

## Top 150+ Science Questions for NDA Exams

1. A telescope has an objective lens of 10 cm diameter and is situated at a distance of one kilometer from two objects. The minimum distance between these two objects, which can be resolved by the telescope, when the mean wavelength of light is  $5000 \text{ \AA}$ , is of the order of

- A. 5 cm
- B. 0.5 m
- C. 5 m
- D. 5 mm

Answer ||| D

Solution |||

Here we will use the Rayleigh criterion equation for getting better resolution :  $\frac{x}{1000} = \frac{1.22\lambda}{D}$

( where x is the distance between the objects, D is the diameter of the objective lens and  $\lambda$  is the wavelength of light)

$$x = \frac{1.22 \times 5 \times 10^3 \times 10^{-10} \times 10^3}{10 \times 10^{-2}}$$

or  $x = 1.22 \times 5 \times 10^{-3} \text{ m}$   
 $= 6.1 \text{ mm}$

then x is of the order of 5 mm.

So, option D is correct.

2. Assertion: The resolving power of a telescope is more if the diameter of the objective lens is more.

Reason: Objective lens of large diameter collects more light.

- A. Assertion is correct, reason is correct; reason is a correct explanation for assertion.
- B. Assertion is correct, reason is correct; reason is not a correct explanation for assertion
- C. Assertion is correct, reason is incorrect
- D. Assertion is incorrect, reason is correct.

Answer ||| A

Solution |||

In a telescope, the resolving power depends upon the diameter of the objective lens.

Resolving power  $\propto$  diameter of the objective lens.

**The minimum separation between two objects that are to be resolved by a microscope is given as**

$$d_{\min} = \frac{1.22\lambda}{2n\sin\theta}$$

**Now, the resolving power of microscope is the reciprocal of the minimum distance.**

**Therefore, we have**

$$R.P = \frac{1}{d_{\min}} = \frac{2n\sin\theta}{1.22\lambda}$$

$$\therefore R.P \propto \frac{n\sin\theta}{\lambda}$$

When diameter of objective is increased,  $\theta$  increases. Hence,  $\sin\theta$  also increases.

As the RP is directly proportional to the  $\sin\theta$ , it increases when diameter of objective increases.

So, option A is correct.

3.A compound microscope consists of an objective lens of focal length 2.0 cm and an eyepiece of focal length 6.25 cm separated by a distance of 15 cm. how far from the objective should an object be placed in order to obtain the final image at the least distance of distant vision (25 cm).

- A. 2 cm
- B. 1.5 cm
- C. 3 cm
- D. 2.5 cm

Answer ||| D

Solution |||

As given in the question

$$f_o = + 2 \text{ cm} , f_e = + 6.25 \text{ cm}$$

$$L = 15 \text{ cm} , D = 25 \text{ cm}$$

When the final image is formed at least distance of distinct vision then

$$V_e = -D = -25 \text{ cm}$$

We have,  $\frac{1}{u_e} = \frac{1}{v_e} - \frac{1}{f_e}$

$$= \frac{1}{(-25)} - \frac{1}{(+6.25)}$$

$$= \frac{-1-4}{25} = \frac{-5}{25}$$

$$\Rightarrow u_e = -5 \text{ cm}$$

$$|u_e| = 5 \text{ cm}$$

Now,  $\therefore v_o = L - |u_e|$

$$= 15 - 5 = 10 \text{ cm}$$

$$\therefore \frac{1}{u_o} = \frac{1}{v_o} - \frac{1}{f_o}$$

$$\frac{1}{(+10)} - \frac{1}{(+2)} = \frac{1-5}{10}$$

=

$$u_o = -2.5 \text{ cm}$$

So, option D is correct.

4. The transverse nature of light is shown by

- A. Interference of light
- B. Refraction of light
- C. Polarization of light
- D. Dispersion of light

Answer ||| C

Solution |||

the transverse nature of light is shown by the polarization of light.

5.If the magnetic dipole moment of an atom of diamagnetic material, paramagnetic material and ferromagnetic material be denoted by P, Q and R respectively.

- A.  $P \neq 0, Q \neq 0$
- B.  $Q = 0, R \neq 0$
- C.  $P = 0, Q \neq 0$
- D.  $P \neq 0, Q = 0$

Answer ||| C

Solution ||| magnetic dipole moment of diamagnetic material is zero (i.e, $P = 0$ ) but magnetic dipole moment of paramagnetic and ferromagnetic material is non-zero (i.e,  $Q \& R \neq 0$ ).

### Magnetic dipoles

- Magnetic dipoles are found to exist in magnetic materials, analogous to electric dipoles.
- A magnetic dipole is a small magnet composed of north and south poles instead of positive and negative charges.
- Within a magnetic field, the force of field exerts a torque that tends to orient the dipoles with the field.
- Magnetic forces are generated by moving electrically charged particles. These forces are in addition to any electrostatic forces that may already exist.
- It is convenient to think magnetic forces in terms of distributed field, which is represented by imaginary lines. These lines also indicate the direction of the force.

### Dia-magnetism

Very weak; exists ONLY in presence of an external field, non-permanent. Applied external field acts on atoms of a material, slightly unbalancing their orbiting electrons, and creates small magnetic dipoles within atoms which oppose the applied field. This action produces a negative magnetic effect known as diamagnetism

### Paramagnetism

There are several theories of paramagnetism, which are valid for specific types of material. The Langevin model, which is true for materials with non-interacting localised electrons, states that each atom has a magnetic moment which is randomly oriented as a result of thermal agitation. The application of a magnetic field creates a slight alignment of these moments and hence a low magnetisation in the same direction as the applied field.

### Ferromagnetic materials

The materials which are strongly attracted by a magnetic field or magnet is known as ferromagnetic material

The opposite magnetic effects of electron orbital motion and electron spin do not eliminate each other in an atom of such a material. There is a relatively large contribution from each atom which aids in the establishment of an internal magnetic field, so that when the material is placed in a magnetic field, it's value is increased many times the value that was present in the free space before the material was placed there.

For more information go through the magnetic properties of the materials.

So, option C is correct.

6. The terminal potential difference of the cell is greater than emf when it is

- A. Being discharged
- B. In open circuit
- C. Being charged
- D. Potential difference never be greater than emf

Answer ||| C

Solution |||

the terminal potential difference of a cell will be greater than its emf when the cell is being charged

$$V = E + IR;$$

(V-potential difference, E- emf, I-current flowing through the battery, R- resistance offered by the battery, i.e., internal resistance)

$$V > E \text{ ( At the time of charging)}$$

So, option C is correct.

7. A long straight wire of radius  $a$  carries a steady current  $i$ . The current is uniformly

distributed across its cross-section. the ratio of the magnetic field at  $\frac{a}{2}$  and  $2a$  is

- A. 0.25
- B. 4
- C. 1

D. 0.5

Answer ||| C

Solution |||

$$\text{Current density } j = \frac{i}{\pi a^2}$$

From Ampere's circuital law



$$\oint B \cdot dl = \mu_0 i_{\text{enclosed}} \quad \text{For } r < a$$

$$B \times 2\pi r = \mu_0 \times j \times \pi r^2$$

$$\Rightarrow B = \frac{\mu_0 i}{\pi a^2} \times \frac{r}{2}$$

$$\text{At } r = \frac{a}{2}, \quad B_1 = \frac{\mu_0 i}{4\pi a}$$

For  $r > a$ ,

$$B \times 2\pi r = \mu_0 i \Rightarrow B = \frac{\mu_0 i}{2\pi r}$$

$$\text{At } r = 2a, \quad B_2 = \frac{\mu_0 i}{4\pi a}$$

$$\text{So, } \frac{B_1}{B_2} = 1$$

So, option C is correct.

8. when ultraviolet rays are incident on a metal plate, and the photoelectric effect does not occur. it may occur by the incidence of

- A. X- rays
- B. Radio waves
- C. Infrared rays
- D. Green light

Answer ||| A

Solution |||

As photoelectric emission does not take place for ultraviolet light (given in the question that when the photoelectric effect does not take place when UV rays are incident on a metal plate) then it is clear that we need a photon having energy more than that of UV rays photon and we know that

$$\text{Energy of photons} = \frac{hc}{\lambda}$$

Clearly, energy of photons is inversely proportional to  $\lambda$ .

So for more energetic photon the wavelength of light ( $\lambda$ ) should be small than that of the ultraviolet light for the photon emission from the given metal plate. hence  $\lambda_o < \lambda_{UV}$ . As the wavelength of X-rays is less than that of ultraviolet light, it may cause photoelectric emission.

So, option A is correct.

9. A 5 W source emits monochromatic light of wavelength 5000 Å. when placed 0.5 m away. It liberates photoelectrons from a photosensitive metallic surface. When the source is moved to a distance of 1.0 m, the number of photoelectrons liberated will be reduced by a factor of

- A. 4
- B. 8
- C. 16
- D. 2

Answer ||| A

Solution |||

Intensity of light is inversely proportional to the square of the distance.

i.e.,  $I \propto \frac{1}{r^2}$

$$\Rightarrow \frac{I_2}{I_1} = \left(\frac{r_1}{r_2}\right)^2$$

given,  $r = 0.5, r_2 = 1.0$  m.

$$\text{therefore } \frac{I_2}{I_1} = \frac{(0.5)^2}{(1)^2} = \frac{1}{4}$$

Now, since number of photoelectrons emitted per second is directly proportional to intensity

So, the number of electron emitted would decrease by a factor of 4.

So, option A is correct.

10. The fossil bone has a  $^{14}\text{C} : ^{12}\text{C}$  ratio, which is  $\left[\frac{1}{16}\right]$  of that in a living animal bone. If the half-life of  $^{14}\text{C}$  is 5730 years, then the age of the fossil bone is

- A. 11460 years
- B. 17190 years
- C. 22920 years
- D. 45840 years

Answer ||| C

Solution |||

After n half lifes (i.e. at  $t = nT$ ) the number of nuclides left undecayed,

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

$$\frac{N}{N_0} = \frac{1}{16}$$

$$\frac{1}{16} = \left(\frac{1}{2}\right)^n$$

$$\Rightarrow \left(\frac{1}{2}\right)^4 = \left(\frac{1}{2}\right)^n$$



Equating the powers, we obtain

$$n = 4$$

$$\frac{t}{T} = 4$$

$$t = 4T$$

$$\text{Or } t = 4 \times 5730 = 22920 \text{ years (} T = 5730 \text{ years)}$$

So, option C is correct.

11. Alternating current cannot be measured by a DC ammeter because

- A. AC cannot pass through DC ammeter
- B. AC changes direction
- C. The average value of current for the complete cycle is zero
- D. DC ammeter will get damage

Answer ||| D

Solution |||

In dc ammeter, a coil is free to rotate in the magnetic field of another fixed magnetic. If an alternating current is passed through the fixed magnet. The magnetic field will reverse its direction with a frequency equal to the alternating current frequency. The direction of torque also changes, average torque will be zero.

AC instruments are based on the heating effect of the current. It will get damaged if connected for a long time.

So, option D is correct.

12. If the binding energy of the electron in the hydrogen atom is 13.6 eV, the energy required to remove the electron from first excited state of  $\text{Li}^{++}$  is

- A. 122.4 eV
- B. 30.6 eV
- C. 13.6 eV
- D. 3.4 eV

Answer ||| B

Solution |||

The energy of the first excited state of helium =  $\frac{3^2 \times 13.6}{2^2} eV = -30.6 eV$

The energy required for the conservation of momentum =  $-(-30.6) eV$

= 30.6 eV

So, option B is correct.

13. Assume that a neutron break into a proton and an electron. The energy released during this process is (mass of neutron =  $1.6725 \times 10^{-27}$  kg, mass of proton =  $1.6725 \times 10^{-27}$  kg, mass of electron =  $9 \times 10^{-31}$  kg).

- A. 0.51 MeV
- B. 7.10 MeV
- C. 6.30 MeV
- D. 5.4 MeV

Answer ||| A

Solution |||

Mass defect,

$$\begin{aligned} \Delta m &= m_p + m_e - m_n \\ &= (1.6725 \times 10^{-27} + 9 \times 10^{-31} - 1.6725 \times 10^{-27}) \text{ kg} \\ &= 9 \times 10^{-31} \text{ kg} \end{aligned}$$

$$\begin{aligned} \text{Energy released} &= \Delta m c^2 \\ &= 9 \times 10^{-31} \times (3 \times 10^8)^2 \text{ J} \\ &= \frac{9 \times 10^{-31} \times 9 \times 10^{16}}{1.6 \times 10^{-13}} \text{ MeV} = 0.51 \text{ MeV} \end{aligned}$$

So, option A is correct.

14. A system goes from A to B via two processes I and II, as shown in the figure.

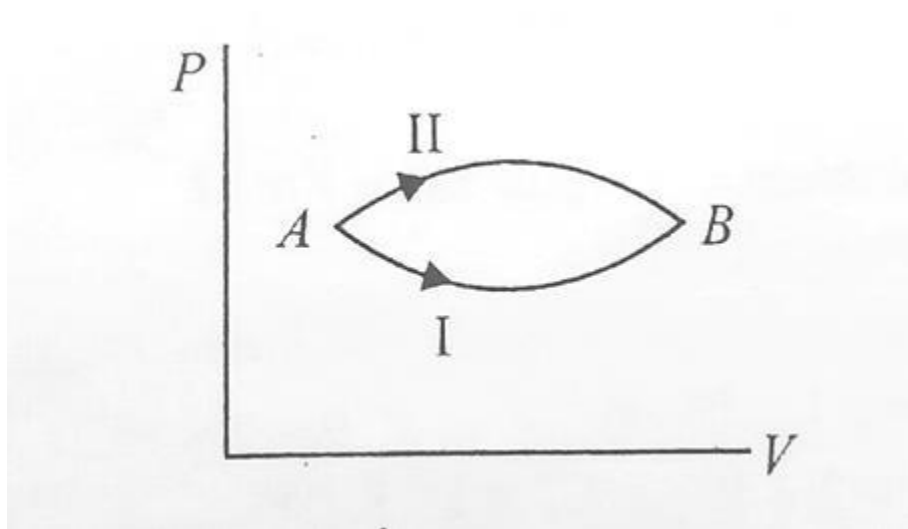
If  $\Delta U_1$  and  $\Delta U_2$  are the changes in the internal energies in the processes I and II, respectively, then

- A.  $\Delta U_2 < \Delta U_1$
- B.  $\Delta U_2 > \Delta U_1$

- C. Relation between  $\Delta U_1$  and  $\Delta U_2$  cannot be determined.
- D.  $\Delta U_1 = \Delta U_2$

Answer ||| D

Solution |||



internal energy is a state function. Its value depends only on the initial and final position .change in internal energy does not depend upon the path, followed by the process. So, change in internal energies does not depend upon both

Option D is correct.

15. A gaseous mixture consists of 16 gm of helium and 16 gm of oxygen. The ratio  $\frac{C_p}{C_v}$  of the mixture is

- A. 1.54
- B. 1.62
- C. 1.4
- D. 1.59

Answer ||| B

Solution |||

$$n_1 = 4, n_2 = \frac{1}{2}$$

$$\gamma_1 = \frac{5}{3} \quad (\text{for monoatomic gas})$$

$$\gamma_2 = \frac{7}{5} \quad (\text{for diatomic gas})$$

$$\frac{n_1 + n_2}{\gamma - 1} = \frac{n_1}{\gamma_1 - 1} + \frac{n_2}{\gamma_2 - 1}$$

$$\Rightarrow \frac{4 + 0.5}{\gamma - 1} = \frac{4}{\frac{5}{3} - 1} + \frac{0.5}{\frac{7}{5} - 1}$$

$$\Rightarrow \frac{4 + 0.5}{\gamma - 1} = \frac{12}{2} + \frac{5}{4} = \frac{29}{4}$$

$$\Rightarrow \frac{\gamma - 1}{4.5} = \frac{4}{29}$$

$$\Rightarrow \gamma - 1 = 0.62$$

$$\gamma = 1.62$$

So, option D is correct.

