching with sympodial axis.

The right option is (a).

### Sol.105 (a)

Litter is mostly dried plant matter. Thus, option (a) is correct .all other options are incorrect. Detritus refers to the remains of plants and animals.it is not purely plant matter; so, option (b) is incorrect. Detritus is of two types – above ground and below ground; so, option (c) is incorrect. Litter is above the ground; so, option (d) is incorrect.

The right option is (a).

### Sol.106 (c)

Several species of Glomus, including G. aggregatum, are cultured and sold as mycorrhizal inoculant for agricultural soils. Being endomycorrhize, it helps the plants in the absorption of nutrients especially phosphorus from soil.

The right option is (c).

### Sol.107 (c)

Producers are at the first trophic level I the food chains of the world. They are autotrophic or photosynthetic organisms. They synthesise organic nutrients from inorganic raw material with the help of solar radiation to produce food (Carbohydrates) for themselves and heterotrophic organisms.



### Sol.108(a)

Commellinabenghalensis or kankauoa bears aerial, chasmogamous (stigma and anthers exposed to pollinating agent). Insect- pollinated flowers and underground cleistogamous flowers are the bisexual flowers, which never open; they always remain closed. In such flowers, the anthers and stigma lie very close to each other. When anthers dehisce in the flower buds, pollen grains come in contact with the stigma of the same flower i.e., autogamy occurs. So, these flowers produce assured see set, even in the absence of pollinators.

The right option is (a).

## Sol. 109 (c)

Saccharomyces cerevisiae is known as baker's yeast and Saccharmyces ellipsoidens is called **Wine Yeast.**These are used in banking and brewing industries, respectively.

The right option is (c).

### **Sol.110 (b)**

Anabaena azollae is a free-living nitrogen-fixing blue-green alga or cyanobacterium but it may also live symbiotically in the leaf cavities of Azalia, an aquatic, free floating, fresh water pteridophyte (fern). This cyanobactrium has nitrogenase enzyme. So, it can fix nitrogen. If this fern is grown in paddy (rice) fields, a remarkable 50 percent increase can be achieved in crop yield.

The right option is (b).

### Sol.111 (b)

In monocot stem like Zea mays, vascular bundles are conjoint, collateral and closed in vascular bundles, the lowermost protoxylem vessels and xylem paraenchyma cells dissolve forming a water containing schizolysigenous cavity called protoxylem cavity or lacuna or lysigenous cavity. Protoxylem cavity and protophleom may be absent in the smaller vascular bundles in maize.

The right option is (b).

### Sol. 112 (a)

The coconut water obtained from the tender coconut is nothing but free nuclear endosperm (made up of thousands of nuclei) and the surrounding white kernel is the cellular endosperm.



### Sol.113 (b)

Salvinia is a heterosporoues water fern. The microsporangia and megasporangia are borne within special reproductive structure called sporocarps. These are borneterminally in clusters on the segment of submerged leaves. Sporocarps are strictly monosporangiate. They bear either only microsporangia or megasporangia. Viroids are single stranded RNA molecules. The female reproductive organ is archegonia in gymnosperms.

The right option is (b).

### Sol.114 (c)

A suspension culture comprises single cells and small groups of cells suspended in a liquid medium. Normally, the medium comprisesauxin2,4-D.the suspension culture must be regularly agitated at 100-250 RPM for getting best results. The rate of growth of suspension culture is higher than that of the callus culture.

The right option is (c).

#### Sol. 115 (d)

Sucrase is not used for plant tissue culture. Sucraseis not a hormone; it is a carbohydrate. All other options show the names of hormones that are used in plant tissue culture.

The right option is (d).

## Sol.116 (c)

Cytokinins are popularly used in plant tissue culture. Their examples are – 6 benzylaminopurine,6-Dimethylallylaminpurine and Kinetin. ABA is Abcisic acid and it is a hormone used in plant tissue culture. putrescine is a polyamine and it is used in plant tissue culture. Indole-3-Butyric acid is an auxin; it is used in plant tissue culture. Among all options, there is only one cytokinin and it has been appended in option (c).

