2nd Copernicus Olympiad

Physics and Astronomy Discipline, Category III,

Global Round Exam.

Name and Surname:

Country:

Date:

Grade:

Rules and Regulations:

- This exam has 25 multiple choice and classical type questions. Each question weighs 4 points. Maximum point student can get is 100. Four (4) incorrect answers will eliminate one correct answer.

- Time allocated for this exam is 90 minutes. You will start when proctor tells you to start and will stop when proctor tells you that time is over.

- Students are not allowed to use any kind of electronic device.

- This exam contains <u>9 pages</u>. Before starting the exam please check and let your proctor know if any page is missing.

- Students can use both pen and pencil, but we recommend to use pencil, so it will be easier to clean when you make mistake.

- Each question has to have only <u>one</u> answer. Questions with more than one answer will be counted as incorrect.

- Students cannot consult the proctor as to the meaning of any question.

- Students must not give or receive assistance of any kind during the exam. Any cheating, any attempt to cheat, assisting others to cheat, or participating therein, or engaging in such improper conduct is a serious violation and will generally result in disqualifying.

- Students must sign each page of their exam paper. Candidates who fail to do so will have their exams disqualified.

End of rules and regulations. **<u>Good luck!</u>**

Q1: How many electrons are contained in $^{238}_{92}U$ nucleus?

    A. 92

    B. 146

    C. 238

    D. 0

Q2: A body having 3 kg m² Moment of Inertia rotating with an angular velocity of 2 rad/s has the same Kinetic Energy as a mass of 12 kg moving with a velocity of _____.

    A. 1 m/s

    B. 2 m/s

    C. 4 m/s

    D. 8 m/s

Q3: What is the average distance from Earth to the Sun, also known as an Astronomical Unit?

    A. 90,000 miles

    B. 100 light-years

    C. 150,000,000 km

    D. 15,000,000 km

Q4: Which of the following quantities connected with Simple Harmonic Motion does not vary periodically?

    A. Displacement

    B. Velocity

    C. Acceleration

    D. Total energy

Q5: Which of the followings is Sagittarius Constellation?

(a)

(b)
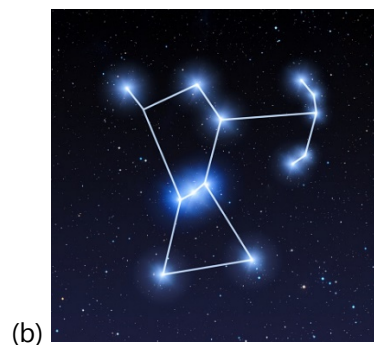
(c)

(d)

Q6: Which of the following pairs have the same dimensions?

    A.   specific heat and latent heat

    B.   impulse and momentum

   C.   surface tension and force

    D.   moment of inertia and torque

Q7: The atmospheric pressure is 106 dyne/cm². What is its value in SI unit?

    A.   105 newton/m²

    B.   106 newton/m²

    C.   104 newton/m²

    D.   103 newton/m²

Q8: Three charges $+3q$, $+q$, and Q are placed on a straight line with equal separation. In order to make the net force on $+q$ to be zero, the value of Q should be :

    A. $+3q$

    B. $+2q$

    C. $-3q$

    D. $-4q$

Q9: Pulley Q is fixed while pulley P is movable. If both pulleys are light and smooth and the strings are massless, the relation between a_1 and a_2 will be:
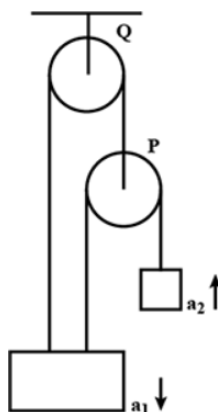
A. $a_2 = 3a_1$

B. $a_2 = 2a_1$

C. $a_2 = a_1$

D. $a_2 = a_1/2$

Q10: Which statement is true for Gauss law:

