Use the following codes to answer Q1-Q5.

(1) If both assertion (A) as well as reason (R) are correct and (R) is the correct explanation of (A)
(2) If both (A) and (R) are correct but (R) is not the correct explanation of (A)
(3) If (A) is correct but (R) is incorrect
(4) If (A) is incorrect but (R) is correct

Q1. **Assertion** : resonance is a special case of forced vibration in which the natural frequency of vibration of the body is the same as the impressed frequency of external periodic force and the amplitude of forced vibration is maximum
Reason: the amplitude of force vibrations of a body increases with an increase in the frequency of the externally impressed periodic force

Q2. **Assertion :** a refrigerator transfers heat from lower temperature to higher temperature.
Reason : heat cannot be transferred from lower temperature to higher temperature normally without doing any external work

Q3. **Assertion :** out of galvanometer , ammeter and voltameter , resistance of ammeter is lowest and resistance of voltameter is highest.
Reason : am ammeter is connect in series and a voltameter is connected in parallel , in a circuit.

Q4. **Assertion** : if the distance between the plates of a capacitor is halved and dielectric constant is made 3 times then the capacitance becomes 6 times.
Reason : capacitance of the capacitor does not depend upon the nature of the material of the plates of the capacitor.

Q5. **Assertion** : magnetism is relativistic
Reason : when we move along with the charge so that there is no motion of charge relative to us, we find no magnetic field associated with the charge.

Q6. A wire of length l is bent in the form of a circular coil of some turns. A current i flows through the coil . the coil placed in a uniform magnetic field B. The maximum torque on the coil can be :

(1) $iBl^2/4\pi$
(2) iBl^2/π
(3) $iBl^2/2\pi$
(4) $2iBl^2/\pi$

Q7. The ratio of the speed of the sound in nitrogen gas to that in helium gas , at 300K is

(1) $\sqrt{\frac{2}{7}}$
(2) $\sqrt{\frac{1}{7}}$
(3) $\frac{\sqrt{3}}{5}$
(4) $\frac{\sqrt{6}}{5}$

Q8. During paddling of a bicycle ,the force of friction exerted by the ground on the two wheels is such that it acts :

(1) In the backward direction on the front wheel and in the forward Direction on the rear wheel
(2) In the forward direction on the front wheel and in the backward direction on the rear wheel
(3) In the backward direction on both the front and the rear wheels
(4) In the forward direction on both the front and the rear wheels.

Q9. A ball of mass M is suspended from a wire of length L ,area of cross-section A and Young's modulus is Y. The elastic potential energy stored in the wire is :

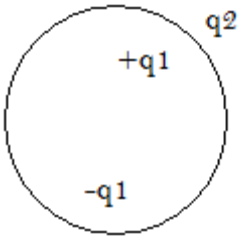
(1) $\frac{M^2g^2L}{2AY}$

(2) $\frac{Mg}{2AYL}$

(3) $\frac{M^2g^2A}{2YL}$

(4) $\frac{MgY}{2AL}$

Q10. Condsider the charge configuration and a spherical Guassian surface as shown in the figure. When calculating the flux of the electric field over the spherical surface,the electric field will be due to :



(1) q_2
(2) $only\ the\ positive\ charges$
(3) All the charges
(4) $+q_1\ and - q_1$

Q11. . A hollow convex lens of glass will behave like a :

(1) Convex lens
(2) Concave lens
(3) Glass plate
(4) Mirror

Q12. A stone attached to one end of a string is revolved around a stick so that the string winds upon the stick and gets shortened . what is conserved ?

(1) Angular momentum
(2) Linear momentum
(3) Kinetic energy
(4) None of the above

Q13. If a liquid neither rises nor decreases in a capillary ,then it means that :

(1) Angle of contact is 0^0
(2) Angle of contact may be 90^0
(3) Surface tension of the liquid must be zero
(4) None of these

Q14. In a p-n junction diode not connected to any circuit

(1) The potential is the same everwhere
(2) The p type side is at a higher potential than the n type side
(3) There is an electric field at the junction directed from the n side to the p type.
(4) There is an electric field at the junction directed from the p-type side to the n-type side.

