

**ADDIS ABABA CITY ADMINISTRATION EDUCATION BUREAU
ARADA SUB-CITY EDUCATION OFFICE**

GRADE 12 PHYSICS MODEL EXAMINATION

FEBRUARY 2014-

TIME ALLOWED: 2 HRS.

GENERAL DIRECTIONS

THIS BOOKLET CONTAINS PHYSICS EXAMINATION. IN THIS EXAMINATION, THERE ARE A TOTAL OF 50 MULTIPLE CHOICE ITEMS. FOLLOW THE INSTRUCTIONS ON THE EXAMINATION PAPER CAREFULLY. THERE IS ONLY ONE BEST ANSWER FOR EACH ITEM CHOOSE THE BEST ANSWER FROM THE SUGGESTED OPTIONS AND BLANKEN THE LETTERS OF YOUR CHOICES ON THE ANSWER SHEET. YOUR ANSWER MARK SHOULD BE HEAVY AND DARK COVERING THE ANSWER SPACE COMPLETELY, PLEASE ERASE ALL UNNECESSARY MARKS COMPLETELY FROM YOUR ANSWER SHEETS.

YOU WILL BE ALLOWED TO WORK FOR **2 HOURS**. IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY GO BACK AND REVIEW. WHEN TIME IS CALLED YOU MUST IMMEDIATELY STOP WORKING AND LAY YOUR PENCIL DOWN AND WAIT FOR FURTHER INSTRUCTIONS.

ANY FORM OF CHEATING OR AN ATTEMPT OF TO CHEAT IN THE EXAMINATION HALL WILL RESULT IN AUTOMATIC DISMISSAL FROM THE EXAMINATION HALL AND CANCELATION OF YOUR SCORE(S).

DO NOT TURN THIS PAGE OVER UNTIL YOU ARE TOLD TO DO SO.

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You may refer to the information given below when you need to work on some of the questions.

Name of constant	Symbol	Value
Acceleration due to gravity	g	10 m/s^2
$\sin 30^\circ = 0.5 = \cos 60^\circ$		
$\cos 30^\circ = 0.866 = \sin 60^\circ$		
Speed of sound in air	v	340 m/s
$\sin 37^\circ = 0.6 = \cos 53^\circ$		
$\cos 37^\circ = 0.8 = \sin 53^\circ$		

1. Which one of the following experimental error can be reduced by taking repeated

measurements?

A. Random error

C. Systematic error

B. Zero error

D. Parallax error

2. What is the vector product ($\vec{A} \times \vec{B}$) of two vectors $\vec{A} = 3\hat{i} - 2\hat{j} + 5\hat{k}$ and $\vec{B} = 7\hat{i} + 4\hat{j} - 8\hat{k}$?

A. $4\hat{i} - 59\hat{j} + 26\hat{k}$

C. $-4\hat{i} + 59\hat{j} + 26\hat{k}$

B. $36\hat{i} + 11\hat{j} - 2\hat{k}$

D. $-36\hat{i} - 11\hat{j} + 2\hat{k}$

3. The Fig.1 shows a path taken by a flying bird.

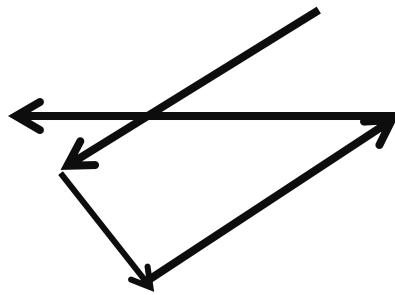


Fig.1

Which one of the following vectors may represent its resultant displacement?

A.



C.



B.



D.



4. Uniform circular motion is a:-

A. Motion with constant velocity

B. Motion in one dimension

C. Motion with acceleration and constant magnitude

D. Motion in which net force is constant

5. A car travels at the rate of 25 km/hr for 4 minutes. Then at 50 km/hr for 8 minutes

and finally at 25 km/hr for 2 minutes. Then the total distance covered in km is;-

- A. 6.2km B. 4.5Km C. 18km D. 9.2km

6. Newton's second law of motion states that the acceleration of an object:-

- A. increases as its mass decreases and as force acting on it increases
B. decreases as its mass decreases and as the force acting on it increase
C. increases as its mass increases and as the force acting on it increase
D. decreases as its mass increases and as the force acting on it increases

7. A monkey is sliding on a frictionless muddy sloppy surface down to a valley. What should it do to save its life from falling to the valley if it holds a number of small stones?