A. All the charges whether inside or outside the gaussian surface contribute to the electric flux.

B. Electric flux depends upon the geometry of the gaussian surface.

C. Gauss theorem can be applied to non-uniform electric field.

D. The electric field over the gaussian surface remains continuous and uniform at every point.

Q11: Label the planets in the solar system.
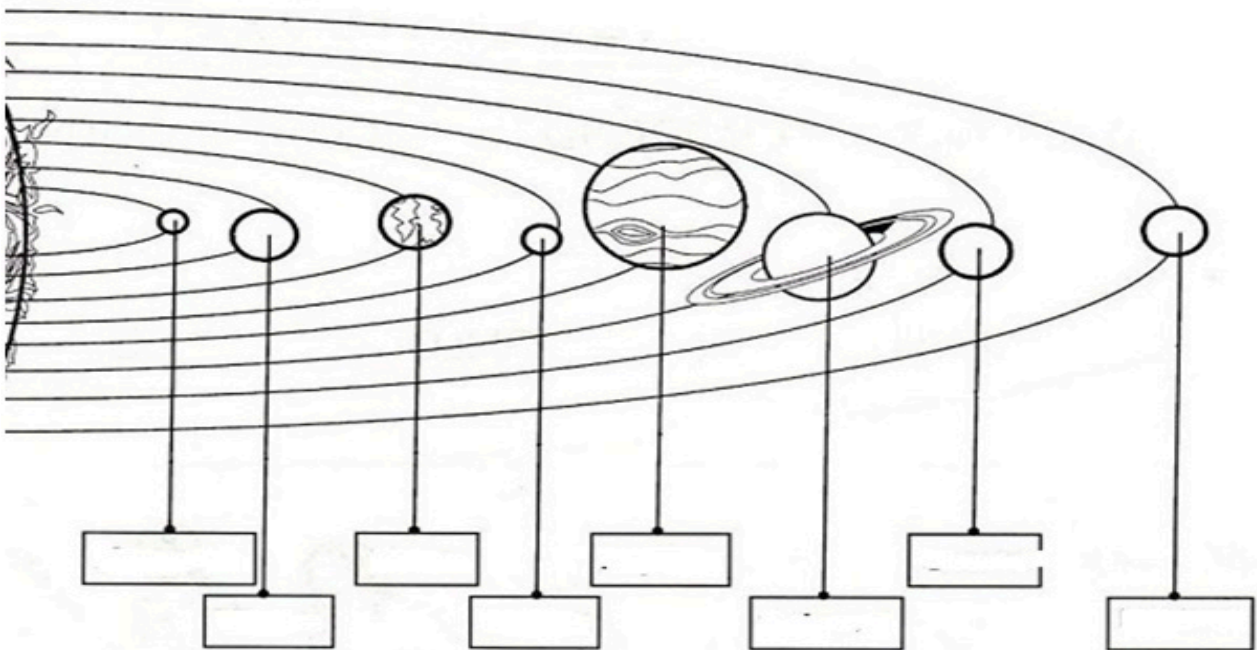
Q12: Three equal weights A, B, C of mass 2 kg each are hanging on a string passing over a fixed frictionless pulley as shown in the figure. Find the tension in the string connecting weights B and C.
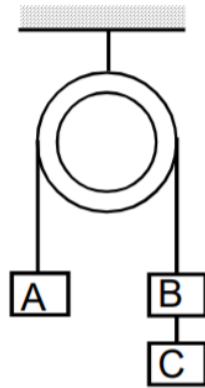
A. zero
B. 13 Newton
C. 3.3 Newton
D. 19.6 Newton

Q13: A particle thrown with velocity u at an angle α from the horizontal. Another particle is thrown with the same velocity at an angle α from the vertical. The ratio of times of flight of two particles will be
A. Tan 2 α : 1
B. Cot 2 α : 1
C. Tan α : 1
D. Cot α : 1