Q15. Two particles are released from the same height at an interval of 1 second. How long after the first particle begins to fall will the two particle be 10 m apart ? (g =10 m/s^2)

(1) 1.5 seconds
(2) 2 seconds
(3) 1.25 seconds
(4) 2.5 seconds

Q16. The centre of mass of a non –uniform rod of length L whose mass per unit length $\lambda = Kx^2/L$, where K is a constant and x is the distance from one end is :

(1) 3L/4
(2) L/8
(3) K/L
(4) 3K/L

Q17. The dimensions of $\varepsilon_0 E^2/2$ (where ε_0 is the permittivity of free space and E is the electric field)

(1) [MLT^{-1}]
(2) [$ML^{-1}T^{-2}$]

(3). $[MLT^{-2}]$

(4). $[ML^2T^{-1}]$

Q18. While determining the value of g using simple pendulum we plot a graph between l and T^2 which is :

(1) A straight line
(2) A parabola
(3) An ellipse
(4) A circle

Q19. A cube has a side length $1.2 \times 10^{-2}\ m$. Calculate its volume ?

(1) $1.7 \times 10^{-6} m^3$
(2) $1.73 \times 10^{-6} m^3$
(3) $1.70 \times 10^{-6} m^3$
(4) $1.732 \times 10^{-6} m^3$

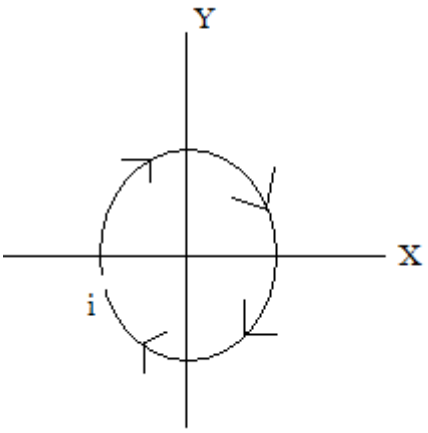
Q20. Temperature of an ideal gas is 300 K . the change in temperature of the gas when its volume changes from V to 2 V in the process P = a V (here a is a positive constant)

(1) 900 K
(2) 1200 K
(3) 600 K
(4) 300 K

Q21. The current through an inductor of 1 H is given by $i = 3t \sin t$. The voltage across the inductor of 1 H is

(1) $3sint + 3\ cost$
(2) $3cost + t\ sint$
(3) $3sint + 3\ tcost$
(4) $3t\ cost + sint$

Q22. A conducting loop carrying a current I is placed in a uniform magnetic field pointing into the plane of the paper. The loop will have a tendency to :



(1) Contract
(2) Expand
(3) Move towards positive x-axis
(4) Move towards negative x-axis

Q23. . Power factor in series LCR circuit at resonance is :

(1) 1
(2) $1/\sqrt{2}$
(3) Zero
(4) Inifinite

Q24. If the critical angel for the medium of a prism is C and angle of prism is A, then there will be no emergent ray when :

(1) A <2C
(2) A=2C
(3) A>2C
(4) A greater than or equal to 2C

Question No (25-26) are based on the following paragraph . Read the paragraph carefully and answer the questions that follow.

Paragraph : you have three tuning forks A,B and C. Fork B has a frequency of 440 Hz. When A and B are sounded together a beat frequency of 3 Hz is heard . When B and C are sounded together, the beat frequency is 4 Hz.

Q25. The possible frequencies of C are :

(1) 437 and 443 Hz
(2) 436 and 444 Hz
(3) 436 and 445 Hz
(4) 437 and 444 Hz

Q26. The possible beat frequencies when A and C are sounded together are :

(1) 2 and 7 Hz
(2) 1 and 6 Hz
(3) 1 and 7 Hz
(4) 2 and 6 Hz

Q27. The input signal to a CE amplifier having a voltage gain of 150 is $V_1 = 2\cos(15t + 10^0)$. The corresponding output signal is :

(1) $300\cos(15t + 190^0)$
(2) $300\cos(15t + 90^0)$
(3) $75\cos(15t + 10^0)$
(4) $2\cos(15t + 90^0)$

Q28. While using a transistor as an amplifier :

(1) the collector junction is forward biased and emitter junction is reverse biased
(2) the collector junction is reverse biased and emitter junction is forward biased
(3) both the junctions are forward biased
(4) both the junctions are reverse biased

Q29. Choose the correct statement for zero error and zero correction:

(1) If the zero of the vernier scale does not coincide with the zero of the main scale then the instrument is said to be having a zero error.
(2) Zero correction has a magnitude equal to zero error but sign is opposite to that of the zero error.
(3) Zero error is positive when the zero of vernier lies to the left of the zero of the main scale.
(4) None of these is wrong

Q30. The volume of a sphere is **2.42 cm^3** . the volume of **12** such spheres taking in to account **the significant figures** is :

(1) 29.04 cm^3
(2) 29 cm^3
(3) 29.0 cm^3
(4) 29.1 cm^3