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10th SCIENCE
QR CODE QUESTIONS & ANSWER

1. LAWS OF MOTION

1. A heavy truck and bike are moving with same kinetic energy. If the mass of truck is four times that of the bike, then calculate ratio of their momenta)

a) 1:4 b) 1:2 **c) 2:1** d) 1:1

Solution :

Let, Mass of the bike $= m_B$

Mass of the truck $= m_T = 4m_B$

Kinetic Energy $= \frac{1}{2}mv^2 = \frac{1}{2}mv^2 \times \frac{m}{m} = \frac{m^2v^2}{2m}$

i.e. KE $= \frac{p^2}{2m}$ $[\because p = mv]$

K.E of truck = K.E of bike

$$\frac{p_T^2}{2(4m_B)} = \frac{p_B^2}{2m_B}$$

$$\frac{p_T^2}{p_B^2} = \frac{8m_B}{2m_B} = \frac{4m_B}{m_B} = \frac{4}{1}$$

$$\frac{p_T}{p_B} = \sqrt{\frac{4}{1}} = \frac{2}{1}$$

∴ **Ratio of the momentum of truck to that of the bike is 2 : 1.**

i.e. Momentum of the truck is twice the momentum of the bike.

2. A planet has a mass of 20% more than that of earth, and radius is 20% less than that of earth. Then find the acceleration due to gravity.

a) 17.375 m s^{-2} **b) 18.375 m s^{-2}** c) 16.375 m s^{-2} d) 11.375 m s^{-2}

Solution :

Mass of the Earth $= M_E$

Mass of the Planet $= M_E + 0.2\,M_E = 1.2M_E$

Radius of the Earth $= R_E$

Radius of the Planet $= R_E - 0.2\,R_E = 0.8R_E$

Acceleration due to gravity of the Planet

$$g' = \frac{G\,(1.2)M_E}{(0.8R_E)^2} = \frac{1.2}{(0.8)^2} \times \frac{GM_E}{{R_E}^2}$$

$$g' = \frac{1.2}{0.64} \times g_E = \frac{1.2}{0.64} \times 9.8$$

$$\mathbf{g' = 18.375\ ms^{-2}}$$

3. Two planets are spiraling around sun in circular orbits of ratio m:n and the density ratio p:q, the acceleration due to gravity g is the ratio of

a) mq : np b) np : mq c) nq : mp **d) mp : nq**

Solution :

Ratio of the Radius, $R_1 : R_2 = m : n$

Ratio of the density, $d_1 : d_2 = p : q$

For sphere, volume $= \frac{4}{3}\pi R^3$

Mass = density × volume

$$\frac{M_1}{M_2} = \frac{d_1 \times \frac{4}{3}\pi {R_1}^3}{d_2 \times \frac{4}{3}\pi {R_2}^3} = \frac{d_1\,{R_1}^3}{d_2\,{R_2}^3}$$

$$\frac{G_1}{g_2} = \frac{GM_1}{{R_1}^2} \times \frac{{R_2}^2}{GM_2} = \frac{M_1}{M_2} \times \frac{{R_2}^2}{{R_1}^2}$$

$$= \frac{d_1\,{R_1}^3}{d_2\,{R_2}^3} \times \frac{{R_2}^2}{{R_1}^2} = \frac{d_1 R_1}{d_2 R_2} = \frac{mp}{nq}$$

∴ Ratio of acceleration due to gravity of the two planets is **mp**: **nq**

4. Two asteroids of equal masses revolve diametrically opposite to each other in circle of radius 1000km with equal velocity. If the mass of one of them is 108 kg, then find their velocity.

(G = 6.6 × 10^{-11} N m^{-2} kg^{-2}) $(0.66)^{1/2}$ = 0.8124

a) 0.816 x 10^{-2} ms^{-2} b) 0.816 x 10^{-3} ms^{-2} c) 0.716 x 10^{-3} ms^{-2} d) 0.716 x 10^{-2} ms^{-2}

5. A bomb of mass 10 kg is initially at rest explodes into two parts. Mass of 4 kg is moving with kinetic energy of 200 J. Velocity of other mass is _____m/s

a) 2.54 b) 6.6 c) - 5.67 **d) -6.6**

Solution :

Mass of the bomb = 10kg, $m_1 = 4kg$, $m_2 = 6kg$

Kinetic Energy of mass 4 kg (m_1) = 200J

$$\therefore \frac{1}{2} m_1 V_1^2 = 200$$

$$\frac{1}{2} \times 4 \times V_1^2 = 200$$

$$2V_1^2 = 200 \Rightarrow V_1^2 = \frac{200}{2} = 100$$

$$V_1 = \sqrt{100} = \mathbf{10 ms^{-1}}$$

Law of conservation of momentum,

$$m_1V_1 + m_2V_2 = 0$$

$$4 \times 10 + 6 \times V_2 = 0$$

$$40 + 6V_2 = 0$$

$$6V_2 = -40$$

$$V_2 = \frac{-40}{6}$$

$$\mathbf{V_2 = -6.6\ ms^{-1}}$$

6. Average force necessary to stop a hammer with 25 Ns momentum in 0.04s is _____N.

a) 625 N b) 225 N c) 50 N d) 25N

Solution :

Initial momentum $P_1 = 0$ Ns,

Final momentum $P_2 = 25$ Ns

Time t = 0.04s

$$\text{Force} = \frac{\text{Change in momentum}}{\text{Time}} = \frac{25-0}{0.04} = \mathbf{625\ N}$$

7. A person jumps onto a swimming pool from a height of 1m and comes to rest by 0.2s If the same person increases his height by 8 m from its old position and jumps, comes to rest by 2s. Compare the ratio of forces exerted by him in both the cases.

a) 10: 3 b) 3:10 c) 1:1 d) none of the above

Solution :

From 3rd equation of motion, $V^2 = u^2 + 2gh$

$$V^2 = 2gh \quad (\because u = 0)$$

$$V = \sqrt{2gh}$$

Case 1: $\boldsymbol{h_1 = 1m}$

$$V_1 = \sqrt{2gh_1} = \sqrt{2g}$$

$$F_1 = \frac{m(v_1 - u_1)}{t_1} = \frac{m(\sqrt{2g} - 0)}{0.2} = \frac{m\sqrt{2g}}{0.2}$$

Case 2: $\boldsymbol{h_2 = 1 + 8 = 9m}$

$$V_2 = \sqrt{2gh_2} = \sqrt{2g \times 9} = 3\sqrt{2g}$$

$$F_2 = \frac{m(v_2 - u_2)}{t_2} = \frac{m(3\sqrt{2g} - 0)}{2} = \frac{3m\sqrt{2g}}{2}$$

$$\frac{F_1}{F_2} = \frac{m\sqrt{2g}}{0.2} \times \frac{2}{3m\sqrt{2g}} = \frac{1}{0.3} = \frac{10}{3}$$

The ratio of force is = 10: 3

8. Some force acts on two bodies of different masses 2kg and 4 kg initially at rest. The ratio of time required to acquire same final velocity is

a) 2:1 **b) 1:2** c) 1:1 d) 4:16

Solution :

$$F_1 = F_2 \Rightarrow m_1a_1 = m_2a_2 \Rightarrow \frac{a_2}{a_1} = \frac{m_1}{m_2}$$

$$a = \frac{v-u}{t} = \frac{v}{t} \ (\because u = 0) \Rightarrow \frac{a_2}{a_1} = \frac{v_2}{v_1} \times \frac{t_1}{t_2}$$

$$\because v_1 = v_2, \quad \frac{a_2}{a_1} = \frac{t_1}{t_2} = \frac{m_1}{m_2} = \frac{2}{4} = \frac{1}{2}$$

$$\therefore \mathbf{t_1 : t_2 = 1 : 2}$$

9. The lift is going up with the passengers. Total mass is 1 ton. The variation in velocity of lift in 2 sec is 3.6ms^{-1}. Then the tension in the rope pulling the lift is _____ N.

a) 1000 N b) 80000 N c) 800 N **d) 8000 N**

Solution :

$$\text{Acceleration} = \frac{\text{change in velocity}}{\text{Time taken}}$$

$$a = \frac{0-3.6}{2} = -1.8\ ms^{-2}$$

Tension in the rope, $T = m(g + a)$

$$\mathbf{T} = 1000\ (g + a) = 1000(9.8 - 1.8)$$

$$\mathbf{T} = 1000 \times 8 = \mathbf{8000\ N}$$

10. When a person standing on spring balance. Reading on the balance is 65 kgf. If the man jumps off from the balance, then the momentary reading in the balance will be

a) first increases and decreases b) first decreases and increases

c) decreases d) no change

Solution : *For jumping he presses the spring platform. So, the reading of spring Balance increases and then it decreases and becomes zero.*

2. OPTICS

1. The refractive index of water with respect to air is 1.33 and the refractive index of glass with respect to air is 1.52. The refractive index of glass with respect to water is

a) 1.33 b) 1.52 **c) 1.142** d) 0.875

Solution :

Refractive index of glass with respect to water = $\frac{\mu \text{ of glass with respect to air}}{\mu \text{ of water with respect to air}} = \frac{1.52}{1.33} = 1.142$

