Kurdistan Region-Iraq *In the Name of Allah* *Subject : Physic*

High Committee of General Examinations وەڵامی نموونەیی

General Examinations for the Preparatory Schools

The Academic Year (2023 – 2024) 1st Attempt *(Grade 12th) Time: 3:30 hours*

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Choose the right answers for the following questions ***(two marks for each question)***

1. How many revolutions (rev) equal 270°? **A)** 2 rev **B)** 1.3 rev **C)** 0.75 rev **D)** 1 rev

2. A remote-controlled car's wheel accelerates at 22.4 rad/s². If the wheel begins with an angular speed of 10.8 rad/s, what is the wheel's angular speed after exactly three full turns?
A) 13 rad/s **B)** 31 rad/s **C)** 36 rad/s **D)** 63 rad/s

3. A bicyclist rides along a circular track. If the bicyclist travels around exactly half the track in 20 s, what is his average angular speed? **A)** 0.314 rad/s **B)** 0.61 rad/s **C)** 0.157 rad/s **D)** 31 rad/s

4. Calculate the unknown value in the corresponding table:
A) 1.294 rad/s **B)** 2.2 rad/s **C)** 29 rad/s **D)** 15 rad/s

v_t	ω	r
$0.75\ m/s$	?	$0.05\ m$

5. The distance between center two billiard balls of same masses is 0.3 m, if the magnitude of the gravitational force between them is 9.05×10^{-11} N what is the mass of one of those balls? [$G = 6.673 \times 10^{-11}$ N. m² / kg²]
A) 0.8 kg **B)** 0.35 kg **C)** 0.45 kg **D)** 0.75 kg

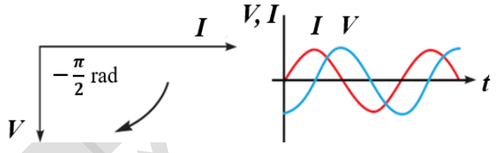
6. Because of Earth's rotation: **A)** the weight of the body at the equator is less than the weight of the body at the poles.
B) the weight of the body at the equator is greater than the weight of the body at the poles.
C) the weight of the body at the equator is equal to the weight of the body at the poles.
D) the mass of the body at the equator is less than the mass of the body at the poles.

7. Which rotational quantity is equivalent to force in transitional motion?
A) rotational kinetic energy (KE_{rot}) **B)** angular momentum (L) **C)** moment of inertia (I) **D)** torque (τ)

8. When the ice skater brings his hands and feet closer to his body, When the net external torque acting on him is zero. Which of the following is true for [his moment of inertia (I) , his angular speed (ω) , his angular momentum (L)]
A) (I) decrease , (ω) increase, (L) constant **B)** (I) increase, (ω) decrease, (L) increase
C) (I) decrease , (ω) increase, (L) increase **D)** (I) increase, (ω) increase, (L) constant

9. A 700 N window washer is standing on a uniform scaffold supported by a vertical rope at each end. The scaffold weighs 200 N and is 3 m long. What is the force in the rope that is nearest to the window washer if he stands1 m from one end? **A)** 333 N **B)** 900 N **C)** 500 N **D)** 567 N

10. The corresponding figure represents the angle of phase difference between the current intensity and the alternating potential difference for which of the following?
A) Pure resistance circuit **B)** A pure self-inductance circuit
C) A capacitor circuit **D)** circuit in resonance



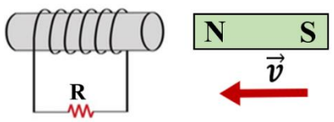
11. A potter's wheel, that has the shape of a disk of radius 0.5 m and mass 80 kg is freely rotating at 4 rad/s. The potter can stop the wheel in 5 s by pressing a wet rag against the rim, how much torque does the potter apply to the wheel $\left(I = \frac{1}{2}\ mr^2\right)$? **A)** -11 N.m **B)** -0.86 N.m **C)** -1.9 N.m **D)** -8 N.m

12. A disk of mass 0.5 kg and radius 0.1 m rolls without slipping on an inclined plane. What is the total kinetic energy of the disk at the instant when the instantaneous speed of its center is 2 m/s :
A) 0.375 J **B)** 0.25 J **C)** 3.75 J **D)** 1.5 J