Thus, the right option is (c).

### Sol. 117 (c)

Ethyl Methane sulpphonate (EMS) is a chemical mutagen. Sodium azide is also a chemical mutagen. Gamma rays are an example of physical mutagens. All of the options (a), (b) and (c) are not physical mutagens; only Gamma rays an example of the same.



### Sol.118 (b)

During the course of tissue culture, somaclonal variation is observed. It is the genetic variation present plants that have been regenerated from a single culture. This variation has been employed a few good varieties of plants. These varieties have displayed features, viz..., resistance to diseases, stress tolerance, early maturation and better yield, better quality. Pollination, maturation and decay are not the apt terms in the paralance of tissue culture. Hence, they ought to be ruled out.

## The right option is (b).

# Sol. 119 (a)

Before pollination the protoplast of pollen grain divides into two unequal cells small generative cell and large tube. or vegeatly cell. In some species the generative cell divides into two male gametes prior to dehiscence of pollen grain. Therefore, at the time of pollination, the pollen grain is either 2-called or 3—celled.

### The right option is (a).

#### Sol. 120 (d)

The transfer of pollen grains from anther to stigma is called **Pollination**. Anemophily is a mode of pollination accomplished through wind while entomophily is the mode of pollination accomplished by insects like moth, butterfly, wasp, bee, etc. the plants with ovaries having only one or a few ovules are generally pollinated by wind but sometimes by insects.

### The right option is (d).

### Sol.121 (d)

Biodiversity is being threatened by reduction in space, smaller and fragmented habitat, excessive exploitation by man, climatic changes, etc. Scared grooves are useful for conserving rare and threatened species.

## The right option is (d).

# Sol. 122 (a)

Antisense RNA can be produced by inverting a DNA copy of an mRNA with respect to the promoter in an expression vector. This yields a full-length complementary copy of the mRNA sequence. Antisense RNA molecule are thought to interact with m RNA molecule by base pairing to form double stranded RNA.



### Sol.123(d)

Spirulina is a fast growing non-toxic blue green alga rich inproteins, vitamin-B complex and minerals.it is cultivated in tanks as important traditional food. Mushrooms are a rich source of vitamins, proteins and minerals.

The right option is (d).

### Sol.124 (d)

All options are correct, except option (d). Due to the presence of cobalt in our food and water, we can acquire diseases like diarroea, hypertension, bone defects and paralysis. The disease called **Minamata**(firstoccurence in 1992 at Minamata bay, Japan) occurs due to Hg. The diseases called **Itai-itai** (first occurence) in 1947 in Toyoma, Japan) occurs due to the presence of Cd.

The right option is (d).

#### Sol.125(c)

Gel electrophoresis is a technique to separate fragments of DNA. Because DNA fragments are negatively charged molecules, they can be separated by forcing them to move towards the anode under an electric field through a medium or matrix. Nowadays, the most commonly used matrix is agarose which is a natural polymer extracted from seaweeds (viz., Gelidium, Gracilaria, Gigartina, etc.)

The right option is (c).

### Sol. 126 (c)

Tuber is oval or spherical swollen underground modified stem lacking adventitious roots. It possesses a number of spirally arranged XI depressions called **Eyes.** Each eye represents node and consists of 1-3 axillary buds in the axils of small, scaly leaves.

The right option is (c).

#### Sol. 127 (d)

Temperate forests are the forests found in the temperate climate zone.

The right option is (d).

## Sol. 128 (d)

CAM plants are mostly succulent xerophytes. The stomata in these plants remain closed during the day. This helps to check transpiration. In this way, water is conserved. **The right option is (d).** 

#### Sol. 129 (a)

Leghaemoglobinis an oxygen scavenger. It protects the nitrogen fixing enzyme nitrogenase.



### Sol. 130 (d)

The amount of living matter present in an ecosystem in its different trophic levels is called **Standing Crop.** It is expressed in the form of number or biomass per unit area. Biomass is measured as either fresh weight or dry weight.

The right option is (d).