- A. Throwing the stones to its back
B. Throwing the stones to upward
C. Throwing the stones forward to the valley
D. Keeping the stones with itself

8. Two forces F_1 and F_2 act on a 4kg block as shown in the Fig.2. The magnitude of the forces are $F_1 = 40\text{N}$ and $F_2 = 20\text{N}$. What is the horizontal acceleration of the block? (Neglecting friction)

- A. 1.6 m/s^2
B. 1 m/s^2
C. 2 m/s^2
D. 0.5 m/s^2

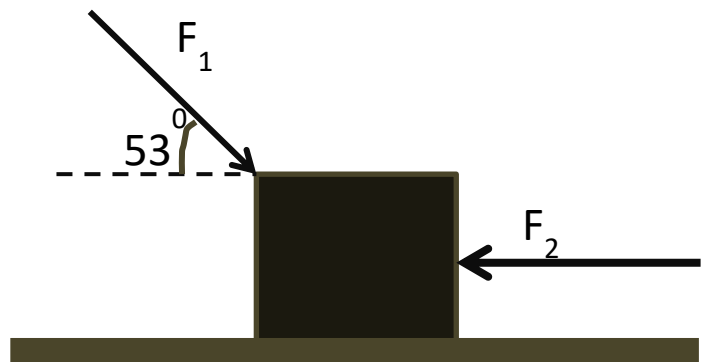


Fig.2

9. When a long spring is stretched by 2cm, its potential energy is U . If the spring is stretched by 10cm then what will be the potential energy stored in the spring?

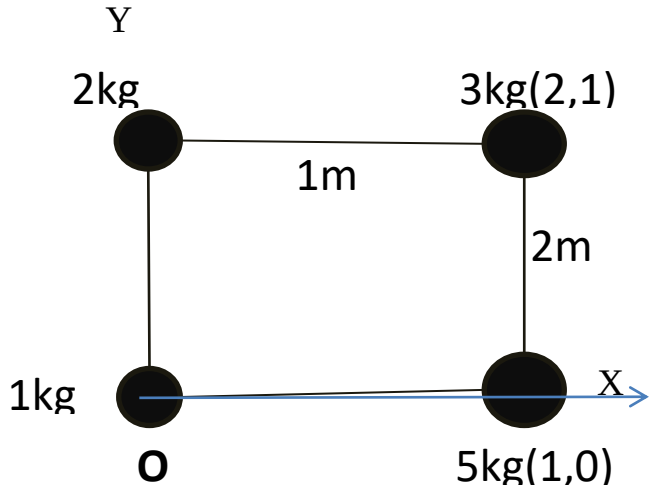
- A. $5U$ B. $10U$ C. $25U$ D. $U/5$

10. What is the center mass of the following system if the frame joining the masses is



massless?

- A. $\frac{8}{11}, \frac{10}{11}$
- B. $\frac{10}{11}, \frac{8}{11}$
- C. $\frac{8}{11}, \frac{8}{11}$
- D. $\frac{8}{11}, 1$



11. An object having mass M is set in a vertical circular motion. The tension T from the rope keeps the object in a circular path with speed V . Where does the rope experience a maximum tension?
 - A. At the top of the circle
 - B. When it is at 45° to the vertical
 - C. At the bottom of the circle
 - D. When the object is at half of the circle
12. Which one of the following statements is NOT correct about a particle that is in equilibrium?
 - A. It can be under the action of more than one force
 - B. It can have acceleration different from zero
 - C. Its velocity can be equal to zero
 - D. It can have a velocity different from zero
13. Any object wholly or partial immersed in a fluid is buoyed up by a force equal to the weight of the fluid displaced by the object is stated by:

A. Pascal law	C. Bernoulli's Principle
B. Archimedes' Principle	D. Newton's law
14. What is the tensile stress when a force of 10N acts over a cross-sectional area of $4 \times 10^{-3} \text{ m}^2$?