2. The time taken by a light ray to travel through a glass slab of thickness 8 mm is (Take $\mu_{glass} = 1.5$)

a) 4 x 10 $^{-11}$ s b) 4 x 10 $^{+11}$ s c) 2.5 x 10 $^{-11}$ s d) 2.5 x 10 $^{+11}$ s

Solution :

Refractive index(μ) = $\frac{\text{speed of light in vaccum}}{\text{velocity of light in a medium}} = \frac{c}{V}$

$\therefore V = \frac{c}{\mu} = \frac{3\times10^8}{1.5} = 2\times10^8 ms^{-1}$

$V = 2\times10^8 \ ms^{-1}$

We know that,

Velocity = $\frac{\text{distance travelled}}{\text{Time taken}}$

$\therefore$ Time taken = $\frac{\text{distance travelled}}{\text{velocity}}$

$t = \frac{8\times10^{-3}m}{2\times10^8 ms^{-1}} = \mathbf{4\times10^{-11}s}$

The time taken by light ray to travel through the glass slab is 4×10^{-11}s

3. A lens of focal length 12cm magnifies the object by three times and produced an erect image. Then the distance between the object and the lens is

a) 8 cm b) 16 cm c) 24 cm d) 32 cm

Solution :

Magnification m = $\frac{V}{u} = 3$

$V = 3u$

From lens formula, $\frac{1}{f} = \frac{1}{V} - \frac{1}{u}$

$\frac{1}{3u} - \frac{1}{u} = \frac{1-3}{3u} = \frac{-2}{3u}$

$\frac{1}{f} = \frac{-2}{3u}$

$u = \frac{-2f}{3} = \frac{-2\times12}{3} = \frac{-24}{3} = -8 \Rightarrow \mathbf{u = 8\ cm}$

$\therefore$ The distance between the object and the lens is 8 cm.

4. A convex lens has a focal length of 12cm. An object is placed at some distance from the lens so that an image is formed at a distance of 24cm in front of the lens. Then the distance between the object and the lens is

a) 8 cm b) 12 cm **c) 24 cm** d) 32 cm

Solution :

f = 12 cm (Positive for convex lens)

V = 24 cm (Positive as image is infront of the lens)

From lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$\frac{1}{u} = \frac{1}{v} - \frac{1}{f} = \frac{1}{24} - \frac{1}{12} = \frac{1-2}{24} = \frac{-1}{24}$

$u = -24$ cm

$\therefore$ The distance between the object and the lens is 24 cm.

5. A lens forms a real image of height 6cm of an object of height 2 cm. If the distance between the object and the image is 16 cm, then the focal length of the lens is

a) 2cm **b) 3cm** c) 6cm d) 12cm

Solution :

Height of the image $h_i = 6cm$

Height of the object $h_0 = 2cm$

Magnification $m = \frac{h_i}{h_0} = \frac{6}{2} = 3$

Since, u is negative $m = \frac{V}{-u} = 3 \Rightarrow V = -3u$

Distance between the object and the image

$-u + V = 16 \Rightarrow -u - 3u = 16$

$-4u = 16 \Rightarrow u = {}^{-16}/_{4} = -4cm$

$V = -3u = -3 \times -4 = 12cm$

$\frac{1}{f} = \frac{1}{V} - \frac{1}{u} = \frac{1}{12} - \frac{1}{-4} = \frac{1+3}{12} = \frac{4}{12} = \frac{1}{3}$

$f = 3cm$

∴ Focal length of the lens f = 3cm

6. The refractive index of medium 2 with respect to medium 1 is 'x' and refractive index of medium 2 with respect to medium 3 is 'y'. Then the refractive index of medium 3 with respect to medium 1 is

a) xy **b) $\frac{x}{y}$** c) $\frac{y}{x}$ d) $\frac{1}{xy}$

Solution :

μ of medium 2 w.r.to medium $1 = \frac{\mu \text{ of medium } 2}{\mu \text{ of medium } 1} = x$

μ of medium 2 w.r.to medium $3 = \frac{\mu \text{ of medium } 2}{\mu \text{ of medium } 3} = y$

μ of medium 3 w.r.to medium $1 = \frac{\mu \text{ of medium } 3}{\mu \text{ of medium } 1} = \frac{x}{y}$

∴ The refractive index of medium 3 with respect to 1 is $\frac{x}{y}$.

7. A convex lens of focal length 'f' is placed somewhere in between an object and a screen. The distance between the object and the screen is x. If the numerical value of the magnification produced by the lens is m, then the focal length of the lens is

a) $\frac{mx}{(m+1)^2}$ b) $\frac{mx}{(m-1)^2}$ c) $\frac{(m+1)^2}{mx}$ d) $\frac{(m-1)^2}{mx}$

Solution :

Since, u is negative,

Magnification $m = \frac{v}{-u} \Rightarrow \therefore v = -mu$

$-u + v = x \Rightarrow -u - mu = x$

$-u(1+m) = x \Rightarrow u = \frac{-x}{1+m}$

$\therefore v = -mu = \frac{mx}{1+m}$

$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{\frac{mx}{1+m}} - \frac{1}{\frac{-x}{1+m}}$

$\frac{1}{f} = \frac{1+m}{mx} + \frac{1+m}{x} = \frac{m^2+2m+1}{mx}$

$\frac{1}{f} = \frac{(m+1)^2}{mx} \Rightarrow \mathbf{f = \frac{mx}{(m+1)^2}}$

8. A converging lens is used to form an image on a screen. When upper half of the lens is covered by an opaque screen

a) Half the image will disappear

b) Complete image will be formed of same intensity

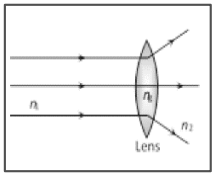
c) Half image will be formed of same intensity

d) Complete image will be formed of decreased intensity

Solution :

When the converging or diverging lens is covered along the axis, full image will be formed. But, its intensity will get reduced.

9. The ray diagram could be correct (Here n_1 , n_2 be the refractive index of medium1 and medium 2, n_g - refractive index of the glass)



a) If $n_1 = n_2 = n_g$ **b) If $n_1 = n_2$ and $n_2 < n_g$**

c) If $n_1 = n_2$ and $n_1 > n_g$ d) Under no circumstances

(Image change)

Solution :

From n_1 to n_2, there is no change in incident ray. Therefore $n_1 = n_2$

From n_2 to n_g, there is no change in incident ray. Therefore $n_1 = n_2$

10. An object is placed at a distance of f/2 from a convex lens. The image will be

a) At one of the foci, virtual and double its size b) At 3f / 2, real and inverted

c) At 2f, virtual and erect d) None of these

Solution :

Object is placed between O and F, ∴ ***virtual image*** is formed. u, v both are negative.

$\frac{1}{f} = \frac{1}{-v} - \frac{1}{-u} = \frac{1}{-v} + \frac{2}{f} \Rightarrow \frac{1}{v} = -\frac{1}{f} + \frac{2}{f} = \frac{1}{f} \Rightarrow v = f$ ∴ image is formed at ***Focus*** (f).

Magnification $m = \frac{-v}{-u} = \frac{-f}{-f/2} = 2$ ∴ formed image is ***Double its size.***

3. THERMAL PHYSICS

1. A piece of ice can

a) not radiate heat **b) radiate and absorb heat**

c) radiate heat but not absorb heat d) absorb heat but not radiate heat

Hint : All body above 0 K will radiate and absorb heat. Ice is at 273 K (or) 0°C.

2. The bottom of a lake not freeze in severe winter even when the surface is all frozen. Why ?

a) The water has large specific heat

b) The water has large latent heat of fusion

c) The conductivity of ice is low

d) The temperature of the earth at the bottom of the lake is high

3. Why does the cooking pot is coated with black?

a) black surfaces reflect more heat b) black surfaces are easier to clean

c) black surfaces absorb more heat d) none of above

4. Which of the following thermometers is used for measuring temperature around 1200° C?

a) Optical pyrometer

b) Mercury thermometer

c) Constant volume gas thermometer

d) Platinum resistance thermometer

5. At what temperature are the Celsius value and Fahrenheit value equal?

a) + 40 º **b) - 40°** c) - 0 º d) + 100 º

Hint : $F = \frac{9}{5} C + 32$; to find C when F = C

$C = \frac{9}{5} C + 32 \Rightarrow \frac{9-5}{5} C = -32 \Rightarrow C = -32 \times \frac{5}{4} = \mathbf{-40}$°C

6. What would happen to a hole in a metal sheet when the sheet is heated?

a) The size of hole is decreases **b) The size of hole is increases**

c) No change in size d) None of above

Hint : When a metal sheet with hole is heated the sheet expands uniformly on all side. Like liquid or gas, the expanded metal sheet cannot occupies the spaces in the hole.
∴ The size of the hole increases.

7. The surface which radiates more heat energy at a given particular temperature is

a) Black and Rough b) Black and Polished

c) White and polished d) White and Rough

Hint : Black surface absorbs more heat ; Rough surface reflects less and gives more area. Hence, black and rough surface radiates more heat energy.