16. The earth radiates in the infrared region of the spectrum. The spectrum is correctly given by

- A. Wien's law
- B. Rayleigh's jeans law
- C. Plank's law of radiation
- D. Stefan's law of radiation

Answer ||| A

Solution |||

it is given by Wien's law

$$\lambda T = b$$

where T is temperature and  $\lambda$  corresponds to the wavelength around which maximum energy radiated.

So, option A is correct.

17. According to Newton's law of cooling, the rate of cooling is proportional to  $(\Delta\theta)^n$ , where  $\Delta\theta$  is the temperature difference between the body and the surroundings and  $n$  is equal to

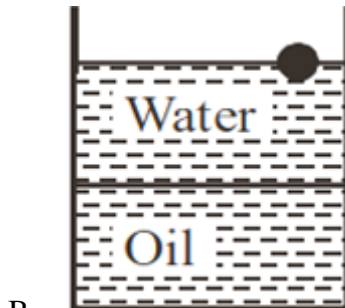
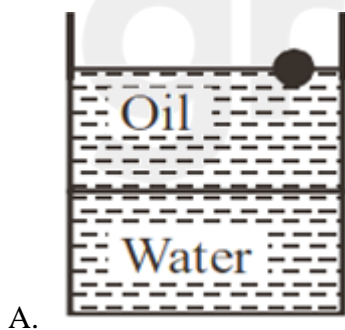
- A. Four
- B. Two
- C. One
- D. Three

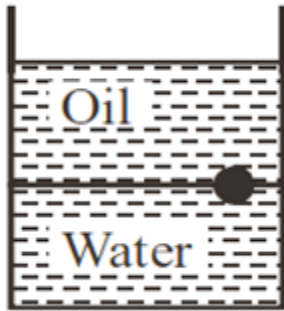
Answer ||| A

Solution ||| According to Newton's law of cooling, as the rate of cooling, is directly proportional to the temperature difference between the body and the surroundings i.e.,  $-d\theta \cdot dt \propto \Delta\theta \Rightarrow n = 1$

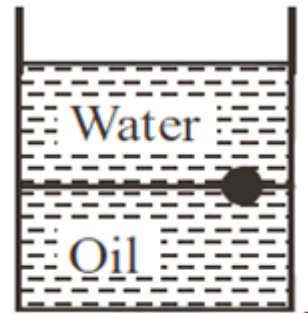
So, option A is correct.

18. A ball is made of a material of density  $\rho$  where  $\rho_{oil} < \rho < \rho_{water}$  with oil and water representing the densities of oil and water, respectively. The oil and water are immiscible. If the above ball is in equilibrium in a mixture of this oil and water, which of the following pictures represents its equilibrium position?





C.



D.

Answer ||| C

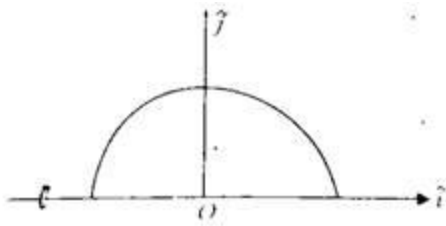
Solution |||



Oil is least dense of them, so it will settle at the top with water at the base. Now, the ball is denser than oil but less dense than water. So, it will sink in oil but not in water. It will stay at the oil-water interface.

So, option C is correct.

19. A thin semi-circular ring of radius  $r$  has a positive charge  $q$  distributed uniformly over it. The net field  $E$  at the centre  $O$  is



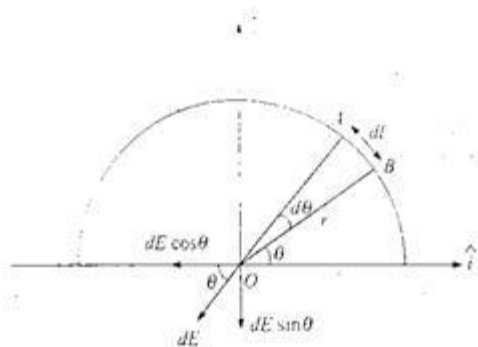
- A.  $\frac{q}{4\pi^2 \epsilon_0 r^2} \hat{j}$
- B.  $-\frac{q}{4\pi^2 \epsilon_0 r^2} \hat{j}$
- C.  $-\frac{q}{2\pi^2 \epsilon_0 r^2} \hat{j}$
- D.  $\frac{q}{2\pi^2 \epsilon_0 r^2} \hat{j}$

Answer ||| C

Solution |||

Linear charge density,  $\lambda = \frac{q}{\pi r}$

Consider a small element AB of length dl subtending an angle  $d\theta$  at the centre O as shown in the figure.



Charge on the element,

$$dq = \lambda dl = \lambda r d\theta \quad \left( \because d\theta = \frac{dl}{r} \right)$$

the electric field at the centre O due to the charge element .

## Road to NDA I 2020

### A 30-Day Crash Course (Batch 2)

START FREE TRIAL

$$dE = \frac{1}{4\pi\epsilon_0} \frac{dq}{r^2} = \frac{\lambda r d\theta}{4\pi\epsilon_0 r^2}$$

Resolve De into two rectangular components.

By symmetry,  $\int dE \cos \theta = 0$

The net electric field at O.

$$\begin{aligned} \vec{E} &= \int_0^\pi dE \sin \theta (-\hat{j}) = \int_0^\pi \frac{\lambda r d\theta}{4\pi\epsilon_0 r^2} \sin \theta (-\hat{j}) \\ &= -\int_0^\pi \frac{qr \sin \theta d\theta}{4\pi^2 \epsilon_0 r^3} \hat{j} \quad \left( \because \lambda = \frac{q}{\pi r} \right) \\ &= -\int_0^\pi \frac{q \sin \theta d\theta}{4\pi^2 \epsilon_0 r^2} \hat{j} = -\frac{q}{4\pi^2 \epsilon_0 r^2} [-\cos \theta]_0^\pi \hat{j} \\ &= -\frac{q}{2\pi^2 \epsilon_0 r^2} \hat{j} \end{aligned}$$

So, option C is correct.

20. if there are n capacitors connected in parallel to a voltage source of magnitude v volt. Then the energy stored is equal to

- A. CV
- B.  $\frac{1}{2} nCV^2$
- C.  $CV^2$
- D.  $\frac{1}{2n} CV^2$

Answer ||| B

Solution |||

The energy stored by any system of the capacitor is

$$E = \sum \frac{1}{2} CV^2 = \frac{1}{2} nCV^2$$

(:-Net capacitor of the system is equal to nC.)



So, option B is correct.

21. Kirchhoff's first law ( $\sum i = 0$ ) and second law ( $\sum iR = \sum E$ ). Where symbols have their usual meanings, are, respectively, based on

- A. Conservation of momentum, conservation of energy.
- B. Conservation of charge, conservation of energy.
- C. Conservation of charge, conservation of momentum.
- D. Conservation of energy, conservation of charge.

Answer ||| B

Solution |||

According to Kirchhoff's first law, a junction can neither act as a source of charge nor as a sink of charge. This supports the law of conservation of charge.

According to Kirchhoff's second law, the energy per unit charge transferred to the moving charges is equal to the energy per unit charge transferred from them. This supports the law of conservation of energy.

So, option B is correct.

22. The length of a given cylinder wire is increased by 100%. Due to the consequent decrease in diameter, the change in the resistance of the wire will be

- A. 300%
- B. 200%
- C. 100%
- D. 50%

Answer ||| A

Solution |||

The new length will be  $2l$  if the original length is  $l$  (As the length is increased by 100%). The volume will remain the same according to question so, area of cross-section is decreased by

half i.e. if  $a$  is the original cross-section the new cross-sectional area will be  $\frac{a}{2}$ .

Now, we know that resistance:  $R = \frac{\rho l}{a}$ ,

So, new resistance will be  $R' = \frac{\rho(2l)}{(a/2)}$

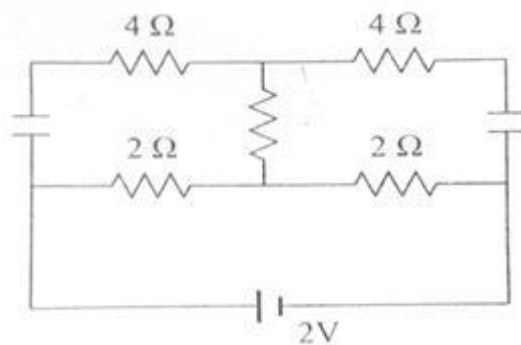
$$R' = 4R$$

The increase in resistance is  $4R - R = 3R$

The percentage increase in resistance =  $\frac{3R}{R} \times 100\% = 300\%$

So, option A is correct.

23. Find the power transfer by the battery at the steady-state of the given circuit



- A. 1.5 W
- B. 2 W
- C. 1 W
- D. None of these

Answer |||

24. The time period of a charged particle undergoing a circular motion in a uniform magnetic field is independent of its

- A. Speed
- B. Mass
- C. Charge
- D. Magnetic induction

Answer ||| A

Solution |||

we know that the time period of a charged particle undergoing a circular motion in a uniform

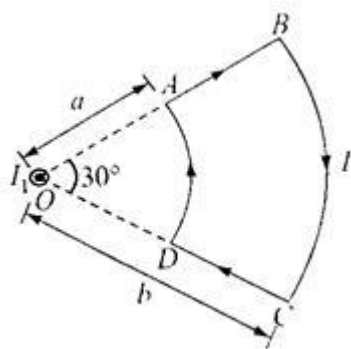
magnetic field is equal to  $\frac{2\pi m}{Bq}$ .

(:- m = mass, B = magnetic field intensity, q = charge of the particle)

Clearly, T is independent of the speed of the charged particle.

So, option A is correct.

25. The magnitude of the magnetic field (B) due to loop ABCD at the origin (O) is



- A. Zero
- B.  $\frac{\mu_0 I(b-a)}{24ab}$
- C.  $\frac{4\pi ab}{\mu_0 I(b-a)}$
- D.  $\frac{\mu_0 I}{4\pi} \left[ 2(b-a) + \frac{\pi}{3}(a+b) \right]$

Answer ||| B

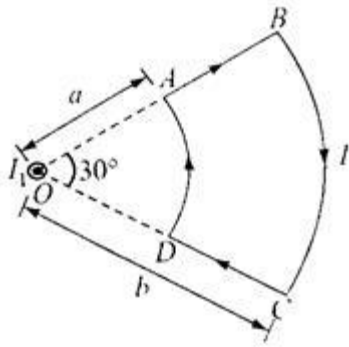
Solution |||

The direction of current in the wire AB and CD pass through O. hence these wire do not contribute to the magnetic induction at O. the field due to wire DA is out of the paper and that due to wire BC is into the paper.

## Road to NDA I 2020

### A 30-Day Crash Course (Batch 2)

START FREE TRIAL



Let us take the direction out of the paper as positive and the direction into the paper as negative

The total magnetic field due to the loop ABCD at O is

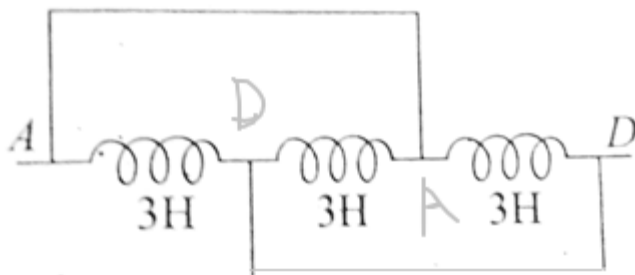
$$B = B_{AB} + B_{BC} + B_{CD} + B_{DA}$$

$$\Rightarrow B = 0 - \frac{\mu_0 I}{4\pi b} \times \frac{\pi}{6} + 0 + \frac{\mu_0 I}{4\pi a} \times \frac{\pi}{6}$$

$$\Rightarrow B = \frac{\mu_0 I}{24ab} (b - a)$$

So, option B is correct.

26. The inductance between A and D is



- A. 3.66 H
- B. 9 H
- C. 0.66 H
- D. 1 H

Answer ||| D

Solution |||

## Road to NDA I 2020

### A 30-Day Crash Course (Batch 2)

START FREE TRIAL

from the diagram we can see that the given inductances are connected in parallel.

$$\Rightarrow \frac{1}{L} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{3}{3} = 1 \text{ H}$$

Therefore net inductance

So, option D is correct.

27. wavelength of light used in an optical instrument

is  $\lambda_1$  and  $\lambda_2$  are  $4000 \text{ \AA}$  and  $5000 \text{ \AA}$  respectively. then the ratio of their respective resolving power (corresponding to  $\lambda_1$  and  $\lambda_2$ ) is

- A. 16 : 25
- B. 9 : 1
- C. 4 : 5
- D. 5 : 4

Answer ||| D

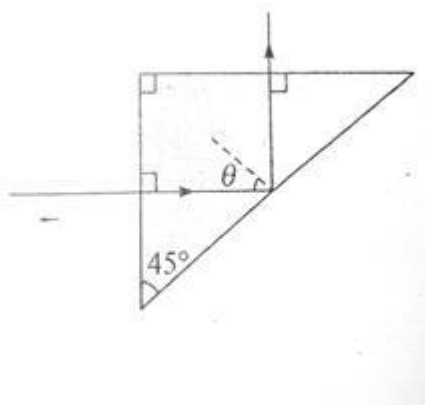
Solution |||

Resolving power is inversely proportional to the wavelength of light

$$R.P \propto \frac{1}{\lambda} \Rightarrow \frac{(R.P_1)}{\lambda_1} = \frac{(R.P_2)}{\lambda_2} = \frac{5}{4}$$

So, option D is correct.

28. A light ray is incident perpendicular to a face of a  $90^\circ$  prism and is totally internally reflected at the glass-air interface if the angle of reflection is  $45^\circ$ , what can be concluded about the refractive index n?



**Road to NDA I 2020**  
A 30-Day Crash Course (Batch 2) START FREE TRIAL

- A.  $n < \frac{1}{\sqrt{2}}$
- B.  $n < \sqrt{2}$
- C.  $n > \frac{1}{\sqrt{2}}$
- D.  $n > \sqrt{2}$

Answer ||| D

Solution |||

For total internal reflection

$$\sin \theta > \sin \theta_c \quad (\theta_c \text{ is the critical angle for total internal reflection})$$

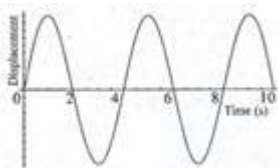
$$\Rightarrow \sin \theta > \frac{1}{n}$$

$$n > \frac{1}{\sin \theta} \Rightarrow n > \frac{1}{\sin 45^\circ}$$

$$n > \frac{1}{\frac{1}{\sqrt{2}}} \Rightarrow n > \sqrt{2}$$

So, option D is correct.

29. The following figure shows displacement versus time curve for a particle executing simple harmonic motion:



Which one of the following statements is correct?

- A. Phase of the oscillating particle is same at  $t = 1$  s and  $t = 3$  s
- B. Phase of the oscillating particle is same at  $t = 2$  s and  $t = 8$  s
- C. Phase of the oscillating particle is same at  $t = 3$  s and  $t = 7$  s
- D. Phase of the oscillating particle is same at  $t = 4$  s and  $t = 10$  s

Answer ||| C

Solution |||

- Phase of oscillating particle at any instant is a physical quantity which completely expresses the position and direction of motion of particle at that instant with respect to its mean position. Phase of the oscillating particle is equal at  $t=3s$  and  $t=7s$ .
- By the figure, we can see that the time period of the oscillation is 4 sec. its mean after 4 sec. the position and the phase of the particle will be same.

30. A circular coil of single turn has a resistance of  $20 \Omega$ . Which one of the following between the ends of any diameter of the coil?

