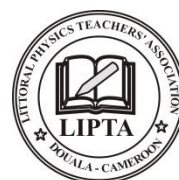


LITTORAL PHYSICS TEACHERS' ASSOCIATION (LIPTA)

REGIONAL MOCK EXAMINATION

GENERAL CERTIFICATE OF EDUCATION



0780 PHYSICS 1

APRIL 2021

ADVANCED LEVEL

Centre Number	
Centre Name	
Candidate Identification Number	
Candidate Name	

One and a half Hours

INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you start answering the questions in this paper. Make sure you have a soft HB pencil and an eraser for this examination.

- USE A SOFT HB PENCIL THROUGH OUT THE EXAMINATION.
- DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Before the examination begins

- Check that this question booklet is headed 'Advance Level – 780 Physics 1'.
- Insert the information required in the spaces above.
- Insert the information required in the answer sheet using your HB pencil: **Candidate Name, Exam Session, Subject Code, Centre Number and name and Candidate Number**. Take care that you do not crease or fold the answer sheet or make any marks on it other than those asked for in these instructions.

How to answer the questions in this examination.

- Answer **ALL** the 50 questions in this examination. All questions carry the same mark.
- The use of calculators and formulae booklets is allowed.
- Each question has FOUR suggested answers; A, B, C and D. Decide which answer is correct. Find the question number on the answer sheet and draw a horizontal line across the letter to join the square brackets for the answer you have chosen. For example if C is the selected answer, mark C as shown below.
[A] [B] **[C]** [D]
- Mark only one answer for each question. If you mark more than one answer, you will score zero for that question. If you change your mind about an answer, erase the first mark carefully, and then mark your new answer.
- Avoid spending too much time on any question. If you find a question difficult, move on to the next question. You can come back to this question later.
- Do all rough work in this booklet, using, where necessary, the blank spaces in the question booklet.
- Mobile phones are NOT allowed in the examination room.
- You must not take this booklet and answer sheet out of the examination room. All question booklets and answer sheets will be collected at the end of the examination.**



SECTION 1
(35 Questions)

Directions:

Each of the questions or incomplete statements in this section is followed by four suggested answers. Select the best answer for each question.

Questions 1 – 35

1. The heat capacity, C , of a solid may be related to its absolute temperature, T , by the equation:

$$C = \alpha T + \beta T^3$$

The SI units of α and β are

	SI units of α	SI units of β
A	J	J K^{-2}
B	J K^2	J
C	J K	J K^3
D	J K^{-2}	J K^{-4}

2. Two forces act on an object. The magnitude of the resultant of the forces is greatest when the angle between their directions is
- 0°
 - 45°
 - 90°
 - 180°

3. Which one of the following is a **WRONG** statement in kinetic theory of gases?
- The force of attraction between the molecules is negligible.
 - The gas molecules make perfectly elastic collisions with one another.
 - The volume occupied by the molecule of a gas is negligible compared with the volume of the gas.
 - The molecules make inelastic collisions with one another and with the walls of the container.

4. During an isothermal change
- No work is done against the atmosphere
 - There is no change in internal energy
 - No energy enters the system
 - The temperature of the system reduces

5. An object is placed on a smooth horizontal surface and a force (F) is applied on it directed towards the right. Figure 1 shows how F varies with distance (x) moved by the object.

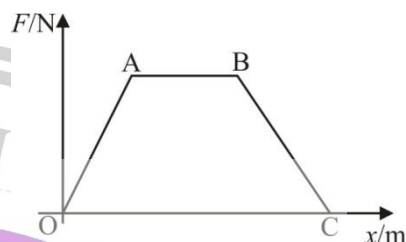


Figure 1

Which of the following is **CORRECT** about the motion of the object?