#### Sol. 131 (a)

A germplasm is a collection of genetic resources for an organisms. For plants, the germplasm may be stored as a seed collection. It includes diverse alleles of all the genes of an organisms.

The right option is (a).

### Sol. 132 (d)

Rainwater is the purest form of water because evaporation of water and the movement of the water vapour to higher altitudes makes rainwater a pure compound. We have selected option (d) in this question but it is not without conditions. Acid rain can contaminate rainwater too. The acid drops mix with water molecules and cause damage to buildings, crops, fields and marble edifices. If acid rain is not checked, rainwater may also become contaminated (due to acids made by nitrogen and sulphur). Further, rainwater on the earth becomes contaminated in a jiffy, for there are many pollutants on the earth in water bodies and in soil.

The right option is (d).

#### Sol. 133 (b)

Fly ash comprises carbon particles most of them burnt. It does not have the ability to produce natural manure. Nearly 38 percent of fly ash is produced by thermal power plants. In these plants, it is trapped by Electro static precipitators (ESPs) which charge its particles and attach them to charged plates. The plates are scraped later. Fly ash is processed for making bricks. Thus, it is a good raw material for construction. Other options are not suitable for the use of fly ash.

The right option is (b).

#### Sol. 134 (c)

The guard cells of stomata in land plants are specialised epidermal cells that comprise chloroplasts. In the remaining epidermal cells, chloroplasts are absent. But chloroplasts of guard cells are capable of poor photosynthesis as there is absence of NADP reductase enzyme.



### Sol. 135 (b)

If the pollen tube enters the ovule through its micropyle, the mode of entry is called **Porogamy.** If the pollen tube enters the ovule through its chalaza, the mode of entry is called **Chalazagamy.** If the pollen tube enters the ovule through its funicle, the mode of entry is called **Mesogamy**. Generative fertilization is called **Syngamy**or **True fertilization.** It gives rise to diploid zygote or oospore.

The right option is (b).

#### **PART D: ZOOLOGY**

#### Sol.136 (d)

Heterotrophic bacteria are most abundant in nature. Many of them have a significant impact on human affairs. These are helpful in making curd from milk .Lactobacillus sp.), production of antibiotic (like Streptomyces sp.) and fixing nitrogen in legume roots (like Rhizobium spe).

The right option is (d).

### Sol.137 (a)

The process of cutting and ligating both the oviducts or fallopian tubes of female is called **Tubectomy.** It is a very reliable technique of birth control. Its failure rate is less than 1 percent.

The right option is (a).

### Sol.138 (c)

Ori represents the site of origin of 31-replication, rap repesets the protiens that take part in the replication of plasmid. Hind ill and Eco RI are the recognition sites of restriction endonucleases. amp<sup>R</sup> and tetRare the-antibiotic- resistant gene parts.

The right option is (c).

### Sol.139 (a)

Transcription unit consists of promoter, structural gene and terminator. The inducer (lactose/ allolactose) is not a component of transcription unit.

The right option is (a).

### Sol.140 (d)

Probes are 15-30 bases long radioactive labelled oligonucleotides (RNA or DNA) WI6 used for detecting complementary nucleotide sequences, disease diagnosisetc.



### Sol.141 (a)

Convergent evolution involves the independent development of similar structures in organisms that not directly related. It is represented by analogous ogans, Examples: Eyes of octpus and mammals, wings of and birds, etc. In divergent evolution, a basic or becomes adapted through specialisation for performing different functions. It is represented by homologous organs. Example: The bones of forelimbs of vertebra (like seal's flipper, bat's wing, cat's paw horse's front and human hand), thorns of Bougainvillia and tendrils Gucurbita.

The right option is (a).

## Sol. 142 (b)

In eukaryotes, the site of synthesis of most of the ribosomal RNA (rRNA) is nucleolus. The nucleolarorganizer contains many copies of ribosomal D,' (repetitive DNA). The RNA cistron of nucleolar DNA forms 45 S precursor with the help of RNA polymerase. This 45 S RNA undergoes cleavage with the help nucleases to give 18S, 28S and 5.8S rRNA units. Out different rRNAS, the 5S rRNA is not synthesized nucleolus. It is synthesized outside it.