- A.  $5 \Omega$
- B.  $10 \Omega$
- C.  $20 \Omega$
- D.  $40 \Omega$

Answer ||| A

Solution |||

Each of the two semicircles between the two ends of the diameter has a resistance of  $20/2=10$ .

These two resistors are in parallel between the two ends of the diameter. Thus the effective resistance is

$$\begin{aligned} R &= R_1 * R_2 / R_1 + R_2 \\ &= 10 * 10 / 10 + 10 \\ &= 5 \end{aligned}$$

31. In a solenoid, the current flowing through the wire is  $I$  and number of turns per unit length is  $n$ . This gives a magnetic field  $B$  inside the solenoid. If number of turn per unit length is increased to  $2n$ , what will be the value of magnetic field in the solenoid?

- A.  $B$
- B.  $2B$
- C.  $B/2$
- D.  $B/4$

Answer ||| B

Solution |||

- A long solenoid is one which has a larger length in comparison to the radius. It consists of a long wire wound in the form of a helix where the neighbouring turns are closely spaced. So each turn can be regarded as a circular loop. The net magnetic field is the vector sum of the fields due to all the turns. Enamelled wires are used for winding so that turns are insulated from each other.
- The magnetic field of a inside long solenoid is:  $B = \mu_0 nI$  or

Where,

$n$  = number of turns per unit length

$I$  = current flowing through a solenoid

$B$  proportional per unit length, so if we doubled the per unit length, then the magnetic field will be doubled.

32. The radii of curvature of the faces of a double convex lens are 10 cm and 20 cm. The refractive index of the glass is 1.5. What is the power of this lens (in units of dioptre)?

- A. +7.5 D
- B. -7.5 D
- C. +2.5 D
- D. +5.0 D

Answer ||| A

Solution |||

The power of double Convex Lens is given by-

$$\begin{aligned} P &= \frac{1}{f} = (n-1) \left[ \frac{1}{R_1} + \frac{1}{R_2} \right] \\ &= (1.5-1) \left( \frac{1}{10} + \frac{1}{20} \right) \\ &= .5(15) = +7.5 D \end{aligned}$$

33. The time period of a simple pendulum made using a thin copper wire of length  $L$  is  $T$ . Suppose the temperature of the room in which this simple pendulum is placed increases by  $30^\circ\text{C}$ , what will be the effect on the time period of the pendulum?



- A. T will increase slightly
- B. T will remain the same
- C. T will decrease slightly
- D. T will become more than 2 times

Answer ||| A

Solution |||

$$T_0 = 2\pi\sqrt{\frac{l_0}{g}}$$

$$T = 2\pi\sqrt{\frac{l_0(1 + \alpha\Delta t)}{g}}$$

$$T = 2\pi\sqrt{\frac{l_0}{g}} \left(1 + \frac{\alpha}{2}\Delta t\right)$$

(by using Binomial expansion)

$$T = T_0\left(1 + \frac{\alpha}{2}\Delta t\right)$$

$$\Rightarrow T - T_0 = T_0 \frac{\alpha}{2}\Delta t$$

$$\frac{\Delta T}{T_0} = \frac{1}{2}(\alpha\Delta t)$$

Where,  $\Delta T$  = increase in time period

In a simple pendulum, which can be recognized as the mass of a point at the end of a string of insignificant given length & a mass, the amplitude is normally only a few degrees. When the amplitude is this small, it does not affect the period of the pendulum. As the amplitude of the pendulum increases, the period progressively increases.

34. A pencil is placed upright at a distance of 10 cm from a convex lens of focal length 15 cm. The nature of the image of the pencil will be

- A. real, inverted and magnified
- B. real, erect and magnified
- C. virtual, erect and reduced

D. virtual, erect and magnified

Answer ||| D

Solution |||

The image formed by the concave mirror when the object is placed between the centre of curvature and focus will be virtual, erect and magnified.

35. A lady is standing in front of a plane mirror at a distance of 1 m from it. She walks 60 cm towards the mirror. The distance of her image now from herself (ignoring the thickness of the mirror) is

- A. 40 cm
- B. 60 cm
- C. 80 cm
- D. 120 cm

Answer ||| C

Solution |||

In a plane mirror, the distance of an object from mirror = distance of the image from the mirror.

So, the distance between mirror and object =  $40 + 40 = 80$  cm

36. The brightness of a star depends on its

- A. size and temperature only
- B. size and distance from the earth
- C. size, temperature and mass
- D. size, temperature and distance from the earth

Answer ||| D

Solution |||

The brightness level of a star depends on its composition, i.e. size and temperature (energy light radiation, e.g. X-ray, etc.) and how far it is from the planet.

37. A glass vessel is filled with water to the rim, and a lid is fixed to it tightly. Then it is left inside a freezer for hours. What is expected to happen?

- A. The water freezes to ice and the level of ice come down
- B. The water in the glass vessel simply freezes to ice
- C. The glass vessel breaks due to expansion as water freezes to ice
- D. The water does not freeze at all

Answer ||| C

Solution |||

When water freezes to ice its volume increases, so if it is kept in a glass vessel in a freezer, it may break the vessel.

38. A simple circuit contains a 12 V battery and a bulb having 24-ohm resistance. When you turn on the switch, the ammeter connected in the circuit would read

- A. 0.5 A
- B. 2 A
- C. 4 A
- D. 5 A

Answer ||| A

Solution |||

$$i = V/R = 12/24 = 0.5A$$

39. Three resistors with magnitudes 2, 4 and 8 ohm are connected in parallel. The equivalent resistance of the system would be

- A. less than 2 ohm
- B. more than 2 ohm but less than 4 ohm
- C. 4 ohm
- D. 14 ohm

Answer ||| A

Solution |||

$$1/R = 1/R_1 + 1/R_2 + 1/R_3$$

$$= \frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \frac{7}{8}$$

$R = \frac{8}{7}$ , It is more than one and less than 2.

The Equivalent Resister connected in Parallel is less than the smallest value of them.

The Equivalent Resister connected in Series is more than the greatest value of them.

40. Atoms with different atomic number, but having same number of Neutron are called?

- A. Isotone
- B. Isobar
- C. Isotope
- D. Isoelectronic

Answer ||| A

Solution |||

**ISOTONE:** Isotones are the atom of different element which contain same number of neutron with different mass number and atomic number.

**ISOTOPES:** Isotopes are atom have same atomic number but different mass number or atomic mass.

**ISOBARS:** Isobars are atoms of different elements which have same mass number but different atomic number.

**ISOELECTRONIC:** Atom/Molecule/Ions containing the same number of Electrons.

41. If an atom's nucleus goes for a radio-active decay, then the level of electronic energy will be,

- A. It will not change for any type of radio activity
- B. It will change only for  $\alpha$  and  $\beta$  type of radio activity
- C. It will change only for  $\alpha$  type of radio activity
- D. It will change only for  $\beta$  type of radio activity

Answer ||| B

Solution |||

For  $\alpha$  particle there is two unit for positive charge and for  $\beta$  particle it is one unit of positive charge change. For  $\gamma$  particle there is no change in charges. Due to this reason energy level will change for  $\alpha$  and  $\beta$  but not for others.

42. which of the following is not an ore?

- A. Malachite
- B. Calamine
- C. Stellite
- D. Goethite

Answer ||| C

Solution |||

Malachite is an ore of copper. It usually found in copper deposits associated with limestone, occurring with azurite as the weathering product of other copper ore minerals.

Calamine is an ore of zinc.

Stellite is a range of cobalt-chromium alloys designed for wear resistance.

Goethite is an ore of iron. It is an iron oxyhydroxide containing ferric iron.

43. Water gas is produced by

- A. Passing steam over red hot coke
- B. Passing steam and air over red hot coke
- C. Burning coke in excess of air
- D. Burning coke in limited supply of air

Answer ||| A

Solution |||

Water gas is a mixture of carbon-monoxide and hydrogen produced by passing steam over red hot coke using the endothermic reactions. This product has a lower calorific value than coal gas so the gas was often passed through a heated retort into which oil was spread, the resulting mixed gas was called carburetted water gas.

44. Choose the correct statement

- 1) In ionic bonds structure is determined by relative directions of the ions
  - 2) In covalent bonds, direction and shape of the bond is decided by the directions.
- A. 1 only  
B. 2 only  
C. Both 1 and 2  
D. Neither 1 nor 2

Answer ||| B

Solution |||

Ionic bonding is a type of chemical bond in which valence electrons are gained by one and lost by another. The atom which receives the electrons acquires negative charge and other will acquire positive charge. It is a relation of mutual electrostatic attraction. Thus, ionic bond is not directional.

Covalent bond is directional. Atoms bonded covalently prefer specific orientation relative to one another. Because of it they are having definite shape.

45. If the work function of the metal is 4.2 eV and for incident radiation of wavelength 330nm, will photoelectric emission occur?

- A. Photoemission will be more  
B. Photoemission will not take place  
C. Photoemission is less  
D. None of the above

Answer ||| B

Solution |||

For photoemission energy 'E' of incident radiation must be more than or equal to work function ' $\phi_0$ ' of the metal.

$E \geq \phi_0$  (The Condition for photoelectric emission)

$$E = hv = hc/\lambda$$

Where  $h$  = plank's constant =  $6.63 \times 10^{-34}$  J. sec

$\nu$  = frequency of radiation

$c$  = light's speed =  $3 \times 10^8$  m/s

$\lambda$  = wavelength of radiation

$$E = 6.63 \times 10^{-34} \times 3 \times 10^8 / 330 \times 10^{-9}$$

$$= 6.018 \times 10^{-19} \text{ J} = 6.018 \times 10^{-19} / 1.6 \times 10^{-19} \text{ eV}$$

$$= 3.76 \text{ eV}$$

$\phi_0 = 4.2 \text{ eV}$  as per question.

$E < \phi_0$ , therefore photoemission will not take place.

No photoemission will take place as work function is more than the photon energy of the incident radiation.

46. What is the de Broglie wavelength of a bullet of mass 0.040 kg travelling at the speed of 1.0 km/s?

- A.  $1.65 \times 10^{-30}$  m
- B.  $1.65 \times 10^{30}$  m
- C.  $1.65 \times 10^{35}$  m
- D.  $1.65 \times 10^{-35}$  m

Answer ||| D

Solution |||

we know de Broglie wavelength of Particle can be given by relation

$$\lambda = \frac{h}{p} = \frac{h}{m \times v}$$

Where,  $\lambda$  is de Broglie wavelength of a Particle

$m$ , mass of the body  $v$ , velocity of the body  $h$ , Planck constant =  $6.63 \times 10^{-34}$  Js

Given,

Mass of bullet,  $m = 0.040$  kg

The speed of bullet is,  $v = 1.0 \text{ km/s} = 1000 \text{ m/s}$

putting the valued of m, v, h in the relation

we get the de Broglie wavelength of Bullet as

$$\lambda = \frac{6.63 \times 10^{-34} \text{ J-sec}}{0.040 \text{ Kg} \times 1000 \text{ ms}^{-1}} = 1.65 \times 10^{-35} \text{ m}$$

So, de Broglie wavelength of Bullet is  $1.65 \times 10^{-35} \text{ m}$

47. When a atom makes a transition from the upper level to lower level then the frequency of radiation emitted is, (two energy level separates by 2.3 eV)

- A.  $5.55 \times 10^{14} \text{ Hz}$
- B.  $5.55 \times 10^{-14} \text{ Hz}$
- C.  $5.05 \times 10^{-14} \text{ Hz}$
- D.  $5.50 \times 10^{14} \text{ Hz}$

Answer ||| A

Solution |||

Given: Energy = 2.3 eV

In joules, Energy E =  $2.3 \times 1.6 \times 10^{-19} = 3.68 \times 10^{-19} \text{ J}$

Energy is given as:

$$E = h\nu$$

Where h is Planck's constant

$\nu$  is frequency of the radiation

$$\nu = \frac{E}{h} = \frac{3.68 \times 10^{-19} \text{ J}}{6.62 \times 10^{-34} \text{ J-s}}$$

On calculating, we get

$$\text{Frequency } \nu = 0.55 \times 10^{15}$$

Or Frequency  $\nu = 5.55 \times 10^{14} \text{ Hz}$ .

48. Which of the following element is exists as a highly toxic pale yellow diatomic gas under standard conditions; and it reacts with almost all other elements except Helium and Neon?



- A. Fluorine
- B. Chlorine
- C. Bromine
- D. Astatine

Answer ||| A

Solution |||

Fluorine is a chemical element with the symbol F and its atomic number is 9. It is the lightest Halogen and exists as a highly toxic pale yellow diatomic gas under standard conditions. As the most electric element, it is highly reactive, as it reacts with almost all other elements except Helium and Neon. Fluorine is the most frequent electrical element on the Pauling electronegativity scale.

49. Which of the following is not true?

- A. The nucleus of atom is positively charged.
- B. 1 atomic mass unit (1u) is the 1/12th mass of an atom of  $^{12}\text{C}$
- C. The neutron mass is almost identical to the proton.
- D. The mass number is total number of proton and electron.

Answer ||| D

Solution |||

An atom has a nucleus which is positively charged. Mass is measured in atomic mass units (U) on the atomic scale. By Definition, 1 atomic mass unit (1u) is the 1/12th mass of an atom of  $^{12}\text{C}$ ;  $1\text{u} = 1.660563 \times 10^{-27}\text{ kg}$ . The neutron mass is almost identical to the proton. Atomic number 'Z' is the number of Protons in an atomic nucleus of an element. The mass number 'A' is the total number of Neutrons and Protons in the atomic nucleus;  $A = Z + N$ ; Here N denotes the number of neutrons in the nucleus.

50. A substance changes from a solid to a gas without going through the liquid phase – this process called sublimation. Which of the following does not shows sublimation-

- A. Alum
- B. Iodine
- C. Arsenic
- D. Naphthalene

Answer ||| A

Solution |||

Through sublimation, a substance changes from a solid to a gas, this never goes through the liquid phase. Examples of solids that are sublime are dry ice (solid carbon dioxide), iodine, arsenic, and naphthalene. In practice metals, salts and polymers are considered as substances that are not indifferent under non-peak conditions.

51. Consider the following

- 1) Most of the area in an atom is vacant
- 2) Positive charge in an atom is evenly distributed
- 3) Positron has an electric charge of +1 e

Which of the following is/are observations of Rutherford's Alpha scattering Experiment?

- A. 1 and 2
- B. 1 and 3
- C. 2 and 3
- D. All of the above

Answer ||| B

Solution |||

Observations of Rutherford's Alpha Scattering Experiment

A significant fraction of  $\alpha$ -particles bombard towards the gold sheet passed through it without any deflection, and so most of the space in an atom is empty. Some of the  $\alpha$ -particles were deflected from the gold sheet by very small angles, and therefore the positive charge in an atom is not evenly distributed. The positive charge in the atom is concentrated in a very small volume. Many  $\alpha$ -particles were deflected back, with only a few  $\alpha$ -particles having an angle deflection of about  $180^\circ$ . So the volume of positively charged particles is much less than the total charged particles in an atom.

52. A sample of oxygen contains two isotopes of oxygen with masses 16 u and 18 u respectively. The proportion of these isotopes in the sample is 3: 1. What will be the average atomic mass of oxygen in this sample?

- A. 17.5 u
- B. 17 u
- C. 16 u
- D. 16.5 u

Answer ||| D

Solution |||

Give, first isotope 16u; second isotope 18u

Proportion of isotopes= 3:1

Average Atomic Mass=  $(16u \cdot 3 + 18u \cdot 1) / (3 + 1)$

=  $(48u + 18u) / 4$

=  $66u / 4$

= 16.5 u

Hence, (D) is the correct option.