13. A mass is attached to a spring and moves with simple harmonic motion on a frictionless horizontal surface. Which of the following is zero at maximum displacement?
A) elastic force spring **B)** velocity **C)** acceleration **D)** elastic potential energy stored in spring

14. A pendulum bob hangs from a string and moves with simple harmonic motion. Which of the following does not affect the period of the pendulum? **A)** The length of the string **B)** The mass of the pendulum bob
C) The free-fall acceleration at the pendulum's location **D)** All answers are correct

15. A bar magnet is positioned near a coil of wire, as shown in figure. What is the direction of the current in the resistor R when the magnet is moved to the left:
A) from left to right **B)** from right to left
C) in two opposite directions **D)** All Answers are wrong



16. Lawand dips his finger into a pan of water twice each second, producing waves if the distance between two successive crests is 0.15 m . Determine the speed of these water waves.
A) 0.15 m/s **B)** 0.3 m/s **C)** 0.45 m/s **D)** 0.725 m/s

17. If the wavelength of standing wave on a string is 90 cm. What is the distance between two adjacent nodes on that string? **A)** 22.25 cm **B)** 90 cm **C)** 180 cm **D)** 45 cm

18. A wave with an amplitude of 0.75 m has the same wave length as a second wave with an amplitude of 0.53 m. The two waves interfere. What is the amplitude of the resultant wave if the interference is constructive?
A) 0.22 m **B)** 0.53 m **C)** 0.75 m **D)** 1.28 m

19. How many nodes and antinodes are in the fifth harmonic (f_5) in pipe closed at one end?
A) (five nodes and five antinodes) **B)** (four nodes and four antinodes)
C) (three nodes and three antinodes) **D)** (four nodes and five antinodes)

20. The speed of sound depends on the temperature of the medium, this dependence is more noticeable in:
A) Solid **B)** Gas **C)** Liquid **D)** All answers are correct

21. A fire engine is moving at 50 m/s and sounding its horn of frequency 1500 Hz. A Van in front of the fire engine is moving at 35 m/s and in the same direction, what is the frequency that the driver of Van hear (speed of sound in air 345 m/s)?
A) 1576 Hz **B)**1932 Hz **C)** 1048 Hz **D)** 1177 Hz

22. If the intensity of a sound is $1\ \frac{\mathrm{W}}{\mathrm{m}^2}$ what is the relative intensity of this sound?
A) 60 dB **B)** 0 dB **C)** 120 dB **D)** 40 dB

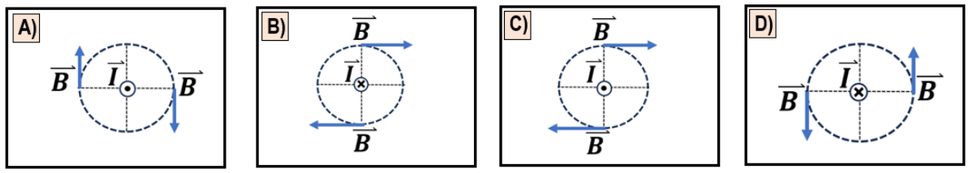
23. A violin string that is 50 cm long has a fundamental frequency of 440 Hz. What is the speed of the waves on this string? **A)** 220 m/s **B)** 880 m/s **C)** 440 m/s **D)** 110 m/s

24. We can express the unit of the magnetic field (Tesla T) in which of the following:
A) $\frac{\mathrm{N}}{\mathrm{A.\ m}}$ **B)** $\frac{\mathrm{N}^2}{\mathrm{A.\ m}}$ **C)** $\frac{\mathrm{N}}{\mathrm{A.m}^2}$ **D)** $\frac{\mathrm{N}^2}{\mathrm{A.m}^2}$