A. 980 Pa	B. 490 Pa	C. 100 Pa	D. 2500 Pa
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15. A copper bar of thermal conductivity 390 W/mK and with an area of $4 \times 10^{-4} \text{ m}^2$ is

0.5m long. What will be the rate of heat flow through the bar if a temperature difference of 30°C is maintained between the two ends?

- A. 4.68 W B. 2.3 W C. 0.078 W D. 9.36 W

16. The average molecular kinetic energy of a body is measured by:-

- A. Heat content of a body
B. Average pressure in a gas
C. The temperature of the body
D. The number of mole in the gas

17. When a gas is compressed a:-

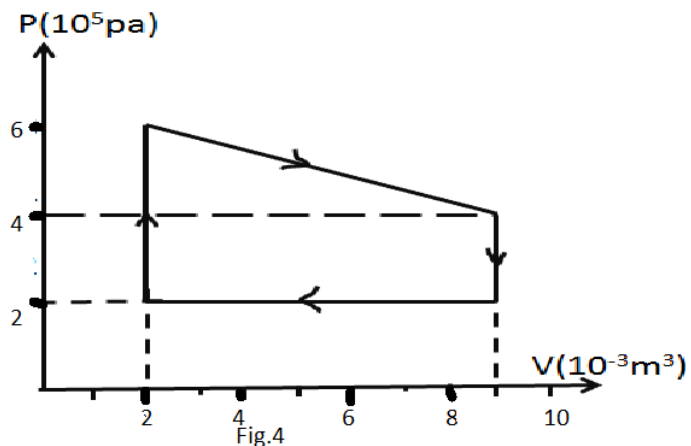
- A. work is done by the system C. Work is done on the system
B. work done is negative D. Work done is zero

18. In the equation $TV^{\gamma-1} = \text{constant}$. If the value of γ is equal to one. Then the process is:-

- A. Isothermal B. Adiabatic C. Isochoric D. Isobaric

19. What is the net work out put per cycle for thermodynamics process shown in the Fig.4?

- A. 2.8kJ
B. 1.4KJ
C. 2.1KJ
D. 0.7KJ



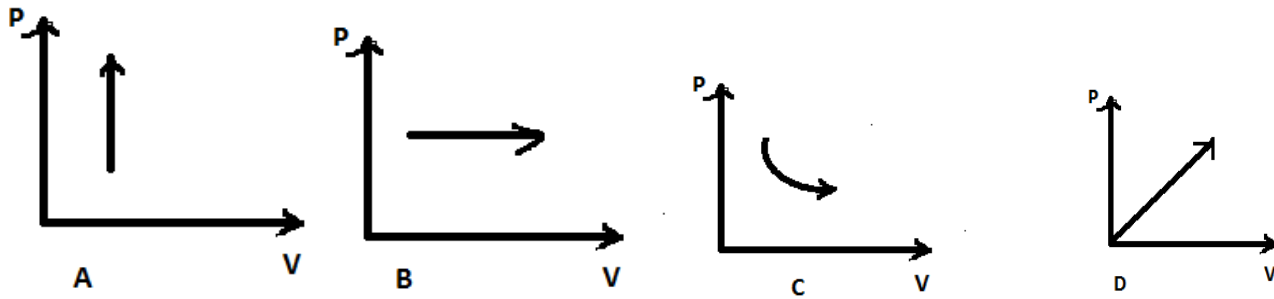
20. In a thermodynamics process, $1.5 \times 10^5 \text{J}$ heat is added to an ideal gas to keep the pressure constant at $2 \times 10^5 \text{Pa}$. What is the change in internal energy of the gas when its volume expands from 6.3m^3 to 7.1m^3 ?