53. What is the molar mass of anhydrous sodium carbonate? (Given that the atomic masses of sodium, carbon and oxygen are 23 u, 12 u and 16 u respectively)

- A. 286 u
- B. 106 u
- C. 83 u
- D. 53 u

Answer ||| B

Solution |||

Given, Atomic mass of

Na  $\Rightarrow$  23u

Carbon  $\Rightarrow$  12u

O  $\Rightarrow$  16u

Molar mass of Anhydrous sodium carbonate  $\Rightarrow$   $\text{Na}_2\text{CO}_3 = 2 \cdot \text{Na} + \text{C} + \text{O} \cdot 3$

=  $46 + 12 + 48 = 106$

Hence, (B) is the correct answer.

54. Permanent hardness of water cannot be removed by which one of the following methods?



**Road to NDA I 2020**  
A 30-Day Crash Course (Batch 2)

START FREE TRIAL

- A. Treatment with washing soda
- B. Calgon's method
- C. Boiling
- D. Ion exchange method

Answer ||| C

Solution |||

Permanent hardness of water is caused by the presence of the chlorides, nitrates and sulphates of calcium and magnesium. Boiling cannot precipitate these substances. It can be removed by treating it with soda water and using permutit process.

55. Which one of the following greenhouse gases is in largest concentration in the atmosphere?

- A. Chlorofluorocarbon
- B. Nitrous oxide
- C. Carbon dioxide
- D. Methane

Answer ||| C

Solution |||

carbon dioxide is present in the largest concentration in atmosphere. It is around 400 ppm in concentration in atmosphere.

56. Which one of the following is a tribasic acid?

- A. Hydrochloric acid
- B. Nitric acid
- C. Sulphuric acid
- D. Phosphoric acid

Answer ||| D

Solution |||

Tribasic acid has three hydrogen ions to donate to a base in a reaction of acid-base. It has got three replaceable hydrogen atoms. Some common examples of tribasic acid are Phosphoric acid ( $\text{H}_3\text{PO}_4$ ) and citric acid.

57. The absolute zero temperature is 0 kelvin. In C unit, which one of the following is the absolute zero temperature?

- A. 0 °C
- B. -100 °C
- C. -273.15 °C
- D. -173.15 °C

Answer ||| C

Solution |||

The absolute zero temperature is -273.15°C on Celsius temperature scale. It is -459.67 °F on the Fahrenheit temperature scale.

Absolute zero temperature is the temperature at which a thermodynamics system has the lowest energy.

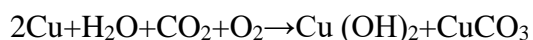
58. On exposure to moist air, copper gains a green coat on its surface due to formation of which one of the following compounds?

- A. Copper carbonate
- B. Copper oxide
- C. Copper sulphate
- D. Copper Nitrate

Answer ||| A

Solution |||

The copper metal turns green in colour because of corrosion when exposed to air. In the rainy season when copper is exposed then it reacts with gases and moisture. After it, atmospheric gases form a mixture of copper carbonate and copper hydroxide. This gives green colour to the surface of copper metal.



59. Which one of the following substances is NOT a mixture?

- A. Ice
- B. Ice-cream
- C. Air

D. Honey

Answer ||| D

Solution |||

Honey is actually a pure substance. Honey is made through a process in which nectar is collected by bees. From the substance, nectar cannot be separated. Honey is having uniform property.

Ice is heterogeneous mixture. If all the ice were to melt and there were no impurities present, it would not be mixture at all but would just be compound H<sub>2</sub>O. The appearance of ice is plainly uniform throughout but composition is not uniform. Ice-cream is also mixture of different compounds.

Air is the mixture of various gases, dust particles and water vapors. Air can be separated into its constituents who do not react to each other. Air shows properties of all the gases present in it.

60. Which one of the following minerals is used as a fuel in nuclear power stations?

A. Bauxite

B. Quartz

C. Feldspar

D. Pitchblende

Answer ||| D

Solution |||

Pitchblende is a radioactive, uranium-rich mineral and ore it has chemical composition, which is largely UO<sub>2</sub>, but also contains UO<sub>3</sub> and oxides of lead, thorium and Rare earth elements. It contains a small amount of radium as a radioactive decay product of Uranium.

61. A : Addition of HCN in alkene is a type of electrophilic substitution reaction.

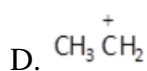
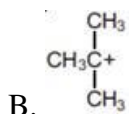
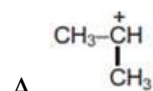
R : In first step, H<sub>3</sub>O<sup>+</sup> attacks on double bond.

- A. Both assertion and reason are true and reason is the correct explanation of assertion
- B. Both assertion and reason are true but reason is not the correct explanation of assertion
- C. If Assertion is true and reason is false.
- D. Both Assertion and reason are false.

Answer ||| D

Solution ||| Both assertion and reason are false since addition of HCN to alkene is an electrophilic addition reaction which does not involve attack of  $\text{H}_3\text{O}^+$  on double bond.

62. Which amongst the following is the most stable carbocation?



Answer ||| B

Solution ||| Stability of carbocation follows the order

$3^\circ > 2^\circ > 1^\circ$  Methyl  $3^\circ$  carbocation is most stable because of +I effect and hyperconjugation.



R : Positive inductive effect of  $\text{C}_2\text{H}_5$ —group is less than  $\text{CH}_3$ —group.

- A. Both assertion and reason are true and reason is the correct explanation of assertion

- B. Both assertion and reason are true but reason is not the correct explanation of assertion
- C. If Assertion is true and reason is false.
- D. Both Assertion and reason are false.

Answer ||| D

Solution ||| Assertion is false because  $\text{CH}_3-\overset{+}{\text{C}}\text{H}-\text{CH}_3$  is more stable than  $\text{C}_2\text{H}_5-\overset{+}{\text{C}}\text{H}-\text{C}_2\text{H}_5$  because  $\text{CH}_3-\overset{+}{\text{C}}\text{H}-\text{CH}_3$  has more number of hyperconjugative structure and reason is also false. Since +I effect of  $-\text{C}_2\text{H}_5$  group is more than that of  $-\text{CH}_3$  group.

64. Glucose exists in how many forms in equilibrium?

- A. 3
- B. 4
- C. 5
- D. 6

Answer ||| A

Solution |||

Three

65. Which of the statement about Li is incorrect?

- A. It is used to make alloys.
- B. It is a good reducing agent.
- C. LiCl is insoluble in alcohol.
- D. None of the above.



Answer ||| C

Solution ||| LiCl is soluble in alcohol, due to the covalent character of LiCl.

66. Which of the following is a primary pollutant?

- A. O<sub>3</sub>
- B. SO<sub>2</sub>
- C. SO<sub>3</sub>
- D. PAN

Answer ||| B

Solution ||| Primary pollutants are those which enter the air as a result of natural events or human activities.

For e.g., CO, SO<sub>2</sub> etc.

67. You are given the solution of lead nitrate. In order to obtain a yellow precipitate, you should mix with it a solution of:

- A. Potassium chloride
- B. Potassium nitride
- C. Potassium sulphide
- D. Potassium iodide

Answer ||| D

Solution |||

Potassium iodide reacts with lead nitrate to give a yellow precipitate of lead iodide.

68. Assertion A.: Platinum and Palladium are used as storage media for hydrogen.

Reason (R): These metals absorb large volumes of hydrogen.

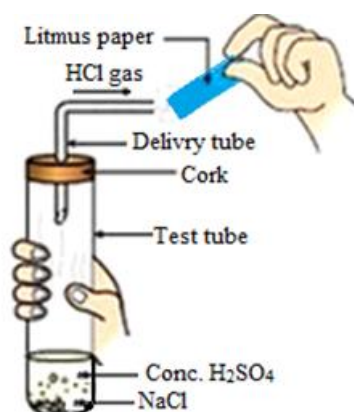
- A. Statements A and R both are correct, and R is the correct explanation of A
- B. A is correct, but R is not correct.
- C. A and R both are correct, but R is not the correct explanation of A
- D. A and R both are false.

Answer ||| A

Solution |||

Palladium and Platinum are unique materials with a strong affinity to hydrogen owing to both its catalytic and hydrogen-absorbing properties. They soak up hydrogen "like a sponge soaks up water". They have the ability to absorb large volumetric quantities of hydrogen at room temperature and atmospheric pressure, and subsequently forms metallic hydrides like  $PdH_x$ . They play a major role in hydrogen purification, storage, detection, and fuel cells. These metallic hydrides absorb hydrogen as H atoms. The metal lattice expands and becomes less stable. On heating, the metallic hydride decomposes to hydrogen and finely divided metal. The hydrogen obtained can be used as fuel.

69. When an experiment is carried out between conc. sulphuric acid and sodium chloride, HCl gas is liberated. When a blue litmus paper is brought near the mouth of the test tube, why is there no change in the colour of the litmus paper?



- A. The litmus paper is kept very close to the mouth of the delivery tube.
- B. The litmus paper used is dry.
- C. dry HCl gas is liberated.

D. Both b & c.

Answer ||| D

Solution ||| :

It is hydrogen ions ( $H^+$ ) that gives acidic properties. To change the colour of blue litmus paper to red, there must be a presence of acid. Dry HCl gas is not acidic because water is required for the dissociation of HCl into  $H^+$  and  $Cl^-$ . Hydrogen Chloride gas will turn blue litmus paper red only if either the gas is moist or the litmus paper is wet with some pure water.

Hence, there is no change in the colour of dry blue litmus paper.

70. The elements which has the highest first ionization potential is:

- A. H
- B. C
- C. N
- D. O

Answer ||| C

Solution |||

Nitrogen has total 7 electrons So its hybridization is  $sp^3$  it mean there are three electrons in 2p subshell which are singly filled. So, according to Hund's Rule, half filled and fully filled orbitals are most stable. So, nitrogen is in a stable state and does not want to lose electrons. Hence, it has the highest first ionization energy.

Easy

71. The hydrogen ion concentration of three acids P, Q and R are  $1 \times 10^{-5}$  mol/L,  $1 \times 10^{-3}$  mol/L and  $1 \times 10^{-2}$  mol/L respectively. Choose the correct order of their increasing acidic strength.

- A.  $P > Q > R$
- B.  $P = Q > R$
- C.  $R > P > Q$
- D.  $R > Q > P$

Answer ||| D

Solution |||

If an acid completely dissociates and the (H<sup>+</sup>) concentration is 10<sup>-1</sup> moles per litre, then pH = 1.0

Hence, the pH of P- 5, Q- 3 and R- 2

So the increasing ionic strength is in this order:

R > Q > P

pH is a measure of the concentration of hydrogen ions in a Solution. Strong acids like hydrochloric acid at the sort of concentrations you normally use in the lab have a pH around 0 to 1. The lower the pH, the higher the concentration of hydrogen ions in the Solution.

72.The nitrogenous fertilizer manufactured in India which occupies the first place in production is:

- A. Urea
- B. Ammonium phosphate
- C. Ammonium sulphate
- D. Calcium ammonium nitrate

Answer ||| A

Solution |||

During the FY 2016-17 India has produced 413.24 LMT of fertilizers. Urea dominates the total fertilizer production in the country. In India, there are 30 Large sized Urea Manufacturing units, 21 DAP and Complex Fertilizers units and 2 units which manufacture Ammonium Sulphate as a by- product.

Easy

73.Which microorganisms should be given priority in groundnut cultivation?

- A. *Azospirillum*
- B. Mycorrhiza
- C. *Rhizobium*
- D. Phosphobacteria

Answer ||| D

Solution |||

Phosphobacteria culture is given the priority in groundnut cultivation. Phosphobacteria are used in different types of crops. Phosphobacteria finds its important role in the application of enhancing the growth of the plant. The Phosphobacteria even helps in reducing the 25 % of the phosphatic fertilizers input to the crops. These are the fertilizers with high demand and price in the market. About 99 % of the total phosphorus is insoluble, and are not available to the plants. This is used in combination with *Pseudomonas striata* as a combined formulation.

74. Which one of the following fertilisers is least hygroscopic?

- A. Urea
- B. Ammonium sulphate
- C. Ammonium Nitrate
- D. Calcium nitrate

Answer ||| C

Solution |||

Ammonium sulphate is water soluble but non-hygroscopic. They are acidic in nature. It contains high level of nitrogen than nitrate fertilizers. They are less readily available to plants than nitrate fertilizers. The ammonical nitrogen has to nitrify in the soil and be converted into nitrate before it can be taken up by plants.

Urea is the most concentrated solid nitrogenous fertilizer, containing 46 per cent nitrogen. It is a white crystalline substance readily soluble in water. It absorbs moisture from the atmosphere and has to be kept in moisture proof containers. It is readily converted to ammoniacal and nitrate forms in the soil.

Ammonium nitrate is white, water soluble and hygroscopic crystalline salt containing 35 percent nitrogen half as nitrate nitrogen and half in the ammonium form. In the ammonium form, it cannot be easily leached from the soil. This fertilizer is quick-acting, but highly hygroscopic and not fit for storage. It has an acidulating effect on the soil.

Calcium nitrate is a white crystalline hygroscopic solid soluble in water containing 15.5 percent nitrogen and 19.5 percent calcium. The calcium is useful for maintaining a desirable soil pH.

75. Which one of the following concentrated organic manures has maximum phosphorus content?

- A. Fish meal
- B. Sterameal
- C. Poultry manure
- D. Guano

Answer ||| C

Solution |||

Poultry manure contains higher nitrogen and phosphorus compared to other bulky organic manures. The average nutrient content is 3.03 percent N; 2.63 percent  $P_2O_5$  and 1.4 percent  $K_2O$ . Fresh chicken manure contains 0.8% potassium, 0.4% to 0.5% phosphorus and 0.9% to 1.5% nitrogen. One chicken produces approximately 8–11 pounds of manure monthly. Chicken manure can be used to create homemade plant fertilizer.

The excreta of birds ferment very quickly. If left exposed, 50 percent of its nitrogen is lost within 30 days.

76. Saponification involves conversion of fat or oil or lipid into soap and alcohol by the action of heat in the presence of:

- A. KOH
- B. NaOH
- C. HCl
- D. NaCl

Answer ||| B

Solution |||

Saponification is a process that involves the conversion of fat or oil or lipid into soap and alcohol by the action of heat in the presence of aqueous alkali (e.g. NaOH). Soaps are salts of fatty acids, and fatty acids are monocarboxylic acids that have long carbon chains (at least 10), e.g. sodium palmitate. Saponification to the sodium salt of myristic acid takes place with NaOH in water. NaOH gives hard soaps.

77. Why would you NOT want to use compost as mulch?

- A. It's unsanitary
- B. It attracts squirrels, ants, and other critters looking for food
- C. The nutrients are too concentrated and will kill the plant
- D. The nitrogen evaporates into the air instead of the soil

Answer ||| C

Solution |||

Compost is organic matter made by garden refuse, kitchen scraps, lawn clippings. Compost that has fully decomposed is sometimes referred to as humus. Compost can be added or dug

into garden beds while the soil is being turned. When planting new plants, it is added to the hole. The plant will not thrive, if it is overdone. The soil will be too rich, and will have too much phosphorus and potassium for plants to handle.

We don't use compost as mulch however. Compost is full of nutrients and mixed with the soil to feed the plants through their roots. In contrast, mulch is the layer of organic materials placed on the top of the soil as a protective cover. Mulch helps to suppress weed germination, retain moisture, insulate the soil, and reduce erosion. Mulch also contributes nutrients to the soil by gradually breaking down over time. Using both compost and mulch in the garden are simple changes with huge impacts on growing plants, cutting down on weeds, and improving soil.

78. Pick up the incorrect statement from the following:

- A. The phenomenon by virtue of which cement does not allow transmission of sound, is known as soundness of cement
- B. The process of changing cement paste into hard mass, is known as setting of cement
- C. The degree of grinding of cement, is called fineness
- D. The heat generated during chemical reaction of cement with water, is known as heat of hydration.