25. A direct current of 10 A passes thought a solenoid, if the magnitude of magnetic field in the middle of the solenoid is $\frac{\pi}{40}\mathrm{T}$ calculate the number of turns per unit length: $(\mu = 4\pi \times 10^{-7}\mathrm{T.m/A})$
A) 2500 $\frac{\mathrm{turn}}{\mathrm{m}}$ **B)** 4250 $\frac{\mathrm{turn}}{\mathrm{m}}$ **C)** 6250 $\frac{\mathrm{turn}}{\mathrm{m}}$ **D)** 5500 $\frac{\mathrm{turn}}{\mathrm{m}}$

26. Suppose an electron is chasing a proton to the north when suddenly a magnetic field pointing the south is applied. What would happen to the particles?
A) proton would go east, and the electron would go west. **B)** proton would go west, and the electron would go east.
C) proton and electron would go to west. **D)** no magnetic force will be exerted on proton and electron.

27. Which of the following correctly describe the direction of magnetic field around straight wire when a direct current pass through it?



28. We want to use an ammeter of internal resistance 5 Ω in order to measure electric currents of intensities up to 10 A, while the ammeter measures currents between (0 and 1 A). What is the resistance of the shunt that should be connected in parallel with the ammeter in order to do this job?
A) 56 Ω **B)** 0.9 Ω **C)** 0.56 Ω **D)** 1.2 Ω

29. A wire 36 m long carries a current of 22 A from east to west. If the magnetic force on the wire due to earth's magnetic field downward (toward Earth) and has a magnetic of 4×10^{-2} N, find the magnitude of magnetic field at this location? **A)** 5×10^{-5} T **B)** 5×10^{-3} T **C)** 5×10^{-6} T **D)** 5×10^{-2} T

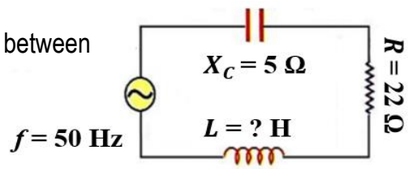
30. A single circular loop with a radius of 22 cm is placed in a uniform external magnetic field with a strength of 0.5 T so that the plane of the coil is perpendicular to the field. The coil is pulled steadily out of the field in 0.25 s. Find the average induced (ε) during this interval? **A)** 0.6 V **B)** 1.2 V **C)** 0.3 V **D)** 0.15 V

31. The tendency of a body rotating about a fixed axis to resist a change in rotational motion:
A) torque (τ) **B)** angular momentum (L) **C)** moment of inertia (I) **D)** angular acceleration (α)

32. Machine that converts electrical energy to mechanical energy:
A) ignition coil in a gasoline engine **B)** motor **C)** generator **D)** transformer

33. Ohm (Ω) equals to: **A)** $\frac{1}{\text{Hz}\,.\text{F}}$ **B)** $\text{Hz}\,.\,\text{H}$ **C)** $\frac{\text{V}\,.\,\text{s}}{\text{A}}$ **D)** (A and B) are correct

34. What is the coefficient of self-induction of a pure self-inductor In the circuit shown in the adjacent figure, If the angle of phase difference between the electric current and the total potential difference is zero?
A) 6.25×10^{-2} H **B)** 1.59×10^{-2} H
C) 2.2×10^{-2} H **D)** 2.98×10^{-2} H

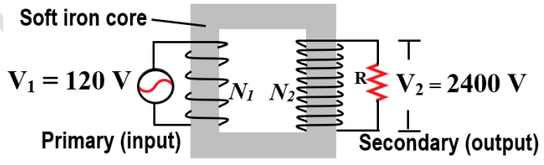


35. A generator coil has 150 turns and a cross-sectional area of 0.35 m^2 and the magnetic field in which the coil rotates is 8.34×10^{-3} T , if its frequency is 89 Hz which of the following is the equation of instantaneous emf induced (ε) of this generator:
A) $\varepsilon = 245 \sin(559\ t)$ **B)** $\varepsilon = 245 \sin(89\ t)$ **C)** $\varepsilon = 245 \sin(559\pi\ t)$ **D)** $\varepsilon = 78 \sin(78\pi\ t)$

36. A capacitor of capacitance 400 μF is connected in series to a pure resistor of resistance 10 Ω across an AC source of frequency $\frac{250}{\pi}$ Hz. If the effective value of the potential difference across the capacitor is 18 V, Find the effective potential difference across the pure resistor? **A)** 32 V **B)** 42.6 V **C)** 36 V **D)** 57 V