	Area under the graph gives...	Velocity along AB...
A.	Work done	Increases
B.	Impulse	Remains the same
C.	Work done	Is zero
D.	Momentum	Decreases

6. The dwarf planet, Pluto, has a mass of 1.30×10^{22} kg and a radius of 1180 km. The intensity of Pluto's gravitational field, in N kg^{-1} , on its surface is
- 16.0
 - 1.60
 - 0.62
 - 3.25

7. In figure 2, a potential difference is applied between two metal plates separated by a distance, d .

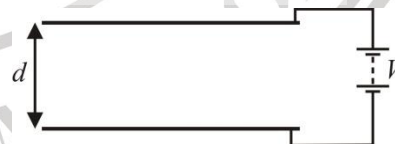


Figure 2

If d is doubled without altering V , then the strength of the electric field between the plates will

- double
- halve
- remain the same
- quadruple



8. Identify the INCORRECT statement among the following.
- All longitudinal waves move through a material medium.
 - Some transverse waves can move through a vacuum.
 - Light wave can undergo diffraction while sound cannot.
 - All mechanical waves cannot move through a vacuum.
9. A student strikes a tuning fork on a table surface and then places it at the mouth of a measuring cylinder as shown in figure 3.

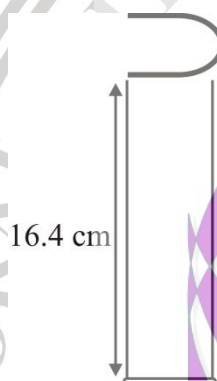


Figure 3

Which of the following tuning fork frequencies will produce the loudest sound?

- 510 Hz
- 550 Hz
- 600 Hz
- 639 Hz

10. Photoelectrons are emitted from a metal surface when light falls on it. If the intensity of the light is increased without changing the frequency, how will the maximum kinetic energy of the emitted electrons and the number of electrons emitted per unit time be affected?

	Maximum k.e. of emitted electrons	Number of emitted electrons per unit time
A.	Unchanged	Increases
B.	Increases	Increases
C.	Increases	Unchanged
D.	Unchanged	Unchanged

11. A 6.0Ω resistor dissipates energy at a rate of 12 W when connected to an alternating voltage source. What is the peak value of the current through the resistor?
- 1.4 A
 - 2.0 A
 - 4.0 A
 - 5.0 A

12. Figure 4 shows what happens to a beam of monochromatic light when it falls on a diffraction grating containing 1000 lines per millimetre.

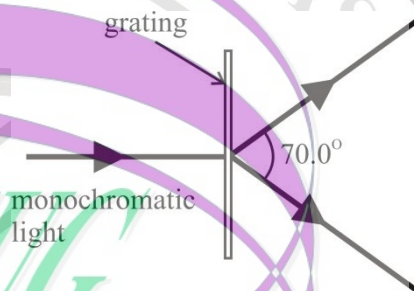


Figure 4

If the angle between the first order diffraction maxima is 70.0° , then the wavelength of the monochromatic light is

- 287 nm
- 470 nm
- 574 nm
- 940 nm

13. Figure 5 shows a battery connected in series with a 2.0Ω resistor.

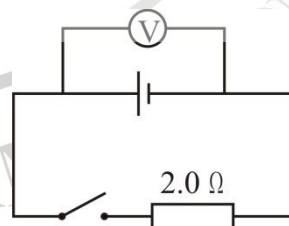


Figure 5

If the voltmeter reads 12 V when the switch is open and 8.0 V when the switch is closed, the internal resistance of the battery is

- 0.7 A
- 1.0 A
- 1.3 A
- 4.0 A



14. Figure 6 shows how the potential energy (V) of two molecules in a solid varies with their separation (x).

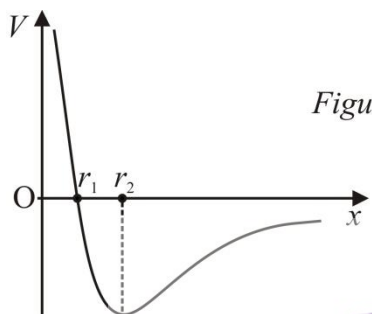


Figure 6

Which row in the following table correctly describes the force between the molecules?

