

Physics Grade 12 Final Exam

2016 (E.C.) First Semester

Time allowed: 2:30 hours

General Instructions:

1. The exam contains **60** questions, **13** pages (including the cover).
2. Read carefully each questions.
3. Choose the best answer from the given alternatives and write the letter of your choice on the provided separate answer sheet.
4. Calculator and extra papers are not allowed.
5. Constants that you may use:
 - (a) Gravitational constant, $G = 6.67 \times 10^{-11} Nm^2/kg^2$
 - (b) Gravitational acceleration, $g = 10m/s^2$
 - (c) Atmospheric pressure, $P = 101.3kPa$
 - (d) Density of water, $\rho = 1g/cm^3$
 - (e) Speed of light in air $v = 3 \times 10^8 m/s$

1. The spectroscopic techniques are developed by collaborative work of physicists and _____.
- A. biologists
B. chemists
C. mathematician
D. astrophysics
2. Athlete Sifan failed down in the truck. A physicist interprets this phenomenon as:
- A. she did not get rest.
B. she did not eat food.
C. her center of mass is outside the base.
D. she is overloaded.
3. During inhalation, pressure in our lungs is
- A. greater than atmospheric pressure.
B. the same as atmospheric pressure.
C. less than atmospheric pressure.
D. impossible to compare with atmospheric pressure.
4. One of the following characteristic of sound wave damage our ear drum.
- A. High frequency
B. High wavelength
C. High period
D. High intensity
5. Which one of the following branches of physics deals with the concept of photosynthesis?
- A. Optical physics
B. Nuclear physics
C. Medical physics
D. Thermodynamics
6. Astronomers use one of the following physics knowledge to describe the motion of planets around the Sun.
- A. Magnetic field of the earth
B. Electric charge of the earth
C. Electromagnetism
D. Universal gravitational law
7. Astronomers use _____ from space object to study how hot the objects are.
- A. mechanical energy
B. electromagnetic radiation
C. gravitational force
D. sound wave

8. Except one of the following, Geologists use to detect or infer the presence of economically useful geological deposits.
- A. Gravity
 - B. Electric
 - C. Magnetic
 - D. Solar
9. When placing bricks, civil engineers make use of plumb lines, mainly to
- A. make electric installation easy.
 - B. maintain the stability of the building.
 - C. make the floor of the building horizontal.
 - D. make the layout of the building rectangular.
10. Mechanical engineers use wrenches to twist a nut or bolt. The wrenches
- A. multiply their speed
 - B. increase their energy
 - C. multiply their force
 - D. multiply work done
11. An electrical engineer mainly demands the understanding of branch of physics called
- A. mechanics.
 - B. thermodynamics.
 - C. optics.
 - D. electromagnetism.
12. A technology that helps physicist in studying atomic structure is
- A. X-ray.
 - B. radar.
 - C. multimeter.
 - D. computer.
13. Magnetic Resonance Imaging (MRI) is mainly used in _____ laboratory.
- A. physics
 - B. chemistry
 - C. geology
 - D. medical
14. An Ethiopian defence force sends a signal to a target. The signal takes 0.01 seconds to return. What is the distance between the radar and the target in meter?
- A. 3×10^6
 - B. 3×10^{10}
 - C. 1.5×10^6
 - D. 1.5×10^{10}

15. Ultrasound used in medical laboratory uses one of the following physics concepts.
- A. Electromagnetic wave
 - B. Sound wave
 - C. Electric signals
 - D. Atomic radiation
16. Defense forces use one of the following spectrum of light for night vision and navigation.
- A. Gama ray
 - B. radio wave
 - C. X-ray
 - D. Infrared wave
17. One of the following is **NOT** an example of accelerated motion?
- A. Horizontal component of projectile motion
 - B. A swinging pendulum
 - C. Vertical component of projectile motion
 - D. Circular motion at constant speed
18. Figure 1 shows a trajectory of a projectile projected from the ground. What is the square of the magnitude of the initial velocity of the projectile in $(m/s)^2$?