Answer ||| C

Solution |||

Soundness of cement is the ability of a hardened paste to retain its volume after setting. A cement is said to be unsound (i.e., having lack of soundness) if it is subjected to delayed destructive expansion. Unsoundness of cement is due to the presence of excessive amounts of hard-burned free lime or magnesia.

Moderate

79. The most heat resistant glass is:

- A. Fused silica
- B. Aluminosilicate
- C. 96% silica
- D. Borosilicate

Answer ||| A

Solution |||

Fused silica is characterized as 100% silicon dioxide and is known as fused quartz in its naturally occurring state. It has a high level of transparency owing to its purity. This glass is heat resistant up to 1650 F in continuous service, and up to 4172 F in short-term service, making it the most heat-resistant glass.

80. Gunpowder consists of a mixture of:

- A. Sand and Charcoal
- B. Nitrate, Sulphur and Charcoal
- C. TNT and Charcoal
- D. Sand, Sulphur and Charcoal

Answer ||| B

Solution |||

Gunpowder, also known as black powder to distinguish it from modern smokeless powder, is the earliest known chemical explosive. It consists of a mixture of sulfur (S), charcoal C., and potassium nitrate (saltpeter,  $\text{KNO}_3$ ). The sulfur and charcoal act as fuels while the saltpeter is an oxidizer.

81. Mayonnaise is an example of-

- A. Sol
- B. Foam
- C. Emulsion
- D. True solution

Answer ||| C

Solution |||

**Colloidal Solution:** It is a mixture in which substances are regularly suspended in a fluid. A colloid is a minutely small material that is regularly spread out all through other substances.

It can occur in solid, liquid or gas.

Types of Colloidal Solution:

- Foam- it is created by ensnaring a gas in a liquid. For example shaving cream.
- Emulsion- a combination of liquids; it is basically when one liquid is consistently dispersed all through another liquid. E.g. Mayonnaise or milk



- Sol- When solid is evenly dispersed throughout a fluid. E.g. paint, blood.

A true solution is different from colloid as in true solution like that in NaCl, molecules are completely mixed into water and the concoction can pass through a semipermeable fil without getting divide.

82.What is the correct chemical formula for Ascorbic Acid?

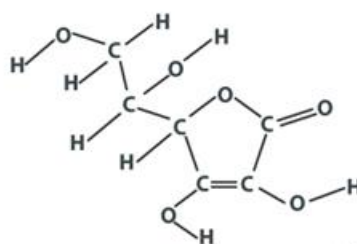
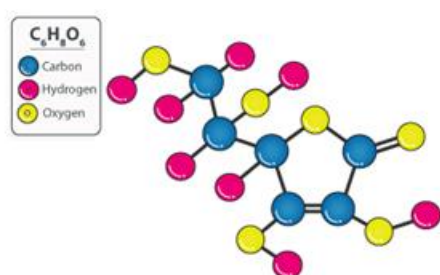
- A.  $C_4H_8O_6$
- B.  $C_4H_6O_8$
- C.  $C_6HO_4$
- D.  $C_6H_8O_6$

Answer ||| D

Solution |||

**Ascorbic Acid:** Belongs to monosaccharide family and has a chemical formula of  $C_6H_8O_6$ . It is a Vitamin C and is present in citrus fruits. It is soluble in water. Common uses are in the treatment of scurvy and formation of collagen fibers in connective tissues, bones and teeth. It also fights against bacteria.

$C_6H_8O_6$	Ascorbic Acid
Weight/molar mass	176.12 g/mol
Density	1.694 g/cm <sup>3</sup>
Boiling Point	553°C
Melting Point	190°C



© Byjus.com

83.Radon is

- A. an inert gas
- B. an artificial fibre
- C. an explosive
- D. a metal

Answer ||| A

Solution |||

• Radon (Rn), chemical element, is a heavy radioactive gas of Group 18 (Noble Gases) of the Periodic Table, generated by the radioactive decay of Radium.

84. The chemical name of Baking Soda is

- A.  $\text{Na}_2\text{CO}_3$
- B.  $\text{NaHCO}_3$
- C.  $\text{CaCO}_3$
- D.  $\text{NaOH}$

Answer ||| B

Solution |||

• The chemical name of Baking Soda is  $\text{NaHCO}_3$ , and as the name suggests, it is made up of Sodium and bicarbonate ions.

• Some uses of Baking Soda:

- o Treat Heartburn. Share on Pinterest.
- o Mouthwash. Mouthwash is a great addition to a good oral hygiene routine.
- o Soothe Canker Sores.
- o Whiten Your Teeth.
- o Deodorant.
- o May Improve Exercise Performance.
- o Relieve Itchy Skin and Sunburns.
- o May Treat Calluses.

85. If we plot a graph between volume  $V$  and the inverse of pressure  $P$  (i.e.  $\frac{1}{P}$ ) for an ideal gas at constant temperature  $T$ , the curve so obtained is

- A. Straight line
- B. Circle

- C. Parabola
- D. Hyperbola

Answer ||| A

Solution |||

We know that the equation of ideal gas is given as:

$$PV = nRT$$

Where P = pressure

V = volume

T = temperature

R = universal gas constant

n = number of moles of gas

According to the question if the temperature is constant then:

$$PV = k \text{ (constant)}$$

$$V = k/P$$

It is in the form of a simple equation 'y = ax'

So the curve of volume V and pressure ( $\frac{1}{P}$ ) will produce the straight line.

86. The setting time of cement is lowered by adding

- A. Oxides of aluminum
- B. Gypsum
- C. Oxides of magnesium
- D. Silica

Answer ||| D

Solution |||

Gypsum is an indispensable component of ordinary Portland cement. The main function of gypsum is to regulate the setting time of cement. Gypsum has a great influence on the water consumption of standard consistency and strength simultaneously.

87. Emulsion is known as a

- A. Colloidal solution of substances having different physical states
- B. true solution
- C. distillation mixture for making alcohols
- D. colloidal solution of two liquids

Answer ||| D

Solution |||

An emulsion is a mixture of two or more liquids that are normally immiscible. Emulsions are part of a more general class of two-phase systems of matter called Colloids. A Colloidal Solution, sometimes known as a Colloidal Suspension, is a solution in which a material is evenly suspended in a liquid.

88. Which of the following separation methods depends on differences in boiling points?

- A. fractional distillation and simple distillation
- B. fractional distillation and filtration
- C. simple distillation and paper chromatography
- D. filtration and paper chromatography

Answer ||| A

Solution |||

**Simple distillation:** Simple distillation is used when the boiling points of chemicals in a mixture having large differences (more than  $25^{\circ}\text{C}$ ). The number of fractionating columns used as the difference in the boiling point of the mixture is large. e.g. process used in separating kerosene and petrol

**Fractional distillation:** Fractional distillation is used when the boiling points of chemicals in a mixture are close to each other, usually within  $77^{\circ}\text{F}$  ( $25^{\circ}\text{C}$ ).

Fractionating columns used to separate the mixtures. e.g. Process used in the separation of Crude Oil into useful fractions

89. Observe the following table:

Substance	Colour	Magnetic/Non-magnetic	Melting point (°C)	Soluble/ Insoluble in water
A	Grey	Magnetic	1535	Insoluble
B	White	Non-magnetic	801	soluble
C	Yellow	Non-magnetic	1427	Insoluble

How can B be separated by A and C from this mixture?

- A. For separating B from A, a magnet is used.
- B. For separating B from C, add water.
- C.
- D. All of these

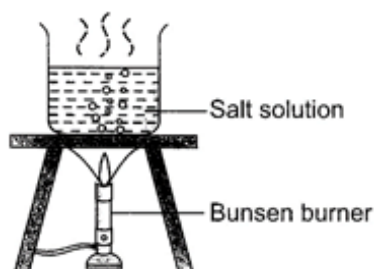
Answer ||| D

Solution |||

A is magnetic but B and C are not, so A sticks to a magnet whereas B and C do not stick to a magnet.

On adding water, B dissolves but C does not. On filtering the mixture of B, C, and water, solid C stays in filter paper as it is insoluble in water. B passes through filter paper in solution as it is soluble in water.

90. Jyoti added 23.6 g of salt into 600 mL of water in a beaker. She stirred the water to dissolve the salt completely. Then she heated the solution until it was reduced to half. How many grams of salt can be recovered from the remaining solution?



- A. 0 g
- B. 10.7 g
- C. 23.6 g

D. 43.6 g

Answer ||| C

Solution |||

23.6 g of salt is recovered as during evaporation only solvent (water) evaporates. The solute (salt) is left behind in the beaker as a residue.

91. Which of the following statements regarding heavy water are correct?

- 1) It is extensively used as a moderator in nuclear reactors
- 2) It cannot be used in an exchange reaction to study the reaction mechanism
- 3) Viscosity of heavy water is relatively smaller than that of ordinary water
- 4) The dielectric constant of heavy water is smaller than that of ordinary water

Select the correct answer using the code given below:

- A. 1 and 2
- B. 2 and 3
- C. 3 and 4
- D. 1 and 4

Answer ||| D

Solution |||

Heavy Water is used in the Nuclear Reactor to slow down the neutrons so that they are captured and become effective to bring out fission reaction. The main reason behind using heavy water is that it captures less number of neutrons than normal water.

Water molecule forms hydrogen bonding and strongly polar. Because of this polarity, it can separate ions in salts and make bonds with other substances like alcohol and acids and dissolves them.

Hydrogen bonding cause many unique properties such as having solid form is less dense than liquid form, high boiling point than  $100^{\circ}\text{C}$  for its molar mass and high heat capacity.

92. The symbol of the element 'Tungsten' is:

- A. Ta
- B. W
- C. TI
- D. Tc

Answer ||| B

Solution |||

According to the Periodic table -

The symbol of Tungsten is '*W*'. Atomic number of Tungsten is 74

'*Ta*' is a symbol of element Tantalum having atomic number 73

'*Ti*' is a symbol of Titanium. It is having atomic number 22

'*Tc*' is chemical element named Technetium. Its atomic number is 43

93. Which one of the following statements is correct?

- A. Rutherford's alpha-particle Scattering Experiment led to the discovery of the electron
- B. J J Thomson suggested that the nucleus of an atom contains protons
- C. The atomic number of an element is the same as the number of protons in the nucleus of its atom
- D. The mass number of an atom is equal to the number of electrons in its shells

Answer ||| C

Solution |||

Rutherford's alpha-particle Scattering Experiment, also known as the Gold Foil Experiment. After this concept, Rutherford concluded that an atom is mostly empty and understand the concept of the nucleus.

J J Thomson proposed the model of the atom in which it only contains electron and proton but not the neutrons.

The number of proton in the nucleus of the atom is equal to the atomic number of atom.

The mass number of an atom is not related to the electron present in shells of an atom.

94. The alkali metals have a relatively low melting point. Which one of the following alkali metals is expected to have the highest melting point?

- A. Li
- B. Na
- C. K
- D. Rb

Answer ||| A

Solution |||

Lithium is the alkali metal which is having the highest melting point. The value of the Melting Point is  $180.5^{\circ}\text{C}$ . It is usually used in psychiatric medication and reduces the risk of suicide.

Melting point of Na (Sodium) is  $97.79^{\circ}\text{C}$ .

Melting point of K (Potassium) is  $63.5^{\circ}\text{C}$ .

Melting point of Rb (Rubidium) is  $39.3^{\circ}\text{C}$ .

95. Which one of the following is useful in the paper manufacturing industry?

- A. Fibrous plants
- B. Orchids
- C. Non-flowering plants
- D. Plants growing in high altitude

Answer ||| A

Solution |||

Plant fibre composed of cellulose and cellulose fibre is most commonly used as paper and cloth industries.

Orchids are mainly used as medicine industry. Chinese used it as a medicinal tea.

Non flowering plants are having many uses such as medicinal, timber and firewood. Resins available from these plants are also useful.

Plants growing in high altitudes like the Himalayas in India, Nepal and Bhutan are having different uses. They used as herbs, wood for industries, fruits, rubber, resins etc.

96. Addition of gypsum to cement:



- A. reduces setting time of cement
- B. produces very light colour cement
- C. increases setting time of cement
- D. shining surface is formed

Answer ||| C

Solution |||

During the cement manufacturing process, when the clinker cools, a small amount of gypsum is introduced during the final grinding process. Gypsum is added to control the "setting of cement". If not added, the cement will set immediately after mixing the water, leaving no time for concrete mixing.

97. Which one of the following statements is not correct?

- A. Application of lime makes the soil acidic
- B. High acidity in soil is typical of humid climate
- C. Increasing soil acidity results in declining soil fertility
- D. Arid Climate is characterized by alkaline soil

Answer ||| A

Solution |||

Presence of lime in agricultural soil increases the pH value of soil and reduces its acidity. It will increase the alkalinity of the soil.

In a warm and humid climate, soil acidity is high, and it occurs over time as the product of weathering and leaches by water moving downwards.

If soil acidity is increased, then nutrient, which is essential for plant growth will be less available, and it will stunt the growth.

Soil is alkaline where rain is less and unable to wash soluble salts. Arid soils present in arid climate is mostly characterized by their water deficiencies.

98. To weld metals together, high temperature is required. Such a high temperature is obtained by burning:

- A. Acetylene in oxygen
- B. LPG in oxygen
- C. Methane in oxygen

D. Acetylene in nitrogen

Answer ||| A

Solution |||

Gas Welding process involves high-temperature burst. This is created by the consumption of gas or gas blend. Oxyacetylene Gas Welding is widely used and recognized gas-welding process.

In this blend of oxygen and acetylene combusts and produces fire at the temperature of around  $3500^{\circ}\text{C}$ .

99. The addition of ethylene dibromide to petrol –

- A. Increases the octane number of fuel
- B. Helps elimination of lead oxide
- C. Removes the sulphur compound in petrol
- D. Serves as a substitute of tetraethyl lead

Answer ||| B

Solution |||

Ethylene Dibromide is used to avoid lead deposits around the spark plug. When tetraethyl lead (added in fuel) burns in an engine, lead oxide is formed which deposits around the spark plug. Ethylene dibromide is added to the petrol. On burning, the resulting mixture forms products that react with the lead oxide to form lead bromide, a volatile compound.

100. Date of manufacture of food items fried in oil should be checked before buying because oils become rancid due to

- A. Oxidation
- B. Reduction
- C. Hydrogenation
- D. Decrease in viscosity

Answer ||| A

Solution |||

Oils go rancid through a chemical reaction that causes the fat molecules in the oil to break down via a free radical process. The whole process is sped up by exposure to air, light and heat.

101. Which method of water purification does not kill microorganism?

- A. Boiling
- B. Filtration
- C. Chlorination
- D. UV-irradiation

Answer ||| B

Solution |||

During Filtration, water flows through a filter designed to trap particles in the water. The filters are generally made of layers of sand and gravel. Filtration collects the suspended impurities in water and enhances the effectiveness of disinfection. The filters are routinely cleaned by back washing.

102. Iron sheet kept in moist air gets covered with rust. Rust is

- A. An element
- B. A compound
- C. A mixture of iron and dust
- D. A mixture of iron, oxygen, and water

Answer ||| B

Solution |||

Rust is the result of an oxidation reaction, oxidation of Iron. But it should be noted that all Iron oxides are not rust only the oxidation in presence of moisture results in rusting.

Iron + Water + Oxygen → Hydrated Iron Oxide (Rust)

103. Which of the following gases is a supporter of combustion?

- A. Hydrogen
- B. Nitrogen
- C. Carbon dioxide

D. Oxygen

Answer ||| D

Solution |||

Though oxygen by itself is non-flammable, it is an oxidizer, i.e., it supports the process of combustion.

Hydrogen itself is flammable but does not allow substances to burn in it.

Carbon Dioxide does not support combustion, and it is for this property of  $\text{CO}_2$  that it is used in fire extinguishers.

Nitrogen is non-flammable and does not support combustion.

