BRIGHT LEARNERS ORGANIZATION AND CONCOUR PREP SCHOOL

CONTINUOUS ASSESSMENT

WEEK 11

ENGINEERING DEPARTMENT

CONTENT

PHYSICS = 80MARKS

GOOD LUCK

UNIVERSITY OF BUEA

FACULTY OF ENGINEERING AND TECHNOLOGYENTRANCE EXAMINATION 21st SEPTEBER 2023

PHYSICS TIME 3 HOURS

Q1. A driver moving at a constant speed of 20 m/s sees an accident up ahead and hits the brakes. If the car decelerates at a constant rate of -5 m/s², how far does the car go before it comes to a stop?

A. 10m
B. 20m
D. 100m
C. 40m

Q2. A car accelerates at a constant rate from 0 to 25m/s over a distance of 25m. Approximately how long does it take the car to reach the velocity of 25m/s?

A. 1 s
B. 2 s
C. 4 s
D. 8 s

Q3. The earth moves around the sun at approximately 30 m/s. Is the earth accelerating?

A. No, because acceleration is a vector.
B. No, because the net displacement is zero.
C.. Yes, because the speed is not constant.
D. Yes, because the velocity is not constant.

Q4. All of the following describe the magnitude and direction of a vector EXCEPT:

A. 10 m/s West
B. 10 m/s in a circle
C. 20 m to the left
D. 20 m straight up

Q5. Which of the following gives the average velocity of an athlete running on a circular track with a circumference of 0.25 km, if that athlete runs 1 km in 4 minutes?

A. 0 m/s
B. 2 m/s
C. 4.2 m/s
D. 16.8 m/s

Q6. All of the following are examples of wave diffraction EXCEPT:

A. A light wave bends when passing from air to water.
B. Music is audible around a corner from the source.
C. The shadow cast by statue is blurred at the edges.
D. Ripples in water become semicircular after passing through a small space.

Q7. The graph below shows the displacement of a particle over time. The particle exhibits increasing:

I. displacement
II. velocity
III. acceleration

A. I only
B. II only
C. I and II only
D. I and III only

Q8. Ignoring air resistance, if the initial height of a body in free fall is increased by a factor of 4, the final velocity when it hits the ground will increase by a factor of:

A. 2
B. 4
C. It depends upon the value of the initial height
D. The velocity will remain the same.

Q9. If an apple that is dropped from an altitude of 100 m reaches an altitude of 80 m after falling for t = 2 seconds, what altitude will it be at in 1 =4 seconds?

A. 60m
B. 40m
C. 20 m
D. Om

Q10. Two balls are dropped from a tall tower. The balls are the same size but Ball X has greater mass than Ball Y. When both balls have reached terminal velocity, which of the following is true?

A. The force of air resistance on either ball is zero.
B. Ball X has greater velocity.
C. The Ball X has greater acceleration.
D. The acceleration of both balls is 9.8 m/s².

Q11. An airplane's propellers exert a force on the plane of 2500N to the east. Wind resistance of 500N

acts to the wast. If the weight of the plane is 40,000N, what is the acceleration of the plane?
A. 0.5 m/s² to the east
B. 0.5 m/s² to the west
C. 0.05 m/s² to the east
D. 0.05 m/s² to the west

Q12. An automobile with a mass of 3000kg is traveling down a straight flat road at a constant speed of 20 m/s. The coefficient of friction between the tires and the road is 0.5. The net force acting on the automobile is:
A. ON
B. 30,000 N
C. 60,000 N
D. 90,000 N

Q13. If F is the force of air resistance on an object with mass moving at a constant velocity, which of the following best describes the acceleration of the object when the force of air resistance is reduced by a factor of 4?
A. F/m
B. 1/2 F/m
C. 1/4 F/m
D. 3/4F/m

Q14. A 10 kg mass is in free fall with no air resistance. In order to slow the mass at a rate equal to the magnitude of g, an upward force must be applied with magnitude:
A. 0N
B. 10 N
C. 100 N
D. 200 N