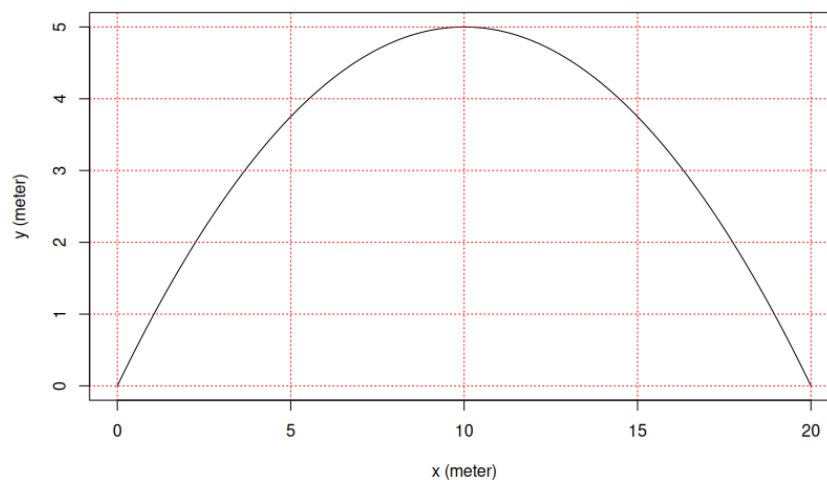


Figure 1: Trajectory of a projectile)

- A. 100
- B. 400
- C. 200
- D. 20

19. In figure 1, what is the direction of acceleration of the projectile at its maximum height?
- A. Vertically upward
B. Zero
C. Horizontally to the right
D. Vertically downward
20. Velocity of a projectile equals its initial velocity plus:
- A. a constantly increasing downward velocity
B. a constant horizontal velocity
C. a constantly increasing horizontal velocity
D. a constant vertical velocity
21. A ball is thrown horizontally from the top of a 20 m high hill. It strikes the ground at an angle of 45° . What is the initial speed of the ball thrown? (in m/s)
- A. 40
B. 20
C. 80
D. 16
22. The Ethiopian defence force wants to have a maximum range when firing shells. What should be the angle of projection of the mortar? (in degree)
- A. 30
B. 45
C. 90
D. 180
23. An object, tied to a string, moves in a circle at constant speed on a horizontal surface as shown in Figure 2. The direction of the displacement of this object, as it travels from A to B is:

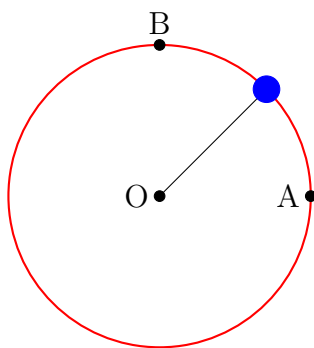


Figure 2: Circular motion of an object

- A. ↘
B. ↗
C. ↖
D. ↙

24. A projectile is fired from ground level with an initial velocity that has a vertical component of 40 m/s and a horizontal component of 60 m/s . The distance from launching to landing points is:
- A. 960
B. 480
C. 240
D. 800
25. Which one of the following is true about uniform circular motion?
- A. Velocity is constant.
B. Acceleration is due to change of magnitude of velocity.
C. Speed is constant.
D. Acceleration is constant.
26. In Figure 3 which one of the following graphs represents angular displacement-time graph, in uniformly accelerated angular motion?