	Attractive force	Repulsive force
A.	$x < r_1$	$x > r_1$
B.	$x < r_2$	$x > r_2$
C.	$x > r_1$	$x < r_1$
D.	$x > r_2$	$x < r_2$

15. A metallic wire is stretched with variable loads within the limit of elasticity. Which of the following will give the Young modulus of the metal?
- The area under the force-extension graph
 - The slope of the force-extension graph
 - The area under the stress-strain graph
 - The slope of the stress-strain graph
16. The half-life of iodine-131 is 8 days and it decays by beta emission. The activity of a certain sample of this isotope is measured to be 64 Bq. Identify the **wrong** statement among the following.
- As time goes by, the number of iodine-131 atoms in the sample also reduces.
 - It takes 8 days for the activity of the sample to reduce to 32 Bq.
 - After 40 days, the activity of the sample becomes 4 Bq.
 - If the number of iodine-131 atoms in the sample increases, the half-life also increases.
17. The wavelengths of two electromagnetic radiations, X and Y are 124 nm and 621 nm respectively in a vacuum. Identify the **correct** statement among the following.
- A photon of X is more energetic than a photon of Y.
 - Both X and Y fall within the visible section of the electromagnetic spectrum.
 - Y has a higher frequency than X.
 - Y can be polarised while X cannot.
18. The 'second' hand of a clock has a length of 1.5 cm. How fast does the tip of the 'second' hand move?
- 1.1 mm/s
 - 1.6 mm/s
 - 2.5 mm/s
 - 25 mm/s
19. In figure 7, two extremely long parallel wires X and Y are carrying currents of 3.0 A and 5.0 A respectively. The force per unit length on wire X has a magnitude of $3.0 \times 10^{-6} \text{ N m}^{-1}$ directed to the right.

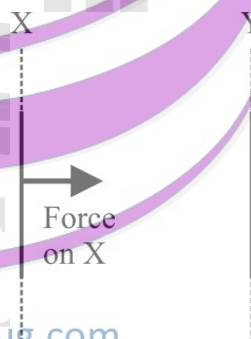


Figure 7

The force per unit length experienced by wire Y is

- $5.0 \times 10^{-6} \text{ N m}^{-1}$ directed to the right
 - $3.0 \times 10^{-6} \text{ N m}^{-1}$ directed to the right
 - $5.0 \times 10^{-6} \text{ N m}^{-1}$ directed to the left
 - $3.0 \times 10^{-6} \text{ N m}^{-1}$ directed to the left
20. A 25Ω resistor, a 10 mH inductor and a $25 \mu\text{F}$ capacitor are connected in series with a variable a.c. voltage source. At resonance, the total impedance in the circuit is
- 8.9Ω
 - 15Ω
 - 25Ω
 - 90Ω



21. Figure 8 shows the trajectory of a projectile fired from the ground at a velocity of 39.2 m s^{-1} directed at an angle of 30° above the horizontal ground.

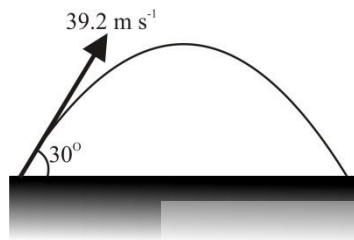


Figure 8

Three seconds into its motion, the velocity of the projectile will be

- A. 19.6 m s^{-1} upwards
B. 9.83 m s^{-1} upwards
C. 19.6 m s^{-1} downwards
D. 9.83 m s^{-1} downwards
22. The entropy of the universe increases in all natural processes. This is a statement of
- A. The zeroth law of thermodynamics
B. The first law of thermodynamics
C. The second law of thermodynamics
D. The law of conservation of energy

23. In which of the following mediums does light move at the highest speed?
- A. Glass
B. Water
C. Air
D. Vacuum

24. In figure 9, the magnet is slowly removed from the coil such that the voltmeter shows a steady reading of $1.2 \times 10^{-4} \text{ V}$.

