Each question is followed by four options lettered A *to* D. *Find the* **correct** *option for* **each** *question and shade in* **pencil** *on your answer sheet, the answer space which bears the same letter as the option you have chosen. Give only* **one** *answer to* **each** *question. An example is given below.*

A body starts moving with a speed of 40 m s^{-1} and accelerates uniformly to 90 m s^{-1} in 4.0 s. Calculate the distance travelled.

A. 100 m
B. 180 m
C. 200 m
D. 260 m

The correct answer is 260 m , *which is lettered* D, *and therefore answer space* D *would be shaded.*

⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐

Think carefully before you shade the answer spaces; erase completely any answer(s) you wish to change.

Do all rough work on this question paper.

Now answer the following questions.

1. The restoring force acting on a body executing simple harmonic motion (SHM) is always
   A. directed towards the centre of gravity of the body.
   B. directed towards a fixed point.
   C. acting to increase the amplitude of the oscillation.
   D. a scalar quantity.

2. In a vacuum flask, heat loss by radiation is minimized by the silvering layer on the inner surface by the process of
   A. diffraction of radiant heat.
   B. multiple refraction.
   C. total internal reflection.
   D. continuous reflection.

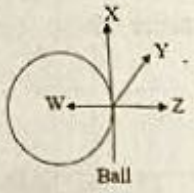
3. The **strongest** audible frequency present in a musical note is known as its
   A. intensity.
   B. harmonic.
   C. fundamental.
   D. overtone.

4. A screw jack has a pitch of 0.5 cm and a tommy bar of length 50 cm. Calculate the velocity ratio of the machine.
   A. $\frac{40}{\pi}$
   B. $40\,\pi$
   C. $\frac{200}{\pi}$
   D. $200\,\pi$

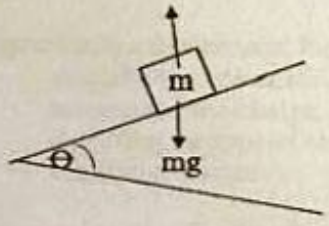
5. The product of the prefixes giga and pico gives
   A. kilo.
   B. milli.
   C. micro.
   D. mega.

6. It is advisable to wear dull, dark or black garments in cold and chilly weather because such materials
   A. take a long time to warm up.
   B. are good reflectors of radiation.
   C. are bad emitters of radiation.
   D. are good absorbers of radiation.

7. A ball is whirled in a vertical plane as illustrated in the diagram below



In which direction will the ball fly if released?
   A. Z
   B. X
   C. Y
   D. W



8. The diagram above illustrates a body of mass, **m** on an inclined plane.
The coefficient of the limiting friction, in terms of the given parameters is
   A. $\tan \theta$.
   B. $\sin \theta$.
   C. $\cos \theta$.
   D. $\frac{R}{mg}$.

9. The efficiency of a pulley system is 75 % and the velocity ratio of the system is 6. Calculate the effort needed to lift a load of mass 120 kg. [$g = 10\ m\ s^{-2}$]
   A. 30 N
   B. 267 N
   C. 225 N
   D. 1000 N

10. The electrolyte in a lead-acid accumulator is
   A. H_2SO_4.
   B. $ZnCl_2$.
   C. NH_4Cl.
   D. MnO_2.

11. The dimensions of thermal conductivity is
   A. $MLT^{-3}\theta^{-1}$.
   B. $MLT^{-1}\theta^{-1}$.
   C. MLT^{2}.
   D. $ML^{-1}T^{-1}\theta^{2}$.

12. A body of mass 60 kg stands on a weighing machine inside a lift. If the lift ascends with an acceleration of 2.5 m s^{-2}, calculate the reading on the machine. [g = 10 m s^{-2}]

A. 750 N

B. 550 N

C. 600 N

D. 450 N

13. A body of mass 20 g is suspended from the end of a spiral spring whose force constant is 0.4 N m^{-1}. Calculate the angular speed of the body

A. 1.41 rads^{-1}
B. 2.83 rads^{-1}
C. 2.24 rads^{-1}
D. 4.47 rads^{-1}

14. An electric device which sets an electron into motion when the electrodes are connected to a conductor is termed as

A. a galvanometer.
B. a cell.
C. a voltmeter.
D. an ammeter.

15. Sound production is the result of

A. vibration of matter.
B. superposition of waves.
C. change in wavelength.
D. change in frequency.

16. In an electric iron, the earth wire is always connected to the

A. element.
B. metal casing
C. plastic handle.
D. thermostat.

17. An energy efficient bulb of power 15 W produces the same brightness as a traditional incandescent bulb of power rating 40 W. If both bulbs are used for 5 hours, determine the energy saved by the energy efficient bulb.