The right option is (b).

### Sol.143 (c)

The pachytene stage of prophase I of meiosis I is characterized by the appearance of recombination nodules the sites at which crossing over occurs between non-sister chromatids of the homologous chromosomes. Cross over is the exchange of genetic material between homologous chromosomes. It is also an enzyme-mediated process and the enzyme involved is called **Recombinase.** 

The right option is (c).

#### So.144 (d)

Contact inhibition is the natural process of arresting cell growth when two or more cells come in contract with each other. It is a property of normal cells. Cancer cells divide in an uncontrolled way. They do not display contactinhibition.

The right option is (d).

## Sol. 145 (b)

In a pregnant female, high levels of HCG will maintain corpus luteum and stimulate it to secrete oestrogen and progesterone.



### Sol.146 (d)

Linked genes show a test cross ratio of 1: 1 dihybrids. Thus, statement given in option (d) is incorrect. All other statements are correct.

The right option is (d).

#### Sol.147 (a)

Phagocytosis is an important feature of cellular innate immunity, performed by cells called phagocytes that engulf or eat pathogens or foreign particles. Common examples of these phagocytes are monocytes, macrophages, neutrophil granulocytes (often referred to as polymorphonuclear leukocytes or PMN or PML, because of the varying shapes of nucleus), tissue dendritic cells, mast cells, etc. Antitetanus and anti-snake bite injections are the examples of passive immunity.

The right option is (a).

### Sol.148(d)

Interstitial cells or cells of Leydig are present in the connective tissue lying in between seminiferous tubules. These cells secrete oestradoestradiol-steroid e.g., testosterone. Androgens stimulate male characters, influence male sex and behavior (libido) and regulate the development, maturation and functions of male accessory sex organs.

The right option is (d).

### Sol.149 (a)

Polymerase Chain Reaction (PCR) is used amplifying a DNA segment or to synthesize in vitro the multiple copies of gene (or DNA) of interest, using two sets of primers and the enzyme DNA polymerase. This enzyme is isolated from a bacterium Thermusaquaticus and it remains active during the high temperature but high temperature induced denaturation of double stranded DNA.

The right option is (a).

### Sol.150 (d)

Nucleoside is made up of ribose sugar of nitrogenous base only. Uracil forms nucleoside with only ribose sugar. So, the option with category nucleoside component uracil is correct.

The right option is (d).

### Sol.151(b)

If one strand of DNA has the sequence as ATCTG, the complementary sequence of mRNA will be UAGAC.



### Sol.152 (d)

All the options mentioned in the question are correct features of sex-linked inheritance. It is criss-cross inheritance. The father does not pass the sex-linked allele to his son. The same is passed on to the daughter, though. Then, it reaches the grandson, hence this phenomenon is also called Diagynic. Males have only one X- that is transferred to the female offspring. Only the Y- chromosome of the father is transferred to the offspring. But this sex chromosome does not carry many alleles. Finally, traits governed by sex-linked recessive genes produce more disorders in males than they do in females. They express themselves in males even when represented by a single allele.

### The right option is (d).

## Sol.153 (d)

The first three options are the steps in the process of crossing over. Thus, they are correct. But Double Crossing Over is the odd man out here. In this process, crossing over occus at two points in the homologous pair of chromosomes. This concept has nothing to do with the three steps of crossing over.

### The right option is (d).

#### Sol.154 (d)

All the three options are the advantages of gene regiulation. Further, gene regulation also helps in growth and differentiation. Finally, a number of related genes needed for a specific metabolic activity can be switched on or off at the same time.

### The right option is (d).

### Sol.155 (d)

Monohybrid cross with incomplete dominance shows both genotypic and phenotypic ratio as same (1: 2: 1).

### The right option is (d).

### Sol.156 (d)

The Human genome Project has been initiated for the complete analysis of the human genome and identification of all those genes that create genetic disorders in man. The project is in its nascent stage. It needs more reserach and scientific inputs. Its completion would lead us to the complete alpha to omega of the human physiology. It would help us produce health and disease-free humans in the centuries to come. Reserach is also being done on plant and animal species and their genetic codes are also being found.