104. Which of the following solutions will not change the colour of blue litmus paper to red?

- 1) Acid solutions
- 2) Base solution
- 3) Common salt solution

Select the correct answer using the code given below.

- A. 1 and 3
- B. 2 and 3
- C. 1 only
- D. 2 only

Answer ||| B

Solution |||

The blue litmus will turn red or pink under an acidic condition. And turns purple or remains blue in basic or alkaline conditions

Common salt solution is neutral in nature i.e., pH near about 7.

105. Which of the following are the postulates of Dalton Atomic Theory?

- A. Matters are composed of very tiny particles called atoms.
- B. Atoms consist of a big positively-charged sphere studded with negatively charged

electrons

- C. Atoms are indivisible.
- D. Both A and C

Answer ||| D

Solution |||

According to Dalton Atomic Theory -

1. The matter is made up of indivisible particles known as Atoms.
2. All the atoms of an element have identical mass while the atoms of different elements have different masses.
3. The compound is formed when atoms of different elements combine in fixed ratios.
4. Atoms are neither created nor destroyed.

Option B was proposed by English physicist Joseph J. Thomson as the "Plum Pudding" theory. According to him, atoms consist of a big positively-charged sphere studded with negatively charged electrons.

106. Among the following observations of the  $\alpha$ -ray Scattering Experiment, choose the correct one:

- A. Only a few  $\alpha$ -particles deflected away from their path.
- B. All  $\alpha$ -particles passed straight.
- C. Most of the  $\alpha$ -particles rebounded after hitting the atoms.
- D. Most of the  $\alpha$ -particles rebounded.

Answer ||| A

Solution |||

The  $\alpha$ -ray Scattering Experiment was designed by Rutherford. In this experiment, fast-moving alpha particles were projected onto a very thin gold foil. Most of the alpha particles passed straight through, but some of the alpha particles bounced back because positive particles (protons) in the nucleus repelled them.

107. If a radioactive substance is oxidized, what are the changes which occur in the nature of radioactivity?

- A. No change
- B. Oxidation will occur.
- C. Reduction will occur.
- D. None of these.

Answer ||| A

Solution |||

There will be no change in the nature of radioactivity when a radioactive substance gets oxidized, as radioactivity is a nuclear phenomenon involving protons and neutrons only. Hence any physical change does not affect the nature of radioactivity.

108. \_\_\_\_\_ is an alloy of mercury.

- A. Duralumin
- B. Bronze
- C. Amalgam
- D. Steel

Answer ||| C

Solution |||

An alloy is a mixture of two or more different elements, at least one of which is metal. In molten state alloys are homogeneous, and in solid-state they may be homogeneous or heterogeneous.

Amalgam is an alloy of Mercury. It is used in dental procedures for filling cavities.

Duralumin is an alloy of Aluminium; Bronze is of Copper, and Steel is of Iron.

109. Soap reacts with hard water containing  $\text{Ca}^{2+}$  or  $\text{Mg}^{2+}$  ions to form:

- A. Froth
- B. Lather
- C. Scum
- D. Foam

Answer ||| C

Solution |||

Soap is a good cleaning agent, but its cleaning capacity is reduced when it is used in hard water.

Hardness of water is due to the presence of sulphates, chlorides or bicarbonate salts of  $\text{Ca}^{2+}$  or  $\text{Mg}^{2+}$  ions.

When soap is added to hard water, the  $\text{Ca}^{2+}$  or  $\text{Mg}^{2+}$  ions present in hard water react with soap. The sodium salts present in soaps are converted to their corresponding calcium and magnesium salts which are precipitated as scum. The insoluble scum sticks on the clothes which reduces the cleaning capacity of soap.

110. Choose the incorrect statements from the following:

- A. A metal used in joining electric wires - Magnesium
- B. A metal which becomes passive if dipped in nitric acid- Aluminium
- C. A metal unreactive towards oxygen and dilute acids - Gold
- D. A metal never found in the free state in nature- Calcium

Answer ||| A

Solution |||

**Magnesium** is used for photographic flash ribbon and powder because, in the finely divided form, it burns in air with intense white light.

**Copper** is used in joining electrical wires due to its high electrical conductivity, enough tensile strength and ductility.

**Aluminium** becomes passive if it is dipped in nitric acid due to the formation of a protective layer of aluminium oxide.

Gold (Au) and Silver (Ag) are less reactive metals. They are unable to displace Hydrogen from acids; thus, they do not react with dilute acids.

Metals like K, Ca, and Mg are highly reactive and are never found in the free state in nature.

111. Among the following sets, choose the set of inert gases:

- A. Fluorine, Chlorine, Bromine
- B. Oxygen, Nitrogen, Hydrogen
- C. Neon, Argon, Krypton
- D. All of the above

Answer ||| C

Solution |||

Fluorine, Chlorine, Bromine are Halogens.

Hydrogen is s-block element whereas oxygen and nitrogen are p-block elements.

Helium, Neon, Argon, Krypton, Xenon and Radon are a set of inert (inactive) gases.

112. Among the following, which is a monocarboxylic acid?

- A. Oxalic acid
- B. Formic acid
- C. Acetic acid
- D. Both B and C

Answer ||| D

Solution |||

Monocarboxylic Acids are molecules with one COOH functional group. They are weak acids. For example, Formic acid, acetic acid, propionic acid, etc.

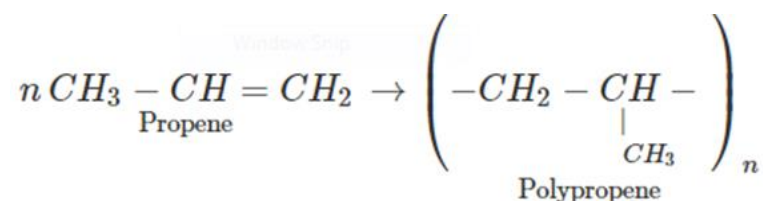
Oxalic acid is a dicarboxylic acid with two carboxyl groups at positions 1 and 2.

113. Which one of the following can be used as Monomer?

- A.  $\text{CH}_3\text{CH}_2\text{Br}$
- B.  $\text{CH}_3\text{CH}_2\text{OH}$
- C.  $\text{C}_6\text{H}_{12}$
- D.  $\text{C}_3\text{H}_6$

Answer ||| D

Solution |||



Propene undergoes addition polymerization to produce poly(propene), which is one of the most versatile thermoplastic polymers.



114. Which of the following is the purest form of Carbon -

- A. Fullerene
- B. Carbon Nanotubes
- C. Coal
- D. Diamond

Answer ||| D

Solution |||

Graphite, Diamond, Fullerenes and Carbon Nanotubes are the main allotropes of Carbon.

Diamond is the purest of all because the Carbon atoms in Diamond are more tightly bound and thus it is difficult for the impurities to penetrate the diamond lattice.

115. For deep-sea diving, the divers use which of the following gaseous mixture for respiration –

- A. Oxygen and Helium
- B. Oxygen, Helium & Nitrogen
- C. Oxygen and Hydrogen
- D. Oxygen and Carbon Dioxide

Answer ||| B

Solution |||

The Mixture of Oxygen, Helium & Nitrogen gas is called “Trimix” and is used by the Deep sea divers during the deep phase of their dives.

The Mixture of only Helium and Oxygen is called “Heliox”. The Helium gas mixed with oxygen generates less resistance than atmospheric air and thus requires less effort by the patient to breathe.

Nitrogen gas contributes to the prevention of High-Pressure Nervous Syndrome.

116. Tungsten is used for the construction of filament in electric bulb because of its \_\_\_\_\_.

- A. high specific resistance
- B. low specific resistance

- C. high light emitting power
- D. high melting point

Answer ||| D

Solution |||

- Tungsten has one of the **highest melting** (3400-degree Celsius) and **boiling point** (5900-degree Celsius) among the elements. This is why Tungsten is used as a filament material in electric bulbs.

117. In Tritium (T), the number of protons (P), and neutrons (N) respectively are

- A. 1 P and 1 N
- B. 1 P and 2N
- C. 1 P and 3 N
- D. 2 P and 1 N

Answer ||| B

Solution |||

Tritium is also called Hydrogen-3 ( $^3\text{H}$ ). It is a radioactive isotope of hydrogen. The nucleus of the Tritium contains 'one proton' and 'two neutrons'.

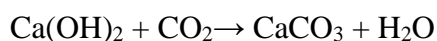
118. When carbon dioxide is passed through lime water, the solution turns milky, but on a prolonged passage, the solution turns clear. This is because:

- A. the Calcium Carbonate formed initially is converted into soluble Calcium Bicarbonate on the passage of more Carbon dioxide
- B. the reaction is reversible, and lime water is regenerated
- C. the Calcium Bicarbonate formed initially is converted into soluble Calcium Carbonate on the passage of more carbon dioxide
- D. the initially formed insoluble compound is soluble in Carbonic Acid

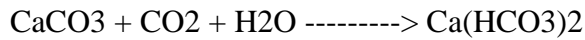
Answer ||| A

Solution |||

When carbon dioxide is passed through lime water, the solution turns milky because of the formation of calcium carbonate, which is white in colour and not very soluble.



If more carbon dioxide is passed through the solution, it reacts with calcium carbonate ( $\text{CaCO}_3$ ) and water ( $\text{H}_2\text{O}$ ) to form calcium bicarbonate  $\text{Ca}(\text{HCO}_3)_2$  which is soluble in water. It gets dissolved in the water and the solution turns clear.



119. The form of carbon known as graphite

- A. is harder than diamond
- B. contains a higher percentage of carbon than diamond
- C. is a better electrical conductor than diamond
- D. has equal carbon-to-carbon distances in all directions

Answer ||| C

Solution |||

The carbon atoms in graphite are linked in a hexagonal network which forms sheets that are one atom thick. These sheets are poorly connected and easily cleave or slide over one another if subjected to a small amount of force. This gives graphite its very low hardness, its perfect cleavage, and its slippery feel. It is softer than diamond. Graphite is used in pencils and lubricants.

It has unequal carbon-to-carbon distances in all directions.

It is a better conductor of heat and electricity as compared to diamond.

It doesn't contain a higher percentage of carbon than diamond.

120. Which of the following is not correct about Baking Soda?

- A. It is used in soda-acid fire extinguisher
- B. It is added for faster cooking
- C. It is a corrosive base
- D. It neutralizes excess acid in the stomach

Answer ||| C

Solution |||

Sodium bicarbonate, commonly known as baking soda, is a chemical compound with the formula  $\text{NaHCO}_3$ .

Heating of sodium bicarbonate releases carbon dioxide hence it is used in soda-acid fire extinguisher.

In cooking, baking soda is primarily used in baking as a leavening agent. It can help to cook faster.

Sodium bicarbonate reacts spontaneously with acids, thereby neutralizing them and releasing CO<sub>2</sub> gas as a reaction product.

It is not a corrosive base.

121. Chromium oxide in paints makes the colour of paint \_\_\_\_\_.

- A. Green
- B. White
- C. Red
- D. Blue

Answer ||| A

Solution |||

- Chromium oxide is used in paints, inks, and glasses.
- It is used as a pigment, producing a **dark green colour**.
- Though chromium oxide green is not toxic, it can cause irritation of the skin and eyes and can cause nausea and other problems if ingested. It also can cause respiratory problems when the dust is inhaled.

122. Which of the following cells do not contain nucleus?

- 1) Root hair cells
- 2) Red blood cells
- 3) Platelets
- 4) Monocytes

Select the correct answer using the code given below.

- A. 1 only
- B. 2 and 3 only
- C. 1, 2 and 4
- D. 2, 3 and 4

Answer ||| B

Solution ||| The absence of a nucleus is an adaptation of the red blood cell for its role. It allows the red blood cell to contain more haemoglobin and, therefore, carry more oxygen

molecules

Like red cells, platelets (thrombocytes) have no nucleus.

Monocytes have a small spherical nucleus and has abundant dark staining condensed chromatin.

There are 5 organelles found in a root hair cell. They are the: nucleus, cytoplasm, cell membrane, cell wall and vacuole.

123. Some statements about the benefits of organic farming are given below. Indicate whether they are true or false using the code given below the statements:

1. It reduces CO<sub>2</sub> emission.
2. It does not lead to toxic effect.
3. It improves the water-retention capacity of the soil.

- A. 1, 2, 3  
False, True, False
- B. 1, 2, 3  
True, False, False
- C. 1, 2, 3  
False, True, True
- D. 1, 2, 3  
True, True, True

Answer ||| D

Solution ||| **Organic farming** is a method of crop and livestock production that involves much more than choosing not to use pesticides, fertilizers, genetically modified organisms, antibiotics and growth hormones.

124. What factors are responsible for the rapid spread of bread mould on slices of bread?

- 1) Large number of spores
- 2) Availability of moisture and nutrients in bread
- 3) Presence of tubular branched hyphae
- 4) Formation of round shaped sporangia

Choose from the options given below

- A. 1 and 3  
B. 2 and 4  
C. 1 and 2  
D. 3 and 4

Answer ||| C

Solution |||

Factors responsible for the rapid spread of bread mould on slices of bread are:

- a large number of spores.
- availability of moisture and nutrients in bread.
- presence of tubular branched hyphae.

Bread Mould prefers damp and warm substratum with ample supply of nutrients on which its airborne spores land and germinate to produce mycelium. Fungi spread rapidly through spores which may be sexual or asexual. The spores germinate when conditions are ambient and produce new hyphae.

125. Which one of the following statements regarding Penicillin is correct?

- A. Penicillin resistant bacteria can store this antibiotic in vacuole
- B. Penicillin resistant bacteria can degrade this antibiotic by an enzyme called  $\beta$ -lactamase
- C. Penicillin resistant bacteria can degrade this antibiotic by an enzyme called lactic acid dehydrogenase
- D. Penicillin is not absorbed by bacteria; so most bacteria are resistant

Answer ||| B

Solution |||

Penicillin is a group of antibacterial drugs that attack wide range of bacteria. *Penicillin* fungi are the source of penicillin, people can take orally or via injection. Alexander Fleming is the discoverer of Penicillin.

People are not developing resistance against penicillin, but the Bacteria is developing. From Beta Lactamase are the enzymes produced by Bacteria. It provides resistant to Beta-lactam antibiotics such as penicillin, cephalosporins etc.

126. Francis Crick had proposed the central dogma in molecular biology, which states that the genetic information flows in the sequence of:

- A. RNA → DNA → Protein
- B. DNA → RNA → Protein
- C. Protein → DNA → RNA
- D. DNA → Protein → RNA

Answer ||| B

Solution |||

According to the Central dogma in molecular biology, the genetic information flows in the sequence of DNA → RNA → Protein.

- DNA is a biopolymer of deoxyribonucleic acids that has four different chemical groups, called bases: Adenine, Guanine, Cytosine, and Thymine
- RNA is a polymeric molecule essential in various biological roles in coding, decoding, regulation and expression of genes.
- Proteins are complex naturally-produced molecules which are composed of one or more long chains of amino acids.

127. Which of the following is the correct passage of air in human being?

- A. Pharynx > larynx > trachea > bronchi > bronchioles > alveoli > cell
- B. Larynx > pharynx > trachea > bronchioles > bronchi > alveoli > cell
- C. Pharynx > trachea > larynx > bronchioles > bronchi > alveoli > cell
- D. Pharynx > trachea > larynx > bronchioles > alveoli > bronchi > cell

Answer ||| A

Solution |||

The air passages are the parts through which the outside air enters the lungs and exits after the exchange of gases. The airways consist of the nostril, nasal cavity, pharynx, larynx, trachea, bronchi, bronchi, and alveolar ducts that eventually carry into the alveolar sac. The airway opens to the exterior through nasal opening. The nasal cavities are lined with the mucous membrane of the ciliated epithelium. Each nasal cavity is divided into three passageways by projection of bones from the inner nasal walls.