A. 8.0×10^5 J
B. 4.5×10^5 J
C. 6.0×10^5 J
D. 1.5×10^5 J

18. Which of the following properties is **not** associated with X-rays? They

A. cause fluorescence.

B. are deflected by electric fields.

C. ionize gas.

D. travel in straight line.

19. A lead bullet of mass 4.0 g at 300 K is fired with a speed of 300 m s^{-1}. Calculate the maximum temperature of the bullet upon impact with the target.

A. 676 K
B. 646 K
C. 666 K
D. 636 K

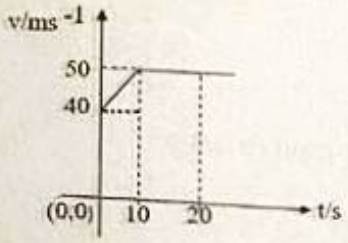
20. A source of sound of frequency 100 Hz approaches a stationary observer with a speed of 10 m s^{-1}. If the speed of sound in air is 340 m s^{-1}, calculate the apparent frequency of the sound heard by the observer.

A. 350.0 Hz

B. 97.1 Hz

C. 103.0 Hz

D. 34.0 Hz

21. 

The diagram above illustrates the motion of a car. Determine the distance covered by the car in 20 seconds.

A. 1600 m
B. 600 m
C. 1100 m
D. 950 m

22. A capacitor is a device used for

A. amplifying an electric signal.
B. storing electric charge.
C. detecting the type of charge.
D. rectifying current.

23. The sensation of vision lingering on the brain for a very short period is known as

A. binocular vision.
B. depth of field of the eye lens.
C. persistence of vision.
D. power of accommodation of the eye.

24. If $Q = \left(\frac{F}{M}\right)^{\frac{1}{2}}$ where F is force and M is mass per unit length, obtain the dimensions of Q.

A. LT^{-2}
B. LT
C. L^2T
D. LT^{-1}

25. Which of the following statements is **true** when a moving ball collides elastically with a stationary ball of equal mass?

A. The moving ball stops and the stationary ball moves with the initial velocity of the moving ball after the impact.

B. The balls coalesce and move with a common velocity after the impact.

C. The balls move with different speed after the impact.

D. Both balls move in the same direction as the initial velocity of the moving ball after the impact.

26. A wind velocity is 15 m s^{-1}, 30° North of East (N30°E). Calculate its northerly component.

A. 4.0 m s^{-1}
B. 10.0 m s^{-1}
C. 7.5 m s^{-1}
D. 13.0 m s^{-1}

Turn over

27. The equivalent of 1kWh in Joules is
A. 1.0×10^{8}.
B. 1.0×10^{3}.
C. 3.6×10^{8}.
D. 3.6×10^{3}.

28. Which of the following dimensions is correct for momentum?
A. $M^{-2}T^{-2}$
B. $ML^{-1}T^{-1}$
C. $ML^{2}T^{2}$
D. MLT^{-1}

29. As a sample of radioactive element decays, its half-life geometrically
A. changes exponentially.
B. increases arithmetically.
C. remains the same.
D. decreases.

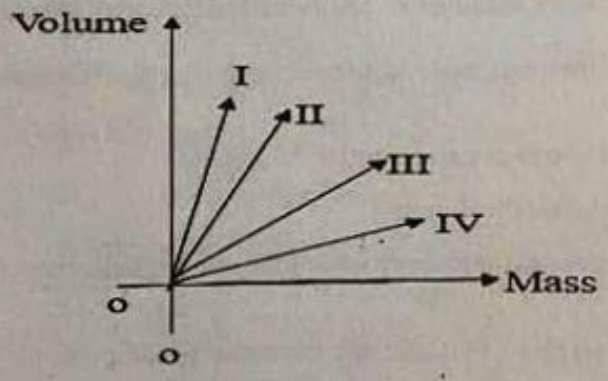
30. Heavy water in certain nuclear reactors function as
I. Coolant
II. Fuel
III. Moderator

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

31. Which set of equipment could be used in an experiment to determine the density of an irregular shaped object?
A. Conical flask and measuring cylinder
B. Beam balance and micrometer screw gauge
C. Measuring cylinder and vernier caliper
D. Beam balance and measuring cylinder

32. Which of the following vibrations is **not** forced?
A. Vibration of the prongs of a tuning fork
B. Motion of the bob in a pendulum clock
C. Flapping of the wings of a bird
D. A metal ball rolling in a smooth hemispherical bowl

33. The diagram below illustrates the relationship between mass and volume for **four** different materials I, II, III, and IV respectively.