Q15. An object of mass m resting on the surface of the earth experiences a force equal to its weight mg, where g is the acceleration due to gravity. If M is the mass of the earth, G is the universal gravitation constant, and R is the radius of the earth, which of the following expressions is equal to g?
A (GMm)/(R ^ 2)
B (GM)/(R ^ 2)
C. (GMm)/R
D. (GM)/R

Q16. A jogger is running on a circular track with a radius of 30 m. If the jogger completes one trip around the track in 63 seconds, what is her average speed?
A. 0 m/s
B. 1 m/s
C. 2 m/s
D. 3 m/s

Q17. On a particular stretch of wet pavement, the kinetic coefficient of friction u for a particular car with mass m is 0.08. If the car is moving at a velocity v, and suddenly locks its wheels and slides to a stop, which of the following expressions gives the distance that it will slide?
A. (v ^ 2)/(mgu)B. (v ^ 2)/(2mgu)
C. (V ^ 2)/(2gu)
D. (V)/(2gu)

Q18. The diagram below shows two different masses hung from identical Hooke's law springs. The Hooke's law constant k for the springs is equal to:
A. 2 N/cm
B. 5 N/cm
C. 10 N/cm
D. 20 N/cm

Q19. The arrows shown below represent all the force vectors that are applied to a single point. Which of the following could NOT be true of the point?
A. The point is moving at a constant velocity.
B. The point is not moving
C. The point is accelerating at a constant rate.
D. The point is not accelerating

Q20. A rescue helicopter lifts a 50 kg rock climber by a rope from a cliff face. The rock climber is accelerated vertically at 5 m/s². What is the tension in the rope?
A. 350 N
B. 500 N
C. 750 N
D. 1500N

Q21. Which of the following describes a situation requiring no net force?

A. A car starts from rest and reaches a speed of 80km/hr after 15 seconds.
B. A bucket is lowered from a rooftop at a constant speed of 2 m/s
C. A skater glides along the ice, gradually slowing from 10 m/s to 5 m/s.
D. The pendulum of a clock moves back and forth at a constant frequency of 0.5 cycles per second.

Q22. A child pushes a block across the floor with constant force of SN. The block moves in a straight line and its speed increases from 0.2 m's to 0.6 m/s. Which of the following must be true?

A. The force applied by the child is greater than the force of kinetic friction between the block and the
floor.
B. The force applied by the child is less than the force of kinetic friction between the block and the floor.
C. The force applied by the child is greater than the force due to the weight of the block.
D. The force applied by the child is less than the force due to the weight of the block

**Q23. A carpenter who is having a difficult time loosening a screw puts away his screwdriver and chooses
another with a handle with a larger diameter. He does this because:**

A. increasing force increases torque
B. decreasing force decreases torque.
C. increasing lever arm increases torque.
D. decreasing lever arm decreases torque.

Q24. A person pushes on a door and it swings open Where should the force be applied in order to make the door swing open as quickly as possible?

A. On the edge of the door nearest the hinges
B. At the center of the door.
C. On the edge farthest from the hinges.
D. A force anywhere on the door will have the same effect

**Q25. A one meter board with uniform density, hanes in static equilibrium from a rope with tension 7. A
weight hangs from the left end of the board as shown. What is the mass of the board?**

A.1kg
B. 2kg
C. 3kg
D. 4kg

Q26. If all of the forces below have equal magnitude, which one creates the most torque?

**Q27. A large rock is tied to a rubber band and dropped straight down. As the rock falls, the rubber band
gradually stretches, eventually bringing the rock to a stop. Which of the following energy transfers is
taking place in this process?**

A. Kinetic to gravitational potential to elastic potential
B. Kinetic to elastic potential to gravitational potential
C. Gravitational potential to elastic potential to kinetic
D. Gravitational potential to kinetic to elastic potential

**Q28. Objects A and B are placed on the spring as shown. Object A has twice as much mass as object B. If
the spring is depressed and released, propelling the objects into the air, object A will:**

A. rise one fourth as high as object B.
B. rise half as high as object B.
C. rise to the same height as object B.
D. rise twice as high as object B

Q29. A 100 N force is applied as shown to a 10 kg object for 2 seconds. If the object is initially at rest, what is its final velocity?