128. Consider the following statements



**Road to NDA I 2020**  
**A 30-Day Crash Course (Batch 2)**

**START FREE TRIAL**

- 1) Fishes have three chambered heart
- 2) Birds have four chambered heart
- 3) Reptiles do respiration by lungs only
- 4) All Amphibian animals have two pair of wings

Which of the following is/are correct?

- A. 1 and 2 only
- B. 2 and 3 only
- C. 3 and 4 only
- D. 1 and 4 only

Answer ||| B

Solution |||

\* The heart of a fish has two chambers, atrium and ventricle. The blood enters the atrium after being transmitted through the fish, which is poorly oxygenated. The blood is then pumped into the ventricle

\* Birds are warm-blooded vertebrates related to reptiles compared to mammals. They have a four-chamber heart

\* The name amphibian, derived from the Greek word meaning "living a dual life", refers to this dual life strategy - although some species are permanent land dwellers, other species have a fully aquatic mode of survival.

\* Reptiles are air-breathing vertebrates. They have internal fertilization, amniotic growth and epidermal scales that cover all parts of their body.

129. Vermicompost is a/an

- A. inorganic fertilizer
- B. toxic substance
- C. organic bio fertilizer
- D. synthetic fertilizer

Answer ||| C

Solution ||| Vermicompost is the product or process of composting using various worms, usually red wigglers, white worms, and other earthworms, to create a heterogeneous mixture of decomposing vegetable or food waste, bedding materials, and vermicast.



130. Which of the following is the strongest part of the Human Body is \_\_\_\_

- A. Muscles
- B. Enamel of teeth
- C. Skin
- D. Bones

Answer ||| B

Solution |||

The strongest part of the Human Body is Enamel of teeth. The shiny, white enamel that covers your teeth is much stronger than bone. This resilient surface is 96 percent mineral, the highest percentage of any tissue in your body – making it durable and damage-resistant.

131. Cell wall of Fungi is made up of \_\_\_\_\_.

- A. Chitin
- B. Pectin
- C. Peptidoglycan
- D. All of the above

Answer ||| A

Solution |||

- **The cell wall of fungi is made up of Chitin.** The rigid layers of fungal cell walls contain complex polysaccharides called chitin and glucans.
- Chitin is also found in exoskeleton of insects, it gives structural strength to the cell walls of fungi.
- Most fungi are multi-cellular organisms. They display two distinct morphological stages: the vegetative and reproductive.

132. Match the following and mark the correct options

Animals                      Respiratory Organ

- |                   |               |
|-------------------|---------------|
| A. Earthworm      | i. Moist skin |
| B. Insects        | ii. Gills     |
| C. Fishes         | iii. Lungs    |
| D. Birds/Reptiles | iv. Trachea   |

Options:

- A. A-ii, B-i, C-iv, D-iii
- B. A-i, B-iv, C-ii, D-iii
- C. A-i, B-iii, C-ii, D-iv
- D. A-i, B-ii, C-iv, D-iii

Answer ||| B

Solution |||

\* Earthworms don't breathe in-and-out with lungs like mammals, no. But, like most animals, they need oxygen for aerobic respiration, and in any case, they need to get rid of the carbon dioxide that is produced by burning their food. Many terrestrial invertebrates have small channels (spiracles) that go from the outside air into the body of the animal. However, earthworms don't even have these; gas exchange takes place by diffusion across the moist skin.

\* Insects breathe with their complex network of tubules, i.e. the tracheae. Large tracheae connect to spiracles opening at the surface of the body, where air enters and carbon dioxide exits. Spiracles usually occur on the pleural surface of the body, typically one on each side of each segment, but numerous variations have evolved.

\* Fish breathe underwater using the oxygen that is dissolved in water. But to absorb oxygen from water, fish use special organs called gills. ... When the water moves through the gills, the dissolved oxygen from the water passes through the thin walls of gills and blood vessels and enters the blood.

\* Respiration in birds is many ways different than in mammals. Birds have a larynx, but it isn't used to make sounds. In fact, an organ termed the "syrinx" serves as the "voice box." Birds have lungs, but they even have air sacs.

133. Consider the following statements about the Drug resistant Superbugs:

- 1) Superbugs are microbes which are extensively or totally drug resistant.

2) The resistance is caused by uncontrolled sale of Antibiotics over the counter without any proper prescription.

Select the correct answer from the options given below:

- A. 1 only
- B. 2 only
- C. Both 1 and 2
- D. Neither 1 nor 2

Answer ||| C

Solution |||

\* Microbes resistant to multiple antimicrobials are called multidrug resistant (MDR). Those considered extensively drug resistant (XDR) or totally drug resistant (TDR) are sometimes called "superbugs"

\* Reasons for the widespread use of antibiotics in human medicine include:

\* Increasing global availability over time since the 1950s

\* Uncontrolled sale in many low or middle income countries, where they can be obtained over the counter without a prescription, potentially resulting in antibiotics being used when not indicated.

\* This may result in emergence of resistance in any remaining bacteria.

\* Popular campaign called "red line campaign" launched to prevent uncontrolled use of antibiotics.

134.If one set of chromosomes for a given plant is represented as N; in case of double fertilization, the zygote and the endo-sperm nucleus of a diploid plant would have how many sets of chromosomes respectively?

- A. N and 2N
- B. 2N and 2N
- C. N and 3N
- D. 2N and 3N

Answer ||| D

Solution |||

Double fertilization is the process which involves two major steps- haploid sperm (N) fuses with a haploid egg cell (N) to form a diploid zygote (2N).

Endosperm nucleus is the triploid nucleus formed in the embryo sac of a seed plant by fusion of a nucleus formed by prior fusion of the polar nuclei. Hence, it has the ploidy of a triploid (3N).

135. A satellite is orbiting at a height of 800 km above Earth, it is placed in which of the following orbits -

- A. Low Earth orbit
- B. Medium Earth orbit
- C. Geosynchronous orbit
- D. High Earth Orbit

Answer ||| A

Solution |||

A **Low Earth Orbit** can generally be at an altitude between 160 km to 2,000 km above the Earth.

A **Medium Earth Orbit** is above the low Earth orbit i.e. from 2,000 km and goes up till 35,000 km above the Earth.

A **Geosynchronous Orbit** is at an altitude of 35,786 km above Earth's Equator. So there is technically only one Geosynchronous Orbit. A satellite placed in this orbit matches Earth's rotation and thus seems stationary when viewed from earth.

A **High Earth Orbit** is located at an altitude above the Geosynchronous Orbit i.e. 35,786 km.

136. As per the code of the nomenclature, which one of the following is the correct way of writing a biological name?

- A. Amoeba Proteus
- B. Amoeba proteus
- C. amorba proteus
- D. Amoeba Proteus

Answer ||| B

Solution |||

The Latin scientific name of species is a two-part consisting genus name and species name. The basic Rule for writing a scientific name is-

- Use both Genus and species name: *Amoeba proteus*
- Italicize the whole name.
- Capitalize only the Genus name.

137. Which was the principle plant used in Green Revolution?

- A. Japonica Rice
- B. Indian Rice
- C. Emmer Wheat
- D. Mexican Wheat

Answer ||| D

Solution |||

Maxican wheat was developed in CIMMYT (Mexico) by dr. Normen e. Borlaug. In 1963 Indian government imported 100 kg wheat (sonora 64,sonora 63 and lerma roja ) through the help of rockefeller foundation.

138. Which endocrine gland requires iodine to synthesize a particular hormone whose deficiency may cause goitre disease?

- A. Hypothalamus
- B. Pancreas
- C. Thymus
- D. Thyroid gland

Answer ||| D

Solution |||

A Goitre is a swelling in the neck as a result of an enlarged thyroid gland. A Goitre may be connected to a thyroid that is not functioning properly. Worldwide, more than 90% of goitre cases are caused by iodine deficiency. The word is from the Latin 'Guturia,' which means throat. Most goitres are benign.

139. Myology is the study of \_\_\_\_\_.

- A. Muscle
- B. Bone
- C. Liver
- D. Teeth

Answer ||| A

Solution |||

The studies of various body parts given in options are as follow-

- **Osteology** is the scientific study of bones.
- **Myology** is the scientific study of Muscles.
- **Odontology** is the scientific study of teeth.
- **Hepatology** is the study of Liver.

140. The oxygenated blood from the lungs is received by the \_\_\_\_\_.

- A. left auricle
- B. left ventricle
- C. Right auricle
- D. Right ventricle

Answer ||| A

Solution |||

- Left atrium receives oxygenated blood pulmonic blood from the pulmonary veins.
- The blood is then pumped through the mitral valve into the left ventricle, which in turn pumps the blood through the aortic valve into aorta.
- Right atrium receives deoxygenated systemic blood from the superior and inferior vena cavae.

141. Human insulin molecule is composed of one  $\alpha$ -chain having 21 amino acids and one  $\beta$ -chain having 30 amino acids. How many functional insulin genes occur in adult humans?

- A. One
- B. Two
- C. Three
- D. Four

Answer ||| B

Solution ||| Insulin is a protein composed of two chains, A chain (with 21 amino acids) and a B chain (with 30 amino acids) and sulphur atoms link them together.

142. Seeds required special conditioning for their germination.

Given below is a condition, consider the options and choose the correct option -

"For no matter how favorable environmental conditions are, seeds failed to germinate if" -

- A. They have not settled properly into the soil
- B. The germination of neighbouring seeds do not take place
- C. The seeds do not undergo a dormant or resting period
- D. The seeds did not soak in water for some period

Answer ||| C

Solution |||

\* Seed dormancy is an evolutionary adaptation that prevents seeds from germinating during unsuitable ecological conditions that would typically lead to a low probability of seedling survival.

\* Dormant seeds do not germinate in a specified period of time under a combination of environmental factors that are normally conducive to the germination of non-dormant seeds.

143. Transfer of genetic information from one generation to the other is accomplished by

- A. DNA
- B. RNA
- C. Both

D. None of these

Answer ||| A

Solution ||| Transfer of characters from one generation to another generation takes place by DNA.

144. Consider the following statement.

- 1) The chemical name of Vitamin C is Ascorbic acid
- 2) Vitamin B is the only vitamin which does not store in the body.
- 3) Vitamin B12 and K are synthesized by intestinal Bacterial.
- 4) Vitamin A is stored in the Liver.

Which of the following statement is/are incorrect?

- A. 1 and 2 only
- B. 2 only
- C. 3 and 4 only
- D. All the above

Answer ||| B

Solution |||

- B-complex vitamins and vitamin C (not only B. are water-soluble vitamins that are not stored in the body and must be replaced each day. Hence Statement 2 is incorrect.
- These vitamins are easily destroyed or washed out during food storage and preparation.
- The B-complex group is found in a variety of foods: cereal grains, meat, poultry, eggs, fish, milk, legumes and fresh vegetables.
- Citrus fruits are good sources of vitamin C.

145. Which of the following is not correctly matched?

- A. Ligament - Connect Bone to Bone
- B. Tendon - Connects muscle to bone
- C. Areolar tissue - Filling Tissue



D. Adipose tissue - Forms blood cells

Answer ||| D

Solution |||

A. Ligament - Connect Bone to Bone

B. Tendon - Connects muscle to bone

C. Areolar tissue - Filling Tissue

D. Adipose tissue - Stores Fats (not Forms blood cells)

146.'Lub-dup' sound is produced due to action of

A. Large intestine

B. Lungs

C. Heart

D. Esophagus

Answer ||| C

Solution |||

The sound of a heartbeat is caused by the heart valves while opening and closing as they pump blood. When the heart is working properly, blood can only flow in one direction. The valves make this possible by opening and closing in exact coordination with the heart's pumping action.

Heartbeat sounds a bit like lub-DUB, lub-DUB, lub-DUB.

The" Lub" is the sound of the tricuspid and mitral valves closing.

The" DUB" is the sound of closing aortic and pulmonary valves.

147.Consider the following statements about bioremediation :

(1) It may be defined as any process that uses microorganisms or their enzymes to return the environment altered by contaminants to its original condition.

(2) Bioremediation may be employed in order to attack specific contaminants, such as chlorinated pesticides that are degraded by bacteria.

Which of the statements given above is/ are correct?

- A. 1 only
- B. 2 only
- C. Both 1 and 2
- D. Neither 1 nor 2

Answer ||| C

Solution ||| \* Bioremediation is a waste management technique that involves the use of organisms to remove or neutralize pollutants from a contaminated site.

\* According to the EPA, bioremediation is a “treatment that uses naturally occurring organisms to break down hazardous substances into less toxic or nontoxic substances”.

Technologies can be generally classified as in situ or ex situ.

\* In situ bioremediation involves treating the contaminated material at the site, while ex situ involves the removal of the contaminated material to be treated elsewhere.

\* Some examples of bioremediation related technologies are phytoremediation, bioventing, bioleaching, landfarming, bioreactor, composting, bioaugmentation, rhizofiltration, and biostimulation.

148. Cell will not be able to exchange material from its surroundings by diffusion, if?

- A. Cell wall damaged
- B. Cell membrane ruptured
- C. Vacuole damaged
- D. Nuclear membrane destroyed

Answer ||| B

Solution |||

If the plasma membrane also known as cell membrane ever breaks or breaks, the cell will not be able to exchange material from its surroundings by diffusion. This will result in the protoplasmic material disappearing and the cell dying.

149. Which of the following is not the source of vitamin D?

- A. soymilk
- B. fatty fish
- C. vegetable
- D. orange juice

Answer ||| C

Solution |||

Foods that provide vitamin D include:

- Fatty fish, like tuna, mackerel, and salmon
- Foods fortified with vitamin D, like some dairy products, orange juice, soy milk, and cereals
- Beef liver
- Cheese
- Egg yolks

150. MICR stands for

- A. Magnetic Ink Character Recognition
- B. Magnetic Ink on Cheque Reader
- C. Magnetic Ink Code Recognition
- D. Magnetic Ink Cases Reader

Answer ||| A

Solution |||

MICR (Magnetic Ink Character Recognition) is a character-recognition technology used to verify the legitimacy or originality of paper documents through special ink and characters. When the document is passed through the reader or scanner, it translates the magnetic information into characters. This technology is frequently used by banks to verify their cheque.

151. Consider the following statement.

- 1) The viscous nature of Human blood is due to protein in Blood
- 2) The cerebellum in the human body where memory power is found.
- 3) Red Blood Cells are formed in Bone Marrow.
- 4) Corpus luteum is a mass of cell found in Brain.

Which of the following statements is /are correct?

- A. 1 and 4 only
- B. 2 and 4 only
- C. 1 and 3 only

D. All the above

Answer ||| C

Solution |||

Corpus luteum is a mass of cell found in Ovary whereas the Cerebrum, not Cerebellum) in the human body where memory power is found. Hence Statements 1 and 3 are correct.

152. In plants Auxin concentration is maximum at

- A. growing apex
- B. only in Xylem and Phloem
- C. in leaves
- D. all of these

Answer ||| A

Solution ||| In plants Auxin concentration is maximum at growing apex. Auxins are a class of plant hormones (or plant growth regulators) with some morphogen-like characteristics. Auxins have a cardinal role in coordination of many growth and behavioral processes in the plant's life cycle and are essential for plant body development.

153. Which one of the following Sugar is the main constituent in Honey \_\_\_\_\_

- A. Fructose
- B. Lactose
- C. Sucrose
- D. Maltose

Answer ||| A

Solution |||

Fructose is the main sugar, which is found in honey, followed by Glucose and Sucrose. The sweet taste of honey is attributed to its higher fructose content, and fructose is known to be sweeter than glucose or sucrose.

Honey has approx. 17% of water.

154. Which one among the following is a plant hormone?

- A. Insulin
- B. Thyroxin
- C. Gibberellin
- D. Estrogen

Answer ||| C

Solution |||

Plant hormones are chemicals present in plants that help in the growth, development and coordination of stimuli and environmental reactions. For example, Auxin, Gibberellin, Cytokinin, Abscisic acid are various plant hormones.