Q14: Heliocentric theory proposed by Nicolaus Copernicus was
A. replaced by circular orbits to fit the data better
B. replaced by elliptical orbits to fit the data better
C. replaced by elliptical orbits to fit the taste of new rulers of Italy
D. replaced by parabolic orbits to fit the data better

Q15: A 180-meter-long train is moving due North at a speed of 25 m/s. A small bird is flying due South, a little above the train, with a speed of 5 m/s. The time taken by the bird to cross the train is
A. 10 s
B. 12 s
C. 9 s
D. 6 s

Q16: The most energy efficient direction of projection of rockets from the Earth's surface is

    A. Eastwards

    B. Westwards

    C. Northwards

    D. Vertically upwards

Q17: Write the name of the constellation below?
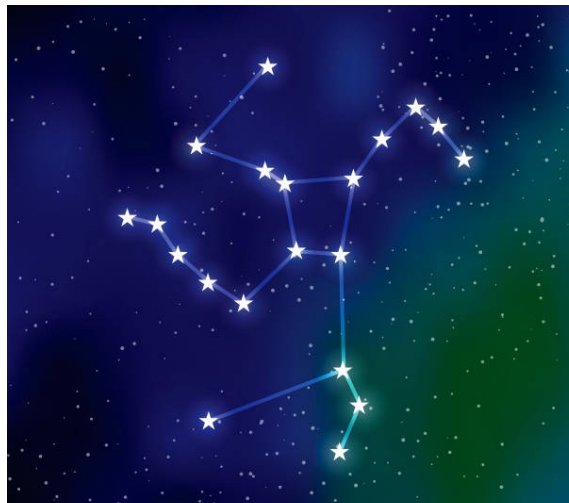
Answer: _____

Q18: An imaginary line that circles the Earth at 0 degrees latitude is called the

    A. Prime Meridian

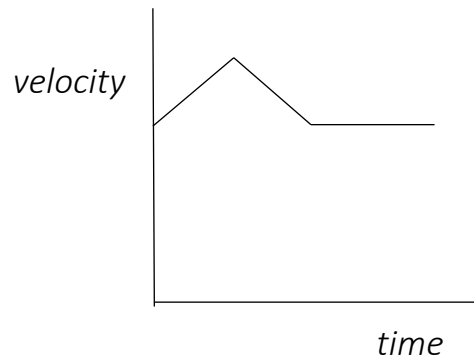   B. International Date Line

    C. Arctic Circle

    D. Equator

Q19: An atom stays in an excited state for about:

    A. 10 micro seconds

    B. 10 milli seconds
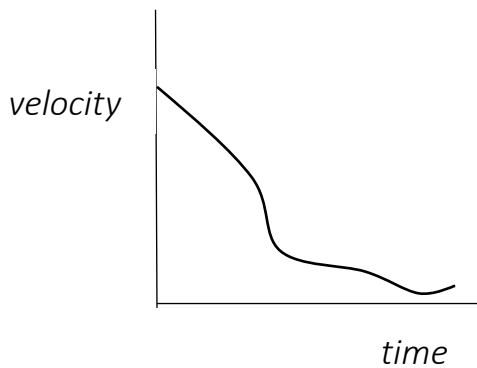
    C. 10 nano seconds

    D. 10 seconds

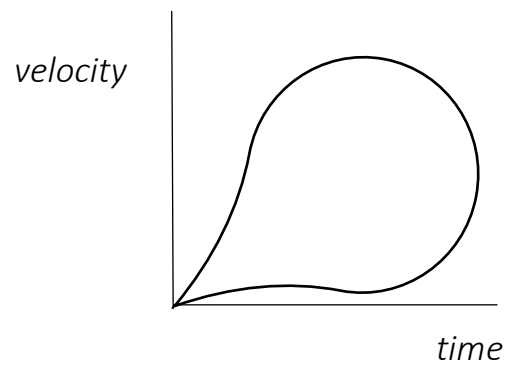Q20: Which of the following velocity time graphs is not possible?
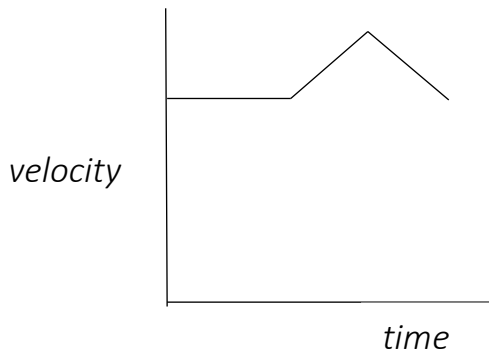
A)