8. Which of the below is used for measurement of high temperature?

a) vapour thermometer b) energy meter

c) pyrometer d) resistance thermometer

9. If boiling water is taken to the dark side of the moon it will be

a) vaporized b) continue to boil

c) stop boiling but remain hot **d) freeze**

Hint : On the dark side of the moon, the temperature is very low that it freezes.

10. Order the substances iron, glass and water in descending about thermal conductivity

a) iron, glass, Water **b) iron , Water, glass**

c) Water, iron, glass d) Water ,glass, iron

11. If a heater coil is cut into four equal parts and only one part is used in the heater, the heat generated is:

a) increases b) decreases

c) no change d) may increase or decrease

Hint : Coil is cut into four equal parts ⇒ length decreases ⇒ resistance decreases
∴ Heat generated is increased.

12. Which of the following denotes highest temperature?

a) 1° C b) 1K c) 1°F d) All are equal

Hint : Convert all to ° **C**

for 1 K, $C = 1 - 273 = -272$°C

for 1°F, $C = \frac{5}{9}(1 - 32) = \frac{5}{9}(-31) = -17.2$ °C

4. ELECTRICITY

1. Two charged bodies having equal potential are connected through a wire, in this case
   a) current will flow **b) current will not flow**
   c) cannot say d) current will flow if a resistor is connected

   Hint: Current will flow only if there is a potential difference.

2. The relation between potential difference (V) and Current (I) is
   a) V α I b) V α I^2 c) V^2 α I d) V α I^3

3. If a 12 V battery is connected in series with resistors 3ohm, 4ohm, 5 ohm, then the current flows through the 3 ohm resistor is
   a) 1 A b) 2 A c) 3 A d) 4 A

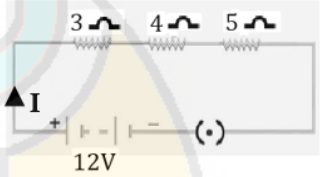
   Solution :

   Same current flows through the series resistance

   $V = IR_1 + IR_2 + IR_3 = I(R_1 + R_2 + R_3)$

   $12 = I(3 + 4 + 5)$

   $\mathbf{I = \frac{12}{12} = 1\ A}$



4. The rheostat is used in the circuit to :
   a) increase the magnitude of current only
   b) decrease the magnitude of current only
   c) increase or decrease the magnitude of current
   d) none of these

5. There are 'n' resistor each of resistance R. First they all are connected in series and equivalent resistance is X. Now they are connected in parallel and equivalent resistance is Y. What is the ratio of X and Y?
   a) X : Y = 1: n b) X : Y = 1: n^2 c) X : Y = n: 1 **d) X : Y = n^2 : 1**

   Hint : $R_s = nR = X$ $R_P = \frac{R}{n} = Y$

   $\frac{X}{Y} = \frac{nR}{R/n} = \frac{n^2}{1}$

6. The heat generated while transferring 50 coulomb of charge in one hour through a potential difference of 50V is
   a) 50 J b) 250 J c) 500 J **d) 2500 J**

   Solution : $Q = 50\ C,\ V = 50V,\ t = 1hour = 60 \times 60 = 3600\ s$

   $w = QV = 50 \times 50 = \mathbf{2500\ J}$

7. The amount of heat produced by a conductor of resistance 20Ω, while 5A current flows for 30 seconds.
   a) 150 J b) 1500 J **c) 15000 J** d) 1000 J

   Solution : R = 20 Ω I = 5 A t = 30 secs

   $H = I^2Rt = 5 \times 5 \times 20 \times 30 = \mathbf{15000\ J}$

8. A 12V battery is connected across a resistor, if the current through the resistor is 2A, then the resistance of the resistor is
   a) 2 Ω b) 4 Ω **c) 6 Ω** d) 12 Ω

Solution : $V = 12V, \quad I = 2A$

$\mathbf{V = IR,} \quad R = \frac{V}{I} = \frac{12}{2} = \mathbf{6\ \Omega}$

9. If 'n' resistors are connected in parallel, then the effective resistance is
   a) nR b) n/R **c) R/n** d) R/2n

10. One Kilowatt hour is equal to
    a) 3.6×10^5 J **b) 3.6×10^6 J** c) 3.6×10^{-5} J d) 3.6×10^{-6} J

5. ACOUSTICS

1. The waves that required a material medium for their propagation is called
   a) Matter waves b) Electromagnetic waves
   c) Carrier waves **d) Mechanical waves**

2. Assertion(A): The velocity of sound in air increases due to the presence of moisture in it
   Reason(R) : The presence of moisture in air lowers the density of air.
   a) Both A and R are false
   b) Both A and R are true but R is not the correct explanation of A
   c) A is false but R is true
   d) Both A and R are true and R is the correct explanation of A

3. Doppler effect is depend on
   a) velocity of listener
   b) distance between the source and listener
   c) velocity of the source
   d) all the above

4. If wind blows in a direction opposite to the sound propagation, then the velocity of sound
   a) Increases **b) Decreases** c) Remains constant d) Cannot be determined

5. A longitudinal wave of wavelength 1cm travels with a speed of 300 m/s .Can this wave be heard by a normal human being?
   a) no b) yes c) only in day time d) only in night time

Hint : $n = \frac{v}{\lambda} = \frac{300}{1 \times 10^{-2}} = \mathbf{30{,}000\ Hz}$

This is greater than 20,000 Hz (maximum frequency that a human can hear)

∴ Normal human being cannot hear this wave.

6. An observer stands at a distance of 850 m from the mountain and fires the gun. If the sound travels at speed of 350 m/s After what time gap he will hear the echo,
   a) 2 s b) 2.2 s c) 2.4 s **d) 4.86 s**

Hint :

For echo, sound has to hit the mountain and return back. ***i.e.*** distance = 850×2 = **1700 m**

Time taken to hear echo= $\frac{distance}{speed} = \frac{1700}{350} = 4.857$ s

∴ Sound of echo will be heard after **4.857 s.**

7. The waves produced by a motorboat sailing in water are
   a) transverse b) longitudinal
   c) longitudinal and transverse d) stationary

8. A wave of frequency 500Hz travels between X and Y, distance' of 600 m in 2s. How many wavelength are there in distance XY?
   a) 1000 b) 300 c) 180 d) 2000

Solution : Frequency (n) = 500 Hz,
distance travelled (d) = 600 m, time (t) = 2s
velocity of the wave (v) = $\frac{d}{t} = \frac{600}{2} = 300$ m/s
wavelength of the wave (λ) = $\frac{v}{n} = \frac{300}{500} = \frac{3}{5}$ m Number of wavelengths between X and Y (N),
N = $\frac{d}{\lambda} = \frac{600}{3/5} =$ **1000 *wavelengths***
∴ 1000 wavelengths are present in the distance XY.

9. Sound waves of wavelength λ travelling in a medium with a speed of v m/s enter into another medium where its speed is 2v m/s. wavelength of sound waves in the second medium is
   a) λ b) λ /2 **c) 2 λ** d) 4 λ

Hint : *frequency remains unchanged*
Wavelength in 1st medium = $\lambda_1 = \frac{v}{n}$ ..... (1)
Wavelength in 2nd medium = $\lambda_2 = \frac{2v}{n}$ .....(2)
(2) ÷ (1), $\frac{\lambda_2}{\lambda_1} = \frac{2v}{v} \times \frac{n}{n} = 2$
$\lambda_2 = 2\lambda_1$

10. Which of the following is not a characteristic of musical sound?
    a) pitch **b) wavelength** c) quality d) loudness

11. What does it mean when a wave's amplitude increases
    a) its frequency also increasing b) its moving in denser medium
    c) its wavelength gets longer **d) its carrying more energy**

12. Assertion : (A) Solids can support both longitudinal and transverse waves but only longitudinal waves can propagate in gases.
    Reason : (R) solids posses two types of elasticity.
    a) Both A and R are false
    b) Both A and R are true but R is not the correct explanation of A
    c) A is false but R is true
    d) Both A and R are true and R is the correct explanation of A

6. NUCLEAR PHYSICS

1. β rays are emitted from the _____.
   a) sun b) stars
   c) atom whose atomic number less than 50 **d) radio active nucleus of an atom**

2. Radio activity may be _____.
   a) natural b) artificial
   c) natural and artificial d) none of the these

3. The natural source of a gamma radiations are _____.
   a) natural gas b) radio carbon c) radio ions d) all the above

4. The alpha particle carries two positive charges and its mass is nearly equal to ------
   a) two protons b) two electrons **c) an atom of helium** d) atom of hydrogen
5. In the nuclear reaction $_{90}Hg^{198} + X$ -------> $_{89}Au^{198} + {}_1H^1$, X stands for _____.
   a) neutron b) proton c) electron d) deuteron
6. The radio isotope used in agriculture is _____.
   a) $_{15}P^{32}$ b) $_{15}P^{31}$ c) $_{11}Na^{23}$ d) $_{11}Na^{24}$
7. The _____ is a natural radio active element , whose atomic number is less than 83.
   a) Aluminium b) Silver **c) Technitium** d) calcium
8. The SI unit of radioactivity is _____.
   a) rutherford **b) becquerel** c) curie d) roentgen
9. _____ travel with the speed of light.
   a) alpha rays b) beta rays **c) gamma particles** d) none of the above
10. _____ is an example for fertile material
    a) Uranium 235 **b) Thorium-232** c) Plutonium 239 d) Plutonium 241