A. 8.7 m/s
B. 1 m/s.
C 17.4m/s
D. 34.8 m/s

**Q30. If i ky blocks were stacked one upon the other starting at the surface of the earth and continuing
forever into space, the blocks near the bottom of the stack would have:**

A. less gravitational potential energy than blocks at the middle or blocks near the top of the stack.
B. less gravitational potential energy than blocks at the middle and the same gravitational energy as
blocks near the top of the stack

C. the same gravitational potential energy as all other blocks.
D. more gravitational potential energy than blocks at the middle or blocks near the top of the stack

Q31. Energy consumption in the home is generally measured in units of kilowatt hours. A kilowatt hour is equal to:

A. 3600 J
B 6000 JC. 3600000 J
D. 6000000 J

Q32. A winch is used to lift heavy objects to the top of building under construction. A winch with a power of 50 kW was replaced with a new winch with a power of 100 kW. Which of the following statements about the new winch is NOT true?

A. The new winch can do twice as much work in the same time as the old winch B. The new winch takes twice as much time to do the same work as the old winch
C. The new winch can raise objects with twice as much mass at the same speed as the old winch.
D. The new winch can raise objects with the same mass at twice the speed of the old winch.

Q33. A spring powered dart-gun fires a dart Im vertically into the air. In order for the dart to go 4m. the spring would have to be depressed

A. 2 times the distance,
B. 3 times the distance.
C4 times the distance
D. 8 times the distance.

Q34. A rocket with a mass of 7.2 x 10 kg starts from rest in outer space and fires its thrusters until it is moving with a velocity of 100 m/s. What was the average force on the rocket due to the thrusters?

A. 7.2×10^3 N
B. 7.2×10^4 N
C. 7.2×10^6 N
D. The average force cannot be determined with the information given.

Q.35. Ball A moving at 12 m/s collides elastically with ball B as shown. If both balls have the same mass, what is the final velocity of ball A?

A. 3 m/s
B. 6 m/s
C. 9 m/sD. 12m/s

Q36. A block of mass my slides across a frictionless surface with speed v, and collides with a stationary block of mass me. The blocks stick together after the collision and move away with a speed ve. Which of the following statements is (are) true about the blocks?

Q37. A trapeze artist who accidentally falls builds up a great deal of momentum before he is brought safely to rest by a safety net. The safety net serves to:

A. increase the force of the collision by decreasing the collision time.
B. decrease the force of the collision by decreasing the collision time.
C. increase the force of the collision by increasing the collision time.
D. decrease the force of the collision by increasing the collision time.

Q38. The chemical potential energy in gasoline is converted to kinetic energy in cars. If a car accelerates from zero to 60km/h, compared to the energy necessary to increase the velocity of the car from zero to 30km/h, the energy necessary to increase the velocity of the car from 30 to 60 km/h is:

A. half as great.
B. the same.
C. twice as great.
D. three times as great.

Q39. A girl riding her bicycle up a steep hill sheve the same tecides to save energy by zigzagging rather than riding straight up Ignoring friction, her strategy will:

A. require the same amount of energy but less force on the pedals
B. require the same anfount of energy and the same amount of force on the pedals.C. require less energy and less force on the pedals.
D. require less energy and more force on the pedals.

Q40. A wheelchair access ramp is to be designed so that 1000N can be lifted to a height of Im through the application of 50N of force. The Wength of the ramp must be at least:

A. 5m
B. 10m
C. 20m
D. 100 m

Q41. An inventor designs a machine that he claims will lift a 30kg object with the application of only a 25N force. If the inventor is correct, what is the shortest possible distance through which the force must be applied for each meter that the object is raised?

A. 5m
B. 8m
C. 12m
D. 15 m

Q42. Which of the following graphs best represents the radioactive decay of ^{238}U?

Q43. The half-life of substance X is 45 years, and it decomposes to substance Y. A sample from a meteorite was taken which contained 1.5% of X and 13.5% of Y by mass. If substance Y is not normally found on a meteorite, what is the approximate age of the meteorite?