### Sol.157(c)

More than 1,200 genes are creating problems for man. They lead to cardiovascular ailments, cancer (of various genres), diabetes (an endocrine disease), arthiritis, neurological ailments (like Alzeimer's disease) and many other disorders whose list cannot be appended because of the limitation of space. We have not been able to overpower AIDS, cancer, paralysis, lukaemia and a host of other killer diseases. The genes of these diseases are present in our bodies. As and when the conditions are conducive for their lethal actions and a few triggers are available for them to act, these killer genes cast their spell in the human body. The fight against terminal diseases is going on. Scientists are trying hard to identify and overpower such genes as make human life short or full of agony.

# The right option is (c).

#### Sol. 158 (c)

Bt cotton is Genetically Modified (GM) cotton which has an incorporated gene extracted from the bacterium Bacillus thuringiensis. This B gene code for Bt toxin in plant tissues is harmful only to a small fraction of insects, most notably the larvae of lepidopterans, moths, butterflies, beetles, flies, etc. However, it is harmless to other forms of life. So, it is used for the biological control of pests/ diseases.

### The right option is (c).

#### Sol.159 (c)

DNA fingerprinting is a technique of determining the nucleotide sequences of some specific areas of DNA that are unique to every person. Every person has a DNA fingerprint. It is the same for every cell and organ of any individual in question. It cannot be altered. The genomic DNA sequence of evevery person is unique.

#### The right option is (c).

### Sol. 160 (a)

All living things have been made from protoplasm. It is also called Living Matter. Nearly 90 percent of living matter (protoplasm) is made of C, H, a and N. Traces of P and S are also present in protoplasm. The organic compounds present in protoplasm are--carbohydrates, proteins, lipids and nucleic acids.

### The right option is (a).

### Sol.161 (d)

Transcription is the process of synthesis of RNA on the DNA template. During transcription adenosine pairs with uracil. Repressor gene determines the transcription of structural gene. It codes for repressor protein. After synthesis the repressor molecule is diffused from the ribosome and bind to the operator in absence of inducer. The human genome has approximately 30,000 genes with 3.2 billion base pairs.



### **Sol. 162 (b)**

Human hormonesare secreted by ductless glands that are also known as **Endocrine Glands.** These hormones trigger a host of vital reactions in our body. The hormones of vertebrates are similar in terms of chemical composition and action. If there is a deficiency of a hormone, the same can be taken as an injection to make up for the shortage. Example: Pancreas releases insulin ahich is used for regulating the blood sugar level in the human body.

The right option is (b).

### Sol.163 (c)

The amount of energy accumulated in green plants through the process of photosynthesis is known as **Primary Productivity**. It may be Gross PP (total orgame. matter synthslzed) or Net PP (the weight of orgame matter stored). The rate of rsynthesis of orgame matter by the consumers is known as Secondary Productivity.

The right option is (c).

#### **Sol. 164 (b)**

In biolistic or gene gun method, 1-2 microgram of tungsten or gold particles (called Microprojectiles) coated with DNA to be used for the transformation are accelerated to velocities that enable their entry into plant cells or nuclei. This technique is popular in plant species and can be used to deliver DNA into virtually all tissues.

The right option is (b).

### Sol.165(a)

The integration of selectable marker with a gene of interest is helpful for identifying transformed cells. However, the presence of selectable marker gene for antibiotic resistance in a genetically modified organism that is released into environment is not desirable.

The right option is (a).

#### **Sol.166 (d)**

All the statements support the broad concept of Neo Lamarckism. Note that Lamarckism was the first theory of evolution. It was propounded by Jean Baptiste de Lamarck (1744-1829). Neo Lamarckism is an altered theory of Lamarck. Neo lamarckism also states that only those variations are passed on to offspring that also affectgerm cells, or where somatic cells make germ cells.