7. ATOMS AND MOLECULES

1. Which of the following has largest number of particles?
   a) 8 g of CH_4 b) 4.4 g of CO_2 c) 34.2 g of $C_{12}H_{22}O_{11}$ **d) 2 g of H_2**

Solution :

a) 8 g of CH_4 molecule is $= \frac{8}{16} \times 6.023 \times 10^{23} = 3.0115 \times 10^{23}$ molecules

b) 4.4 g of CO_2 molecule is $= \frac{4.4}{44} \times 6.023 \times 10^{23} = 0.6023 \times 10^{23}$ molecules

c) 34.2 g of $C_{12}H_{22}O_{11}$ molecule is $= \frac{6.023 \times 10^{23}}{342} \times 34.2 = 0.6023 \times 10^{23}$ molecules

d) 2 g of H_2 molecule is $= \frac{6.023 \times 10^{23}}{2} \times 2 = 6.023 \times 10^{23}$ molecules

2. Number of molecules in 16 g of Oxygen is
   a) 6.023×10^{23} b) 6.023×10^{-23} **c) 3.011×10^{23}** d) 3.011×10^{-23}

Solution : *gram molecular mass of* $O_2 = 16 \times 2 = 32g$

No. of molecules of $O_2 = \frac{16}{32} \times 6.023 \times 10^{23} = \frac{1}{2} \times 6.023 \times 10^{23} = 3.0115 \times 10^{23}$ **molecules**

3. The mass of Sodium in 11.7 g of NaCl is _____.
   a) 2.3 g **b) 4.6 g** c) 6.9 g d) 7.1 g

Solution : Molecular mass of NaCl $= 23 + 35.5 = 58.5\ g$

$\therefore$ Mass of Na in 11.7g of NaCl $= \frac{23}{58.5} \times 11.7 = 4.6$ **g**

4. Which of the following contains the largest number of molecules?
   a) 0.2 moles of H_2 **b) 8.0 g of H_2** c) 17 g of H_2O d) 6.0 g of CO_2

Solution :

a) No. of molecules in 0.2 moles of $H_2 = 0.2 \times 6.023 \times 10^{23}$

b) **No. of molecules in 8.0g of H_2** $= \frac{8}{2} \times 6.023 \times 10^{23} = 4 \times 6.023 \times 10^{23}$

c) No. of molecules in 17 g of H_2O $= \frac{17}{18} \times 6.023 \times 10^{23} = 0.94 \times 6.023 \times 10^{23}$

d) No. of molecules in 6.0 g of CO_2 $= \frac{6}{44} \times 6.023 \times 10^{23} = 0.136 \times 6.023 \times 10^{23}$

5. One gram of which of the following contains largest number of Oxygen atom.
   a) O b) O_2 c) O_3 **d) All contains Same**

Solution :

a) molecular mass of O = 16 g
no of atoms in O = $\frac{1}{16} \times 6.023 \times 10^{23}$
= $\frac{6.023 \times 10^{23}}{16}$

b) molecular mass of O_2 = 32 g
no of atoms in O_2 = $\frac{1}{32} \times 6.023 \times 10^{23} \times 2$
= $\frac{6.023 \times 10^{23}}{16}$

c) molecular mass of O_3 = 48 g
no of atoms in O_3 = $\frac{1}{48} \times 6.023 \times 10^{23} \times 3$
= $\frac{6.023 \times 10^{23}}{16}$

6. The mass of one C atom is
   a) 6.023×10^{23} b) 1.99×10^{23} c) 2.0 g **d) 12 g**

7. A group of atoms bonded together is
   a) a molecule b) an atom c) a salt d) an element

8. How many molecules are present in 1 g of Hydrogen _____.
   a) 6.023×10^{23} **b) 3.0115×10^{23}** c) 1.511×10^{23} d) 2.511×10^{23}

Solution : *No. of H_2 molecules* = $\frac{1}{2} \times 6.023 \times 10^{23}$ = **3.0115×10^{23} molecules**

9. $_{17}Cl^{35}$ and $_{17}Cl^{37}$ are
   a) isotopes b) isobars c) isotones d) none of these

Solution : *Two or more forms of an element having the same atomic number, but different mass number is called **isotopes.***

10. Which one has no unit
    a) AAM b) GAM **c) RAM** d) GMM

Solution : *Relative Atomic Mass* **(RAM)** *is only a Ratio, so it has no unit.*

8. PERIODIC CLASSIFICATION OF ELEMENTS

1. Pure gold is
   a) 16 carat b) 22 carat c) 20 carat **d) 24 carat**

2. Blue gold is
   a) Alloy of 46% gold with 54% indium
   b) Alloy of 36% gold with 64% indium
   c) Alloy of 26% gold with 74% indium
   d) Alloy of 16% gold with 84% indium

3. Give an example of a metal which is a liquid at room temperature.
   a) Mercury b) Sodium c) Silver d) Lead

4. Ionic radii increases in
   a) Group b) Period c) a and b d) none of these

Solution : *atomic radius, ionic radii also **increases** in the Group. Whereas decreases in Period.*

5. Which one of the following is highly electro negativity
   a) fluorine b) chlorine c) bromine d) iodine

Solution :

The size of the atom decreases an electronegativity increases **(F< Cl<B<I)**

6. Why sodium is kept immersed in kerosene oil?
   a) Sodium reacts both with air and water b) Sodium react with kerosene
   c) Sodium react does not reacts both with air and water d) None

Solution :

*Sodium is highly reactive metal. It reacts with oxygen in air at room temperature, the reaction is **highly exothermic**. To prevent accidental damage this sodium is kept preserved under kerosene. Sodium does not react with kerosene.*

7. The poorest conductor of heat is
   a) Aluminium b) Silver **c) Lead** d) Gold

Solution :

*Gold, silver, and aluminium are very good conductor of heat. But, **Lead** is the poorest conductor of heat.*

8. The luster of a metal is due to
   a) Its high density b) Its high polishing
   c) Its chemical inertness **d) Presence of free electrons**

Solution :

*Metals are **lustrous** because of the **Presence of free electrons** they have. The free electrons can move freely in the metal causing any light incident on them to get reflected back. This reflection is specular reflection rather than diffused and thus the metal surface appears shiny or lustrous.*

9. Which of the following metals form amphoteric oxide
   a) Copper b) Silver **c) Aluminium** d) iron

Solution :

★ ***Amphoteric Oxide** is that metallic oxide displaying a dual behaviour. It shows the characteristics of both an acid as well as a base. It reacts with both alkalis as well as acids.*

★ *Amphoteric metals are Copper, Zinc, Lead, Tin, Beryllium, Aluminium.*

★ ***Al** reacted with HCl, it acts as a base to form salt $AlCl_3$(Salt)*

★ ***Al** reacted with NaOH, it act as an acid to form $NaAlO_2$ (Salt)*

10. The Electrial conductivity of a metal is due to _____.
    a) Its high density b) Its high polishing
    c) Its chemical inertness **d) Presence of free electrons**

11. non metals generally act as
    a) oxidizing agents b) reducing agents c) both (a) and (b) d) none of these

Solution :

*non- metals act as an **oxidizing agent** because non-metals have a tendency to gain electrons and get reduced.*

9. SOLUTIONS

Multiple choice questions :

1. Deep sea drivers use (O_2 + He) mixture in preference to (O_2 + N_2) mixture. This is because
   a) Helium is lighter than nitrogen
   b) Helium is less soluble in blood than nitrogen
   c) Helium is more soluble in blood
   d) Helium provides a better inert atmosphere than nitrogen

Solution :

★ *Nitrogen and Oxygen mixture- During diving body in under high pressure. This high external pressure causes the nitrogen to get mixed with blood, which then changes to toxic chemicals, which is fatal.*

★ ***Helium is less soluble in blood than nitrogen.** So, Helium and oxygen mixture- Even if helium got mixed with blood it will not cause any problem as helium is inert.*

2. Naphthalene dissolves in kerosene because naphthalene and kerosene are respectively
   a) Polar and non polar b) Polar and polar
   c) Non polar and non polar d) Non polar and polar

Solution :

★ Non-polar compounds are soluble in non-polar solvents.

★ Polar compounds are soluble in Polar solvents.

★ ***Napthalene and Kerosene both are non polar compounds.***

3. Saturated solution of NaCl on heating

a) Becomes supersaturated **b) Becomes unsaturated**

c) Remains saturated d) Vaporizes

Solution :

*Heating a saturated usually causes some of the undissolved solid to dissolve so the solution remains saturated. However, once this has all dissolved further heating increases the solubility so that the solution could dissolve more and it would be **unsaturated**.*

Fill in the blanks :

1. Nitrogen in soil is an example for **saturated** solution in nature.
2. A concentrated solution contains **high** amount of solute.
3. The solubility of gases in water **increases** as the pressure increases.
4. Anhydrous Calcium Chloride salt absorb moisture from atmospheric air is called **hygroscopic** substances.
5. The solubility of a substance is defined as the amount of solute in present in **100** g of the solvent grams.
6. Which is homogeneous mixture: **soda water** and **air**. (soda water, wood, air).
7. The solubility of ammonium chloride increases as temperature **increases**.