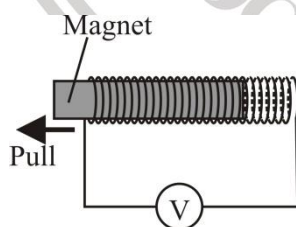


Figure 9

If the coil has 60 turns, then the magnetic flux cuts through the coil at a rate of

- A. $2.0 \times 10^{-6} \text{ Wb s}^{-1}$
B. $5.0 \times 10^5 \text{ Wb s}^{-1}$
C. $1.7 \times 10^{-3} \text{ Wb s}^{-1}$
D. $2.0 \times 10^6 \text{ Wb s}^{-1}$



25. Two charged particles are placed some distance apart in a vacuum. Which of the following will independently double the size of the electric force between them?

- A. Doubling the distance between the particles
B. Halving the distance between the particles
C. Doubling the charge on one particle
D. Doubling the charge on each particle

26. A thermometer that can measure very small changes in temperature is said to be

- A. accurate
B. sensitive
C. reproducible
D. quick

27. In figure 10, C is a joint in a lagged composite bar AB. The bar consists of two rods AC and CB of the same length and thickness whose thermal conductivities are respectively in the ratio 2:3.



Figure 10

What is the junction temperature at C?

- A. 55°C
B. 60°C
C. 62.5°C
D. 75°C

28. In figure 11, the motion of the engine piston between M and N is simple harmonic motion. The piston frequency is 50.0 Hz .

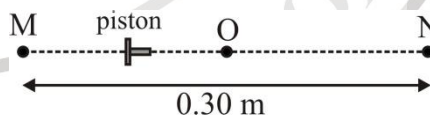


Figure 11

When the piston is at the midpoint O, its velocity and acceleration are

	Velocity/ m s^{-1}	Acceleration/ m s^{-2}
A.	47.1	0
B.	0	1.48×10^4
C.	94.2	0
D.	0	14.8

29. P and Q are two objects moving towards each other along a straight line as shown in *figure 12*. The magnitudes of their momentum are 22.5 kg m s^{-1} and 10.5 kg m s^{-1} respectively.

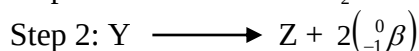
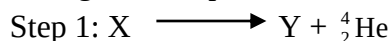


Figure 12

If the objects stick together after collision, their final momentum will be

- A. 33.0 kg m s^{-1} to the right
 B. 33.0 kg m s^{-1} to the left
 C. 12.0 kg m s^{-1} to the right
 D. 12.0 kg m s^{-1} to the left
30. An iron-cored 16 mH inductor of negligible resistance is connected in series with a switch, a 4.0 V battery of negligible internal resistance and a 3.2Ω resistor. As soon as the switch is closed, the current in the circuit grows at a rate of
- A. 0
 B. 1.3 amperes per second
 C. 110 amperes per second
 D. 250 amperes per second
31. Neptune has a radius of 24600 km and a gravitational field intensity of 11.0 m s^{-2} at its surface. A piece of rock sample on the surface of Neptune has a mass of 2.00 kg . For this rock sample to completely leave the gravitational field of Neptune, it must be given a kinetic energy of
- A. 541 MJ
 B. 200 MJ
 C. 271 MJ
 D. 155 MJ
32. Identify the **incorrect** statement among the following about a couple acting on an object.
- A. Their resultant is zero
 B. The force pair may have different magnitudes
 C. Their lines of action are always parallel to each other
 D. They tend to produce a rotation on the object on which they act.

33. A nuclide (X) decays to another one (Z) through two steps:



Identify the **CORRECT** statement among the following.