**Auxin** is a plant hormone that helps in cell growth and elongation.

**Gibberellins** promote stem development.

The Thyroid Gland (in humans) basically releases two hormones Triiodothyronine (T3) and Thyroxine (T4), which help regulate our body's metabolism. In addition, these hormones regulate weight, determine energy levels, internal body temperature, skin, hair, etc.

**Estrogen** is a female sex hormone that is released by the ovaries. It is responsible for fertility, menstruation and menopause. Excess of estrogen in the female body increases the risk of breast cancer, uterine cancer, depression, mood, etc. If the estrogen level in the female body is low, skin lesions, skin thinning, hair loss etc.

155. A person with 'O' blood group known as the universal donor due to-

- A. Lack of antigen in his blood
- B. Lack of antibodies in his blood
- C. Presence of antigen in his blood
- D. Presence of antibodies in his blood

Answer ||| A

Solution |||

Individuals with blood group 'O' are a universal donor because of their red blood cells have neither A nor B antigens on their surface. Hence A is correct.

156. Match the following :

List I	List II
A) Replication	1) Formation of RNA from DNA
B) Transcription	2) Synthesis of a copy of DNA
C) Translation	3) Single strand of DNA
D) Template	4) Synthesis of proteins by RNA

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

Answer ||| C

Solution |||

- \* Replication is the synthesis of the copy of DNA.
- \* Transcription is the formation of RNA from DNA.
- \* Translation is the formation of proteins from RNA.
- \* Template is the single strand of DNA.

157. Which organism among the following was not used in the genetic engineering programme leading to the development of Golden Rice?

- A. Escherichia coli
- B. Erwinia uredovora
- C. Agrobacterium tumefaciens
- D. Narcissus pseudonarcissus

Answer ||| A

Solution |||

**Road to NDA I 2020**  
**A 30-Day Crash Course (Batch 2)**

**START FREE TRIAL**

Golden Rice is a variety of rice (*Oryza sativa*) produced through genetic engineering to biosynthesize beta-carotene, a precursor of Vitamin A, in the edible parts of rice. It is intended to produce a fortified food to be grown and consumed in areas with a shortage of dietary vitamin A, a deficiency which each year is estimated to kill 670,000 children under the age of 5 and cause an additional 500,000 cases of irreversible childhood blindness.

Golden rice was created by transforming rice with two beta-carotene biosynthesis genes:

- 1) psy (phytoene synthase) from daffodil ('*Narcissus pseudonarcissus*')
- 2) crtI (phytoene desaturase) from the soil bacterium *Erwinia uredovora*
- 3) Ag *Narcissus pseudonarcissus*
- 4) *Robacterium tumefaciens*

(The insertion of a lcy (lycopene cyclase) gene was thought to be needed, but further research showed it is already produced in wild-type rice endosperm.)

158. Which of the following is true regarding 'Vessel Elements' in plants?

- A. They have thick cell walls
- B. They form tubular vessels
- C. They are not found in Gymnosperms
- D. All of the above

Answer ||| D

Solution |||

- \* Vessel elements are a cell type that gets contained within xylem tissue of Angiosperms.
- \* Vessel elements add to the transport of water & minerals.
- \* Morphologically, vessel elements are present as hollow tubular cells that have a thick cell wall and are open at both ends.

159. Which type of blood cells have a life span of only 100-120 days?

- A. Red Blood Cells
- B. White Blood Cells
- C. Plasma
- D. Platelets

Answer ||| A

Solution |||

- **The life span of Red Blood Cells is average 100-120 days.**
- RBCs are most common type of Blood Cells, which helps in delivering oxygen to the body tissues.
- RBCs take up oxygen in the lungs and release it into tissues while squeezing through the body's capillaries.
- After they have completed their lifespan, they are removed from the bloodstream by the spleen.
- They lack a cell nucleus and most organelles, in order to accommodate maximum space for haemoglobin.

160. Which cells are called policeman of blood?

- A. Red Blood Cells
- B. White Blood Cells
- C. Plasma
- D. Heart Cells

Answer ||| B

Solution |||

- **White Blood Cells are called as Policeman of Blood or soldiers of blood.**
- The white blood cells provide immunity to our body.
- They help in fighting against diseases, infections, allergies and foreign particles.
- These cells keep our body safe and healthy.
- They have nuclei which differentiate them from Red Blood Cells.
- These broadest categories of WBC can be divided into the five main types:
  - a) Neutrophils
  - b) Eosinophils
  - c) Basophils



- d) Lymphocytes
- e) Monocytes

161. Match the following and mark the correct options –

**Vitamins**

- a) Niacin
- b) Biotin
- c) Riboflavin
- d) Thiamine

**function**

- i. maintain healthy skin and nerves
- ii. Body growth and RBC production
- iii. Metabolism of protein and carbohydrate
- iv. Essential for heart function and healthy nerve cell

- A. a-ii, b-i, c-iv, d-iii
- B. a-i, b-iii, c-ii, d-iv
- C. a-i, b-ii, c-iii, d-iv
- D. a-i, b-ii, c-iv, d-iii

Answer ||| B

Solution |||

Vitamin E is an antioxidant also called Tocopherol. It assists the body form red blood cells and use vitamin K.

Vitamin K is required because, without it, blood would not stick together (coagulate). Some studies suggest that it is essential for bone health.

Biotin is important for the metabolism of carbohydrates and proteins, and in the production of hormones & cholesterol.

Niacin is a B vitamin that assists maintain healthy skin and nerves. It even has cholesterol-lowering effects at higher doses.

Folate works with Vitamin B-12 to help in making red blood cells. It is required for the production of DNA, which controls tissue growth & cell function. Any woman who is under pregnancy should be sure to get sufficient folate. Low levels of folate are combined with birth defects such as spina bifida. Many foods are now even fortified with folic acid.

Pantothenic Acid is important for the metabolism of food. It also plays a significant role in the production of hormones & cholesterol.

Riboflavin (i.e. Vitamin B2) works with the other B type vitamins. It is essential for body growth & for the production of red blood cells.

Thiamine (i.e. Vitamin B1) assist the body cells converts carbohydrates into energy. Getting enough carbohydrates is essential during pregnancy and breastfeeding. It is also important for heart function and healthy nerve cells.

Vitamin A helps to form and to maintain healthy teeth, soft tissue, bones, mucous membranes, and skin.

Vitamin B6 is also known as Pyridoxine. Vitamin B6 helps in forming red blood cells and maintaining brain function. This vitamin even plays an important role in the proteins that are part of various chemical reactions in the body. The more protein one eats the more pyridoxine individual body requires.

Vitamin B12, like that of other B Vitamins, is essential for metabolism. It even helps in forming red blood cells and maintaining the central nervous system.

Vitamin C, also known as Ascorbic Acid, is an antioxidant that encourages healthy teeth and gums. It assists the body to absorb iron and maintain healthy tissue. It is also significant for wound healing.

Vitamin D is also called as the "Sunshine Vitamin," since it is made by the body after being in the sun. 10-15 minutes of sunshine three times in a week is sufficient to produce the body's requirement of vitamin D for the majority of people at most latitudes. People who do not reside in sunny places may not make sufficient vitamin D. It is very tough to get sufficient vitamin D from food sources alone. Vitamin D makes the body in absorbing calcium. You need calcium for the normal maintenance and development of healthy teeth & bones. It even helps in maintaining proper blood levels of calcium & phosphorus.

162. Consider the following statements:

- 1) The most common cause of Hepatitis is virus
- 2) Hepatitis A and B are mainly spread by contaminated food and water
- 3) Hepatitis E is mainly sexually transmitted

Choose the correct statements:

- A. 1 and 2 only
- B. 2 and 3 only
- C. 1 only

D. 3 only

Answer ||| C

Solution ||| • Hepatitis is an inflammation of the liver. Viruses are the most common cause of hepatitis in the world.

- There are 5 main hepatitis viruses, referred to as types A, B, C, D and E.
- Hepatitis A and E are typically caused by ingestion of contaminated food or water. Hepatitis B, C and D usually occur as a result of parenteral contact with infected body fluids

163. Yeast is a \_\_\_\_\_

- A. Bacteria
- B. Fungi
- C. Algae
- D. Bryophyte

Answer ||| B

Solution |||

- *Yeasts are eukaryotic, single-celled microorganisms classified as members of the **fungus kingdom**.*
- *Yeast, the most common one being *S. cerevisiae*, is used in baking as a leavening agent.*

164. Which of the following isn't a part of the Cell Nucleus:

- A. Chromosome
- B. Nucleolus
- C. Cytoplasm
- D. Nuclear Envelope

Answer ||| C

Solution |||

The cytoplasm isn't the part of the nucleus but the nucleus is found in the cytoplasm. The four components of the Nucleus are:

- a. Nucleoplasm
- b. Atomic envelope

- c. Nucleolus
- d. Chromosomes.

The nucleus is a membrane-bound organelle that contains genetic material (DNA) of eukaryotic organisms.

165. Damage to the apical meristem of a growing young plant will affect the

- A. length of the plant
- B. colour of the flower
- C. colour of the leaves
- D. taste of the fruits

Answer ||| A

Solution |||

Apical Meristem is also known as 'growing tip'. It is found in the buds and growing tips of roots in plants. It is responsible for the growth of new cells in young seedlings.

166. Consider the following statements regarding Fat-soluble vitamin:

- 1) They are stored in the body and are not excreted out.
- 2) They could not become toxic.
- 3) Vitamin A, C, K, B comes under fat-soluble vitamins.

Which among the following given above statement are correct?

- A. Only 1 is correct
- B. 1 and 2 are correct
- C. 1 and 3 are correct
- D. All are correct

Answer ||| A

Solution |||

There are two types of Vitamins:

- Fat-soluble vitamins are stored in the body's cells and are not excreted as easily as water-soluble vitamins. They do not need to be consumed as often as water-soluble vitamins,

although adequate amounts are needed. If you take too much of a fat-soluble vitamin, it could become toxic. Fat-soluble vitamins are stored in the body's fatty tissue. The four fat-soluble vitamins are vitamins A, D, E, and K. These vitamins are absorbed more easily by the body in the presence of dietary fat.

- Water-soluble vitamins travel freely through the body, and excess amounts usually are excreted by the kidneys. The body needs water-soluble vitamins in frequent, small doses. These vitamins are not as likely as fat-soluble vitamins to reach toxic levels. But niacin, vitamin B6, folate, choline, and vitamin C have upper consumption limits. Vitamin B6 at high levels over a long period of time has been shown to cause irreversible nerve damage. There are eight water-soluble vitamins. They are: Vitamin C, the B Vitamins: Thiamin (Vitamin B1) Riboflavin (Vitamin B2) Niacin (Vitamin B3) Pantothenic Acid. Vitamin B6. Folic Acid. Vitamin B12. Vitamin B12 is the only water-soluble vitamin that can be stored in the liver for many years.

167. The oxygen evolved during photosynthesis comes from splitting of

- A. water
- B. carbon dioxide
- C. oxygen
- D. light

Answer ||| A

Solution |||

Photolysis of water happens, in which oxygen is released during photosynthesis. It is the process of breakdown of water molecule into hydrogen and oxygen under the influence of light during the light reaction of photosynthesis.

168. The most common secondary structure of proteins is

- A.  $\alpha$ -pleated sheet
- B.  $\beta$ -pleated sheet parallel
- C.  $\gamma$ -pleated sheet non-parallel
- D.  $\alpha$ -helix

Answer ||| A

Solution |||

The  $\beta$ -sheet (also known as a  $\beta$ -pleated sheet) is a common motif of normal secondary structure in proteins.

Beta Sheets comprise of beta-strands (also  $\beta$ -strand) connected laterally by at least 2 or 3 backbone Hydrogen Bonds, forming a usually twisted, pleated sheet.

A  $\beta$ -strand is a stretch of a polypeptide chain, typically three to ten amino acids long with a backbone in an expanded conformation. The supramolecular association of  $\beta$ -sheets has been implicated in the formation of the protein aggregates & fibrils observed in many human diseases, particularly the amyloidoses such as Alzheimer's Disease.

169. Which gland shapes a significant relationship between the Nervous System and the Endocrine framework, via the Pituitary Gland -

- A. Hypothalamus
- B. Pituitary Gland
- C. Thyroid Gland
- D. Parathyroid Gland

Answer ||| A

Solution |||

Hypothalamus Gland forms an important link between the Nervous System and the Endocrine System via the pituitary gland.

It helps in maintaining the body temperature, control sleep, hunger, thirst, emotions and moods and also helps in releasing Hormones.

Hypothalamus is a small region of the brain.

170. Which of the following is a fibrous protein?

- A. Hemoglobin
- B. Albumin
- C. Keratin
- D. Enzymes

Answer ||| C

Solution ||| Fibrous proteins form 'rod' or 'wire' -like shapes and are usually inert structural or storage proteins. They are generally water-insoluble. Fibrous proteins are usually used to construct connective tissues, tendons, bone matrix and muscle fiber.

171. Which one of the following cell organelles does NOT possess its own genetic material encoding proteins?

- A. Ribosome
- B. Nucleus
- C. Mitochondria
- D. Chloroplast

Answer ||| A

Solution |||

Mitochondria, Nucleus and Chloroplast are the three organelles that actually contains their own genetic material. Apart from these three, all other organelles are considered non-living part of the cell or may not be possessing their own genetic material or DNA.

172. Match the following –

<u>Column I</u>	<u>Column II</u>
(i) Stomata	(a) Absorption of water
(ii) Xylem	(b) Transpiration
(iii) Root hairs	(c) Transport of food
(iv) Phloem	(d) Transport of water

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

Answer ||| C

Solution |||

Functions performed by the followings:

\* Stomata: They are pores surrounded by specialized parenchymatic cells, called guard cells. Stomata have two main functions; namely, they allow for gas exchange acting as an entryway for carbon dioxide (CO<sub>2</sub>) and releasing the Oxygen (O<sub>2</sub>) that we breath. The other main function is regulating water movement through transpiration.

\* Xylem: Xylem is one of the 2 types of transport tissue in vascular plants, phloem being the other. The important function of xylem is to transport water from roots to shoots & leaves, but it also transports some nutrients.

\* Root hairs: The function of root hairs is to combine water & mineral nutrients that are available in the soil & take this mixture up through the roots to the rest of the plant. As root hair cells don't carry out photosynthesis, they do not contain chloroplasts.

\* Phloem: Phloem is the vascular tissue that is responsible for the transport of food, sugars from source tissues (for example photosynthetic leaf cells) to sink tissues (for example, non-photosynthetic root cells/ developing flowers). Other molecules such as proteins & mRNAs are even transported throughout the plant via the Phloem.

173. Tooth enamel is made up of which one of the following calcium compounds ?

- A. Calcium carbonate
- B. Calcium sulphate
- C. Calcium hydroxide
- D. Calcium phosphate

Answer ||| D

Solution |||

Enamel is the hardest substance in the human body and contains the highest percentage of minerals at 96% with water and organic material composing the rest. Hydroxyapatite is the primary mineral which is a crystalline Calcium Phosphate. Formation of enamel takes place while tooth develop within the jaw bone before appearing in to the mouth. It does not contain blood vessel and nerves.

174. Which one of the following statements regarding Electrocardiogram is correct?

- A. Electrocardiogram is graphical representation of electrical activity of cornea
- B. Electrocardiogram is graphical representation of activity of kidney
- C. Electrocardiogram is graphical representation of activity of brain
- D. Electrocardiogram is graphical representation of electrical activity of heart

Answer ||| D



Solution |||

Electrocardiogram is a test that checks functioning of heart by measuring the electrical activity of heart. After every heart beat a electrical impulse travels through your heart. This wave causes muscle to squeeze and pump blood from the heart. Electrocardiography is the process of producing Electrocardiogram.

gradeup