A. 45 years
C. 140 years
B. 100 years
D. 270 years

Q44. In maclear fission, a uranium nucleus (combines with a neutron, becomes unstable, and splits into Ce and Zr plus two neutrons. The change in the mass of the interacting parts is 0.211amu. How much energy is released in this reaction? (Note c_3=931.5 MeV/amu)

A. 98MeV
B. 130MeVC. 157MeV
D. 197MeV

Q45. ^{216}Po undergoes two alpha decays and two beta decays to form:

A. ^{208}Ti
B. ^{224}Ra
C. ^{212}Pb
D. ^{208}Pb

Q46. The mass number of an atom undergoing radioactive decay will remain unchanged in all of the processes below EXCEPT:

A. alpha decay.
B. beta decay.
C. electron capture.
D. gamma emission.

Q47. A helium balloon will rise into the atmosphere until:

A. The temperature of the helium inside the balloon is equal to the temperature of the air outside the balloon.
B. The mass of the helium inside the balloon is equal to the mass of the air outside the balloon.
C. The weight of the balloon is equal to the force of the upward air current.
D. The density of the helium in in the balloon is equal to the density of the air surrounding the balloon.

Q48. Mercury has specific gravity of 13.6. The column of mercury in the barometer below has a height = 76 cm. If a similar barometer were made with water, what would be the approximate height & of the column of water?

A. 5.6cm
B. 76cm
C. 154cm
D.1034cm

Q49. A child's bathtub toy has a density of 0.45 g/cm³ What fraction of the toy floats above the water?

A. 5%
B. 45%
C 55%
D. 95%

Q50. The pressure at the bottom of a cylindrical tube filled with water was measured to be 5000 Pa. If the water in the tube were replaced with ethyl alcohol, what would be the new pressure at the bottom of the tube? (The density of ethyl alcohol is 0.8 g/cm².)

A. 4000 Pa
C. 5000 Pa
B. 4800 Pa
D. 6250 Pa

Q51. An ideal fluid with pressure P flows through a horizontal pipe with radius r. If the radius of the pipe is increased by a factor of 2, which of the following most likely gives the new pressure?

A. P
B. 4P
C. 16P
D. The new pressure cannot be determined without more information.

Q52. All of the Following would increase the volume flow rate of a fluid being pumped through a pipe EXCEPT:

A. increasing the pressure difference between the ends of the pipe.
B. decreasing the fluid viscosity.
C. increasing the pipe radius.
D. increasing the length of the pipe.

Q53. Water in moist soil rises through capillary action. The intermolecular forces between water molecules are:

A. weaker than the intermolecular forces between water and soil molecules.
B. equal to the intermolecular forces between water and soil molecules.C. stronger than the intermolecular forces between water and soil molecules.
D. The intermolecular forces cannot be determined with the information given.

Q54. The Young's modulus for bone is 9 x 109 N/m². What is the percent change in length of a tibia with a cross-sectional area of 6 cm², if it experiences a compressive force of 5.4 x 10 N?

A. 0.001%
B. 0.1%
C. 1%
D. 10%

Q55. The bulk modulus for a substance would be most important to a researcher who is testing material that will be:

A. used in high tension cables.
B. submerged deep in the ocean.
C. subjected to high temperatures.
D. transported at great speeds.

Q56. Which of the following gives the percent change to the Young's Modulus for a substance, when its cross-sectional area is increased by a factor of 3?

A. 0%
B. 33%
C. 300%
D. 900%

Q57. Waves generally travel faster in solids than in gases because:

A. The density of solids is generally greater than the density of gases.
B. The density of gases is generally greater than the density of solids.
C. Solids are less compressible than gases.
D. Gases are less compressible than solids.

Q58. Sound waves are an example of

A. longitudinal waves because the medium moves perpendicularly to the propagation of the wave.B. longitudinal waves because the medium moves parallel to the propagation of the wave,
C. transverse waves because the medium moves perpendicularly to the propagation of the wave.
D. transverse waves because the medium moves parallel to the propagation of the wave

Q59. If a guitar string is 0.5 m long, What is the wavelength of its third harmonic?