- A. X and Z are isotopes
 B. X and Z have the same nucleon number
 C. Y and Z are isotopes
 D. Proton number of X is greater than that of Z by 2
34. An electron beam passes undeflected through a region in which mutually perpendicular electric and magnetic fields of magnitude 10^6 V m^{-1} and 0.02 T respectively exist. The velocity of an electron in the beam is
- A. $3.0 \times 10^6 \text{ m s}^{-1}$
 B. $5.0 \times 10^4 \text{ m s}^{-1}$
 C. $1.0 \times 10^7 \text{ m s}^{-1}$
 D. $5.0 \times 10^7 \text{ m s}^{-1}$
35. Which of the following operations involves the greatest power?
- A. A car moving against a resistive force of 0.4 kN at a speed of 20 m s^{-1}
 B. A crane lifting a load of 3.0 kN at a speed of 2.0 m s^{-1}
 C. A load being pulled across a horizontal surface at a speed of 6.0 m s^{-1} against a constant frictional force of 1.5 kN
 D. A crane lifting a load of 5.0 kN at a speed of 1.0 m s^{-1}

SECTION 2 (10 Questions)

Directions:

For each group of questions below, **ONE** or **TWO** of the responses given is/are correct.

CHOOSE:

- A. If 1 and 2 are correct
 B. If 2 and 3 are correct
 C. If 1 only is correct
 D. If 3 only is correct

Directions summarised			
A	B	C	D
1, 2 only	2, 3 only	1 only	3 only

Questions 36 – 45

36. If two objects (X and Y) are in thermal equilibrium, then

1. X contains the same quantity of heat as Y.
2. No heat flows between X and Y if they are placed in physical contact
3. X and Y have the same temperature

37. Figure 13 shows a network of three capacitors each having a capacitance of $5.0 \mu\text{F}$.

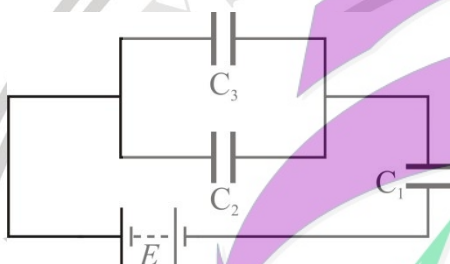


Figure 13

Which of the following statements is/are correct?

1. The total capacitance in the network is $7.5 \mu\text{F}$
2. The same quantity of charge is stored in each of the capacitors
3. The potential difference across C_1 is greater than the potential difference across C_2 .

38. In a Young's double-slit experiment

1. The central bright fringe will be white if white light is used
2. Bringing the source closer to the double slits increases the brightness of the fringes
3. Bringing the source closer to the double slits increases the fringe separation

39. Which of the following illustrates that light, an electromagnetic wave, also possesses particle-like characteristics?

1. Photoelectric effect
2. Electron diffraction
3. Polarisation of light



40. In figure 14, the planet takes 2 months to move from A to B and the same time from C to D.

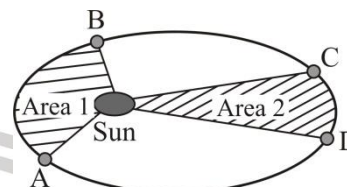


Figure 14

Which of the following statements is/are Correct?

1. The planet moves faster at D than at A.
2. Area 1 is equal to area 2.
3. The planet moves faster at A than at D.

41. An electric field is generated around

1. A charged particle at rest
2. A charged particle in motion
3. Any particle that has mass

42. Which of the following materials will become a better conductor of electricity when heated?

1. Copper
2. Iron
3. Silicon

43. Figure 15 shows how the displacement of a moving object varies with time.

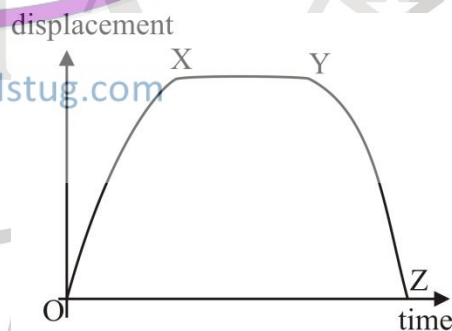


Figure 15

Which of the following is/are **correct** about the motion of the object?