Which of the materials has the **highest** density?
A. IV
B. II
C. III
D. I

34. Particles of mass 1.0×10^{-2} kg is fixed to the tip of a fan blade which rotates with an angular speed of 100 rads^{-1}. If the length of the blade is 0.2 m, the centripetal force on the particle is
A. 400 N.
B. 20 N.
C. 200 N.
D. 2 N.

35. An electron accelerating through a p.d of 10 kV strikes a tungsten target and causes emission of an X-ray photon. Calculate the maximum frequency of the X-ray photon.
[$h = 6.63 \times 10^{-34}$ J s, $e = 1.6 \times 10^{-19}$ J]
A. 1.6×10^{24} Hz
B. 2.4×10^{18} Hz
C. 2.4×10^{20} Hz
D. 1.6×10^{14} Hz

36. Which of the following statements about electric field intensity is **correct**? It
A. increases with the distance in the electric field.
B. does not obey the inverse square law.
C. is measured in NC^{-1}.
D. is a scalar quantity.

37. A ball is thrown horizontally from the top of a tower with a speed of 12 m s^{-1}. If the ball hit the ground 2.0 s later, determine the height of the tower. [$g = 10$ m s^{-2}]
A. 40.0 m
B. 20.0 m
C. 24.0 m
D. 44.0 m

38. The value of an a.c. that produces the same heating effect as the value of a d.c. is the
A. instantaneous current.
B. peak current.
C. mean current.
D. root mean square current.

39. A *p*-type semiconductor can be made from germanium semiconductor by doping it with a
A. tetravalent atom.
B. divalent atom.
C. trivalent atom.
D. monovalent atom.

40. What will be the change in the atomic number of the daughter nuclide when a radioactive atom releases an alpha particle?
A. Increases by 4
B. Decreases by 2
C. Decreases by 4
D. Increases by 2

41. Two mirrors are inclined at an angle of 120° to each other. Calculate the number of images observed.
A. 2
B. 4
C. 3
D. 5

42. Which of the following is **not** a component of a dry cell?
A. Copper rod
B. Magnesium dioxide paste
C. Zinc case
D. Carbon rod

Turn over

43. A body in uniformly accelerated motion covers a distance s in time t. If **u** , **v**, and **a** are the magnitudes of the initial velocity, final velocity and acceleration respectively, which of the following equations is not correct?

A. $\mathbf{u}^2 = \mathbf{v}^2 + 2\mathbf{a}s$

B. $s = \frac{1}{2}(\mathbf{u} + \mathbf{v})t$

C. $s = \mathbf{u}t + \frac{1}{2}\mathbf{a}t^2$

D. $\mathbf{v} = \mathbf{u} + \mathbf{a}t$

44. When 50 g of water at 30 °C is mixed with 20 g of hot water, the resulting temperature of the mixture is 40 °C . Calculate the temperature of the hot water assumin no heat loss to the sur rounding.

A. 50 °C
B. 70 °C
C. 65 °C
D. 80 °C

45. Two bodies have their masses in the ratio 3:1. They experience horizontal forces such that their accelerations are in the ratio of 2:9 respectively. Determine the ratio of the forces.

A. 2:5
B. 2:1
C. 2:3
D. 1:4

46. The mouth piece of a telephone receiver **primarily** converts sound energy to

A. chemical energy.
B. heat energy.
C. electrical energy.
D. mechanical energy.

47. Which of the following devices is used to set up a d.c. voltage?

A. Induction coil
B. Voltmeter
C. Transformer
D. Ammeter

48. The coefficient of static friction between a 40 kg crate and a concrete surface is 0.25. Calculate the magnitude of the maximum force needed to keep the crate stationary if the concrete base is inclined at an angle of 45° to the horizontal.

A. 212 N
B. 300 N
C. 283 N
D. 400 N

49. According to Pascal's principle, the pressure in a fluid always

A. transmits equally in all directions.

B. depends on the density of the fluid.

C. distributes partially in all direction.

D. increases with height.

50. In a voltmeter, 2 g of metal is deposited by a charge flow of 1000 C. Calculate the time taken to deposit 7 g of the same metal if 2 A passes through the voltmeter.

A. 120.9 minutes
B. 29.2 minutes
C. 59.2 minutes
D. 5.9 minutes

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