37. An AC source of effective value of 90 V is connected across a parallel combination of resistance of R = 300 Ω, an inductor of impedance of X_L = 600 Ω and a capacitor of impedance of X_C = 200 Ω, Calculate the value of the effective current of the source? **A)** 212.13 A **B)** 0.42 A **C)** 2.1213 A **D)** 4.2 A

38. What is the ratio of the number of turns of wire on the primary to the number of turns on the secondary in the corresponding transformer?
A) $\left(\frac{1}{20}\right)$ **B)** $\left(\frac{20}{1}\right)$
C) $\left(\frac{24.6}{1}\right)$ **D)** $\left(\frac{156}{1}\right)$



39. Two coherent light waves of the same wavelength they interfere, If the interference is constructive, then the wavelength of the resultant wave is:
A) zero **B)** the same wavelength of either of two waves
C) twice wavelength of either of these waves **D)** less than the wavelength of either of these waves

40. If the angle of phase difference between two coherent waves is $(6\ \pi\ rad)$ the path difference between two waves is: **A)** $\frac{1}{3}\lambda$ **B)** 4λ **C)** 3λ **D)** $\frac{3}{2}\lambda$

41. Which of the following is not an essential component of a laser?
A) a partially transparent mirror **B)** a fully reflecting mirror **C)** a converging lens **D)** an active medium

42. Monochromatic light from a laser source (helium-neon) of wavelength λ =632.8 nm shines at a right angle to the surface of a diffraction grating that contains 150 500 lines/m. Find the angle at which one would observe the first order bright fringe? **A)** 0.125° **B)** 10.98° **C)** 0.63° **D)** 5.465°

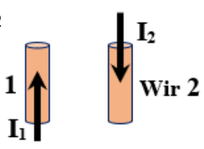
43. Find the angular acceleration of a ball swung at a constant angular speed of 5 rad/s on a rope that is 0.5 m long.
A) 1 rad/s² **B)** 0 rad/s² **C)** 2.5 rad/s² **D)** 12.5 rad/s²

44. The arm of a crane at a construction site is 12 m long, and it makes an angle of 60° with the horizontal. Assume that the maximum load the crane can handle is limited by the amount of torque the load produces around the base of the arm. What is the magnitude of the maximum torque the crane can withstand if the maximum load the crane can handle is 300 N? **A)** 1800 N . m **B)** 3118 N . m **C)** 900 N . m **D)** 3200 N . m

45. A wave whose particles vibrate perpendicular to the direction the wave is traveling, called:
A) transverse wave **B)** longitudinal wave **C)** sound wave **D)** (A and B) are correct

46. If a sound seems to be getting louder, which of the following is probably increasing?
A) speed of sound **B)** intensity **C)** wavelength **D)** frequency

47. In the figure Wire 1 carries current I_1 and creates magnetic field B_1, Wire 2 carries current I_2 and creates magnetic field B_2. What is the direction of the magnetic force acting on wire 1 as a result of B_2? **A)** to the right of page **B)** down the page
C) up the page **D)** to the left of page



48. The (Maser) device works In the region of which of the following waves?
A) infrared **B)** Ultraviolet waves **C)** X- ray **D)** Microwaves

49. Which of the following represents Hook's law:
A) $\vec{F}_{elastic} = -K\vec{x}$ **B)** $\vec{F}_{elastic} = \frac{-K^2}{\vec{x}}$ **C)** $\vec{F}_{elastic} = \frac{-\vec{x}}{K^2}$ **D)** $K = \frac{\sqrt{\vec{x}}}{\vec{F}_{elastic}}$

50. A wire conducting (a , b) moves at a constant speed $(\vec{v})$ in a magnetic field $(\vec{B})$as shown in the figure, which of the following is correct?
A) induced (ε) is generated, (a) positive pole, and (b) negative pole.
B) induced (ε) is generated, (a) negative pole, and (b) positive pole.
C) induced (ε) is generated, (a) positive pole, and (b) positive pole.
D) No induced (ε) is generated.