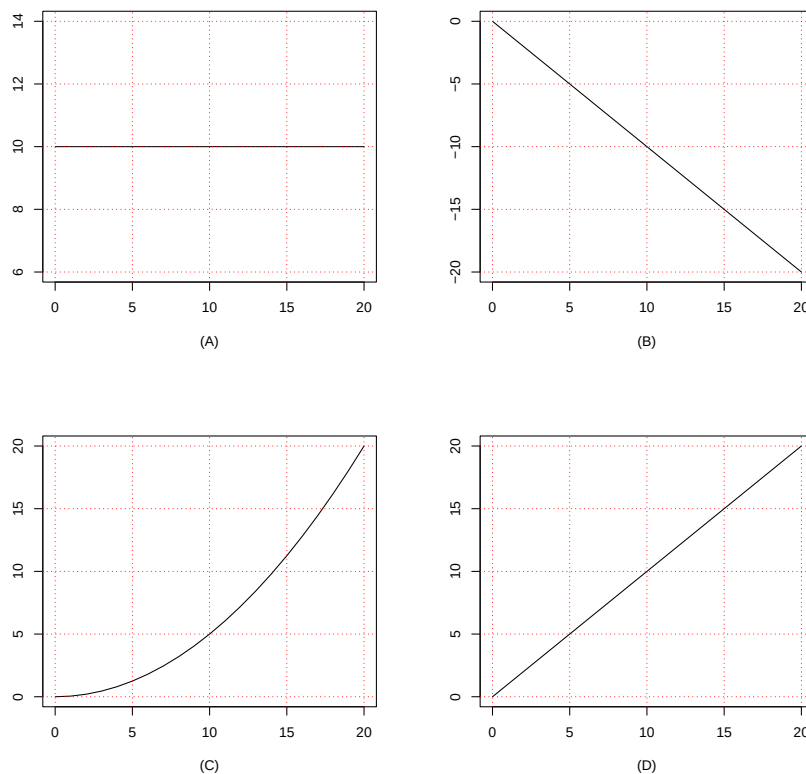


Figure 3: Angular position versus time graph

27. The angular speed of the minute hand of a watch is
- A. $60^0/minute$ C. $2\pi \text{ radian}/minute$
B. $0.1^0/minute$ D. $6^0/minute$
28. A wheel rotates with uniform angular velocity of magnitude, $\omega = 20 \text{ rad/s}$. What is the angular displacement of the wheel just after 5 seconds?
- A. 4 rad C. 500 rad
B. 25 rad D. 100 rad
29. If a wheel turns with constant angular speed then,
- A. each point on its rim moves with constant velocity.
B. the wheel turns through equal angles in equal times.
C. each point on its rim moves with constant acceleration.
D. the angle through which the wheel turns in each second increases.
30. A wheel starts from rest and has an angular acceleration of $720^0/s^2$. The time it takes to make 5 revolution is _____ seconds.
- A. $\sqrt{10}$ C. $\sqrt{6}$
B. $\sqrt{5}$ D. 5
31. A wheel starts from rest and rotates with constant angular acceleration to increase its angular speed by 20rad/s in 4sec. What is the angular displacement of the wheel after 4 seconds?
- A. 40rad C. 20rad
B. 10rad D. 80rad
32. In view of the above question 31, the average angular velocity after 5 seconds is:
- A. 25rad/s C. 10rad/s
B. 12.5rad/s D. 20rad/s
33. Moment of inertia of a rotating body depends on the following except:
- A. Shape of the body C. Mass of the body
B. axis of rotation D. angular speed

34. Consider the following figure that describes rotation of an object about a fixed axis. Which one of the following is correct about rotation of the object?

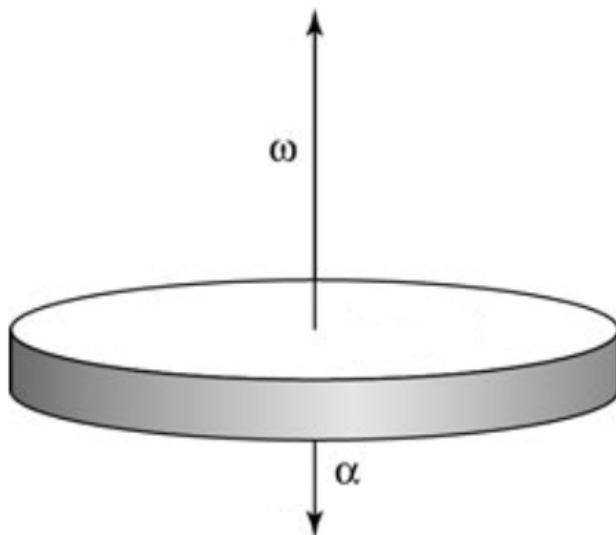


Figure 4:

- A. The direction of rotation is clockwise.
B. Angular velocity and angular acceleration are parallel to the plane of rotation.
C. The angular velocity of the object is increasing.
D. The angular velocity of the object is decreasing.
35. A disk spins at a constant rate of 20 revolutions in 4 seconds. The linear speed of a point 20cm from the center of the disc is
- A. 12.4 m/s
B. 15.7 m/s
C. 62.8 m/s
D. 6.28 m/s

A 10 kg of solid disk of a radius 2 m is rotating from rest with a uniform angular acceleration to reach 30 rad/s in 5 seconds. Based on this information, answer question numbers 36-37

36. The net torque is:
- A. 120 Nm
B. 125 Nm
C. 625 Nm
D. 240 Nm

37. The average rotational power of the disk during 5 seconds is
- A. 1.8 kW
B. 1.2 kW
C. 0.9 kW
D. 1.5 kW
38. A constant torque of 50Nm is applied to a wheel causing it to make 40 rotations in a time period of 8 seconds. Calculate the work done by the torque.
- A. 12.56 kJ
B. 125.6 kJ
C. 62.8 kJ
D. 6.28 kJ
39. Which one of the following describes Kepler's second law of planetary motion?
- A. Each planet moves in an elliptical path, with the Sun at one focus.
B. The line that joins the Sun to the orbiting planet sweeps out equal areas in equal times.
C. The square of the time it takes the planet to go round the Sun is proportional to the cube of its average distance from the Sun.
D. The orbit of each planet is circular path.
40. A bucket used for collecting water from a well is suspended from a light rope that is wrapped around a frictionless pulley with radius 10 cm and moment of inertia 0.1 kgm^2 . The empty bucket has a mass of 2 kg. If the bucket is dropped from rest, then the speed of the bucket as it hits surface of water 3 m below is:

- A. $2\sqrt{3} \text{ m/s}$
B. $20\sqrt{3} \text{ m/s}$
C. $2\sqrt{30} \text{ m/s}$
D. $20\sqrt{3} \text{ m/s}$

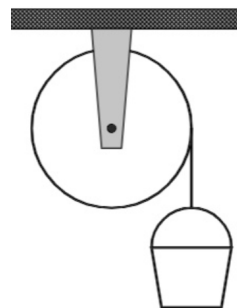


Figure 5:

41. Planetary motion uses the following principle except:
- A. Kepler's laws
B. Universal gravitational law
C. conservation of angular momentum
D. Coulomb's law

42. Consider the following uniform rod of length L that rotates about its axis of rotation. What is the torque of this rotating rod about its axis of rotation by the force $\mathbf{F}$?

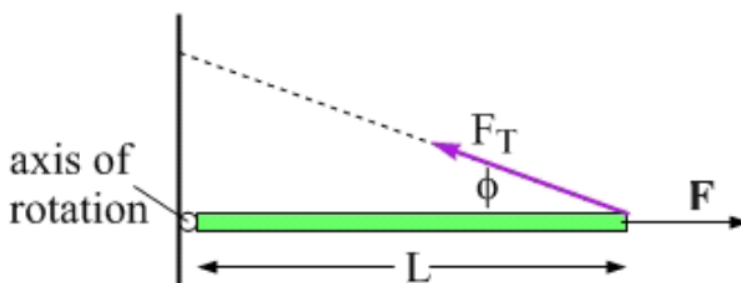


Figure 6:

- A. $LF \sin \phi$
 B. LF
 C. zero
 D. $LF \cos \phi$
43. The following figure shows motion of a planet around a star at a certain focus. The letters a, b, and c represent:

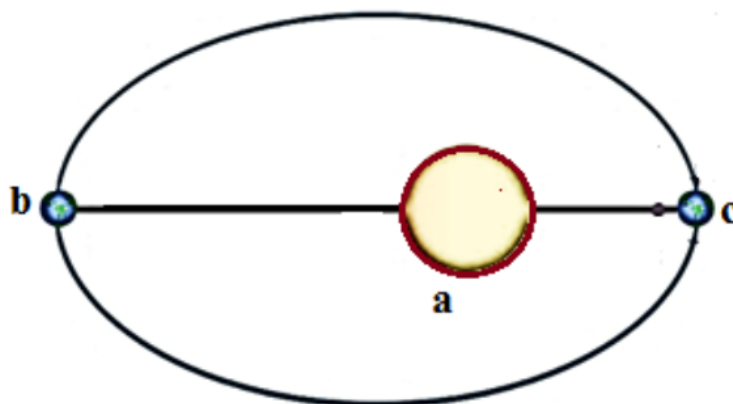


Figure 7:

- A. aphelion, sun, and perihelion
 B. sun, aphelion, and perihelion
 C. sun, perihelion, and aphelion
 D. perihelion, sun, and aphelion
44. Which one of the following expressions is correct about the relationship between periods and mean distances of two planets around the sun?

- A. $\left(\frac{T_1}{T_2}\right)^3 = \left(\frac{r_1}{r_2}\right)^2$
 B. $\left(\frac{T_2}{T_1}\right)^3 = \left(\frac{r_1}{r_2}\right)^2$
 C. $\left(\frac{T_2}{T_1}\right)^2 = \left(\frac{r_1}{r_2}\right)^3$
 D. $\left(\frac{T_1}{T_2}\right)^2 = \left(\frac{r_1}{r_2}\right)^3$