10. TYPES OF CHEMICAL REACTIONS

1. Which of the following reactions involves the combination of two elements :-

a) $CaO + CO_2 \rightarrow CaCO_3$ **b) $4Na + O_2 \rightarrow 2Na_2O$**

c) $SO_2 + (1/2)O_2 \rightarrow SO_3$ d) $NH_3 + HCI \rightarrow NH_4CI$

Solution :

Sodium (Na) and Oxygen (O_2) both are elements.

2. $Zn + H_2SO_4(dil) \rightarrow ZnSO_4 + H_2$ Above reaction is

a) Decomposition reaction **b) Single displacement reaction**

c) Combination reaction d) Synthesis reaction

Solution :

Single displacement reaction : *Reaction between an element and a compound.*

Zn *- Element,* ***H_2SO_4*** *– Compound*

3. Rate at which reaction proceeds is directly proportional to

a) Product of the active masses of products **b) Product of the active masses of reactants**

c) Both a and b d) None of these

4. Take about 1.0g $CaCO_3$ in a test tube. Heat it over a flame, when a colorless gas comes out. The reaction is called a

a) Decomposition reaction b) Displacement reaction

c) Double decomposition reaction d) Double displacement reaction

Solution :

when calcium carbonate is heated, it breaks down into Calcium oxide and Carbon dioxide.

$$\underset{\text{Calcium Carbonate}}{CaCO_{3(s)}} \xrightarrow{Heat} \underset{\text{Calcium Oxide}}{CaO_{(s)}} + \underset{\text{Colourless gas}}{CO_{2(g)}\uparrow}$$

*So, It is a type of compound to compound/compound **decomposition reaction.***

5. What type of chemical reaction releases energy in the form of heat?

a) geothermic b) endothermic c) subthermic **d) exothermic**

6. In which of the following, heat energy will be evolved?
   a) Electrolysis of water
   b) Dissolution of NH_4Cl in water
   c) Burning of L.P.G.
   d) Decomposition of AgBr in the presence of sunlight

Solution :

a) Electrolysis of water is the decomposition of water into oxygen and hydrogen gas due to the passage of an electric current. ... It is also called water splitting.

b) Dissolution of NH_4Cl in water : The ammonium chloride compound decomposes into its component ions: NH_4^+ and Cl^-. This is called dissociation reaction.

*c) **Burning of LPG:** water vapour, Carbon Dioxide and heat evolved, and usually very small amounts of Carbon Monoxide are the products are formed.*

d) Decomposition of AgBr in the presence of sunlight : silver bromide absorbs photo electrons from rays of sun forming photo chemical reaction where silver and bromide separates from each other,

$$2AgBr \rightarrow Ag_2 + Br_2$$

7. The reaction in which two compound exchange their ions to form two new compounds is called
   a) displacement reaction
   b) combination reaction
   c) double displacement reaction
   d) redox reaction

8. As an electrolyte, water is
   a) strong **b) neutral** c) weak d) a good insulator

9. Hydrochloric acid completely ionized in solution hence it is
   a) weak monobasic acid
   b) strong monobasic acid
   c) weak monoacid base
   d) strong monoacid base

10. Pure water is _____ substance.
    a) Neutral b) Basic c) strong electrolyte d) Acidic

11. What is the pH value of saliva after meal?
    a) 4.8 **b) 5.8** c) 6.8 d) Less than 4

Solution :

★ *Normal pH range of saliva is 6.2 to 7.6. The pH value of saliva after the meal is 5.8.*

★ *after meal becomes acidic in nature.*

11. CARBON AND ITS COMPOUNDS

Multiple choice questions:

1. Detergents pollute rivers and water bodies. However, detergents can be made biodegradable and pollution free by taking.
   a) Cyclic hydrocarbon chain
   b) Shorter hydrocarbon chain
   c) Unbranched hydrocarbon chain
   d) Hydrocarbon with more branched chain

Solution :

★ *Detergent molecules associated with branched hydrocarbon tail which is a source of pollution of water.*

★ *However, detergents can be made biodegradable and pollution free by taking **unbranched hydrocarbon chain** because unbranched chains are more prone to attack by bacteria.*

2. Which percentage of acetic acid in water can be used as preservative?
   a) 5-8% b) 10-15% c) 15- 20% d) 100%

3. A few drops of ethanoic acid were added to solid sodium carbonate. The possible result of the reactions were:
   a) A hissing sound was evolved
   b) brown fumes evolved
   c) Brisk effervescence occurred
   d) a pungent smelling gas evolved

Solution :

The following reaction occurs when Acetic acid is added to Sodium carbonate:

$$2\ CH_3COOH + Na_2CO_3 \text{ ----------> } 2\ CH_3COONa + H_2O + CO_2\uparrow$$

*Here, The Liberation of Carbon dioxide (CO_2) is termed as **Brisk Effervescence occured**.*

4. Which of the four test tubes containing the following chemicals shows the brisk effervescence when dilute acetic acid added to them?

i) KOH ii) $NaHCO_3$ iii) K_2CO_3 iv) NaCl

a) i & ii **b) ii & iii** c) i & iv d) ii & iii

Solution :

★ *Brisk effervescence was produced in test tubes* ***ii & iii****, because of release of* CO_2.

★ *Acids on reaction with metal carbonates form corresponding metal salt,* CO_2 *and and* H_2O.

The reactions involved are -	
Test tube 2	$CH_3COOH_{(aq)} + NaHCO_{3\,(aq)} \text{-------> } CH_3COONa_{(aq)} + H_2O + CO_{2\,(g)}\uparrow$
Test tube 3	$2CH_3COOH_{(aq)} + K_2CO_3 \text{--------> } 2CH_3COOK_{(aq)} + CO_{2\,(g)}\uparrow + H_2O$

Fill in the blanks:

5. A very dilute solution of ethanoic acid (acetic acid) is **vinegar.**
6. When sodium metal is dropped in ethanol **hydrogen** gas is released.
7. Match the following :

GENERAL FORMULA	NAME OF THE FUNCTIONAL GROUP	ANSWER
i) R-COOH	a) Ketone	***d) Carboxylic acid***
ii) R-CO-R	b) Ether	***a) Ketone***
iii) R-O-R	c) Aldehyde	***b) Ether***
iv) R-CHO	d) Carboxylic acid	***c) Aldehyde***

8. Match the following

SUBSTANCE	CONSTITUENTS	ANSWER
i) Soap	a) Acetic acid	***b) Fatty acid***
ii) Vinegar	b) Fatty acid	***a) Acetic acid***
iii) Detergents	c) Alkene	***d) Sulphonic acid***
iv) Polythene	d) Sulphonic acid	***c) Alkene***

9. This is not a characteristic of members of homologous series

a) The possess varying chemical properties

b) The properties vary in regular and predictable manner

c) The formulae fit the general molecular formula

d) Adjacent members differ by one carbon and two hydrogen atoms

Solution :

Chemical properties of the members of a homologous series are ***similar.***

10. Consider the chemical formulae CH_3COOH and $HCOOCH_3$ and choose the correct statement

a) Both have the equal boiling point **b) Both have the equal molecular weight**

c) Both have the equal number of covalent bonds d) Both have same functional group

Solution :

★ *The compounds having similar molecular formula but different arrangement of atoms or groups in space are called isomers and the phenomenon is called as isomerism.*

★ *Functional group is a group of atoms which provide characteristic properties to a compound.*

★ *CH_3COOH and $HCOOCH_3$ are functional isomers with containing ester functional group and containing carboxylic acid functional group.*

★ *Thus they have same molecular weight but different functional groups attached.*