- A. $14.1 \times 10^5 \text{J}$ C. $3.1 \times 10^5 \text{J}$
B. $-10 \times 10^4 \text{J}$ D. $-1.0 \times 10^4 \text{J}$

21. Which statement is NOT a correct assumption made in the kinetic theory of gases?

- A. There is no interaction among particles and the wall except during collision.
 - B. Collision between particles, and between particles and wall are inelastic.
 - C. The volume occupied by the particles is negligible compared to the volume of the gas as the whole.
 - D. The distribution of velocities of particles is random in direction.
22. If the density of oxygen is 1.43kg/m^3 , and the root-mean-square speed of oxygen molecule 460m/s , what is the pressure exerted on the oxygen molecule?
- A. 101 kpa
 - B. 303 kpa
 - C. 202 kpa
 - D. 50 kpa
23. Which one of the following is NOT correct about second law of thermodynamics?
- A. No process is possible in which there is an overall decrease in the entropy of the universe
 - B. The complete conversion of energy from hot source into work is not possible.
 - C. Two bodies that are separately in thermal equilibrium with a third body must be in thermal equilibrium with each other.
 - D. The spontaneous transference of energy from a cooler body to hotter body is not possible.
24. For a reversible thermodynamic process, the necessary condition is that:
- A. In the whole cycle of the system, the loss of heat energy should be zero
 - B. The process should be too fast.
 - C. The process should be slow so that the system remain in thermal and mechanical equilibrium with surrounding
 - D. The loss of heat energy should be zero and it should be quasistatic
25. A heat engine operating between 100°C and 700°C has an efficiency that is 60% of its maximum theoretical efficiency. How much energy does this engine absorb from the hot reservoir to do 5000J of useful work?
- A. 13513J
 - B. 6703J
 - C. 27002J
 - D. 8200J
26. A device that performs the inverse of a heat engine is:-
- A. Cylinder
 - B. Refrigerator
 - C. Compressor
 - D. Motor

27. Which one of the following P-V diagram represent isochoric process?



28. In periodic oscillation, the number of cycle per unit time is:-

- A. Period B. Frequency C. Amplitude D. Wavelength

29. The frequency of oscillation of a particle in simple harmonic oscillation is :

- A. Independent of the amplitude of the motion
 B. Directly proportional to the period of oscillation
 C. Indirectly proportional to the period of the oscillation
 D. Directly proportional to the mass of oscillating object.

30. The displacement of an oscillator performing simple harmonic motion:-

- A. Remains constant during its oscillation
 B. Remains non zero
 C. Attains its maximum value when its acceleration is zero
 D. Attains its minimum value when its velocity is maximum

31. The displacement of a simple harmonic motion is given as $X(t) = 0.4\text{m Sin}(8\pi t)$.

What is the period of oscillation ?

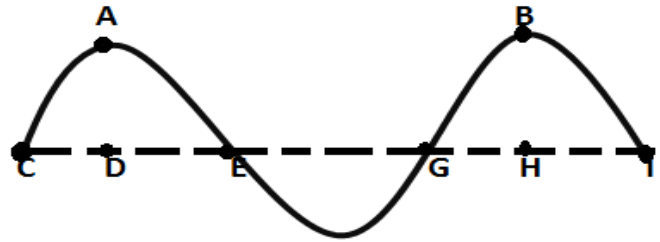
- A. 0.25s B. 4s C. 0.5s D. 2s

32. An object experiencing simple harmonic motion of an amplitude 12cm and a time period is 3s. What is the displacement after 0.5s, if the object starts from the limit of oscillation at $x=A$?

- A. 0.24m B. 0.12m C. 0.03m D. 0.06m

33. A transvers wave is traveling through a medium, as shown in the Fig.5 below. The particles of the medium are moving:

- A. Parallel to the line joining AD
 B. Perpendicular to the line joining AD
 C. Along a line joining CI
 D. At various angles to the line CI



34. The speed of a sinusoidal wave on a string depends on:

- A. The frequency of the wave C. The wavelength of the wave
 B. The length of the string D. The tension on the string

35. The tension in a string with a linear mass density of 0.001kg/m is 0.4N. A sinusoidal wave with a wavelength of 20cm on this string has a frequency of

- A. 0.0125Hz B. 0.25Hz C. 100Hz D. 630Hz

36. The sum of two sinusoidal traveling waves is a sinusoidal traveling wave only if:

- A. Their amplitudes are the same and they travel in the same direction
 B. Their amplitudes are the same and they travel in opposite direction
 C. Their frequencies are the same and they travel in the same direction
 D. Their frequencies are the same and they travel in opposite direction