A. 0.25 m
B. 0.33 m
C. 0.5 m
D. Im

Q60. When two waves are superimposed, the resulting wave can be found by summing their:

A. frequencies
B. periods
C. wavelengths
D. displacements

Q61. A vibrating string has consecutive harmonics at wavelengths of 2.0 m and 4.0 m. What is the length of the string?

A. 1.0 m
B. 2.0m
C. 4.0m
D. 8.0 m

Q62. In order for two sound waves to have an audible beat frequency, the two waves must be:
A. in phase.
B. out of phase.
C. close in frequency.
D. of the same wavelength
Q63. If the mass on the bob of a pendulum is increased by a factor of 3, the period of the pendulum's motion will:
A. be increased by a factor of 2.
B. remain the same.
C. be decreased by a factor of 2.
D. be decreased by a factor of 4.
64. Which of the following would most Accurately demonstrate the kinetic energy of a pendulum?
Q65. If the amplitude of a sine wave is doubled, the intensity:
A. remains the same.
B. increases by a factor of 2.
C. increases by a factor of 4.
D. increases by a factor of 16.
Q66. A clock uses the motion of a pendulum to keep time. If the clock were placed at a height several thousand kilometers above the earth's surface, it would run:
A. faster than it would on the surface of the earth.
B. slower than it would on the surface of the earth.
C. at the same speed that it would at the surface of the earth.
D. at a speed that can't be determined from its speed at the surface of the earth.
Q67. All of the following are examples of harmonic motion EXCEPT:
A. a pendulum moving back and forth
B. a skydiver falling through the atmosphere. C. a car moving around a circular track.
D. a string vibrating on a musical instrument.
Q68. The electric field for two point charges A and B is shown below. Which of the following is true?
A. Both charges are positive.
B. Both charges are negative.
C. The charges have opposite charges.
D. The charges cannot be determined.
Q69. If the distance between a point charge and an infinitely large charged plate is increased by a factor of 2, the new force on the point charge will:
A. decrease by a factor of 4.
B. decrease by a factor of 2.
C. remain the same.
D. increase by a factor of 2.
Q70. Each resistor in the circuit below has a resistance of 22. The battery is a 12 volt battery. What is the current across resistor B?
A.1A
B. 2 A
C.3 A
D. 4 A
Q71. What is the energy required to operate a 60 W light bulb for 1 minute?
A1J
B. 60J
C. 360J
D. 3600 J
Q72. Which of the following changes to a parallel capacitor would not increase its capacitance?
A. decreasing the distance between the plates
B. increasing the area of the plates
C. increasing the dielectric constant
D. increasing the voltage across the plates
Q73. All of the following expressions are equal to an Ohm EXCEPT:
A. V sec/C
B. W/A_2
C. A/V
D. V_2/W
Q74. If the AC current delivered to a home by the electric company is delivered at 120V.me, what is the maximum voltage across an outlet?
A. 86V
B. 120V
C 170V
D. 220V
Q75. The magnetic field created by a long straight current carrying wire:
A. decreases in strength proportionally with the distance from the wire.
B. decreases in strength with the square of the distance from the wire.

C. increases in strength proportionally with the distance from the wire.
D. increases in strength with the square of the distance from the wire.

Q76. A charged particle moves horizontally through a magnetic field which points directly upward. The force on the particle due to the magnetic field is:

A. perpendicular to the magnetic field and parallel to the velocity of the particle.
B. parallel to the magnetic field and perpendicular to the velocity of the particle.
C. parallel to the magnetic field and parallel to the velocity of the particle.
D. perpendicular to the magnetic field and perpendicular to the velocity of the particle.

Q77. A particle of mass m is fired into a magnetic field of strength B at a speed v. The particle travels in a circular path inside the field with a radius r. Which of the following expressions gives the magnitude of the charge on the particle?

Q78. Which of the following graphs, best represents a particle with constant velocity?

Q79. Compared to humans, bees perceive a slightly higher frequency of electromagnetic waves. Based on only this information, to which of the following flower colors is a bee more likely to be attracted?

A. green
B. red
C. yellow
D. Blue

Q80. Which of the following is not a possible path for a light ray through a glass lens?