12. PLANT ANATOMY AND PLANT PHYSIOLOGY

1. During light reaction which of the following molecules are formed?
   a) ATP **b) ATP and NADPH + H**
   c) $NADPH_2$ d) None of these
2. In photosynthesis energy from light reaction to dark reaction is transferred in the form of
   a) RUDP b) ADP **c) ATP** d) both ATP and ADP
3. The first product of photosynthesis is sugar and it is converted into
   a) Starch b) Protein c) Glycogen **d) None of these**
4. The dark reaction in photosynthesis is called so because it is
   a) Light dependent **b) Light independent**
   c) Cannot occur during day time d) All of these
5. Photosynthesis in green algae and bacteria is respectively
   a) oxygenic and an oxygenic b) oxygenic both
   c) an oxygenic both d) an oxygenic and oxygenic
6. The first step in glucose breakdown in an cell is
   a) ETC b) Acetyl CO A c) Kreb cycle **d) Glycolysis**
7. Respiration is
   a) Anbolic process b) Catabolic process
   c) Both a and b d) Endothermic process
8. Respiration occurs in the presence of oxygen is called
   a) Fermentation b) Anaerobic respiration
   c) Glycolysis **d) Aerobic respiration**
9. End product of aerobic respiration in plants are
   a) Sugar and Oxygen **b) CO_2, Water, energy**
   c) CO_2 and energy d) Water and energy
10. R.Q. is
    a) C/B b) N/C **c) CO_2 / O_2** d) O_2 /CO_2
11. Which of the following is the key intermediate compound linking glycolysis to the Kreb's cycle?
    a) Pyruvic acid b) Malic acid **c) Acetyl COA** d) None of these
12. ETC can produce a total of
    a) 6 ATP b) 8 ATP c) 24 ATP **d) 38 ATP**
13. Ground tissue system includes
    a) xylem and phloem b) stomata, epidermis, trichomes
    c) cortex, endodermis, pericycle, pith d) meristems
14. Which is not a function of epidermis?
    a) Gaseous exchange **b) conduction of water**
    c) transpiration d) protection
15. conjoint, collateral, open and end arch vascular bundles found in
    a) monocot stem **b) dicot stem** c) monocot root d) dicot root

13. STRUCTURAL ORGANISATION OF ANIMALS

1. Leech saliva contains _____ that prevents blood coagulation.
   a) Hirudin b) amylase c) lipase d) pepsin
2. How many pairs of eyes are present on the dorsal side of leech?
   a) Two pairs b) Three pairs c) Four pairs **d) Five pairs**
3. what are the functions of the suckers in leech ?
   a) Attachment and locomotion b) attachment and respiration
   c) attachment and reproduction d) attachment and circulation
4. How does a leech move on a substratum?
   a) By looping or crawling b) By pseudopodia
   c) By the contractions of muscle d) Oscillatory movement

5. _____ is a hermaphrodite.
   a) Frog b) Lizard **c) Leech** d) Dog
6. Rabbits are _____ animals, that means moving in groups.
   a) sanguivorous **b) Gregarious**
7. Upper lip of a rabbit has a cleft in the middle called _____.
   a) furrow **b) Harelip** c) fissure d) palate
8. The existence of two sets of teeth in the life of any animal is called _____.
   a) heterodont b) monodont c) homodont **d) diphyodont**
9. Which is the largest gland in rabbits that secrete bile?
   a) Pancreas **b) Liver** c) Pineal d) Adrenal
10. The younger one's of a hare and rabbit are _____ and _____ respectively.
    a) Leverets and kittens b) calf and kitten
    c) calf and leverets d) cub and hare
11. Where is the sublingual part of salivary gland located ?
    a) Above the tongue **b) Below the tongue**
    c) Upper jaw d) Lower jaw
12. In which angle does the eyes of the rabbit rotate ?
    a) 320° **b) 360°** c) 260° d) 160°
13. The abbreviation of CNS is _____
    a) cerebral nervous system b) contact nervous system
    c) central nervous system d) cranial nerve signals
14. The innermost layer of the brain of Rabbit is _____.
    a) Duramater **b) piamater** c) arachanoidmater d) meninges
15. Name the specialized cells that surrounds and nourishes egg cell of a rabbit?
    a) Graffian follicles b) Theca externa c) Theca interna **d) None of the above**
16. The secretion of _____ glands neutralizes the acidity of urethra and vagina.
    a) Cowpers gland b) Pineal gland c) Adrenal gland d) Thyroid gland
17. Which of the following statement is false?
    a) Hare feeds on harder bark and twigs. b) Rabbit feeds on soft grasses and vegetables
    c) The external ears of Hare are shorter d) Rabbit makes their home in burrows
18. In leech , the blood vessels are replaced by channels called _____.
    a) Arteries b) Veins **c) Haemocoelic channels** d) Hydrophilic channels
19. Leech is used to treat _____ and _____ in human beings.
    a) Circulatory disorders and cardiovascular diseases
    b) Nervous disorder and neural diseases
    c) Respiratory disorders and lung diseases
    d) None of the above
20. The gap between the incisors and premolar teeth of a rabbit is called _____.
    a) diastema b) Maxilla c) Dentary d) Pre maxilla

14. TRANSPORTATION IN PLANTS AND CIRCULATION IN ANIMALS

I Multiple Choice Questions :

1. The only artery which carries deoxygenated blood is
   a) Hepatic portal artery b) Renal artery
   c) Hepatic artery **d) Pulmonary artery**
2. Which type of blood cell will increased during the condition of allergy.
   a) Eosinophils b) Basophils c) Neutrophils d) Leucocytes
3. The longest time duration for one cardiac cycle occurs in _____.
   a) Auricular systole b) Ventricular systole c) Auricular diastole **d) Ventricular diastole**
4. Which one of the following Species contains the Haemocoel
   a) Amphibian **b) Arthropods** c) Reptiles d) Mammals

5. In heart, the Lubb sound is produced by the closing valve of _____.
   a) Bicuspid, Tricuspid, Semilunar valves **b) Tricuspid and bicuspid valves**
   c) Tricuspid and Semilunar valves d) Bicuspid and Semilunar valves
6. Which one of the following is under the range of hypotension
   a) 120 mm Hg / 80 mm Hg **b) 90 mm Hg / 60 mm Hg**
   c) 140 mm Hg / 90 mm Hg d) 160 mm Hg / 100 mm Hg
7. Sphygmomonometer is used to measure the _____.
   a) Blood pressure b) Heart beat c) Internal organ sound d) All of these
8. AB blood group is Universal Recipient because of the following
   a) Antibody 'AB' is not present in plasma b) Antibody present in plasma
   c) Antibody 'A' is present in plasma d) Antibody 'B' is present in plasma
9. Rh-factor was discovered by _____.
   a) Landsteiner and Wiener b) Decastello and stenin
   c) William Harvey d) Karl Landsteiner
10. Systemic circulation means
    a) Lungs – Heart Lungs **b) Heart Body – Heart**
    c) Heart Heart d) Lungs Heart Body

15. NERVOUS SYSTEM

1. The gap between neurons is called
   a) dentrite **b) Synapse** c) axon d) Impulse
2. A patient is not able to balance his body, and is unable to walk properly. Name the part of the brain which is affected
   a) Hind brain b) mid brain c) Spinal cord d) fore brain
3. Which part of the human brain is more developed in comparison to other parts?
   a) cerebrum b) cerebellum c) optic lobes d) Medulla oblongata
4. Which of the following protects the brain from shocks?
   a) Pons **b) Cerebrospinal fluid** c) duramater d) Arachnoid membrane
5. All the voluntary actions of the body are controlled by
   a) Cerbrum **b) Cerebellum** c) Pons d) Medulla
6. Electrical impulse travel in neuron from
   a) dentrite → axon → axon end → cell body
   b) cell body →dendrite → axon → axon end
   c) dendrite → cell body → axon → axon end
   d) axon end → axon → cell body → dentrite
7. Which is the correct sequence of reflex arc?
   a) Receptors →muscle → sensory neuron → motor neuron → spinal cord
   b) Receptors → motor neuron → spinal cord → sensory neuron → muscle
   c) Receptors → spinal cord → sensory neuron → motor neuron → muscle
   d) Receptors → sensory neuron → spinal cord → motor neuron → muscle
8. The contraction of the pupil of the eye in the presence of bright light is an example of
   a) voluntary reflex b) spinal reflex **c) cerebral reflex** d) Adrenal reflex
9. The number of pairs of nerves which are from the spinal cord of man is
   a) 21 **b) 31** c) 41 d) 51
10. Which of the following helps in maintaining posture and balance of human body?
    a) cerebellum b) cerebrum c) medulla d) pons
11. The human hind brain comprises three parts, one of which is
    a) Spinal cord b) Corpus callosum
    c) Hypothalamus **d) Cerebellum**
12. Unidirectional transmission of nerve impulse is maintained by
    a) Interneurons b) Synapse **c) Myelin sheath** d) Membrane polarity

13. In reflex action, reflex arc is formed by
    a) Receptor, Spinal cord, Muscle b) Spinal cord, Muscle, Receptor
    c) Muscle, receptor, brain d) Brain, spinal cord, muscle
14. Select incorrect statement:
    a) cerebral cortex, greyish in appearance thrown into prominent fold known as sulci and gyri.
    b) Hypothalamus controls the body temperature and urge for eating.
    c) Right and left cerebral hemispheres are connected via corpus striatum
    d) Dendrites transmit impulse away from the cell body
15. The correct sequence of meninges of brain from outside to inside is:
    a) piamater, duramater, arachnoid b) duramater, piamater, arachnoid
    c) duramater, arachnoid, piamater d) arachnoid, duramater, piamater
16. One of the following action is an example of autonomic system
    a) Knee-jerk reflex **b) peristalsis of intestine**
    c) swallowing of food d) pupillary reflex
17. Nerve cells do not divide because they do not have
    a) Golgi body b) nucleus **c) centrosome** d) mitochondria
18. The spinal cord originates from
    a) medulla oblongata b) brain c) medulla **d) brain stem**
19. In a neuron the conversion of electric signal to a chemical signal occurs in
    a) axon end b) cell body c) dendrites d) myelin sheath