37. The speed of a sound wave is determined by

- A. Its amplitude
- B. Its pitch
- C. Its intensity
- D. Transmitting medium

38. To produce beats it is necessary to use two waves:-

- A. Traveling in opposite direction
- B. Of slightly different frequency
- C. Of equal wavelength
- D. Of equal amplitude

39. The intensity of sound 5m from a point source is 0.8W/m^2 . The power out put of the source is:-

- A. 160W
- B. 251W
- C. 320W
- D. 390W

40. The intensity of sound wave A is 100 times that of sound wave B. Relative to wave B, the sound level of wave A is:-

- A. 100dB
- B. 2dB
- C. 10dB
- D. 20dB

41. The speed of sound in air is 340m/s. The length of the shortest pipe closed at one end that will respond to a 520Hz tuning fork is approximately:-

- A. 16cm
- B. 9cm
- C. 4cm
- D. 33cm

42. A stationary source generates 5Hz water wave its speed is 2m/s. A boat is approaching the source at 10m/s. The frequency of this wave as observed by a person in the boat

is :

- A. 15Hz
- B. 20Hz
- C. 25Hz
- D. 30Hz

43. A wavefront is surface of contact

- A. Phase
- B. Frequency
- C. intensity
- D. Amplitude

44. Interference of light is evidence that

- A. The speed of light is very large
- B. Light is a transvers wave
- C. Light is electromagnetic in character
- D. Light is a wave phenomenon

45. The Fig.7 shows total internal reflection. Which of the following statement is NOT true?

- A. Angle AON is the angle of incidence
- B. Angle of AON=angle of BON
- C. Angle of AON must be critical angle
- D. The speed of light in medium I is greater than in medium II

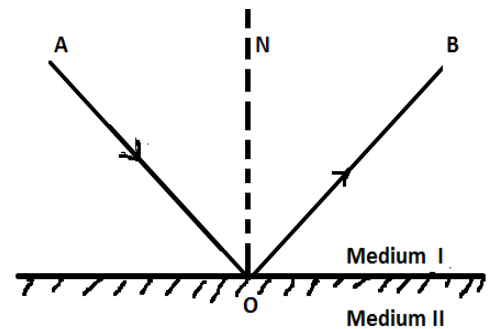


Fig.7

46. Consider the law of reflection (I) and the law of refraction (II), Huygens' principle is used to derive:

- A. Only I
- B. Only II
- C. Both I and II
- D. Neither I nor II

47. In a Young's double slits experiment, light of wavelength 600nm illuminates two slits that are separated by 1mm. The separation between adjacent bright fringes on a screen 5m from the slits.

- A. 0.1cm
- B. 0.3cm
- C. 0.5cm
- D. 1cm

48. What will happen in a Young's double slits experiment when the slit separation is halved?

- A. A decrease in fringe intensity
- B. wavelength will be halved
- C. fringe spacing will be halved
- D. fringe spacing will be doubled

49. A ray of light passes through three media as shown in Fig.8 the speed of light in these media obey.

- A. $V_1 > V_2 > V_3$
- B. $V_3 > V_2 > V_1$
- C. $V_3 > V_1 > V_2$
- D. $V_2 > V_1 > V_3$

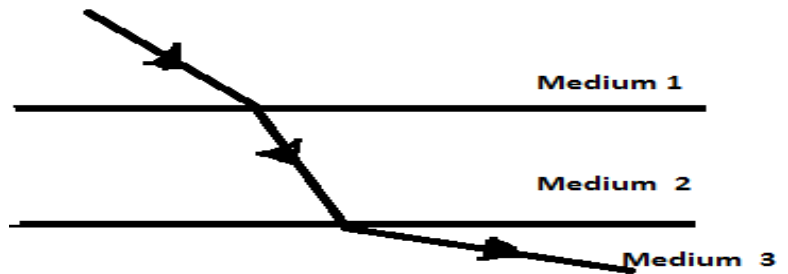


Fig.8

50. In the equation $d \sin \theta = n \lambda$ for the light of a diffraction grating, n refers to :

- A. The number of slit
- B. The slit width
- C. The slit separation
- D. The order of grating or spectrum