### Sol.167(c)

All postulates are correct, except one. In option (c) it has been stated that no mutataion is inheritable. However, according to the Mutation Theory, all mutations are inheritable.

The right option is (c).

### Sol. 168(a)

In some cases, hybrids may become sexual mature but they may be sterile. The mule is a hybrid the (male) donkey and (female) horse. This mule issterile. Further, the hiny is a hybrid of the (female) donkey art (female) horse. This hinny too is sterile.

The right option is (a).

### Sol.169 (d)

DNA fingerprinting is individual specific DN.A identification which is made possible by the finding that no two people are likely to have the same number copies of repetitive DNA sequences of regions. The chromosomes of every human cells contain short, highly repeated DNA sequence (15nucleotide) called Minisatelliteand scatterd throughout.

The right option is (d).

#### Sol.170(c)

Colour blindness and haemophilia are two chief sex-linked or X-linked recessive diseases. The gene haemophilia goes to son from mother and to daughter from father. In this disease, the blood fails to clot w exposed to air result in continuous bleeding and leads death.

The right option is (c).

### Sol. 171 (a)

Stabilising selection is also called **Balancing Selection**. This type of selection favoursan averge-sized individuals but eliminates small-sized individuals Itbrings down variation and thus it does not promote evolutionary change. But it maintains the mean value from generation to generation. If we draw a grapha curve odf the population, we shall obtain a bell-shapes curve.

The right option is (a).

#### Sol.172 (c)

In transient polymorphism, different morphs or forms exist in a population that is undergoing a strong selection pressure. The frequency of the phenotypic appearance of each form is determined by the intensity of the selection pressure. Transient polymorphism applicable in those cases in which one form is gradually being replaced by another.



### Sol.173(c)

An embryo with about 64-cells and a cavity called **Blastocoel** is known as **Blastocyst**. It is composed of an outer envelope of cells-the trophoblast. Implantation is attachment of blastocyst to the uterine wall. This occurs 7 days after fertilization. It develops from 8-cell morula 16-cell morula and then, to 64-cell stage. The blastocyst sinks into a pit formed in the endometrium and get completely burried in the endometrium.

The right option is (c).

#### **Sol.174**

Producers lap up the energy of the sun whichis transformed into chemical form during the course of photosynthesis. Green plants are at the first trophic level. Herebivores are at the secondary trophic level and carnivores are at the third trophic level. Deer is herbivorous. Further, rabbit and rat are also herbivorous animals. But frog eats grassoppers; it is an omnivore.

Identify the right option on your own.

#### Sol. 175 (c)

Option (c) is not correct. Oestrogen is used for making oral contraceptives so that unwanted pregnancy could be checked. It is not used as an anthihistamine. Other options are the applications of steroids in various fields (for the sake of human welfare).

The right option is (c).

#### Sol.176 (d)

The restriction enzymes are also called Molecular Scissors or Cleaving Enzymes. They are used for breaking up DNA molecules. They are of three types.

The right option is (d).

#### Sol.177 (d)

Liver is the main source of vitamin  $B_{12}$ . We can also get it in small traces from milk, eeggs, meat and fish.

It is not present in vegetarian diet.

The right option is (d).

### Sol. 178 (d)

Options (a),(b) and (c) are the examples of bioweapons. Some of them were used during two world Warstoo. The last option is a nature-friendly bacterium. It is used for nitrogen fixation. It is not a bioweapon by any norm.



# Sol.179 (d)

The fallopian tube is tube 10-12 cm long and extends from the periphery of each ovary to the uterus. The part closer to the ovary is the funnel shaped and is known as **Infundibulum.** The edges of the infundibulum posses finger like projections, called **Fimbriae** which help in collection of the ovum after ovulation. The uterus opens into vagina through a narrow cervix.

The right option is (d).

### Sol. 180 (b)

SCPs are used for making wine and beer. They are extensively used in the bakery industry; yeast is an example in this context. However, they also produce toxic chemicals that are consumed by man and thus he falls sick. The nuc;leic acid produced by SCOs is also harmful to man. Their use ought of be restricted. Bakery products should not be consumed in excess.