16. PLANT AND ANIMAL HORMONES

1. A plant hormone is _____
    a) an ion responsible for turgour pressure b) a pigment that gives colour
    c) an organic compound d) a secondary metabolite
2. The plant hormones which promote growth are
    a) gibberellins and ethylene **b) auxins, gibberellins and cytokinins**
    c) abscisic acid, ethylene and gibberellins d) auxins, cytokinins and abscissic acid
3. Auxin synthesis occurs in _____.
    a) root / shoot tip b) cortex c) xylem d) phloem
4. Parthenocarpy is induced by _____.
    a) ethylene b) spraying auxin on pistil
    c) spraying auxin on fruit d) spraying auxin on leaf
5. _____ is not an influence of auxins
    a) Apical dominance b) Tropic movements
    c) Cell elongation **d) Bolting**
6. Abscissic acid is primarily synthesized in _____.
    a) lysosome b) golgi complex **c) chloroplast** d) ribosome
7. Genetically dwarf plants can be induced to grow tall by using _____.
    a) gibberellins b) auxins c) cytokinins d) ethylene
8. Which one of the following pairs is not correctly matched?
    a) Abscissic acid - stomatal closure **b) Gibberellins - leaf fall**
    c) Cytokinin - cell division d) IAA - cell wall elongation
9. _____ is a natural growth inhibitor
    a) NAA **b) ABA** c) IAA d) GA
10. Removal of apical bud of a flowering plant or pruning of a flowering plant leads to _____.
    a) formation of new apical buds
    b) formation of adventitious roots
    c) early flowering or stopping floral growth
    d) promotion of lateral branches

11. Endocrine glands put their secretions directly into
    a) Ducts **b) Blood** c) both d) none of the above
12. The secretion of the following pituitary hormones is controlled by hypothalamus
    a) Thyrotropin (TSH) and cortisol
    b) Follicle stimulating hormone (FSH) and progesterone
    c) Corticotropin (ACTH) growth hormone (GH) and vasopressin
    d) Lutenising hormone (LH), corticotrophin (ACTH) and thyrotropin (TSH)
13. Pituitary gland is found in
    a) Around trachea b) Gonad c) Pancreas **d) Brain**
14. Which one is Not secreted by pituitary?
    a) Thyroxine b) FSH c) GH d) ACTH
15. Anterior lobe of pituitary secretes
    a) TSH, ADH, AND Prolactin **b) LH, FSH and a growth hormone**
    c) ACTH, TSH, and oxytocin d) STH, GH, and antidiuretic hormone
16. Gonadotropins are secreted from
    a) hypothalamus b) Posterior pituitary **c) Anterior pituitary** d) Gonads
17. Growth hormone is secreted by the
    a) Anterior lobe of the pituitary b) Posterior lobe of the pituitary
    c) Adrenal gland d) Gonads
18. In an accident the anterior pituitary of a four year old boy was severely damaged but the boy survived What is likely to happen?
    a) High levels of thyroxine will be released b) Spermatogenesis will be stimulated
    c) The boy will not grow much in height d) The growth of mammary glands will be stimulated
19. A gorilla like man with huge hand and legs. This is due to the abnormal secretion of
    a) Pituitary FSH b) Pituitary LH **c) Pituitary GH** d) Thyroid
20. Hypersecretion of growth hormone by pituitary results in
    a) Dwarfism **b) Gigantism** c) Cretinism d) Myxedema
21. The synthesis and release of thyroxine from the thyroid gland is stimulated by
    a) LH **b) TSH** c) ACTH d) FSH
22. LH and FSH are called
    a) antistress hormones **b) gonadotrophic hormones**
    c) emergency hormone d) neurohormones

17. REPRODUCTION IN PLANTS AND ANIMALS

1. The correct sequence of reproductive phases seen in a flower is _____
    a) flowering, seed formation, fertilization, pollination
    b) pollination, fertilization, seed formation, flowering
    c) seed formation, fertilization, flowering, pollination
    d) flowering, pollination, fertilization, seed formation
2. The number of cells and nuclei in a mature embryo sac is _____
    a) 7 cells 8 nuclei b) 8 cells 7 nuclei c) 6 cells 8 nuclei d) 7 cells 6 nuclei
3. Mango is being propagated through _____
    a) tissue culture **b) grafting** c) stem cutting d) layering
4. Which one of the following generate new genetic combination leading to variation
    a) vegetative reproduction b) parthenogenesis
    c) sexual reproduction d) asexual reproduction
5. Process of fusion of haploid gametes is known as _____
    a) cell cycle b) meiosis c) mitosis **d) syngamy**
6. Which one of the following produce the male gamete
    a) endosperm b) synergid **c) pollengrain** d) antipodals

7. Cross pollination through insects are known as
   a) anemophily **b) entomophily** c) hydrophily d) ornithophily
8. Find out the odd one :
   a) endosperm b) synergid **c) pollengrain** d) antipodals
9. Choose the correct match
   a) endosperm - 2n b) embryo - 3n c) egg - 2n **d) male gamete - n**
10. Which of the following is a post-fertilization event in flowering plants?
    a) transfer of pollen grains b) formation of flower
    c) fruit formation d) germination of pollen grains
11. The release of sperms from the sertoli cells is called
    a) Spermateliosis b) Vitellogenesis c) Spermiogenesis **d) Spermiation**
12. Graffian follicle contains
    a) many oocytes b) many sperms **c) a single oocyte** d) site for egg fertilization
13. Which is correctly matched in a normal menstrual cycle ?
    a) Endometrium regenerates - 5 to 10 days
    b) Release of egg – 5th day
    c) Endometrium secretes nutrients for implantation - 11 to 18 days
    d) Rise in progesterone level – 1 to 15 days
14. In human beings fertilization takes place in
    a) fallopian tube b) eustachian tube c) ovary duct d) uterus
15. Which one of the following are primary sexual organs
    a) testes and ovaries b) testes and penis
    c) ovary and vagina d) testes, penis, ovary and vagina
16. Which one of the following is correct : After the removal of uterus
    a) Ovulation occurs b) ovulation does not occurs
    c) fertilization takes place d) None of the above
17. Which one of the following is incorrect related to Asymptomatic Bacteriuria?
    a) caused due to Bacteria b) infection occur in the urinary bladder
    c) it shows symptoms **d) it may not show symptoms**
18. To avoid sanitary pad rash, the pads should be changed _____.
    a) every six hours b) every 4 hours c) every 7 hours d) twice in a day
19. A temporary association between the developing embryo and maternal tissues are called _____.
    a) Uterus b) ovary **c) placenta** d) endometrium
20. The correct sequence of spermatogenesis is _____.
    a) growth phase, multiplication phase, spermiogenesis, maturation phase
    b) multiplication phase, growth phase, maturation phase, spermiogenesis
    c) multiplications phase, maturation phase, spermiogenesis, growth phase
    d) spermiogenesis, maturation phase, multiplication phase, growth phase

18. HEREDITY

1. If a genotype consists of different types of alleles, it is called
   a) Heterozygous b) monoallelic c) uniallelic d) homozygous
2. The graphical representation to calculate the probability of all possible genotypes of offspring in a genetic cross was developed by
   a) Gregor Johann Mendel b) Har Gobind Khorana
   c) James Watson **d) Reginald C Punnet**
3. The two versions of a trait (character) which are brought in by the male and female gametes are situated on
   a) Copies of the same chromosome **b) two different chromosomes**
   c) sex chromosomes d) any chromosome

4. A tall plant was grown in nutrient deficient soil remained dwarf when it is crossed with dwarf plants
   a) All hybrid plants are dwarf b) 50% tall and 50% dwarf
   c) 75% tall and 25% dwarf d) 25% dwarf and 75%
5. The F1 generation has all tall and F2 generation ratio is 3:1, it proves
   a) Law of dominance b) linkage c) incomplete dominance d) Law of segregation
6. In a dihybrid cross out of 16 plants obtained, the number of genotypes shall be
   a) 4 **b) 9** c) 10 d) 12
7. Mendel found certain traits not assort independently, it is due to
   a) Dominance **b) linkage** c) crossing over d) amitosis
8. Which is the functional unit of inheritance?
   a) cistron b) Muton c) chromosome **d) gene**
9. The chromosome ends are called
   a) Satellite **b) telomere** c) centromere d) kinetochores
10. Which of the following description of chromosomes is not correctly matched?
    a) Metacentric – the chromosomes with two equal arms.
    b) Sub metacentric – the chromosomes with two unequal arms.
    c) Acrocentric – the chromosomes with two arms identical in size
    d) Telocentric – the chromosomes with one arm.
11. Chromosomes other than sex chromosomes are called
    a) Allosomes **b) autosomes** c) lamp brush chromosomes d) heterosomes
12. Nucleotide of DNA molecule is made up of nitrogenous bases. The base pairing occurs in which of the following pattern?
    a) Adenine – Thymine; Cytosine – Guanine
    b) Adenine – Cytosine; Guanine – Thymine
    c) Adenine – Guanine; Cytosine – Thymine
    d) Adenine – Guanine; Cytosine – Taurine
13. Which of the following is the correct match?
    a) Helicases – binds the double helix near the replication fork
    b) Topoisomerases – separates the two strands of DNA at the site of origin of replication
    c) DNA polymerase – stops the DNA replication
    d) DNA ligase – joins the okazaki fragments
14. Sex is determined in human beings
    a) By ovum b) At the time of fertilization
    c) 40 days after fertilization **d) 7th to 8th week when genitals differentiate in foetus.**
15. Mutations are responsible for
    a) Extinction of organisms **b) Variations in population**
    c) Increase in population d) Maintaining genetic continuity
16. One of the following is a random process
    a) Variation b) Adaptation c) evolution **d) mutation**
17. Sickle cell anaemia is a
    a) Metabolic disorder b) degenerative disorder
    c) genetic disorder d) pathogenic disorder