B)

C)

D)

Q21: A particle is dropped under gravity from rest from a height h and it travels a distance 9h/25 in the last second. Find the height h. (Take g = 9.8m/s^2)

    A.   100m

    B.   122.5m

    C.   145m

    D.   167.5m

Q22: Mike is standing at 72 degrees, 30 minutes East Longitude. Shirley is at 72 degrees, 30 minutes West Longitude. Which one is closer to the Prime Meridian?

    A.   Mike

    B.   Shirley

    C.   They are the same distance

    D.   Information is insufficient

Q23: If an object moves 3.14 km in a circular path of radius 1000m, then the value of displacement is____

    A. 4 km

    B. 8 km

    C. 2 km

    D. 0 km

Q24: which one of the below circuits is properly connected with the electrical components?
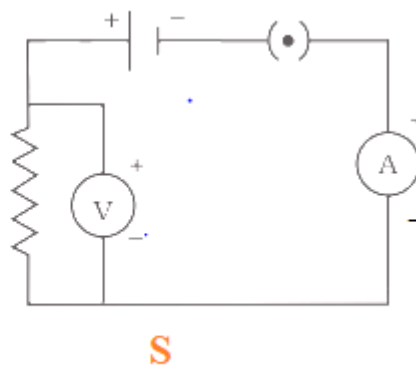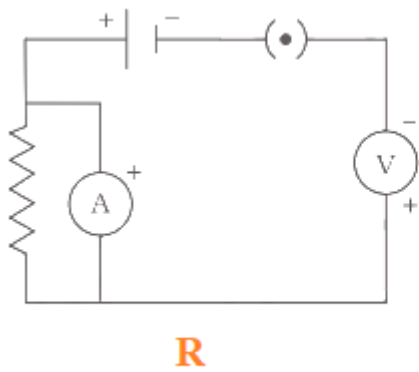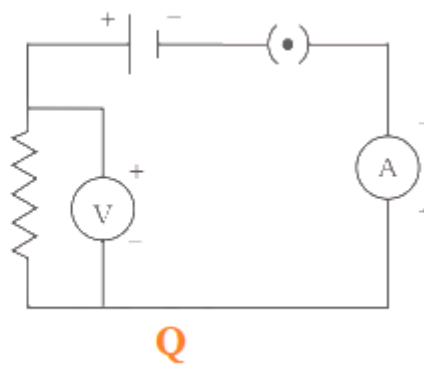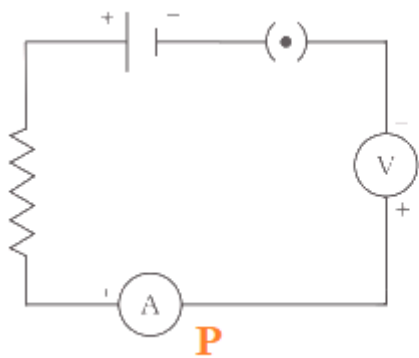
    A. P

    B. Q

    C. R

    D. S

Q25: A projectile is projected with an initial velocity (6i + 8j) m/sec. If g= 10m/s^2, then find the followings:

(i) the angle of projection?

Answer: _____

(ii) the horizontal range of the projectile?

Answer: _____

(iii) the maximum height of the projectile?

Answer: _____