Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic: Fields And Their Consequences (Gravitational Field)

Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Mark Schemes

Q1.

(a) Gravitational field lines show the direction (and relative magnitude) of force on a mass (placed in the force field) ✔
Or
The direction a stationary/placed mass would (initially) move.

1

(b) (Lines are closer together so) the field is stronger ✔
(Material forming the Earth) at **K** has a high(er) density (than the surrounding material) ✔

*For second mark allow more mass at **K**.*
'Force is stronger' does not gain first mark.

2

(c) The ball will speed up/accelerate (when moving towards **K**) ✔
(because) the potential is lower at **K** ✔
Or
the angled field lines between **J** and **K** have a component towards the right ie towards **K**) ✔

2

(d) A gravitational field should only show attraction to a body / lines of force should only be going to an object / arrow heads (on the left) should point towards **L**. ✔ (owtte)

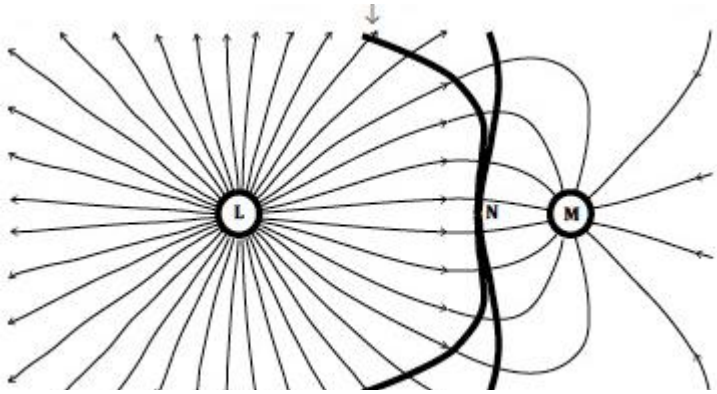
Reference to positive or negative almost always will lose the mark.

1

(e) object = L
object = L ✔

1

(f) The drawn line should approximately cross the field lines at right angles ✔



A mark is given if the line is symmetrical top to bottom and it bends to the left. ✔

First mark:

Only look at the 4 lines of force close to N. Essentially the range is from a vertical line to one that curves only slightly in order to cross the 4 field lines close to N at right angles. This mark can also be given if a right angle symbol appears on the diagram at any field crossing of the drawn line.

Second mark:

There must be some bending of the line to the left (beyond the 4 lines close to N) but no more than that indicated by the arrow above the diagram (For reference the range extends to the position of the second field line that is truncated)

So a very large circle centred on L and leaving the diagram might get 2nd mark but not the 1st.

A vertical line might get the 1st but not the 2nd.

A small circle around M will not score.

If multiple lines are drawn only mark the line that passes through N.

2

[9]

Q2.

(a) the work done per unit mass ✔

in moving from infinity to the point ✔

2

(b) Gravitational potential is defined as zero at ∞ ✔

(Forces attractive) so work must be done (on a mass) to reach ∞ (hence negative) ✔

2

(c) $V = -GM / r = 6.67 \times 10^{-11} \times 5.97\ 10^{24} / 6.37 \times 10^{6}$ ✔

$= -6.25 \times 10^{7}$ J kg^{-1} ✔

2

(d) in the plane of the equator

always above the same location on the earth

having the same period as the earth / 24 hours

✔✔any two lines

2

(e) $V = -GM / r = 6.67 \times 10^{-11} \times 5.97 \times 10^{24} / 4.23 \times 10^{7} = -9.41 \times 10^{6}$ J kg^{-1} ✔

$E_p = \Delta V \times m = = (6.26 - 0.94) \times 10^{7} \times 1200$ ✔

$= 6.38 \times 10^{10}$ J ✔

3

(f) radius must increase ✔

velocity gets smaller ✔

reference to R^3 is proportional to T^2 ✔

reference (from circular motion) v^2 is proportional to $1/r$ ✔

4

[15]