19. ORIGIN AND EVOLUTION OF LIFE

1. Fossils are generally found in
   a) Sedimentary rocks b) igneous rocks c) metamorphic rocks d) any type of rocks
2. Dinosaurs are
   a) Extinct amphibians **b) extinct reptiles** c) primitive mammals d) living reptiles

3. Which of the following would be easily fossilised?
   a) Heart **b) tooth** c) skin d) liver
4. The organisms which live in extreme environmental conditions on earth are called
   a) Thermophiles b) acidophiles
   c) extremophiles d) archaeobacteria
5. The study of local plants and their uses through the traditional knowledge is known as
   a) Paleobotany **b) ethnobotany**
   c) palynology d) economic botany
6. Which is not Lamarckian concept?
   a) Environmental changes cause variations.
   b) Rate of survival of organisms varies due to variations
   c) Inheritance of acquired characters
   d) If an organ is used continuously, it will develop continuously.
7. According to Darwin, evolution is a
   a) Sudden but discontinuous process. b) Slow, gradual and continuous process
   c) Slow, sudden and discontinuous process. d) Slow and discontinuous process
8. Which of the following is not associated with the "Theory of natural selection"?
   a) Internal vital force b) over production of the offspring
   c) struggle for existence d) survival of the fittest
9. Human forelimb, wing of bat and flipper of whale represent
   a) analogous organs b) vestigial organs
   c) Homologous organs d) evolutionary organs
10. Analogous organs have
    a) Dissimilar origin and dissimilar function b) Similar origin with similar function
    c) Similar origin with dissimilar function **d) Dissimilar origin and similar function**
11. Which of the following is a vestigial organ?
    a) Nails b) scalp hair c) wisdom tooth **d) all of the above**
12. Which of the following is not atavistic in humans?
    a) Tail in some babies **b) enlarged canines**
    c) dense body hair d) six fingers
13. Evolutionary history of an organism is known as
    a) Phylogeny b) ontogeny c) ancestry d) palaeontology
14. 'Ontogeny recapitulates phylogeny'. This is
    a) Hardy Weinberg law b) Darwin's law
    c) inheritance law **d) bio genetic law**
15. Archaeopteryx is known as missing/ connecting link. It has the characters of both
    a) Fishes and amphibians b) Reptiles and mammals
    c) Birds and reptiles d) Chordates and non chordates

20. BREEDING AND BIOTECHNOLOGY

1. Triticale is the first man made cereal crop. The combination of parents involved in its production is Triticum and _____.
   a) Sorghum b) Barley c) Saccharum **d) Rye**
2. Aims of plant breeding are to produce _____.
   a) Disease free varieties b) High Yielding varieties
   c) Early maturing varieties **d) All the above**
3. Scientists are trying to get hybridisation between tomato and potato. The most accurate name would be ____.
   a) Topemo b) Mopato **c) Pomato** d) Tomepo

4. When a plant species is carried from its place of origin to a new place and cultivated, it is called _____.
a) Introduction b) Transplantation c) Aforestation d) Selection

5. _____ is the oldest breeding method
a) Introduction **b) Selection**
c) Hybridization d) Mutation breeding

6. The progeny of a homozygous plant constitute a _____.
a) Pureline b) Mixed population c) Mass selection d) Clone

7. The method of mass selection is applied in _____ crops
a) Cross pollinated b) Self pollinated
c) Both self and cross pollinated d) Potato and Sugarcane

8. New and better varieties of plants can be formed by _____ method.
a) Selection **b) Introduction**
c) Hybridisation d) Hybridisation followed by selection

9. An improved variety is _____.
a) Always superior to the other existing varieties
b) Always inferior to the other existing varieties
c) May be superior to the other existing varieties
d) Both a and b are correct

10. Semi dwarf varieties of wheat developed from wheat varieties of Mexico are _____.
a) Sonalika and NP 836 b) Sharbati Sonora and Pusa Lema
c) Sonalika and Kalyan Sona d) Sonora 64 and HUW 468

11. When the breeding takes between animals of the same breed is called as _____.
a) inbreeding b) outbreeding c) breeding d) breed

12. The first cloned animal is _____.
a) cow **b) sheep** c) dog d) whale

13. The disease where the blood fails to clot due to the absence of clotting factor is _____.
a) Haemophobia **b) Haemophilia** c) Haemophotics d) Haemoethics

14. Which is an activator used to dissolve blood clot
a) plasminogen b) plasmogen c) plasm ocoel d) plasmomonogen

15. Manmade antibodies are _____.
a) monoclonal b) diclonal c) triclonal d) tetroclonal

16. Pancreatic cells secretes _____.
a) insulin b) tripsin c) rennin d) thymine

17. Bone marrow does not produce the _____.
a) blood b) skin c) stomach d) brain

18. Which one of the following is the neurogenerative disorder
a) parkinson's disease b) alzheimer's disease
c) neurogenital disease d) replicable disease

19. What is the use of Restriction Endonuclease in Gene cloning technology?
a) to cut the DNA at particular nucleotide b) to cut any place of the DNA
c) to join the two DNA fragments **d) to separate the DNA strand**

20. Which one of the following act as a vector?
a) E.coli **b) plasmid of E.coli** c) Nucleoid of E.coli d) cytoplasm of E.coli

21. HEALTH AND DISEASES

1. When was POCSO act introduced?
a) 2017 **b) 2012** c) 2008 d) 2011

2. World Anti Tobacco Day
a) May 31st b) May 1st c) May 15th d) May 21st

3. The target cells of the body do not respond to insulin
   a) IDDM **b) NIDDM** c) Gestational diabetes d) Juvenile diabetes
4. Myocardial infarction is
   a) death of heart muscle tissue b) deficient blood supply to heart muscle
   c) deposition of cholesterol in blood vessels d) heart valves are affected
5. Cancers affecting epithelial cells
   a) Sarcomas **b) Carcinomas** c) lymphomas d) melanomas
6. The drug which stimulates the nervous system and makes a person more alert and active is called
   a) seductive b) Opiate narcotics **c) Stimulant** d) hallucinogen
7. Use of disposable syringes for administering medicines is recommended to prevent
   a) Malaria b) Stroke **c) AIDS** d) Leprosy
8. Normal blood glucose level of blood is
   a) 80 – 100 mg/dL **b) 80 – 120 mg/dL** c) 80 – 150 mg /dL d) 70 – 120 mg/dL
9. A doctor advised a patient to take less sugar in her diet. Which disease is she suffering from?
   a) diabetes mellitus b) diabetes insipidus c) Goitre d) Cushing's syndrome
10. In alcoholics liver gets damaged as it
    a) accumulates excess of fats b) stores excess of glycogen
    c) secretes more bile d) has to detoxify alcohol
11. A communicable disease is caused by
    a) metabolic disorder b) allergy **c) pathogen** d) hormonal imbalance
12. Health deals with
    a) social well being b) physical fitness c) mental fitness **d) all the above**

22. ENVIRONMENTAL MANAGEMENT

1. The most rapidly dwindling natural resource in the world is
   a) water **b) forest** c) wind d) sunlight
2. Select the ecofriendly activity among the following
   a) using car for transportation b) using polybags for shopping
   c) using dyes for colouring clothes **d) using windmills to generate power**
3. which one of the following fuels are formed by the degradation of biomass?
   a) biogas b) CNG **c) Coal and petroleum** d) Nuclear fuel
4. The three "R" s which help us to conserve natural resource for future generation are
   a) reduce, regenerate, redistribute
   b) reduce, recycle, regenerate
   c) reduce, reuse, recycle
   d) redistribute, regenerate, recycle
5. Which one of the following is not a fossil fuel?
   a) LPG b) Natural gas c) Biogas **d) CNG**
6. The CHIPKO Andolan is associated with
   a) Tigers b) Turtles **c) Trees** d) Marine organisms
7. Afforestation should be done with
   a) exotic species **b) Indigenous species** c) Bamboos d) Eucalyptus
8. A man bought a device which can cook food without any fuel like wood or Kerosene but the device does not work during night. The device is **Solar Cooker**.
9. An electrical device which consumes less units of electricity when used for Long hours a day is **CFL.**
10. Sewage water is polluted and can be acidic in nature if the pH is
    a) zero b) above 7 **c) below 7** d) exactly 7