45. The law that states every particle attracts every other particle in the universe with force directly proportional to the product of the masses and inversely proportional to the square of the distance between them is:
- A. Coulomb's law
 - B. Newton's law of universal gravitation
 - C. Faraday's law
 - D. Kepler's law
46. The gravitational force exerted by the Sun to keep planets and other objects in their orbits. acts as:
- A. the centripetal force
 - B. repulsive force
 - C. out ward force
 - D. torque
47. Planet x and planet y have mass of $9 \times 10^{24} \text{ kg}$ and $4 \times 10^{25} \text{ kg}$, respectively. If the gravitational force between the two planets is $6.67 \times 10^{20} \text{ N}$, then the separation of the two planets is:
- A. $3 \times 10^9 \text{ m}$
 - B. $4 \times 10^9 \text{ m}$
 - C. $6 \times 10^9 \text{ m}$
 - D. $2 \times 10^9 \text{ m}$
48. The reason why planets don't fall into the sun from its strong gravitational force is due to:
- A. High enough radial acceleration of the planets.
 - B. Counter repulsion force.
 - C. Balanced force of repulsion and attraction forces.
 - D. High enough tangential velocity of the planets.
49. Which one of the following is incorrect about properties of states of matter?
- A. Liquids have a relatively high density compared to gases and solids.
 - B. Liquids exhibit surface tension, that allows them to form drops and hold together like a film.
 - C. Gases are fluid and can flow easily.
 - D. Particles in solids are held together by strong intermolecular forces, resulting in a rigid structure.
50. Static fluid pressure depends on:
- A. shape of the container
 - B. surface area of the container
 - C. total mass
 - D. depth of the fluid

51. Which one of the following is incorrect about density?
- A. It is a characteristic property of any pure substance.
 - B. It is used to determine whether an object sinks or floats in a fluid.
 - C. It is mass per unit volume.
 - D. Density of a copper depends on its mass.
52. A solid sphere of mass whose relative density is 8.92 has radius of 30mm. The mass of the sphere is:
- A. 1kg
 - B. 1.5kg
 - C. 0.5kg
 - D. 2kg
53. A closed cylindrical container is filled with a fluid that has a specific gravity of 1.7. what is the pressure exerted by the fluid at a depth of 15m?
- A. 25.5kPa
 - B. 255kPa
 - C. 155kPa
 - D. 170kPa
54. A diver is currently located at a depth of 50m in the ocean ($1025\text{kg}/\text{m}^3$). What is the gauge pressure at this point?
- A. 5.125kPa
 - B. 51.25kPa
 - C. 512.5kPa
 - D. 612.5kPa
55. In view of the above question number 54, What is the absolute pressure?
- A. 5.125kPa
 - B. 51.25kPa
 - C. 512.5kPa
 - D. 613.8kPa
56. Which one of the following principles is applicable in the physical concepts of hydraulic lifts, hydraulic brakes, and hydraulic presses?
- A. Pascal's principle
 - B. Bernoulli's principle
 - C. Conservation law
 - D. Archimedes principle
57. The value of atmospheric pressure at sea level is
- A. 760 m of Hg.
 - B. 760 cm of Hg.
 - C. 1.013kPa.
 - D. 76 cm of Hg.

58. Consider the following pressure measuring device. Based on the figure, which one of the following expression is correct?

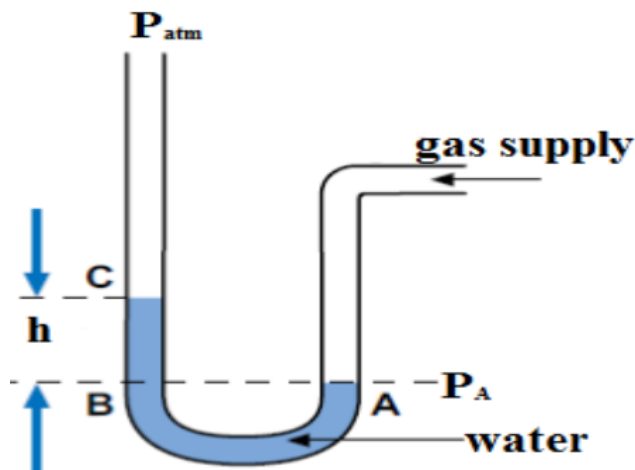


Figure 8:

- A. $P_C = P_B$
 B. $P_C = P_A$
 C. $P_B = P_A$
 D. $P_{gas} = P_C$
59. A down ward force of 100N is applied to the small piston with a diameter of 50cm in the hydraulic lift system. What is the up ward force exerted by large piston with diameter of 2m?
- A. 20N
 B. 20kN
 C. 1.6kN
 D. 16kN
60. The mass of a vertical column of air that exerts a pressure of 1atm. over a $10m \times 10m$ square surface is:
- A. $1.013 \times 10^6 kg$
 B. $1.013 \times 10^5 kg$
 C. $101.3 \times 10^6 kg$
 D. $1013 \times 10^8 kg$