1. Along YZ, the object is speeding up.
2. The slope at any point gives the velocity of the object.
3. Along XY, the object is moving at a constant non-zero speed

44. Suppose a light spring is loaded with a mass of 50 g and it extends by 10 cm, within limits of elasticity.

1. The spring constant is 4.9 N m^{-1}
2. If released, the mass oscillates at a period of 1.63 s
3. At the moment of release, the acceleration of the mass is zero

45. Figure 16 shows a potentiometer circuit at balanced point

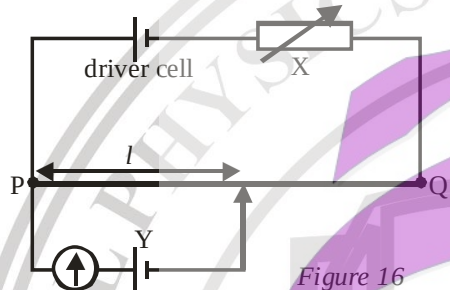


Figure 16

Identify the CORRECT statement (s) among the following

1. A balanced point can still be obtained if the terminals of Y are reversed.
2. The currents through the slide wire PQ and the cell Y are the same.
3. An increase in the resistance of X would require an increase in l to restore the balance

SECTION 3 (5 Questions)

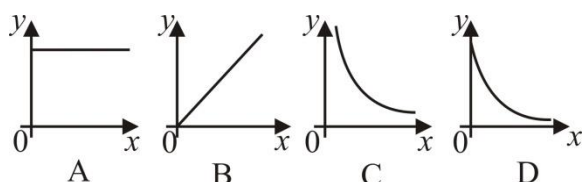
Directions:

Each of the questions has four sets of graphs labelled A to D. Which of the graphs in each question best fits the relationship between x and y ?

Questions 46 – 50

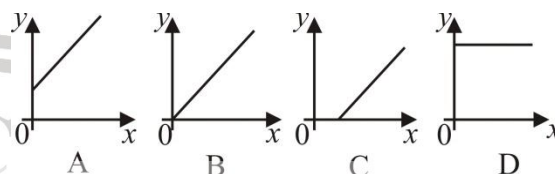
46.

y	x
Pressure of a fixed mass of gas at constant temperature	Reciprocal of the volume of the gas



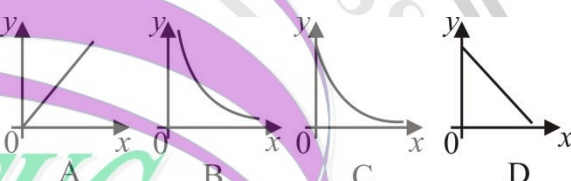
47.

y	x
Stopping potential of a metal	Frequency of electromagnetic radiation falling on it



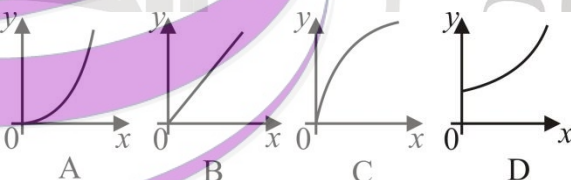
48.

y	x
The activity of a radioactive sample	Number of radioactive atoms in the sample



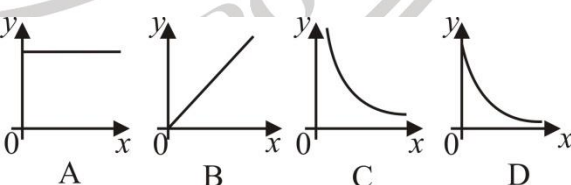
49.

y	x
Kinetic energy of a moving object	Velocity of the object



50.

y	x
The force on a beam of electrons moving perpendicularly in a magnetic field	Speed of the electrons



STOP
GO BACK AND CHECK YOUR WORK

